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MATERIA MEDICA, THERAPEUTICS, Etc.

MEDICAL PHARMACY, PRESCRIPTION-WRITING, AND MEDICAL LATIN.

A MANUAL FOR STUDENTS AND PRACTITIONERS.

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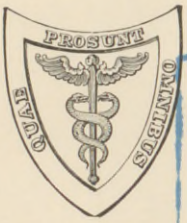

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PREFACE.

THIS volume is intended to afford a condensed yet comprehensive text-book and work of reference on Materia Medica, Therapeutics, and a range of cognate subjects which can be grouped with manifest advantage. In addition to the paragraphs covering the Physical Properties, Physiological Action, Therapeutics, and Toxicology of each medicinal agent, chapters will be found on Prescription-writing, Medical Latin, Medical Pharmacy, and Practical Anæsthesia. Tables of Doses, of Poisons and Antidotes, and of Incompatibilities, together with a Therapeutic Index of Diseases and Remedies and a General Index, conclude a volume which it is hoped may prove of service to practitioners as well as students. It contains in a concise, definite, and assimilable form the essential knowledge required in the most complete college courses on Materia Medica and Therapeutics.

Acknowledgment is due to Dr. L. F. Warner, of New York, whose excellent book has been freely used with his permission.

W. S.

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CONTENTS.

MATERIA MEDICA AND THERAPEUTICS.

Materia Medica is that branch of medical science which treats of *medicinal remedies*, their names, origin, chemical composition, physical peculiarities, methods of preparation, their mutual antagonism and synergism, and their physiological effects in medicinal and poisonous doses.

Therapeutics teaches of the uses of remedies in the various morbid conditions of the human economy.

Remedies may be divided into—

Hygienic, which are treated of exhaustively in works on this subject;

Mechanical, such as venesection, cupping, aspiration, infusion, transfusion, etc., which fall more appropriately within the realm of minor surgery;

Imponderable, as air, light, heat, cold, and electricity;

Pharmacological, or *drugs* properly so called, to which, strictly speaking, our field is limited: in this sense Pharmacology is synonymous with Materia Medica.

Pharmacy treats of the *art* of collecting, preparing, and dispensing medicines.

IMPONDERABLE REMEDIES.

LIGHT.

The effects of heat and light are hard to dissociate. **Light** is a stimulant to all vital functions, and its use is indicated whenever there is imperfect nutrition from any cause.

HEAT.

Like light, **heat** is a vital stimulus, a necessity to all organic life. Although the normal temperature of the body

is remarkably uniform (about 98.4° F.), yet, as is well known, man is able to bear exposure to great variations of heat and cold without harmful effect. We are not surprised, then, to find that most of the physiological effects of heat upon which depend its uses are of a *local* nature, not systemic. It is used as an *excitant*, *evulsive*, and *analgesic* over small areas, in the hot-water bottle, poultice, etc., and over large areas to produce vicarious eliminative action of the skin (diaphoresis) in certain conditions of imperfect kidney-elimination and in certain cutaneous affections. For this latter purpose a more general application is obtained by hot baths—hot-air or "Turkish" baths and hot-vapor or "Russian" baths. Dry heat is a most valuable resource in combating surgical shock. The Turkish bath consists in exposing the subject to a gradual increase of temperature from 95° to about 155° F.: an immensely increased activity of cutaneous circulation results, and consequently a corresponding diminution of that of internal organs. These baths are a valuable remedy in the conditions mentioned above, but may prove dangerous if the patient be the victim of extensive cardiac or arterial disorder.

Heat is also employed to the extent of actual tissue-destruction in *vesication* and *cauterization*. The thermo- and galvano-cauteries are exceedingly valuable as counter-irritant, revulsive, and hæmostatic measures.

Thermometric scales: The Fahrenheit scale is in ordinary use in America and England; the centigrade is used on the continent of Europe.

To convert degrees of the centigrade scale into those of Fahrenheit: Multiply the number of the former by 9 and divide by 5; if the temperature be above the freezing-point (0°), add 32; if it be below the freezing-point, subtract the result from 32, algebraically.

To convert degrees of the Fahrenheit scale into those of centigrade: If the temperature be above the freezing-point (32°), subtract 32; if it be below the freezing-point, subtract the number from 32, algebraically; then multiply the remainder by 5 and divide by 9.

COLD.

The effects of **cold** are *primary* and *secondary*. For the *primary* effects a considerable degree is required. Cold is efficient by lessening vascular and nervous excitement, constringing the tissues, lessening the actual volume of parts, and producing local anæsthesia. Cold is used in *nervous disorders*, as *meningitis*, *chorea*, *epilepsy*, *hysteria*, etc., generally as an application to head or spine—to *abate inflammatory processes* and *check hemorrhage* in a variety of conditions.

The *secondary* effects of cold are obtained by a lesser degree, but applied over a larger area, generally nearly the whole body-surface, as in the cold bath, wet pack, etc. They are useful as a *general tonic* in debilitated conditions; as a respiratory stimulant in the narcotic poisoning of opium, chloral, alcohol, chloroform, and ether; as *antipyretic* in the hyperpyrexia of insolation (sunstroke), rheumatism, typhoid and other continued fevers.

Action of hot and cold applications to the spine: It is supposed that *heat causes stimulation*, and *cold*, *paresis*, of the vaso-motor nerves of the parts of the body deriving their vaso-motor supply from the section of the spinal cord over which the application is made (Chapman).

ELECTRICITY.

Electricity is used in medicine for its *therapeutic* effect, as well as for purposes of *diagnosis* and *prognosis*. *Two currents* are used, the *primary* or *galvanic* and the *induced* or *faradic*, the battery furnishing the current being supplied with a *positive* pole, or *anode*, and a *negative* pole, or *cathode*. When the electrical current is passed through a muscle it causes contraction of the latter, the greatest contraction resulting if the current be applied directly to the *motor point*, or place where the motor nerve enters the muscle. As a muscle degenerates it loses its electro-contractility, the response to the faradic current disappearing first, while the galvanic current produces contraction for some time longer, until finally no current will produce any effect. The con-

traction occurs at the moment of making or breaking the circuit; slow interruptions bring about alternate contraction and relaxation, while very frequent interruptions throw the muscle into a condition of spasm. The constant current produces no contraction while it is flowing through the muscle. If a current of sufficient strength be used, and the positive pole, or anode, is placed over the muscle at any other than its motor point, a contraction occurs when the circuit is closed, and a slighter one when the current is opened; if the cathode, or negative pole, be applied, a greater contraction occurs than with the anode. This refers to *normal* muscle. When the muscle degenerates, at first both poles cause a similar contraction, and later on the anode produces the greater, so that the original order is reversed; at last no current produces any response. The following *formulæ* are used to denote these *reactions* of *degeneration:*

$$\left.\begin{matrix} \text{AnClC} < \text{CaClC} \\ \text{AnOC} > \text{CaOC} \end{matrix}\right\} \text{reaction of } \textit{normal} \text{ muscle;}$$

$$\left.\begin{matrix} \text{AnClC} = \text{CaClC} \\ \text{AnOC} = \text{CaOC} \end{matrix}\right\} \text{first stage of degeneration of } \textit{muscle;}$$

$$\left.\begin{matrix} \text{AnClC} > \text{CaClC} \\ \text{AnOC} < \text{CaOC} \end{matrix}\right\} \text{advanced degeneration of } \textit{muscle.}$$

AnClC and AnOC stand for anodal closing contraction and anodal opening contraction; CaClC and CaOC for cathodal closing contraction and cathodal opening contraction; the sign $<$ is "less than"; $>$ is "greater than".

Electricity-therapeutics: Electricity is used in palsies, neuralgia, rheumatism, and anæsthesias, and as a tonic. In *functional palsies*, such as those due to various poisons (tobacco, mercury, arsenic, lead), the electric treatment is very useful; in *organic palsies*, due to hemorrhage into the brain or cord, electricity simply elevates the tone of the muscle, but cannot influence the paralysis. In *organic palsies with inflammation* the current does harm. In general, the current selected in the treatment of paralysis should be the one giving the greatest amount of contraction with the least amount of

pain. In *anæsthesias* the dry brush should be used, as it is the most painful ; in *neuralgias*, the mild galvanic ; in *rheumatism*, the mild faradic. As a *tonic*, if the patient is confined to bed, electric excitation of each muscle takes the place of exercise.

MASSAGE.

Massage is a term used to designate methodical rubbing, kneading, and percussion of the body. The person practising massage is known as a *masseur* (male) or *masseuse* (female). Massage is performed by making regular movements from the extremities toward the centre of the body, in a way which can only be learned by special instruction and continued practice. It acts as a stimulant to both nerve and muscle and to many of the functions of the body, assisting the circulation and favoring the removal of waste-products. Massage is employed both for its *local* and *general* effect : in *paralyses ;* in *synovitis ; arthritis, sprains,* and *fractures ;* in *neuralgia ;* in *chronic constipation* (abdominal massage) ; in *pelvic disorders* of women (pelvic massage). In the "rest-cure" (S. Weir Mitchell) it is combined with isolation, rest, forced feeding, and faradism. It is also useful for its general effect in *neurasthenia, nervous prostration,* and *hysteria.*

PHARMACOLOGICAL REMEDIES.

Drugs—action of: Drugs may act (1) *locally*, usually from some direct chemical effect on tissues ; (2) *constitutionally* (systemically or remotely), for which it is necessary that they should be absorbed by the capillaries and lymphatics into the blood, often undergoing chemical changes in the process. The process of absorption is generally proved by finding traces of drug-elements in the blood, tissues, and secretions, and also by the fact that if the circulation be interrupted the influence of drugs is not transmitted.

Circumstances modifying the activity of drugs : Diversity of action may depend *on the drug itself* as modified by season, climate, etc. ; on the pharmaceutical preparation used : as the

solubilities of the active principles of the same drug may vary, it is evident that their activity will vary with the solvent used (vide *Digitalis*, its tincture and infusion); again, liquid preparations are more potent than solid; *on chemical* or *physiological antagonism* or *synergism* of drugs taken at or about the same time; on *age* and *sex* of *patient:* females require proportionately smaller doses, unless we except cathartics; infancy and old age bear drugs poorly: however, there are certain drugs, notably belladonna, arsenic, quinine, aconite, and cathartics generally, which are borne by children in proportionately larger doses. *Young's rule* for graduating the dosage for children may be expressed thus: $\frac{\text{age}}{\text{age} + 12}$. *Cowling's rule* is to divide the age at next succeeding birthday by twenty-four.

On idiosyncrasy of patient: Some individuals are peculiarly susceptible, or the opposite, to certain drugs. Thus the administration of two grains of quinine to a very susceptible person may be followed in a short time by a severe attack of spasmodic asthma, accompanied by a very pronounced and distressing urticaria.

On habit: Certain forms of disease, time of administration regarding meals, and the condition of the stomach may all modify effects.

Drugs—avenues of introduction: (1) By the skin.

(*a*) *Enepidermatic*—application to skin *without friction:* absorption is more rapid if a liquid be used as solvent. It is not much used because of interference offered by the epidermis and secretions of the skin.

(*b*) *Epidermatic—with friction:* systemic effects may be produced, as is especially well seen in the inunction of the ointment or oleate of mercury, or of cod-liver oil in marasmic conditions.

(*c*) *Endermatic*—the application of a drug to a surface denuded of its epidermis by vesication: painful, and practically obsolete.

(2) By the mucous membranes:

(*a*) *Of gastro-intestinal tract*, the most usual method: perfect conditions for absorption are afforded either in the *acid*

secretion of the stomach or the *alkaline* of the small intestine. Also by *rectal enemata:* when absorption is desired, from f℥j to f℥iv of fluid should be injected: dosage by rectum is roughly about double that by mouth, or of narcotic drugs somewhat less than this. Medicinal and nutritive enemata are very valuable in cases of persistent vomiting from any cause, inability to swallow, or in *forced* feeding and stimulation. Enemata of defibrinated beef-blood have proved beneficial in *pernicious anæmia.*

(*b*) Absorption may also take place through the mucous membranes of the conjunctiva, nose, throat, bronchi, and genito-urinary tract.

(3) By the subcutaneous areolar tissue, principally by the hypodermic method: the usual sites of injection are the arm, thigh, and abdomen, and perfect asepsis is required to prevent infection. Under this subdivision may also be placed transfusion of blood and infusion of blood, milk, saline solutions, etc.

Drugs—preparations: These preparations may be solid, semi-solid, or liquid.

The **solid** preparations are as follows:

Abstracta (abstracts), alcoholic extracts diluted with lactose (milk-sugar), and representing twice the strength of the parent drug. No longer official.

Pulveres (powders), drugs in finely divided state, and rendered so by pulverization, precipitation, or elutriation; they are a suitable form for administration of drugs of pleasant taste and slight bulk, which are permanent in the atmosphere.

Extracta (extracts) are obtained by evaporating *liquid* preparations, as tinctures, infusions, or vinegars, to a solid or semi-solid consistency. Extracts of fresh drugs may be *alcoholic, acetic,* or *aqueous.*

Triturationes (triturations) are more finely divided than powders: strength, 10% in milk-sugar.

Pilulæ (pills) are small globular masses suitable for the exhibition of drugs which are insoluble in the ordinary solvents or offensive to taste, but not bulky.

Trochisci (troches, lozenges, tablets, or pastilles); *confec-*

tiones (confections); and *chartæ* (papers) complete the list of solid preparations.

Resinæ (resins) are made by precipitating with water, tinctures of drugs which owe their activity to resinous bodies.

Massæ (masses) are pill-masses kept on hand by the pharmacist.

The **liquid** preparations are—

Liquores (solutions) are made by dissolving *non-volatile* principles in *water*.

Aquæ (waters) are solutions of *volatile* principles in water.

Misturæ (mixtures) contain *insoluble* substances suspended in water by some viscid substance, as gum arabic, tragacanth, or sugar.

Tincturæ (tinctures), or solutions of the soluble principles of recognized drugs in *alcohol*, *ethereal spirit*, or *aromatic spirit of ammonia*, and known accordingly as *alcoholic*, *ethereal*, or *ammoniated* tinctures. As these menstrua evaporate readily, tinctures should be kept tightly corked, or they may become seriously increased in strength.

Infusa (infusions) contain the virtue of the drug as obtained by *digestion* or *maceration* in *cold* or *hot* (but not boiling) water; cold water is used when the active principles are affected by heat or are volatile. When boiling water is used we have a *decoction* (decoctum).

Emulsiones (emulsions) are aqueous liquids containing oil or resin in suspension.

Glycerita (glycerites) are solutions of medicinal principles in glycerin.

Elixiria (elixirs) are sweetened liquids of pleasant flavor containing some alcohol, and are intended mainly as vehicles.

Mucilagines (mucilages) are liquids containing some gummy substance in solution or suspension.

Collodia (collodions) are intended for external use, and contain gun-cotton in solution in a mixture of ether and alcohol.

Spiritus (spirits) are *alcoholic solutions* of *volatile* substances, bearing much the same relations to tinctures that aquæ do to liquores.

Vina (wines) are solutions of medicinal principles in stronger white wine.

Aceta (vinegars) are solutions of medicinal principles in dilute acetic acid.

Mellita (honeys) are preparations containing drugs held suspended or dissolved in honey.

Syrupi (syrups) are preparations of medicinal substances in concentrated solutions of sugar. *Syrupus* (*simplex*) is composed of 65 parts of sugar heated with sufficient water to make 100 parts. Flavoring and medicated *syrups* contain other agents in addition.

Extracta Fluida (fluid extracts) are very convenient preparations, produced by *partial* evaporation of *solutions* of *active principles* in *alcohol* or *diluted alcohol.* One minim represents one grain of drug (1 c.c. = 1 Gm.).

Oleoresinæ (oleoresins) are extracts of *crude* drugs made with ether, and are composed of *fixed* or *volatile oils holding resins in solution:* they are liquids and self-preserving. The ether is separated by distillation.

The **semi-solids** are—

Suppositoria (suppositories), which are mixtures of medicinal agents in cacao-butter, melting at the body-temperature in rectum, vagina, or urethra.

Unguenta (ointments), which are preparations of agents for local use in some fatty substance, generally benzoinated lard, or in petrolatum.

Oleata (oleates) are *combinations* of *metallic bases* or alkaloids with *oleic acid.*

Cerata (cerates) are ointments to which enough white wax or spermaceti is added to render them still solid at the body-temperature.

Linimenta (liniments) are alcoholic or oily preparations, *always liquid at body-heat,* and intended to be *applied with friction.*

Emplastra (plasters) are *adhesive* at body-heat; made in different ways, but often have as a basis lead plaster, a compound of olive oil and litharge (lead oleate).

WEIGHTS AND MEASURES.

In the United States, Troy or Apothecaries' Weight is still used most extensively, although the metric system is gradually coming into vogue. The Pharmacopœia has adopted the latter for its formulæ.

Troy, or Apothecaries', Weight.

20 grains (gr.)	= 1 scruple (℈)	= 20 grains.
3 scruples	= 1 drachm (ʒ)	= 60 "
8 drachms	= 1 ounce (℥)	= 480 "
12 ounces	= 1 pound (℔)	= 5760 "

Wine, or Apothecaries', Measure.

60 minims (♏)	= 1 fluidrachm (fʒ).
8 fluidrachms	= 1 fluidounce (f℥).
16 fluidounces	= 1 pint (O).
2 pints	= 1 quart.
4 quarts	= 1 gallon (Cong., C) = 231 cubic inches.

Avoirdupois Weight.

1 ounce (av. oz.)	= 437.5 grains.
16 ounces	= 1 av. lb. (abbrev. lb.).
1 pound	= 7000 grains.

The Troy weight is used in the compounding of prescriptions, the Avoirdupois weight is in ordinary use generally, and the Wine measure is used for measuring liquids in pharmaceutical work. In this country *liquids* are *measured* and *solids* are *weighed*.

The Troy and Avoirdupois *pounds* are abbreviated in the same manner, lb., but differ in the number of grains contained (5760, 7000). The Troy pound is used very rarely. The scruple (℈) is becoming obsolete; it is just as convenient to write for 20 grains, and the abbreviation for scruple may be mistaken for a carelessly written drachm mark.

The older systems were based on the *grain*, originally a *grain* of *wheat*, taken from the centre of the ear.

Metric System.

Myriameter	(Mm.)	10,000	Myrialiter	(Ml.)	10,000	Myriagramme	(Mg.).
Kilometer	(Km.)	1,000	Kiloliter	(Kl.)	1,000	Kilogramme	(Kg.).
Hectometer	(Hm.)	100	Hectoliter	(Hl.)	100	Hectogramme	(Hg.).
Decameter	(Dm.)	10	Decaliter	(Dl.)	10	Decagramme	(Dg.).
Meter	(m.)	1	Liter	(l.)	1	Gramme	(Gm.).
Decimeter	(dm.)	$\frac{1}{10}$	Deciliter	(dl.)	$\frac{1}{10}$	Decigramme	(dg.).
Centimeter	(cm.)	$\frac{1}{100}$	Centiliter	(cl.)	$\frac{1}{100}$	Centigramme	(cg.).
Millimeter	(mm.)	$\frac{1}{1000}$	Milliliter	(ml.)	$\frac{1}{1000}$	Milligramme	(mg.).

The Latin prefixes represent its subdivisions; the Greek prefixes, its multiplications.

The units of the metric or decimal systems are: 1, the *meter*, the measure of length, the $\frac{1}{40}$ millionth part of the earth's circumference; 2, the *liter*, or measure of *capacity*, the cube of $\frac{1}{10}$ meter; 3, the *gramme*, the *weight* of 1 cubic centimeter of water at 4° centigrade.

The subdivisions used in medicine are the centimeter (cm.), the millimeter (mm.), and occasionally the micromillimeter, or the $\frac{1}{1000}$ part of a millimeter (mkm., used in microscopic work); the liter (l.) and cubic centimeter (c.c.); the gramme (Gm.), the centigramme (cg.), and the milligramme (mg.); the kilogramme, or kilo (Kg.), is used in commercial transactions.

The equivalents of the metric system in inches, grains, and liquid measure are: *meter* = 39.37 in.; the centimeter is therefore almost .4 inch, or we may estimate $2\frac{1}{2}$ centimeters to the inch; the *liter* measures 2.113 pints, or a little over a quart; there are approximately 30 c.c. in the fluid-ounce; the *gramme* weighs 15.432 grains, variously estimated at either 15 or 16 grains.

Comparative equivalents of Troy and metric weights: A *gramme* is practically equivalent to 15 grains: ℥j therefore = Gm. 4.; f℥j = 30 c.c. Bearing these few points in mind, transposition from one system to the other is readily done. Thus, reduce the quantity to grains and *divide* by 15, the quotient representing, approximately, the quantity in grammes. Or reduce to drachms and *multiply* by 4. The terms decagramme, hectogramme, and kilogramme are seldom used in prescribing, their equivalent being expressed in Gm.: thus

Gm. 10, Gm. 100, etc.; for subdivision, Gm. .1, Gm. .01, Gm. .001, etc.

Drops (guttæ, *gtt.*) are usually regarded as equal to minims, but vary with a number of conditions: of *tinctures*, for the most part, a fluidrachm contains about 120 drops, or *2 drops to the minim*, while an equal amount of chloroform contains over 200. In prescribing less powerful liquids a *teaspoonful* is roughly used as equalling f℥j; but it is safer to consider *six teaspoonfuls to the* f℥j; a tablespoonful for f℥ss; a wineglassful for f℥ij; a teacupful for f℥iv. It is much safer to rely on the accurately *graduated medicine-glasses* now furnished by all druggists.

PRESCRIPTION-WRITING.

A complete prescription consists of the *Superscription*, or heading; the *Inscription*, or names of the ingredients; the *Subscription*, or directions to the compounder; the *Signa* or *Signatura*, the directions to the patient; the *name* of the *physician*, the *name* of the *patient*, and the *date*. Latin is preferred in the writing of prescriptions for the same reasons which commend its use in the naming of pharmacopœial drugs and compounds in general—viz., the terms are distinctive, not subject to change, and mean the same in all civilized countries; occasionally they are useful in withholding the names of drugs from the patient. The superscription consists of the abbreviation ℞, for "recipe," with a terminal stroke on the R, which survives as a remnant of the sign of Jupiter, ♃, formerly preceding all medical formulæ as an invocation to the deity. Literally translated "take thou," or "take," it tells the pharmacist to compound the ingredients which follow. These are invariably in Latin, the quantities following on each line, indicated by the customary abbreviations. Thus: gr. for granum, plural grana, grain or grains; ℈ for scruple (scrupulus); ʒ for drachm (drachma); ℥ for ounce (uncia); and O for pint (octarius). The abbreviations lb. for pound (libra) and Cong. for gallon (congius) are more rarely used. ♏ stands for minim (minimum); and the liquid

drachms and ounces are indicated by the prefix f, thus f℥j, f℥j. The metric weights and measures are expressed in decimals in *Arabic* numerals, followed or preceded by c.c. or Gm., signifying measure or weight (10.50 c.c., 5.125 Gm.). A prescription written with the Troy system of weights always contains *Roman* numerals: gr. iv, gr. xlviii, etc.

Examples of prescriptions:

For Mr. ———

℞ Plumbi acetatis, Gm. 4.
Tincturæ opii, c.c. 45.
Aquæ, quantum sufficit ad c.c. 500.
M.

Sig.—For external use.

2. 4. '99. *Dr.* ———

For Mrs. ———

℞ Sodii bicarbonatis,
Sodii boratis, āā ℥j.
Acidi carbolici, ♏ xxx.
Glycerini, f℥j.
Aquæ, Oij.
M.

Sig.—Use as a spray.

2. 4. '99. *Dr.* ———

For Baby ———

℞ Hydrargyri chloridi mitis, 0.35.
Sodii bicarbonatis, 3.00.
M. Fiant tabellæ No. xxiv.

Sig.—One tablet every hour until eight have been taken.

2. 4. '99. *Dr.* ———

For Mr. ———

℞ Aloini, gr. v.
Extracti Belladonnæ, gr. iv.
Strychninæ sulphatis, gr. ss.
M. Divide in pilulas No. xxiv.

Sig.—One pill at bedtime.

2. 4. '99. *Dr.* ———

The complete **inscription** is made up of the *basis*, or main medicinal ingredient; the *adjuvant*, or aid to the basis; the *corrective*, or agent to counteract or correct some unpleasant action of the basis; and the *vehicle* or *diluent* (excipient, if the prescription calls for pills), which serves to dilute and present the whole in as pleasant a combination as possible. Most prescriptions do not contain all of these ingredients; many call for but one. The names of the drugs are abbreviated. If written out in full, the quantities would be in the accusative, the names of the ingredients in the genitive, case.

The **subscription**, or directions to the pharmacist, is simple, consisting of M. for "misce," S. for "solve," etc.

The **signa**, signatura, or the directions to the patient, abbreviated *Sig.*, are always written in English, to lessen the chance of mistake. There is every reason why the patient should be able to read this part of the prescription, and great importance attaches to the careful wording of this part of the formula. It is careless and often dangerous to write "Use as directed," but the directions should be as clear and concise as possible. The *name* of the *patient* properly appears at the top of the formula, particularly when several patients are prescribed for in the same house. The name of the physician and the date are added below.

The **order** usually adopted in writing prescriptions is as follows: The names of the ingredients are first produced, in the order of their importance; the number of doses is next decided upon, and the individual dose of each drug multiplied by the number of doses and the quantities affixed to the names of the ingredients. The character of the combination influences the number of doses—*e. g.*, a cough-mixture is

usually given at frequent intervals, while a laxative in many instances requires but one dose daily. In selecting the proper quantity for liquid mixtures the regular sizes of vials alone are considered. These are of ½, 1, 2, 3, 4, 6, 8, 16 ounces capacity, and it should be remembered that in all cases a bottle should be filled. A partially filled vial immediately excites a patient's suspicion as to the possibility of mistake on the part of prescriber or compounder. In ordering pills or powders even numbers—12, 24, 32—are found convenient; in metric formulæ decimal subdivisions are useful.

The **rules of Latin grammar** particularly applicable to prescription-writing are: The *quantities* of the ingredients appear in the *accusative* case, governed by the imperative "Recipe"; they are seldom produced in full. The names of the ingredients appear in the *genitive* case, the construction reading "Recipe drachmam unam Acidi Borici," take one drachm of Boric Acid, ℞ Acidi Borici, ʒj. The directions to the compounder are very simple: M. for "misce," S. for "solve," "M. Ft. pil. No. xxiv," "Misce. Fiant pilulæ No. xxiv." The directions to the patient are in English. All nouns ending in *a* form a genitive *æ*, and are of the first declension; the accusative ends in *am* and the nominative plural in *æ; exceptions*, Physostigma, Aspidosperma, Theobroma, enema, gargarisma, gramma (of Greek derivation); these form a genitive of *atis*. Nouns terminating in *us* are of the second declension, and change to *i* for the genitive, *um* for the accusative, singular number; *i* for the nominative plural; *exceptions*, a few nouns of the fourth declension, fructus, Cornus, Quercus, and spiritus (these do not change in the genitive). Rhus becomes Rhoïs. Those nouns ending in *um* are neuter in gender and of the second declension. They change to *i* for the genitive, *um* for the accusative, *a* for the nominative plural. All other pharmacopœïal nouns belong to the third declension and change variously. Thus: *as* becomes *atis; is* may become *is, idis, itis, eris*, for the genitive; the accusative of *as* becomes *am*, the nominative plural *ates*. So much variety exists that the nouns must be studied individually. Sassafras, Kino, Cusso, Matico, Buchu, Catechu do not change. Adjectives agree with their nouns in num-

ber, gender, and case; those ending in *us* take on the termination *a* for the feminine and *um* for the neuter gender, and are declined according to the first and second declensions.

Adjectives ending in *is* and *ens* are declined according to the third declension; the first takes on the termination *e* for the neuter gender.

A few nouns of Greek origin end in *ë*, and form a genitive of *ës* and an accusative of *ën*, Aloe, Aloës, Mastiche, Mastichës.

Pills, capsules, and **powders** may be indicated in the subscription as follows: Fiat pulvis. *Dispensa tales doses No. xij:* "Let a powder be made. Dispense 12 such powders." *Divide in chartulas No. xij:* "Divide *into* 12 powders." *Dispensa in capsulis:* "Dispense in capsules." *Fiant pilulæ No. xij:* "Let 12 pills be made." *Fiat massa in pilulas No. xij dividenda:* "Let a mass be made which is to be divided into 12 pills."

Again, an **official formula** may be specified as follows: ℞ Pilulas Aloës et Mastichës No. xij: "Take 12 pills of Aloes and Mastiche." Or, the formula for a *single* pill may be written and then the order given to compound a certain number: Fiat pilula. Dispensa tales pilulas No. xij.

The **prepositions** most frequently employed are: *ana*, abbr. *āā*, "of each" (Greek, genitive case); *in*, "in," governing accusative case when it means *into*, otherwise followed by ablative case; *cum*, "with" (ablative); *ad*, "to," "up to" (accusative).

The most commonly occurring **nouns, verbs,** and **phrases** and their abbreviations comprise the following groups:

Nouns:

Centimetrum cubicum (c.c.), a cubic centimeter;
Charta, æ (chart.), a small paper;
Cibus, i (cib. or c.), food;
Cochlear, aris (coch.), } a spoonful;
Cochleare, aris (coch.), }
Cochleare magnum (coch. mag.), } a tablespoonful = f℥ss;
Cochleare amplum (coch. ampl.), }
Cochleare medicum (coch. med.), } a dessertspoonful = f℥ij;
Cochleare modicum (coch. mod.), }

Cochleare parvum (coch. parv.), a teaspoonful = f℥j;
Collyrium, ii (collyr.), an eye-wash;
Congius, ii (Cong.), a gallon;
Cyathus, i (cyath.), a glass;
Decoctum, i (decoct.), a decoction;
Dosis, is (dos.), a dose;
Drachma, æ (ʒ), a drachm;
Fluidrachm, æ (fʒ), a fluidrachm;
Fluiduncia, æ (fȝ), a fluidounce;
Gargarisma, atis (garg.), a gargle;
Gramma, atis (Gm.), a gramme;
Granum, i (gr.), a grain;
Gutta, æ (gtt.), a drop;
Haustus, i (haust.), a draught;
Infusum, i (inf.), an infusion;
Lagena, æ (lag.), a bottle;
Libra, æ (lb.), a pound;
Manipulus, i (manip.), a handful;
Massa, æ (mass.), a mass;
Mica panis (mica pan.), crumb of bread;
Minimum, i (♏), a minim;
Mistura, æ (mist.), a mixture;
Octarius, ii (O), a pint;
Pilula, æ (pil.), a pill;
Poculum, i (poc.), a cup;
Pulvis, eris (pulv.), a powder;
Scatula, æ (scat.), a box;
Scrupulus, i (℈), a scruple;
Spiritus, us (spir.), a spirit;
Tabella, æ (tab.), a tablet;
Uncia, æ (℥), an ounce.

Adjectives and participles:

Bulliens, entis (bull.), boiling;
Colatus, a, um (col.), strained;
Contusus, a, um (cont.), ground;
Dividendus, a, um (gerund. divid.), to be divided, being divided.

Exactus, a, um (exact.), accurate;
Semis, ss, a half;
Talis, such, like this.

Prepositions and adverbs:

Ad (acc.), to, up to;
Ana (āā, gen.), of each;
Ante (acc.), before;
Bene, well;
Cum (abl.), with;
Guttatim (guttat.), by drops;
In (acc.), into;
In (abl.), in;
Numero (no.), by number;
Per (acc.), through, by;
Post (acc.), after;
Pro (abl.), for;
Secundum (acc.), sec. according to;
Statim (stat.), immediately.

Verbs:

Adde (addere), add;
Bulliat, bulliant (bullio), let it, let them, boil;
Capiat, let him take;
Da (dare), give;
Detur (dentur), let there be given;
Divide (dividere), divide;
Dividatur (dividere), let it be divided;
Dividendus (gerund.), to be divided;
Fac (facere), make;
Fiat (fieri), let it be made;
Fiant (fieri), let them be made;
Filtra (filtrare), filter;
Misce (M., miscere), mix;
Recipe (℞, recipere), take;
Solve (S., solvere), dissolve;
Sufficit (sufficere), it suffices;
Tere (tereo), rub.

CLASSIFICATION OF DRUGS.

Some classification of medicinal agents seems necessary, but, owing to the great variety of effects and uses of certain individual remedies, no satisfactory arrangement is possible. Various groups, as antispasmodics, anæsthetics, somnifacients, delirifacients, cardiac stimulants and depressants, etc., to be later defined, are recognized. Our purpose will be to treat of each drug in that class in which it finds its chief efficiency, and to mention it in its other less important therapeutical associations.

ANTISPASMODICS.

Antispasmodics are a class of drugs whose physiological effects are not pronounced, acting in some unexplained manner on the cerebrum, and especially valuable in neurotic conditions, as hysteria, "nervousness," etc. They are all stimulant and diaphoretic, and most of them have a strong, peculiar odor.

CAMPHORA, *U. S.* (Camphor), $C_{10}H_{16}O$ = 151.66.

Origin and properties: Camphor is a stearopten (having the nature of a ketone) obtained from the *roots* and *branches* of *Cinnamomum Camphora* (nat. ord. Laurineæ), or camphor laurel, an Asiatic tree, and purified by sublimation. It occurs in soft, rather consistent pieces, of hot and peculiar taste and cooling after-taste, and of characteristic odor. It is *volatile*, burns with a very smoky flame, floats on water, in which it is quite insoluble and by which it is precipitated from its solutions in alcohol, ether, chloroform, and oils. Chemically, it resembles the turpentines, and forms substitution-products with the chlorine group.

Preparations and doses: Camphora, dose gr. v–xv; best given in emulsion or pill.

Camphora Monobromata (see below), dose gr. v.

Aqua Camphoræ (.8%), dose f℥ss–ij.

Spiritus Camphoræ (10%), dose ♏xx–xl.

Linimentum Camphoræ, 20% in olive oil,
Ceratum Camphoræ (2%),
Linimentum Saponis,
} external use.

Physiological action: Camphor is much more active than other members of this group. Locally, it is an *irritant* to skin and mucous membranes, producing superficial inflammation of the former, and, when swallowed, symptoms of irritant poisoning; it is mildly diaphoretic, stimulant to circulation in medicinal, and depressing in larger, doses. Nervous system—small doses exhilarate, larger doses cause headache, dizziness, delirium, and epileptiform convulsions, while toxic doses produce convulsions, stupor, and coma. Upon the genito-urinary tract moderate doses exert a *sedative effect*, while larger doses seem to stimulate.

Therapeutics: In *hysteria*, *melancholia*, *nervous headache*, and *dysmenorrhœa* as a sedative; in *typhoid* and *adynamic fevers* as a stimulant diaphoretic; in *diarrhœa*, *dysentery*, *cholera*, etc., generally combined with opium; in *chronic bronchitis* and *emphysema*, acting as a blennorrhetic and antispasmodic; to allay irritation of the genito-urinary tract, as in *priapism*, *chordee*, *nymphomania*, *dysmenorrhœa*, etc., in which large doses are necessary; *acute coryza* in its incipiency may be aborted by camphor.

Its external applications are valuable mild counter-irritants.

Camphorated Oil (Oleum Camphoratum) is a solution of camphor in cotton-seed oil or other fixed oil. Ten or twenty minims of a 10% solution may be given hypodermically in the heart-failure of pneumonia, typhoid fever, etc. In this form it is a rapidly acting cardiac stimulant.

Acidum Camphoricum (Camphoric Acid) occurs in small white scaly crystals, freely soluble in hot water and alcohol; sparingly soluble in cold water. It is very effective in controlling the *night-sweats* of *phthisis*, and has been found serviceable in ammoniacal cystitis. It is made by boiling camphor with nitric acid. Dose gr. x–xxx, best given in capsules.

Oleum Camphoræ (Oil of Camphor) consists of a terpene

containing some camphor and *safrol* in solution; the latter imparts to it an odor suggesting oil of sassafras. Oil of camphor is obtained as a by-product in the manufacture of camphor; its action is similar to that of oil of turpentine modified by the small amount of camphor it contains.

Camphora Monobromata, U. S. (Monobromated Camphor), $C_{10}H_{15}BrO$, is camphor in which one atom of hydrogen is replaced by bromine. It occurs in colorless crystals or scales, freely soluble in alcohol, and combines the sedative action of the bromides and camphors. Dose gr. v, in *nervous excitement;* it is particularly useful in spermatorrhœa.

SPIRITUS ÆTHERIS COMPOSITUS, *U. S.* (Compound Spirit of Ether; Hoffman's Anodyne).

Ingredients and properties: Hoffman's anodyne is composed of *oleum ætherum*, 2½%; ether, 32½%, in alcohol. It owes its activity to the first two. *Oleum ætherum*, or heavy oil of wine, is obtained by distilling alcohol with an excess of sulphuric acid, and adding an equal amount of ether to the distillate: it is antispasmodic, but is only used in the above preparation. *Hoffman's anodyne* is a colorless, volatile, inflammable liquid, of ethereal odor and burning but sweetish taste, and giving when mixed with water a milky color, which is a test of its purity. The color is due to precipitation of the oil of wine, which is expensive and often wanting in sophisticated preparations. Occasionally, castor oil is added to mixtures not containing the oil of wine; on dilution with water a milky appearance results, but if the precipitated oil be gathered on a filter, it is found *non-volatile*.

The value of Hoffman's anodyne probably depends upon its containing three ingredients, which stimulate in the order named—ether, alcohol, and the heavy oil of wine—the ether being the most rapidly acting and evanescent, the oil of wine the third to take effect and the most lasting (Hare). The mixture is no more toxic than its ingredients.

Therapeutics: It is an efficient antispasmodic in the distressing attacks of cardiac disease, having slight stimulating

effects; it is also employed in hiccough, asthma, and hysteria, and as a valuable carminative and anodyne.

VALERIANA, *U. S.* (Valerian).

Origin: The *rhizome* and *roots* of *Valeriana officinalis* (nat. ord. Valerianeæ). Habitat: Europe and Northern Asia; naturalized in New England. Valerian contains a volatile oil, *oleum valerianæ*, of peculiar odor and yielding *valerianic acid*, *valerian camphor*, and *resin*.

Preparations: The number of official preparations is out of proportion to its usefulness. The principal are—

Tinctura Valerianæ (20%), dose f℥ss–iv.

Tinctura Valer. Ammoniata (20%), dose f℥ss–iv.

Extractum Valerianæ Fluidum, dose f℥j.

Ammonii Valerianas, dose gr. ij–viij.

Zinci Valerianas, dose gr. j–iij; a *zinc* salt.

The oil of valerian, and the valerianates of iron and quinine, complete the list.

Elixir Ammonii Valerianatis, unofficial, but much used, dose f℥j.

Physiological action and therapeutics: Valerian is not constant in its action, at times exciting and at others allaying reflex excitability—a variability which may be due to the numerous phases of the condition for which it is most employed. Large doses may cause epigastric burning and symptoms of gastric irritation, with headache, vertigo, mental exhilaration, and hallucinations; but these are not invariable. It probably stimulates slightly the circulation. Its chief value has been found in *hysterical conditions generally*, in which it is frequently used; also used with varying success as an antispasmodic in pertussis, asthma, chorea, and spasmodic conditions generally; but will prove most efficient in those of neurotic origin, as *laryngismus stridulus*. The valerianate of ammonium has met with success in neuralgias, nervous headache, and hysteria.

ASAFŒTIDA, *U. S.* (Asafetida).

Origin and composition: A gum-resin obtained from the *root* of *Ferula fœtida* (nat. ord. Umbelliferæ). Habitat:

Central Asia. It is made by drying the milk-juice collected after incising the living root. Besides gum and resin, it contains a *volatile oil*, which gives the drug its peculiar garlicky odor.

Preparations: Asafœtida, gum-resin, dose gr. x–xv.

Pilulæ Asafœtidæ (in each gr. iij), No. ij–iv.

Emulsum Asafœtidæ (milk of asafœtida), dose f℥ss–j.

Mistura Magnesiæ et Asafœtidæ (Dewees' carminative) contains 7% of tinct. asafœtidæ and 1% of tinct. opii; dose ♏xx (unofficial).

Tinctura Asafœtidæ (20%), dose f℥ss–j.

A pill of aloes and asafœtida and a plaster are official.

Physiological action: Its effects are disputed. It is probably mildly stimulant and carminative; it increases the secretions of the bronchi and intestines, and gives rise to very offensive stools; by some it is claimed to stimulate peristalsis.

Therapeutics: Like valerian, it is of use in hysterical conditions. From its supposed expectorant and intestinal effects it is said to have peculiar efficiency in spasmodic pectoral affections, in flatulence and tympanites: these conditions in children may be relieved by enemata of emulsum asafœtidæ, though the odor renders the remedy very objectionable.

MOSCHUS, *U. S.* (Musk).

Musk is the dried secretion from the *preputial follicles* of *Moschus moschiferus* (class Mammalia; order Ruminantia), or musk-deer; seldom found in shops, and is apt to be greatly sophisticated. Habitat: Central Asia.

Preparations: Moschus, dose gr. v–xv.

Tinctura Moschi, dose f℥ss–ij.

Physiological action and therapeutics: On the healthy organism its effects are probably *nil*. In certain adynamic and nervous conditions it may prove exhilarant, stimulant, and antispasmodic. It has its advocates in conditions of collapse and in the adynamic stages of typhoid and alcoholic pneumonias, and may prove valuable in *hysterical manifestations, singultus,* and other spasmodic conditions. Musk is

indicated especially in the crises of low fevers; a single dose is given by enema.

SUCCINUM (Amber).

Oleum succini (oil of amber) is a *volatile oil* obtained by destructive distillation from amber, which in turn is a *fossil resin* of an extinct coniferous tree (*Pinitis succinifer*) found along the Baltic shores.

Locally, it is an irritant, and has been used in rheumatism and as an embrocation in whooping-cough. Internally, it is a reputed antispasmodic. Dose gr. v–xv in capsule: larger doses may cause gastric irritation.

HUMULUS, *U. S.* (Hops).

Origin and composition: The *strobiles* (cones) of *Humulus lupulus* (nat. ord. Urticaceæ), or hop vine, having at the bases of their imbricated leaves a yellowish powder, officially known as *lupulinum*, and containing among other principles a bitter principle and a volatile oil. Habitat: cultivated.

Physiological action and therapeutics: Like other bitters, it is a stomachic tonic, and may be used as such: the drug may produce diaphoresis, exerts a slightly sedative effect on the cerebrum, and is a slight cardiac excitant. Humulus has been recommended in combination with tinct. capsici as a substitute for alcohol. It exerts a somewhat sedative effect on the genito-urinary tract, and is used in abnormal sexual excitement and vesical irritability, meeting with most success in functional conditions. It is a domestic remedy and has a number of therapeutically weak preparations. Dose of the tincture, f℥j–iij; of fluid extract, ♏x–xv; of the oleoresin, gr. ij–v.

Lactucarium, U. S., the concrete *milk-juice* of *Lactuca sativa* (nat. ord. Compositæ) (garden lettuce), has an official fluid extract and a syrup, but is probably inert. Sedative properties have been claimed for it.

CIMICIFUGA, *U. S.* (Cimicifuga).

Source and composition; The *rhizome* and *roots* of *Cimicifuga racemosa* (nat. ord. Ranunculaceæ), an indigenous herb.

Its exact status as to classification is not clear. It contains, however, a *volatile oil*, which gives to the plant its characteristic odor, *tannic* and *gallic acids*, a *resin*, and a not yet isolated active principle.

Preparations: Cimicifuga, dose gr. xx–ʒj.

Tinctura Cimicifugæ (20%), dose fʒss–ʒj.

Extractum Cimicifugæ fluidum, dose ♏xv–fʒss.

Extractum Cimicifugæ, dose gr. iij–v.

Physiological action: The taste of the drug is bitter and slightly astringent, and in small doses it promotes appetite and digestion. It slows the heart and lowers the arterial pressure, acting as a direct cardiac depressant. On the uterus and unstriped muscle it certainly has some action, as it seems of value in dysmenorrhœa and in the pelvic congestions of the climacteric. Anodyne and soporific properties are claimed for it. It undoubtedly increases the secretions of the skin and bronchial mucous membrane.

Therapeutics: Cimicifuga is certainly of value in *simple chorea* of children; it must be given in doses approaching the therapeutic limit, which is reached with the appearance of *frontal* headache. As a stomachic bitter it is used in *dyspepsia*, especially if *atonic* or *irritative;* sedative and analgesic effects are claimed for it in *acute rheumatism* and *neuralgia;* while by a tonic action on the unstriped muscular fibre it is probably of use in *congestive dysmenorrhœa*, *subinvolution of the uterus*, and *spermatorrhœa*. It is also a good expectorant in *chronic bronchitis*, especially the forms associated with profuse expectoration. Large doses may cause vomiting.

ANÆSTHETICS.

The term "**anæsthetic**," which from its derivation (*α*, non, and *αισθησις*, sensation) would apply to any pain-allaying measure, has been limited to certain ethereal substances administered by inhalation and producing unconsciousness, accompanied by loss or diminution of sensation, motion, and reflex action. The manner in which they accomplish this is still under discussion, but they probably act directly upon

the cerebral cortex. Those most commonly employed are ether and chloroform.

ÆTHER, *U. S.* (Ether).

Chemistry: Ether is a liquid composed of about 96% by weight of absolute ether or ethyl oxide ($(C_2H_5)_2O = 73.84$), and about 4% of alcohol containing a little water. It is formed by the dehydration of ethyl alcohol by sulphuric acid (hence erroneously called *sulphuric ether*), and subsequent purification by calcium chloride, by which the alcohol and acid impurities are removed.

Properties: Ether is a thin, volatile liquid of pungent odor, soluble in 10 parts of water, and easily in all ordinary solvents (alcohol and chloroform in all proportions). It is inflammable, explodes forcibly when ignited, and boils at about the body-temperature (98.2° F.). Its sp. gr. is about 0.725; but its vapor *sinks*, being heavier than the atmosphere; hence artificial lights should be placed *above* it.

Physiological action: Two stages are recognized. The first, or so-called *stage of excitement*, is characterized by a choking sensation, coughing, and other symptoms of irritation of the respiratory tract; then succeed mental excitement, lightness of the head, buzzing in the ears, and a variety of emotional disturbances (laughing, weeping, shouting, fighting, etc.); the patient can still be somewhat aroused. At the end of the first stage a tetanic condition may occur, with cyanosis and great muscular rigidity. The second stage begins with complete unconsciousness, upon which loss of susceptibility to pain quickly supervenes, with *abolition of reflexes* and, generally, *complete muscular relaxation* (although rigidity may last much longer, especially in alcoholic patients). The portions of the body retaining sensibility longest are the eyes and muco-cutaneous junctions. The action of all the nervous centres is suspended except that of the medulla, which continues to preside over the organic functions of respiration and circulation. If pushed, death results from *respiratory paralysis*, although *heart-failure* may, in some cases at least, occur first. Early in anæsthesia there is car-

diac and vaso-motor stimulation; later, the blood-pressure falls.

Therapeutics: Ether is antispasmodic and anodyne, with slight *primary stimulant* effect. Hypodermically, it is valuable in collapse as a cardiac stimulant. Locally applied, it evaporates quickly and causes coolness and slight anæsthesia of the parts.

Preparations: Æther, used for anæsthesia; by mouth, dose f℥ss–j.

Spiritus Ætheris (about one-third ether and two-thirds alcohol), dose f℥j–iij.

Spiritus Ætheris Compositus (antispasmodic), dose f℥ss–ij.

Spiritus Ætheris Nitrosi, dose f℥ss–j.

The last is known as "sweet spirit of nitre," and is an alcoholic solution of ethyl nitrite, containing about 5% of the ether (to be considered later).

Practical Anæsthesia.

The **technique of etherization** may be divided into three stages: *a*, the preparation of the patient; *b*, the administration of the ether; *c*, the after-care of the patient.

The **preparation of the patient** is important, especially in prolonged operations, as those on the abdomen. This is done (1) by emptying the digestive tract; by the administration of liquid diet on the evening preceding operation, followed by thorough purgation; the danger from vomiting is thus greatly reduced, an important factor in abdominal operations; (2) by a physical examination of heart and lungs, and by a chemical and microscopic analysis of the urine.

The **administration of the ether**: The effects of the anæsthetic appear in three stages: 1, excitement; 2, narcosis; 3, paralysis. Previous to the giving of ether foreign bodies should be removed from the mouth. The ether is to be given slowly, and the patient warned about its primary irritative effect and assured that plenty of fresh air will be allowed him if much coughing should ensue. The anæsthetic is now administered *drop* by *drop* and the patient encouraged to breathe regularly. Frequently by this method the second

stage is reached without any of the symptoms of irritation, such as coughing and choking. Should this occur, it is best to suspend the ether for a few seconds, until the patient regains his composure. During the first few minutes there is sometimes a cessation of respiration. This is a true respiratory forgetfulness, which is soon overcome by encouraging the patient to breathe, and perhaps by pressure on the lower ribs. Occasionally, absolute unconsciousness, absence of muscular rigidity, and loss of sensation are reached in the first stage; but usually the second, or surgical, stage is required. This is marked by regular, automatic breathing; by a slightly accelerated, full, strong and regular pulse; by the absence of the conjunctival and other reflexes; by complete muscular relaxation; the skin is warm and dry. It should be the aim of the etherizer to keep the patient in this stage with the minimum amount of ether until the operation is completed. The amount of ether, the time required fully to anæsthetize a patient, and the quantity necessary for prolonged anæsthesia vary with the person, and each case must be judged individually. In general, the *absence* of *muscular rigidity* is taken as the sign for beginning the operation; this is absolutely necessary for most operations. The conjunctival reflex is early abolished, and the reaction of the pupil to light is the last to disappear.

The **dangers** from ether are twofold—from *respiratory* and from *cardiac* failure. The largest number of ether-deaths have occurred from primary failure of respiration. In the third stage the respirations become more frequent and shallow; the pulse increases in frequency and loses in volume; the skin becomes cool and relaxed, and is bathed in perspiration; and the reflexes, even that of the pupil to light, are absolutely lost. It is the stage of exhaustion. The *danger-signals* are: weak breathing; rapid and feeble, frequently additionally an intermittent pulse (which may be regular); the *fixed dilatation* of the pupil; the expression of the face; noisy, blowing breathing, due to complete paralysis of the muscles of the pharynx. Frequently a sudden change occurs in the facial expression synchronous with cardiac failure. *Accidents* during etherization are: *Vomiting.* This

occurs from insufficient etherization, and carries the danger of suffocation with it if solid particles of food lodge in the larynx. It is not to be confounded with the *accumulation of mucus* in the mouth and throat. In either case the head is turned to one side and the jaw is pushed well forward, so as to allow of the ready expulsion of solids or liquids. *Inspired mucus* not infrequently causes catarrhal pneumonia, which may be ascribed to the irritant effects of the ether. Should an over-dose be taken the treatment is symptomatic: the head is allowed to hang low, the tongue is pulled far forward, and the chest is slapped with a wet towel or ether is poured over it; artificial respiration is resorted to, augmented, if possible, by the electric brush. Strychnine in doses of gr. $\frac{1}{15}$ hypodermically is the best vaso-motor, respiratory, and cardiac stimulant in such cases.

The *time* usually required to place a patient fully under the action of the anæsthetic varies from 8 to 10 minutes; the *quantity* to reach this stage varies from 1 to 3 ounces, and the amount for the average operation varies from 3 to 6 ounces, according to the *method of administration*.

Methods of administration: (1) The use of the ordinary Allis inhaler; (2) a piece of folded gauze placed over the patient's nose and mouth; or (3) a towel folded in shape of a cone, with a piece of loose cotton in the apex. The Allis inhaler is safe, but allows of considerable ingress of air, so that a larger quantity of ether is required than by the other two methods. If it becomes necessary to push the ether, a towel may be placed over the inhaler for a few seconds.

The unpleasant **after-effects of ether** are *vomiting* and *nausea*, both of which are very much lessened, if not altogether eliminated by thorough purgation before operation and careful etherization. *Inspiration of mucus* or of particles of food should be guarded against by keeping the head low, and turned to one side, with the chin well forward. *Bronchitis* is a not uncommon sequel, recognized by the ordinary signs and treated by the usual methods. *Pneumonia* may occur from inspiration of mucus, but may not develop until some days after an operation; it may be due in part to the irritant action of the ether and in part to cold contracted during or after

a prolonged operation. It is usually very insidious in its onset, and is frequently characterized by a rise of temperature long before pain, cough, or physical signs call attention to the chest.

Children are usually quickly anæsthetized, because they are apt to cry actively and to take full inspirations; for this reason the administration must be watched with especial care to avoid an over-dose. The depression at the end of narcosis is proportionately greater than in adults.

Aged people usually bear ether well and occasionally take more in proportion than do robust adults. *Stout people* frequently become excessively cyanosed, so that the ether cannot be pushed to complete narcosis. *Men* take a larger quantity than women do, and show a greater tendency to become violent during the first stage.

CHLOROFORMUM, *U. S.* (Chloroform), $CHCl_3 = 119.08$.

Chloroform, trichlormethane, is a liquid consisting of 99 to 99.4% by weight of absolute chloroform, and 1 to 0.6% of alcohol. It should be kept in dark amber-colored, glass-stoppered bottles, in a cool and dark place. It is a colorless fluid of *neutral* reaction, hot and sweetish taste, and peculiar, pleasant odor; it is very sparingly soluble in water, freely soluble in other solvents, and is itself a very good solvent for fats, resins, some of the balsams, and many alkaloids. It is also called methylic ether. Chloroform is usually prepared by the action of *calcium hypochlorite* upon *acetone;* it also results when chloral is heated with an alkali, and may be made by the action of calcium hypochlorite upon alcohol.

Physiological action: When inhaled the effects resemble those of ether, but are much more rapid and powerful, and marked by an absence of faucial irritation when given in the proper dilution with air (about 3½% of chloroform vapor). Complete anæsthesia takes place in from one-half to two minutes, while the average for ether is eight to ten minutes; there is less liability to unpleasant sequelæ, as vomiting, etc., and the patient regains consciousness earlier.

Circulation: Authorities agree that it is more depressing to

the heart than ether; that the arterial tension is lower; and that death takes place generally from *cardiac paralysis*, but in rare instances from arrest of respiration: these unpleasant symptoms may occur with hardly any warning. Locally, undiluted, it is decidedly irritant, and vesicates when evaporation is prevented. By mouth its effects resemble those of ether closely—anodyne and antispasmodic.

Preparations: Aqua Chloroformi, a saturated, aqueous solution, dose f℥j–f℥ss.

Chloroformum, official chloroform, should have a sp. gr. of at least 1.49; seldom used internally; this is the form for inhalation.

Emulsum Chloroformi (chloroform 8%, tragacanth 25%, expressed oil of almond 6%), dose f℥ss–j.

Spiritus Chloroformi (6%), dose ♏x–f℥j.

Linimentum Chloroformi (chloroform 30%, soap liniment 70%).

Therapeutics: Anæsthesia by ether and chloroform is indicated in operative surgery, where both anæsthetics find their chief utility. During the second stage of labor, not to full anæsthesia, ether may be used; but chloroform seems safer here than in other conditions, and is probably preferable.

In *dislocations* and *fractures* they are valuable, by overcoming muscular spasm, both for diagnosis and reduction; in convulsions of all kinds; in the *diagnosis* of *hysteria* and *malingering* from actual disease.

Internally, they correspond closely, chloroform having the advantage of being more palatable. In their various preparations they are used in *gastralgia, colicky pains, dysmenorrhœa, hysteria*, and as vermifuges. Chloroform is said to abort malarial paroxysms, and its liniments are standard local remedies for chronic rheumatism and neuralgia.

Contraindications: In *cardiac disease*, either valvular without compensation or when *structural* changes exist in the walls; in *cerebral tumors* and *cerebral endarteritis* the primary congestion may produce hemorrhage; in *chronic alcoholism*: these patients bear anæsthesia badly; in *advanced pulmonary disease*, ether especially; in *acute nephritis* ether may cause uræmia, and chloroform is to be preferred.

Ether, being undoubtedly less liable to cause death, is to be preferred *in all cases* except the following, in which chloroform is more available: in hot climates, ether *boiling* at less than 100° F.; in *military practice*, chloroform being less bulky and expensive; in *young children* it is less apt to cause fright, but is distinctly more dangerous; in *diseases* of *stomach* and *kidneys* there is less danger of nausea and uræmia; or when artificial light is needed or the cautery is to be applied about the face.

Toxicology. *During ether-anæsthesia:* When dangerous symptoms arise suspend the anæsthetic, draw the tongue forward, give atropine or strychnine hypodermically, and if necessary artificial respiration and faradization of respiratory muscles should be employed.

During chloroform-anæsthesia: Stop its administration, and immediately *invert the patient*, head downward, which sends the blood to the right heart and causes it to contract. Ammonia, strychnine, digitalis, or strophanthus may be given hypodermically, or amyl nitrite by inhalation.

When either is taken internally in toxic amount, treat as a case of irritant poisoning.

NITROGEN MONOXIDE, or LAUGHING-GAS.

Preparation: This non-official gas, so much used in dentistry, is prepared by heating ammonium nitrate, decomposing it into water and nitrogen monoxide.

Physiological action: Inhaled, it produces in from one to three minutes anæsthesia, preceded by a period of excitement, with hilarious, pugnacious, or erotic sensations; its *modus operandi* is not known, but this is probably more than pure asphyxia. It may be used as an anæsthetic in brief minor surgical operations, being comparatively harmless and the safest of all known anæsthetics. As it causes a great rise in the blood-pressure, it is contraindicated in atheroma; it is said to have produced diabetes. It does not produce muscular relaxation, and is therefore of little use in general surgery.

ETHYL BROMIDE, or HYDROBROMIC ETHER.

Ethyl bromide, or **hydrobromic ether**, is a certain and moderately safe anæsthetic for operations requiring a brief anæsthesia. As it decomposes easily, with formation of compounds dangerous to life, it must be absolutely pure. Ethyl bromide does not reduce the contractions of the uterus during labor as much as other anæsthetics, and was therefore recommended especially in obstetric practice. A number of cases of sudden death are recorded, probably due to impurities.

Local Anæsthesia.

Slight **local anæsthesia** has been produced by the topical application of carbolic acid, chloroform, tincture of aconite, veratrine, certain volatile oils, as those of peppermint and of bitter almond, and by dilute hydrocyanic acid. A method still somewhat in vogue is the production of cold by the rapid evaporation of volatile substances, as ether or rhigolene. These means, however, have been practically superseded by the advent of cocaine.

COCAINÆ HYDROCHLORAS, *U. S.* (Cocaine Hydrochlorate; Cocaine).

Cocaine is the hydrochlorate of an alkaloid obtained from Coca. Coca also contains a larger or smaller percentage of *hygrine*, an alkaloid having mydriatic powers.

Action: Cocaine acts as an anæsthetic *when in contact* with nerves of *sensation* or *special sense*. The skin forms a barrier against these effects, while no such barrier exists with mucous membranes. The tissues are at first constringed from vaso-motor stimulation, but a reactionary congestion soon follows. Slight paresis of motor nerves may also be produced (Wood). The skin barrier is overcome by *hypodermic use:* the cocaine solution (2 to 8%) should be injected just *into* the skin, and not deeply in the tissues: the hydrochlorate is the salt used, and forms a watery solution. Greater efficiency is secured in the extremities by controlling the circulation with an elastic band (Corning's method).

Otherwise it is partially carried away by the circulation. Laparotomy even may be performed under its use.

Action on mucous membranes: The *mucous membranes* react very differently as to absorptive power: cocaine is absorbed quickly by the mucous membrane of the *eye*, the *nose*, the *pharynx*, and the *rectum*; it is absorbed very slowly by the *vaginal* and *vesical* mucous membranes, repeated applications being sometimes necessary. The safe maximum dose by mouth regulates the quantity which can be applied locally to mucous membrane, which is $\frac{3}{4}$ grain. It is best to use a 4% solution. A 10% solution is necessary to secure anæsthesia in operations about the vagina.

Indications for local anæsthesia: In the minor surgical operations of ophthalmic, laryngological, gynecological, and general practice. Bony structures are with difficulty rendered insensitive, and ether is more suitable.

In *pruritus ani* and *pruritus vulvæ*, *anal fissure*, and other painful conditions its topical use affords great relief.

In *neuralgias* by injection into the neighborhood of the affected nerve-trunk at any point proximal to the seat of pain.

In *hay asthma* repeated applications contract the turgescent vessels, and most of the cases are alleviated.

Gastralgia from gastritis or gastric ulcer, and *persistent vomiting*, may yield to its internal administration in doses of gr. $\frac{1}{8}$–$\frac{3}{4}$ of the hydrochlorate.

The **special disadvantage** of local anæsthesia lies in the fact that muscular action is not controlled, and the rigidity is frequently so marked as to interfere with operative procedures. In operations on the eye the presence of consciousness is a decided advantage.

Constitutional symptoms: In all instances in which cocaine is used for its local anæsthetic effect constitutional symptoms may arise. Death has occurred in a girl of eleven years of age, from $\frac{1}{2}$ grain; convulsions and mania have resulted in the adult from the use of $\frac{1}{6}$ grain. The symptoms of *poisoning* from its local use are the same as those produced in other cases of cocaine-poisoning, viz.: hurried breathing, collapse, in many cases epileptiform convulsions and cyanosis. The *treatment* is symptomatic.

EUCAINE HYDROCHLORATE.

Eucaine hydrochlorate is a synthetic product similar in composition to cocaine, and has been introduced as a substitute for the latter. It differs from cocaine in not producing a contraction of the bloodvessels when locally applied, and in yielding a permanent solution in water. It produces a distinct smarting when a solution is dropped into the eye. Eucaine is a good local anæsthetic, but in over-doses produces symptoms similar to those caused by cocaine, over which it does not seem to possess any decided advantage; it is rapidly declining in favor. Dose and uses are the same as those of cocaine.

HYPNOTICS (SOMNIFACIENTS).

This class of drugs, known also as **narcotics**, may be subdivided into those which have a pain-allaying effect (analgesics), of which opium is a notable example, standing in many respects alone, and the pure hypnotics, or sleep-producing agents, the number of which has recently been much augmented.

OPIUM, *U. S.* (Opium).

Opium is the concrete, milky exudation obtained by incising the *unripe capsules* of *Papaver somniferum* (nat. ord. Papaveraceæ), and yielding, in its normal, moist condition, not less than 9% of crystallized morphine when assayed.

Properties: Good opium is of a fine chestnut color and dense consistency, and has a strong characteristic odor. It should break with a deeply notched fracture, and when drawn across white paper should leave an interrupted stain. It has a bitter, acrid taste, and imparts its activity to water, alcohol, and diluted acids.

Preparations: Opii Pulvis should contain not less than 13% nor more than 15% of *morphine;* used in making most of the opium preparations; dose gr. ss–ij.

Opium Deodoratum: this is powdered opium deprived by ether of its narcotine; contains 13–15% of morphine, and is thus of the same strength as the powder; dose gr. ss–ij.

Pilulæ Opii : each contains gr. j ; opium pills may be borne better by an irritable stomach.

Extractum Opii : twice the strength of opium ; dose accordingly.

Emplastrum Opii ; has very little utility.

Trochisci Glycyrrhizæ et Opii, each contains gr. $\frac{1}{20}$ of extract.

Pulvis Ipecacuanhæ et Opii (Dover's powder); the powder of ipecac and opium, of each gr. j to lactose gr. x ; dose gr. x.

Tinctura Opii (laudanum) ; 10% of powder ; dose ♏x–xv (20 to 30 drops) ; a favorite for use in enemata.

Tinctura Ipecacuanhæ et Opii ; ♏x = opium gr. j.

Tinctura Opii Camphorata (paregoric) ; contains opium gr. ij to f℥j and a variety of other ingredients, including camphor in same amount ; used for children ; dose f℥j–f℥ss *for adults*, proportionately smaller for children ; forms 12% of mist. glycyrrhizæ comp.

Tinctura Opii Deodorati ; narcotine and odorous principles removed by ether ; strength and dosage same as laudanum. Less apt to cause nausea.

Acetum Opii (black drop) ; also 10% ; dose, see *Laudanum.*

Vinum Opii (Sydenham's laudanum) ; 10% of opium ; dose ♏xij or gtt. xxv.

Mistura Magnesiæ et Asafœtidæ, not official ; contains 1% of laudanum.

The alkaloids and their salts are :

Morphina, for pharmaceutical use principally.

Morphinæ Acetas,
Morphinæ Sulphas,
Morphinæ Hydrochloras, } dose gr. $\frac{1}{6}$ to $\frac{1}{4}$.

Pulvis Morphinæ Compositus ; contains of morph. sulphate 1 part, with 20 parts each of camphor, licorice, and calcium carbonate ; known as *Tully's powder ;* dose gr. x.

Trochisci Morphinæ et Ipecacuanhæ ; morphine sulphate gr. $\frac{1}{40}$ and ipecac gr. $\frac{1}{12}$ in each.

Codeina, *U. S.*, gr. ss to ij ; about one-quarter as strong as morphine ; a favorite in cough-medicines and diabetes.

Important unofficial preparations : Liquor Magendie (" Ma-

gendie's solution") has been used for hypodermic purposes; contains gr. xvj of morph. sulph. to aq. f℥j; f℥j = gr. ij, f℥ss = gr. j; an ordinary dose for hypodermic use is ♏vj to x.

Liquor Morphinæ Sulphatis (U. S. P., 1870); contains gr. j to f℥j.

Physiological action: The effects of opium vary decidedly with the size of the dose. *Small doses*, in persons unaccustomed to the drug, produce at first a sense of well-being, stimulation of the mental faculties, especially the imaginative (probably due to lessened restraint by blunting of the highest mental endowments, as judgment, etc.), followed by a blissful dreamy state, merging more or less quickly into a sleep which may be disturbed or restful, and from which the patient awakes either refreshed or with more or less headache, nausea, and depression. *Larger Doses:* When large medicinal doses have been administered the period of stimulation is shorter, the sleep more profound, the pupils are somewhat contracted, sweating *may* ensue, and the symptoms of depression and gastric disturbance are more marked. When *very large doses* have been taken the patient sinks almost at once into a profound sleep, with slow and noisy breathing, slow full pulse, and minutely contracted pupils, while the skin gets cool and becomes covered with clammy perspiration. After *fatal* doses stupor, coma, stertor, respiratory and circulatory depression occur, and finally death from paralysis of the respiratory centre.

The effects *seriatim*, in different portions of the body and their explanations on physiological grounds as far as known, are as follows:

Nervous system: A progressive paralysis, involving in succession the cerebral, sensory, and reflex functions, and finally the important centres in the medulla.

Circulation: A *primary acceleration* of pulse-rate, followed by a slow, full pulse and increased arterial pressure: these effects are due to stimulation of the pneumogastric and of the cardiac muscle. After toxic doses a rapid and feeble pulse from paralysis of the same.

Respiration: Opium *slows* respiration by a *centric* effect;

in poisoning the respirations may be as infrequent as one a minute, or even less.

Pupils: Generally equally contracted, and after large doses very much so—a centric effect, as it does not occur when instilled into the eye. *All secretions* except perspiration are decreased; the urinary *solids* may be increased or decreased, but the *fluids* are always diminished; retention of urine may occur.

Digestion: Secretions and peristalsis diminished; as a direct consequence digestive impairment, with anorexia, nausea, and constipation, results.

Secretions: Opium checks all secretions except that of the skin.

Absorption and elimination: Opium is absorbed quickly and eliminated largely by the gastro-intestinal mucous membrane; to a less extent by the kidneys. It is, therefore, of great importance to wash out the stomach repeatedly in case of poisoning.

Morphine.

This *alkaloid*, representing practically the medicinal and for the most part the physiological powers of opium, occurs in colorless crystals, odorless, but of very bitter taste. Owing to its insolubility, its salts, the sulphate, hydrochlorate, and acetate, are most frequently used. Morphine should average 14% in good opium (13 to 15%); hence gr. $\frac{1}{6}$ about equals gr. j of opium.

Morphine differs from opium in being *less apt to derange digestion, less constipating, less diaphoretic*, and *less tetanizing*, while it is more apt to cause pruritus, is more hypnotic and analgesic, and probably more of a cardiac stimulant; retention of urine is less apt to occur under its use.

Codeina, *U. S.* (Codeine).

Codeine is present in small amount (0.03%). The physiological powers of this alkaloid are not clearly understood; it probably, as used, has varied in composition, which alone would explain the conflicting reports upon its effects.

Other Alkaloids.

Besides morphine and codeine, opium contains a number of other alkaloids, the most important of which are—

Thebaine or paramorphine,
Laudanine,
Porphyroxine,
} tetanizing agents.

Narcotine, to which some attribute the unpleasant gastric effects.

Narceine, papaverine, meconine, cryptopine, and hydrocotanine, have been somewhat investigated.

Opium also contains various acids (meconic, theobolactic, and sulphuric), gum, extractive, and a volatile odorous principle, the last of which shares with narcotine the reputation of being the nauseant principle.

Acute opium-poisoning—treatment: Very small doses have proved fatal in children, and gr. $\frac{1}{6}$ of morphine is said to have caused death in a feeble adult. When toxic symptoms develop after a moderate dose, or when a presumably toxic dose has been taken—

Empty the stomach at once, preferably with the stomach-pump or gastric siphon—the latter may be improvised from a rubber tube and funnel—or emetics may be given : *mustard*, being generally available, may be given in ʒss dose and repeated in ten or fifteen minutes, or the *sulphate of copper or zinc* may be administered in proper doses.

Next give chemical and physiological antidotes to neutralize the remainder—*potassium permanganate, tannic acid, strychnine*, or *atropine;* the last should be administered *tentatively in small doses*, guided by its physiological effects, *especially on respiration.*

The remainder of the treatment consists in *various measures to maintain respiration*, such as walking patient about, flagellation, hot and cold affusions, faradism, and, if necessary, artificial or forced respiration and oxygen inhalation; strong coffee is valuable, given by mouth or rectum. The electric brush is perhaps the *most effective* and *least exhausting* measure to keep the patient awake; there is considerable

danger from death through exhaustion late in the poisoning. Potassium permanganate is the most efficient chemical antidote. The lavage of the stomach should be continued at intervals, as morphine is eliminated by the mucous membrane of the gastro-intestinal tract.

Chronic opium-poisoning or habit: Toleration of the drug may be greatly increased and large amounts consumed. The digestive and nervous systems are most affected; the subject loses mental and moral tone; if rapidly increasing amounts be taken, great deterioration of the general health may ensue.

Treatment of the habit is very often only temporarily effectual; the drug may be withdrawn immediately or more slowly. The danger of sudden withdrawal is from collapse, and as this method offers no advantages it is considered best to withdraw more slowly, say in the course of a week or two. Much depends on careful attention, nursing, feeding, and moral support. The simple hypnotics may be given with stimulating nutritious food. On withdrawing the drug a diarrhœa may be set up and require very careful treatment. Prophylaxis is all-important.

Opium—therapeutics: This drug is indicated and is a most valuable remedy in *pain* of true organic origin. It is a potent analgesic; as an *antispasmodic* in certain conditions, notably *spasmodic asthma*, which may frequently be aborted by its hypodermic use; also in *spasm* of *glottis* and *lead colic;* in *diarrhœa* and *dysentery* opium combined with astringents is the most available treatment.

In *peritonitis* comparatively large doses are given, acting by allaying pain, decreasing peristalsis, and, in early sthenic stages, by some direct antagonism to the inflammatory process itself (antiphlogistic).

In *cholera morbus*, invaluable hypodermically.

In beginning inflammation of pleura and lungs and in *acute coryza* it seems to lessen activity of process.

In *hemorrhages* and in the distressing *paroxysms* of *valvular disease*, morphine subcutaneously.

In *true diabetes*, codeine preferably; also in diabetes insipidus; in *uræmia*, hypodermically and with care; in acute diseases, as the exanthemata; in distressing *cough*.

Its use is warranted in the last stages of chronic disease and in small amounts in old age; as hypnotic only in very rare cases.

Administration: Opium may be administered by mouth, by rectum, or subcutaneously as the conditions demand. It should never be given as a hypnotic when simpler measures are adequate, is *contraindicated* in coma of any kind, and *caution* should be exercised in using it in cerebral conditions, chronic kidney disease, uræmia, respiratory embarrassment, delirium tremens, or when possibility of hernial strangulation exists. Never follow a dose of opium or its synergists by another dose subcutaneously, for the two may take effect at the same time. Remember that *children bear opium badly*, and that certain adults have an idiosyncrasy.

CANNABIS INDICA, *U. S.* (**Indian Cannabis; Indian Hemp**).

Cannabis Indica is the *flowering tops* of the female plant of *Cannabis sativa* (nat. ord. Urticaceæ), grown in the East Indies. The same plant, grown in America, yields a drug (*Cannabis Americana*) devoid of activity. It is used in India as a narcotic stimulant under the various names of hashisch, bhang, churrus, and gunjah. Two alkaloids have been found: *cannabinine* and *tetanocannabinine*.

Preparations: Extractum Cannabis Indicæ; most used; dose gr. ¼–j.

Extractum Cannabis Indicæ Fluidum, dose ♏j–x+.

Tinctura Cannabis Indicæ (20%), dose f℥ss.

Physiological action: There are two stages: (1) characterized by mental exhilaration, followed by (2) drowsiness and sleep. After a dose varying with efficiency of drug and the temperament and surroundings of the patient a condition of peculiar agreeable mental exhilaration is felt; the ideas flow quickly, and the sense of duration of time and extent of space is lost. Sometimes a condition of double consciousness exists. There is more or less cutaneous anæsthesia, a sensation of weight in limbs, and some muscular incoördination from loss of muscular sense. Hallucinations and mild delirium may occur. Then succeed drowsiness and sleep, from which the

patient awakens with some depression. Cannabis differs from opium in not affecting respiration, in that it *dilates the pupils*, and in not lessening the secretions. The circulation is not affected. No fatal cases are recorded. In Hindoos it not infrequently produces catalepsy.

Cannabis indica contains a volatile oil and a resin, *cannabin*, probably also several alkaloids, one of which has received the name *cannabinine*. The extract is most commonly used, but is of very uncertain strength; it is soluble in alcohol and ether, but not in water. All the preparations of cannabis indica are notably unreliable; the extract is regarded usually as the best, but it is advisable to determine the value of each specimen by actual therapeutic test.

Therapeutics: Its uses are fewer than formerly. It has been used in *tetanus*, *chorea*, and *hysteria* as an antispasmodic; in *neuralgias*, *muscular rheumatism*, and *migraine* as an analgesic; as an addition to cough-mixtures and in phthisis to produce comfort. It is said to be a feeble sexual stimulant.

As a hypnotic it has been used, but is of uncertain strength and not now in favor, while as an anæsthetic it is useless. *Tannate of cannabine* is also an uncertain hypnotic.

CHLORAL, *U. S.* (Chloral; Chloral Hydrate).

Chloral hydrate is a crystalline solid, composed of trichloraldehyde or chloral with one molecule of water ($C_2HCl_3O,H_2O = 164.97$).

Chloral is a thin, oily, colorless *liquid*, prepared by passing chlorine gas through anhydrous alcohol, the results being chloral and hydrochloric acid, which separate in layers, the lowermost of which is chloral. It is purified by distillation with sulphuric acid and quicklime. Chloral is not itself used in medicine.

Chloral hydrate is not a true hydrate, but a combination of a chloral element with an entire molecule of water. It is a colorless, crystalline, deliquescent salt of disagreeable taste, more stable than chloral, and freely soluble in water, alcohol, and ether.

Physiological action: *Locally*, chloral is an irritant, and occasionally causes gastro-intestinal irritation. In *medicinal doses* of gr. xv–xx the principal effect of chloral hydrate is a quiet, natural, and refreshing sleep. *Larger doses* cause profound sleep, diminution of reflexes, depression of respiration, depression of cardiac force and capillary dilatation, slightly contracted pupil, muscular weakness, and perhaps a certain degree of anæsthesia. *Toxic doses* are followed by coma, and cause death by cessation of respiration, of circulation (more rarely), or of both simultaneously. The depression of respiration is caused by a direct action on the centre; the heart is depressed directly and stops in diastole; the loss of reflexes and motion is due to depression of the *motor cord* and the anæsthesia to a late depression of the sensory cord. The nerves are unaffected, but the vaso-motors are paralyzed with the heart. The supposed transformation into chloroform by the alkaline blood does not occur, the drug acting as chloral. In large doses it lowers the *bodily temperature* decidedly. Chloral is eliminated by the kidneys as *urochloralic* acid.

Therapeutics: The chief uses of chloral hydrate, medicinally, are hypnotic and anticonvulsant. It is used as a *hypnotic* in sleeplessness not dependent on pain, as in insomnia from overwork or hysteria, acute mania or delirium tremens, succeeding the better the more purely nervous the cause. It is used as an anticonvulsant in *puerperal, uræmic, infantile*, or *strychnine convulsions*, in all of which, administered by rectum or mouth, it is very efficient in palliating until other curative measures can be tried; in *tetanus* a large percentage of cures is reported by some, while with others it has failed; in *trismus neonatorum; whooping-cough* and *choreic spasm* are alleviated; *sea-sickness* and the *vomiting of pregnancy* and other *neurotic vomiting* may be checked by chloral combined with recumbent position and proper diet; in conditions of high arterial tension it affords relief.

The *crossed action* of chloral and morphine may be obtained in the following combination:

℞ Chloralis, ʒv.
Morphinæ sulphatis, gr. iv.
Syrupi, fʒij.
Aquæ aurantii florum, q. s. ad fʒiv.
M.
Sig.—A teaspoonful at bedtime, if necessary.

Chloral hydrate is used by some *obstetricians* to relax a rigid cervix uteri and to relieve the pains of labor. This is the only condition in which it is analgesic in safe doses. It is a good antifermentative, and as such it is used to prevent decomposition of urine; added to liq. Magend. in small percentage it renders it more stable.

Toxicology: Acute and chronic poisoning.

Acute poisoning: The principal symptoms are profound depression of respiration and circulation, stupor and coma, suffusion of conjunctivæ, and muscular weakness, as shown by dropping of the lower jaw, with a pronounced fall of the bodily temperature. *Treat as for opium-poisoning*, avoiding, however, anything (as forced exercise) which causes muscular exertion on the patient's part, and watch the heart's action closely. *Dry heat* is a valuable measure.

Chronic poisoning: The continued abuse of chloral hydrate may cause mental weakness, dementia, and in some cases paralysis or paresis; *respiratory* disturbance, as pronounced dyspnœa; *cutaneous* eruptions, probably from continued dilatation of the superficial capillaries, taking the form of *erythema* or *urticaria* (especially after chloral and alcohol), catarrhal pharyngitis, and many other rarer effects.

Administration: Dose gr. v–xx (the latter the maximum dose ordinarily), to be given in some agreeable syrup. Chloral has caused death suddenly, like chloroform, a fact always to be remembered. Rectal administration may prove convenient or necessary; the drug is readily absorbed and the dose is the same as by mouth. *Alkalies* are *incompatible*, forming chloroform and formic acid. Caution is necessary when any cardiac lesion is present.

Croton chloral: This is a crystalline substance, freely soluble

in water and possessing effects similar to, but weaker than, chloral hydrate, with the added power of causing, it is said, anæsthesia of the head and face. It is very little used, except in trifacial neuralgia.

CHLORALAMID.

Chloralamid is a product of chloral hydrate and formamid, occurring in colorless crystals of somewhat bitter taste; slowly soluble in 19 parts of water, and easily so in alcohol, from which solution it is not precipitated by water. It is *decomposed* by *alkalies* and by a temperature of 140° F.: hence it should never be prescribed in warm solutions.

Physiological action and therapeutics: Containing, as it does, about two-thirds by weight of chloral hydrate, we should expect to find it acting similarly; but this is not true throughout the entire range of its action. Upon the respiration and circulation in proportionate dosage its effects are almost *nil*, although slight decline in blood-pressure may follow large doses. It is entirely non-irritating even in strong solutions, and gives rise to no digestive disturbances. It acts feebly upon the spinal cord, but upon the cerebrum its effects are pronounced (Wood). In medicinal doses (gr. x–xxx) it induces a natural and refreshing sleep, lasting from six to nine hours, and is in most cases entirely free from any unpleasant accompanying or after-effects, though it is slower and more uncertain than chloral. Large doses (gr. xlv–ʒj) occasionally cause headache, dizziness, nausea, and slight intoxication. It seems to a slight degree analgesic, but its principal use will be as a pure hypnotic. One theory of its action is that a *slow conversion* takes place into chloral hydrate in the alkaline blood, the absence of depression being ascribed to the slowness with which this takes place, and also to a possible stimulant effect by the formamid element. It is cheaper than sulphonal, acts more quickly, and is apparently as free from depressing effects. It may be given in one dose of gr. xxx (or gr. xv repeated) and in alcoholic solution.

Chloralose ($C_8H_{11}Cl_3O_6$): This compound is formed together with *parachloralose* when anhydrous chloral and glucose are heated together. Chloralose produces profound sleep without unpleasant after-effects. It is a stimulant to the motor side of the cord and has little influence on the circulation. Dose 5 to 10 grains, administered in the form of capsules. Chloralose is readily soluble in hot water.

Chloral camphor is a liquid formed when equal parts of chloral and camphor are rubbed together. Its action is counter-irritant and anæsthetic when applied locally in *neuralgia*.

Butyl-chloral hydrate: This is also called croton-chloral hydrate, and is formed by the action of chlorine gas on aldehyde. In medicinal doses, 5 to 15 grains, it produces deep sleep with anæsthesia of the head. In large dose it causes death by respiratory arrest; the circulation is unaffected except by enormous doses. This drug has been highly recommended in *tic-douloureux* and may be given in 5-grain doses every half hour until 30 grains have been taken (Wood). It is slowly soluble in water, and only to a limited extent.

SULPHONAL, or SULFONAL, $(CH_3)_2C(SO_2C_2H_5)_2$.

Sulphonal, chemically *diethyl-sulfon-dimethyl-methane*, was first brought to professional notice in 1888. It occurs in very stable crystals, soluble in 20 parts of hot and 100 parts of cold water, and is tasteless and odorless.

Physiological action: In medicinal doses, gr. v to xxx in man, it produces quiet sleep by direct action on the cerebral cortex. Owing to its insolubility and consequent slow absorption, its hypnotic effects are not produced until one-half to two hours have elapsed, and they are apt to be protracted, causing lassitude and mental confusion during the succeeding day. There seems to be no cardiac or respiratory depression, and the motor and sensory nerves are unaffected; hence it is *not analgesic*. Convulsions may occur in animals, but have

not been noticed in man. It is eliminated as *ethyl-sulphonic acid*. Sulphonal lessens reflex action in man and the animals probably by a stimulation of the inhibitory (Setschenow's) centre. Large amounts have been taken in single dose without fatal effect, but a number of fatal cases of poisoning are on record following the protracted use of medicinal doses. This chronic form of poisoning is exceedingly dangerous, as most of the cases go on to a fatal issue. The first symptom is a red color of the urine, due to the presence of *hematoporphyrin*, a decomposition-product of the hæmatin of the blood. Albumin and blood usually appear later on, and the kidneys show decided evidences of nephritis after death. These *renal* symptoms are often accompanied by *gastro-intestinal* and *nervous disturbance*, such as colic, obstinate constipation, anorexia, local palsies and anæsthesias, mental depression, general ascending paresis, and failure of memory, often followed rapidly by death. The treatment consists in the immediate withdrawal of the drug and the ingestion of large amounts of hot water.

Therapeutics and administration: As a *pure hypnotic* it is very valuable, being safer than, but not so certain as chloral; it is useless when pain exists. Sulphonal is used in the *insomnia* of mental over-exertion or nervous excitement, of hysteria, and of insanity. Small doses, gr. iij to vj, often prove antiemetic. It should be administered in powder-form, mixed with warm milk, broths, etc., about one and a half hours before sleep is desired. Tablets and pills may escape absorption. Sulphonal has also been used as an *antispasmodic* in hiccough, chorea, and epilepsy; as a *sexual sedative* in spermatorrhœa and chordee; as an *intestinal antiseptic*, given one hour after meals.

Trional (*diethyl-sulfon-methyl-ethyl-methane*) and **Tetronal** (*diethyl-sulfon-diethyl-methane*) are two compounds closely resembling sulphonal. They are more prompt in their action, and until recently were considered safe. Several cases of poisoning have been reported from the continued use of these drugs, and it is probable that they are poisonous in much the same manner that sulfonal is. The dose is from 5 to 20 grains,

given in milk, on retiring. Both drugs are especially valuable in the insomnia due to mental excitement.

AMYLENE HYDRATE.

Amylene hydrate is a colorless *liquid* of penetrating odor and somewhat pungent taste, readily miscible with alcohol in all proportions, and soluble in 8 parts of water; introduced in 1885. Moderate doses induce sleep without depression of organic functions: large doses may cause narcotic symptoms, with paralysis of centres in medulla. In medicinal doses, ♏xx to xl, it is a safe and moderately reliable hypnotic, but is inferior to chloral and sulphonal in activity.

PARALDEHYDUM, *U. S.* (Paraldehyde), $C_6H_{12}O_3$ – 131.7.

Paraldehyde is a colorless *fluid* at ordinary temperatures, of very penetrating odor and peculiarly disagreeable taste. Ordinary doses act as a *pure hypnotic* of rather uncertain power, requiring two or three times the amount that chloral does. No unpleasant effects follow, except that the breath becomes offensive. Very large amounts *may* paralyze respiration and circulation. An erythematous eruption may follow a single dose, while its continued use may cause malnutrition. Paraldehyde has never been used to any extent, because of its horribly nauseating taste, because of the odor imparted to the breath, and because of its uncertain effect. In doses of f℥ss–j or more it is a pure hypnotic; it should be well diluted.

URETHAN.

Urethan, which is chemically carbamide of ethyl, occurs in crystals easily soluble in water and not unpleasant to the taste. Its administration is followed in from one-quarter to three-quarters of an hour by *natural sleep*, without unpleasant after-effects, with no depression of circulation, and possibly slight depression of respiration. It is not so certain in its action as chloral and sulphonal. Large amounts produce paralysis of respiration in animals. It does not affect the sensory nerves. Dose gr. xv to ℥j by mouth or rectum.

It is used as a hypnotic; as an antispasmodic in uræmic or puerperal convulsions.

HYPNONE.

Hypnone, or aceto-phenone, is an uncertain hypnotic, causing death by asphyxia when given in over-dose to the lower animals. Most clinicians report unfavorably upon it. It is a colorless, volatile liquid, of characteristic odor, and is easily soluble in alcohol. Dose f℥ss to f℥j.

METHYLAL.

Methylal, like hypnone, is a very volatile liquid, but has a greater solubility, being dissolved by water, alcohol, and oils. It is claimed by its advocates to produce lowered excitability of the cerebral cortex, with decrease of reflex activity and a varying degree of anæsthesia, and by mouth or inhalation to produce sleep without either depression of circulation or respiration; others, however, have found it depressing to these functions. It is quickly absorbed and eliminated, and its hypnotic effect is of brief duration. Patients quickly lose susceptibility to the drug, and its value is still in doubt. Dose f℥j.

BELLADONNA GROUP.

The drugs of this group present a marked similarity of action and uses. They cause marked mydriasis (dilatation of pupil) and a peculiar delirium; they are antispasmodic.

Belladonnæ Folia, *U. S.* (**Belladonna Leaves**).

The *leaves* of *Atropa belladonna* (nat. ord. Solanaceæ).

Belladonnæ Radix, *U. S.* (**Belladonna Root**).

The *root* of *Atropa belladonna* (nat. ord. Solanaceæ).

Belladonna is the deadly nightshade, a plant indigenous in Europe, the whole of which contains the narcotic principle;

but the leaves and root only are official. Its *sole active constituent is atropina* (atropine); this occurs in crystals of a bitter, burning taste, odorless, quite soluble in alcohol and ether and in about 300 parts of cold water. The official sulphate is easily soluble in water.

Preparations: Of the *leaves:*

Tinctura Belladonnæ Foliorum (15%), dose ♏x–f℥ss.

Extractum Belladonnæ Foliorum Alcoholicum, dose gr. $\frac{1}{8}$–$\frac{1}{2}$.

Unguentum Belladonnæ (10% of above).

Emplastrum Belladonnæ.

Of the *root:*

Extractum Belladonnæ Fluidum, dose ♏j–ij–iv.

Linimentum Belladonnæ (5% camphor in fluid extract of belladonna root).

Atropina, *U. S.*,
Atropinæ Sulphas, *U. S.*, } dose gr. $\frac{1}{100}$ to $\frac{1}{50}$.

Physiological action. *Nervous system:* In general, atropine may be considered to *stimulate* the *sympathetic* system, and to *depress* the *motor*, and to a less degree the sensory, nerves, thus *diminishing* the reflexes. But in therapeutic doses these effects on the motor and sensory nervous organs are probably slight. Sufficient doses excite the cerebrum, taking the form of an *active, busy delirium*, followed, if dose be toxic, by stupor, deepening into coma. (It is not a true hypnotic.) Convulsions are present or absent according as the cerebral excitement or the peripheral paralysis predominates. The delirium is produced by direct action on the cerebral cortex.

Heart: After a primary slowing (?) its action is increased in rapidity from (*a*) paralysis of the inhibitory fibres of the pneumogastric, and (*b*) stimulation of the cardiac sympathetic ganglia. Large doses may prove cardiac paralyzers.

Vaso-motor apparatus: The sympathetic vaso-constrictors are stimulated by therapeutic doses, with a resulting increase of arterial pressure; large doses paralyze and the blood-pressure falls.

Respiration: Belladonna is one of our most potent measures for stimulation of the respiratory function, acting when vagi are cut—viz., by direct stimulation of the respiratory

centre. Very large toxic doses cause paralysis in the same manner. The temperature also is increased by medicinal and lowered by very large doses, probably by an action on the heat-centre.

Intestinal canal: Peristaltic movement is said to be stimulated at first from peripheral depression of the splanchnic (inhibitory) nerves; later it is doubtless lessened by depression of the smooth muscular fibres.

Secretions: Secretion of *salivary* and *muciparous glands* is diminished, causing as one of the earliest symptoms a dryness of the mouth. This is due to depression of the terminal filaments (*e. g.*, in the case of the submaxillary gland depression of the terminal filaments of the chorda tympani), with probably a stimulation of the sympathetic. Belladonna lessens all the secretions except those of the bowels and kidneys.

Perspiration is decreased through action on the nervous system; at the same time a bright, so-called scarlatiniform eruption may develop, followed in some cases by desquamation.

The effects on *urinary* and *intestinal secretion* are in doubt, though the urine is probably increased from diminution of perspiration, and its solids are said to be augmented. The drug is largely eliminated unchanged by the urine.

Muscles: Non-striated muscle is depressed, while voluntary muscle is probably not affected; though the drug may check spasm in the latter by direct action on the peripheral motor nerve terminals (thrown into muscle directly by hypodermic syringe).

Eye: The pupils are dilated, however the drug be exhibited, this mydriasis being due to paralysis of the oculomotor nerve and stimulation of the cervical sympathetic. It is accompanied by loss of power of accommodation and increased intraocular tension, and lasts from five to twelve days. As intraocular tension is increased by atropine, the latter is contraindicated in *glaucoma*. The mode of action is probably the same whether topically applied or administered internally.

Local effects: It acts as a paralyzant of motor and sensory

nerves, although probably not enough is absorbed through the epidermis to cause analgesia.

Therapeutics: Belladonna, or its equivalent atropine, is used to fulfil the following indications:

(1) To relieve spasm in *whooping-cough*, *nervous cough*, *spasmodic asthma*, and *hiccough*. It may palliate and is often used in *spasm of the sphincter ani* from fissure or other painful rectal or anal condition, and in *urethral spasm* it may be advantageously given as a suppository. It has been used hypodermically in torticollis.

In simple *spasmodic colic*, *spasmodic dysmenorrhœa*, and *peristaltic spasm* (as in lead-colic) it is valuable. In the last-named condition, where the pain and constipation are due to a tetanic condition of the muscles of the intestinal wall, the rationale of its use is not apparent unless we consider the splanchnics largely *cerebro-spinal nerves*, which are accordingly *depressed*.

In *nocturnal incontinence of urine* in children, when due to relaxation of the sphincter vesicæ or to a morbid irritability of the bladder mucous membrane, it is often of great value, but must be pushed almost to the physiological limit; also in *nocturnal emissions*[1] and as an adjunct to cathartics to prevent griping.

(2) To diminish secretions in *ptyalism*, either mercurial or that of pregnancy; *chronic gastritis* with excessive secretion; *acute coryza*—simply palliative; *colliquative diarrhœa* and *night-sweats*—very effectual; *to diminish lacteal secretion*—either locally as an ointment or internally.

(3) As a stimulant in *shock*, where the loss of temperature is due to vaso-motor paralysis, it is invaluable. It is also employed, but with less success, in adynamic fevers: it is valuable in collapse occurring suddenly in the course of any acute disease, and as a *respiratory* stimulant in ether-narcosis.

(4) To relieve pain in *neuralgia*, especially *facial*, *sciatic*,

[1] In this condition the patient should be directed to empty his bladder and rectum thoroughly before retiring to relieve all prostatic pressure, to abstain from fluid during evening, to lie upon the side, and should be encouraged for moral effect.

and *ovarian*, it may prove satisfactory; but has its superiors. It should be injected into the region of the affected nerve. Locally its effects must be slight, but it has found employment in *pruritus vulvæ*, *vaginismus*, etc.

(5) As an antidote to opium-poisoning it should be cautiously employed (see *Opium*).

(6) In ophthalmology atropine is much used in gr. iv to f℥j solutions for the following purposes: to dilate the pupil and paralyze accommodation; for thorough *examination* in cases of astigmatism or cataract, and for thorough examination of the fundus in general; as a *remedy* in preventing adhesions of iris in iritis, and to break them up when formed; in inflammatory conditions of the cornea, etc.

Toxicology: *Toxic doses* of belladonna or atropine produce a *dilated* pupil; a *dry* mouth, throat, and *skin;* a peculiar, wakeful delirium; a scarlet rash, resembling that of scarlet fever, but not punctate; lessened reflexes; a *rapid, corded* pulse; deep and quickened respirations, with an elevation of the bodily temperature. The later symptoms are: fall of temperature, pupils dilated absolutely, stupor and coma, respirations quick and shallow, heart rapid and feeble, skin cold and clammy, muscles relaxed; finally death by *asphyxia*. There are no characteristic post-mortem lesions.

The *characteristic symptoms* are dryness of throat, rapid breathing and pulse, muscular relaxation, pupils dilated—often enormously so—skin eruption, active delirium with or without convulsions, passing into stupor or coma, and complete collapse. Belladonna-poisoning can often be recognized by dropping the patient's urine into the eye of a cat or rabbit, causing dilatation of the pupil. *Treat* by evacuation of stomach by pump, syphon, or emetic; by *chemical antidotes*—tannic acid and solutions of the caustic alkalies; then administer remedies *to prevent circulatory* and *respiratory failure* (see *Opium*). The physiological antidotes are morphine, pilocarpine, and physostigmine; but their use should be guided by the symptoms presented. Systemic effects, such as delirium, retention of urine, etc., often follow the prolonged use of the drug in the eye and occasionally result from a single instillation.

Homatropine Hydrobromate: Atropine is resolvable into *tropine* and *tropic acid*. Tropine salts with hydrochloric acid form *tropeins*. Homatropine is a tropein derived in this manner from tropine amygdalate. It is chiefly employed as a *mydriatic*. Its effects are similar to those of atropine, but are more quickly developed and pass off much more rapidly. The *mydriasis* produced by homatropine usually disappears in less than forty-eight hours, but the paralysis of accommodation is not so complete. It does not cause systemic disturbance so readily as atropine.

STRAMONIUM.

Stramonii Folia, *U. S.* (Stramonium Leaves).

The *leaves* of *Datura Stramonium* (nat. ord. Solanaceæ).

Stramonii Semen, *U. S.* (Stramonium Seed).

The *seed* of *Datura Stramonium* (nat. ord. Solanaceæ). Habitat: Asia; naturalized in most countries. The active principle is *daturine*, probably a mixture of atropine and hyoscyamine.

Preparations: There are no official preparations of the leaves, but they are dried and used for smoking. Of the seed we have—

Extractum Stramonii Seminis, dose gr. $\frac{1}{4}$–$\frac{1}{2}$.

Extractum Stramonii Seminis Fluidum, dose ♏j–iij.

Tinctura Stramonii Seminis, dose ♏x–f℥ss.

Unguentum Stramonii (10% of extract).

The **physiological** and **toxic effects** of stramonium correspond so closely to those of belladonna that no separate consideration is needed. Owing to the common occurrence of the weed, poisoning is rather more frequent. *Treat as for belladonna-poisoning.*

Judging from its physiological effects the **uses** correspond closely to those of belladonna, but it is not commonly employed. Often used in the form of cigarette in asthma.

HYOSCYAMUS, *U. S.* (Hyoscyamus; Henbane).

Hyoscyamus is the *leaves* and *flowering tops* of *Hyoscyamus niger* (nat. ord. Solanaceæ), collected from plants of the second year's growth. Habitat: Europe. It contains two alkaloids —the one, *hyoscyamine*, crystalline, isomeric with atropine, and having an official sulphate; the other, *hyoscine*, amorphous, isomeric with atropine and hyoscyamine, but differing from them in physiological effects. The latter forms crystallizable salts, and is most used as the *hydrobromate*.

Preparations: Hyoscyami Pulvis, dose gr. v–x.

Extractum Hyoscyami Alcoholicum, much used, dose gr. $\frac{1}{2}$–ij.

Extractum Hyoscyami Fluidum, dose ♏v–x.

Tinctura Hyoscyami (15%), most used, dose f℥ss–ij.

Hyoscyaminæ Sulphas, dose gr. $\frac{1}{200}$–$\frac{1}{100}$.

Hyoscinæ Hydrobromas, dose gr. $\frac{1}{200}$–$\frac{1}{100}$.

Physiological action: The physiological effects of hyoscyamus are very analogous to those of belladonna, hyoscyamine being nearly identical with atropine. Hyoscyamus differs in being *less energetic, less persistent* in its action, and *more hypnotic*.

Toxicology: The same as of *Belladonna*, which see.

Therapeutics: The preparations of hyoscyamus may be employed to fulfil the same indications as belladonna—viz., antispasmodic, slightly analgesic, to diminish secretions, etc. As a respiratory stimulant it is inferior to its companion drug.

Hyoscine: This alkaloid has recently been studied, and seems to be *the hypnotic principle* of hyoscyamus. In addition to the ordinary symptoms produced by drugs of this group, it has a marked depressing effect on the cerebral cortex and the motor tract of the spinal cord, and, unlike them, it is a respiratory depressant (Wood). In large doses hyoscine produces a peculiar, *muttering* delirium, dryness of the throat, dilated pupils, slow respirations which become weak, lessened reflexes, a slow, weak pulse; the voice becomes husky, at times there is aphonia; the sexual centres are depressed. The dominant symptom of an ordinary dose

is deep sleep. Hyoscine is a centric respiratory depressant; the heart is also directly depressed, while the lessened reflexes are caused by motor cord depression.

Hyoscine hydrobromate is employed as a hypnotic in sleeplessness with great mental excitement, as in mania, insanity, and delirium tremens. It is said to be safe in advanced kidney disease when morphine is inadmissible; also valuable in nymphomania, spermatorrhœa, and sexual excitement generally (Wood). It is devoid of the unpleasant after-effects of opium, and may be given in doses of gr. $\frac{1}{200}$ to $\frac{1}{100}$ by mouth or hypodermically. Some persons show a decided susceptibility to this alkaloid, and doses within these limits have caused alarming symptoms; but no fatal cases are reported. The drug is contraindicated in inflammatory sore throat.

DUBOISIA.

Duboisia, which is unofficial, contains *duboisine*, probably identical with hyoscyamine, and its effects and uses are those of other members of this group. It is derived from *Duboisia myoporoides* (nat. ord. *Solanaceæ*), and is a native of Australia. Dose gr. $\frac{1}{80}$. It has been used as a hypnotic in insanity, and as an antispasmodic in paralysis agitans and in epilepsy.

AGARICIN.

Agaricin is a preparation of agaricus or larch fungus (genus Boletus). Its mode of action is unknown. It is successful in colliquative sweating and excessive bronchial secretion, and may therefore be considered in this connection. The dose of agaricin (the active principle) is from 1 to 2 grains, that of agaric 5 grains.

COCA, *U. S.* (Coca).

Coca is the *leaves* of *Erythroxylon coca* (nat. ord. Lineæ). Habitat: Peru and Bolivia; cultivated in South America. It contains *cocaine*, the local anæsthetic effects of which have already been considered, and *hygrine*, a mydriatic principle.

Extractum Erythroxyli Fluidum is official, dose ♏xx–f℥j.

Physiological action: *Coca leaves* have long enjoyed a reputation among the natives of Western South America for allaying hunger while under great bodily strain. It is highly probable that this effect is caused by the local anæsthetic effect of the drug on the stomach, and that the individual takes in sufficient food at the end of the journey to make up for any deficient amount while actively exercising. Experiments as to the action of cocaine on tissue-waste are contradictory, though it is asserted that the fresh South American leaf when chewed produces an effect entirely different from that of the dried drug or its active principle, *cocaine*. It is also certain that the peculiar sensation of mental exaltation claimed for the drug does not appear in the European, though it may be produced in the Indians of South America, whose nervous systems are not so highly developed.

Nervous system: A sense of exhilaration and stimulation of the mental faculties, followed by restlessness or "nervousness," is produced; loss of desire for sleep and lessened sense of fatigue; reflexes are at first increased, but later diminish, probably from paralysis of *afferent* and *efferent* nerve-fibres both peripherally and in the cord. Later, after large doses, delirium, inco-ordination of movement, epileptiform convulsions, paralysis, and anæsthesia may ensue.

Circulation: The heart's action is rendered more rapid by depression of the cardio-inhibitory fibres of the vagus, and a consequent increase of blood-pressure follows. *Large doses depress* the circulation.

Respiration is at first powerfully stimulated; but later, after large doses, is depressed, and toxic doses *destroy life by paralysis of this function:* these effects are *centric*, occurring when vagi have been divided. Cocaine increases heat-production and the body-temperature is raised.

Secretions: Cocaine is eliminated in the urine, which may be increased; the skin may be moist: neither effect is constant.

Eye: Pupil primarily slightly contracted, later *widely dilated*, from its local application; the intraocular tension is lowered and accommodation paralyzed, but to a less extent than by atropine. It causes desquamation of the corneal epithelium if its use is persisted in.

Local action: Cocaine, locally applied, causes anæsthesia in a part covered by mucous membrane and also a primary blanching, due to vaso-motor constriction. This is followed by dilatation of the smaller arteries. Injected under the skin in aqueous solutions it produces anæsthesia by a direct action on the terminal filaments of the sensory nerves. It does not penetrate the unbroken skin (see also page 49).

Cocaine-habit: The symptoms are digestive disturbances, insomnia, emaciation, general enfeeblement of body and intellect, with tremors and loss of co-ordinate movement. Withdraw the drug. This can usually be done *at once*. *Acute poisoning* may occur: the symptoms are restlessness and excitement, rapid breathing, and muscular twitchings; later, collapse, slow and labored respiration, largely dilated pupils, epileptiform convulsions, loss of consciousness, delusions, mania, etc. The smallest fatal dose is not certain. Respiratory stimulants are indicated.

Therapeutics: *Cocaine* is used as a *respiratory* and *vaso-motor* stimulant, as a *local anæsthetic*, and may be used as a *mydriatic* and *vaso-constrictor*. As a *respiratory* stimulant it ranks between strychnine and atropine; as a *vaso-motor* stimulant it is useful in shock and collapse. As a local anæsthetic it finds its widest range of usefulness, acting on all mucous membranes, but is very apt to cause constitutional symptoms (see *Local Anæsthetics*). It acts more quickly, less permanently, and is not so powerful as atropine as a *mydriatic;* unlike atropine, it causes shedding of the corneal epithelium and does not completely paralyze accommodation. As a *local astringent* it is very useful (in 4% aqueous solution) to reduce an engorged mucous membrane; the astringent effect may be made more permanent by following its use with a 20 grain to the f℥j antipyrin solution.

Coca is a nervous tonic, and may do good in melancholia, neurasthenia, etc. It will often relieve gastralgia and the pain of gastric ulcer, and check vomiting.

Tropacocaine, or benzoyl tropein, is a tropeine prepared from the narrow-leaved coca-plant of Java. It resembles

cocaine in its general action, but is said to be far less toxic. Death from centric asphyxia has been produced in animals by large doses. The method of administration for local anæsthesia is the same as that for cocaine. It does not produce the local astringent effect of cocaine.

Schleich's solution contains a small percentage of morphine and cocaine, together with a small amount of common salt. Used hypodermically, it exerts a local anæsthetic effect, probably merely through distention of the tissues, as the quantity of cocaine and morphine employed is too small to exert any marked effect.

Eucaine (see page 51).

SPINANTS.

Spinants are drugs tending to excite muscular contraction or motor paralysis, and may be divided into *excito-motors* and *depresso-motors*.

EXCITO-MOTORS.

As far as striped muscle is concerned, the drugs so considered are those containing *strychnine* and *brucine*. Ergot and digitalis act similarly on particular organs, the uterus and heart.

NUX VOMICA, *U. S.* (Nux Vomica).

Nux vomica is the *seed* of *Strychnos Nux vomica* (nat. ord. Loganiaceæ). Habitat: India and East India Islands. It contains two alkaloids—*strychnine* and *brucine*—in combination with igasuric acid. Strychnine represents fully the activity of its parent drug; brucine being similar, but weaker, in its action.

Preparations: Extractum Nucis Vomicæ, dose gr. $\frac{1}{4}$–j.
Extractum Nucis Vomicæ Fluidum, dose ♏ij–v.
Tinctura Nucis Vomicæ (20%), dose ♏v–xv.
Strychnina, *U. S.*, Strychninæ Sulphas, *U. S.*, } dose gr. $\frac{1}{60}$–$\frac{1}{20}$.

Strychnine is a white powder, crystallizing from its solutions, odorless, intensely bitter, very insoluble in water, but

freely so in alcohol, and present to the extent of ¼ to ½% in the crude drug. Its sulphate is soluble in water; but its solutions are seldom used medicinally, because of their intense bitterness. It yields a violet color with oxidizing agents, and this is the basis of several tests for the drug; but the physiological test is more reliable. The latter consists in injecting some of the suspected solution into a frog or other small animal, and noting if physiological effects are produced. The *chemical test* consists in dissolving a crystal of the alkaloid or one of its salts in concentrated sulphuric acid, and adding a crystal of potassium bichromate, when a bluish and then violet-purplish-color is produced (Otto's test). This test is exceedingly delicate.

Physiological action. *Nervous system:* The cerebrum is unaffected, and consciousness is unimpaired, except in the last stages of poisoning, when its loss is due to asphyxia. Strychnine exerts a *selective* action on the motor cells in the anterior cornua, the *reflex function being exaggerated* and the convulsions due to a direct action on the motor side of the cord. The convulsion itself is produced by peripheral irritation reaching the over-excited motor cord through the afferent nerves. In poisoning, the motor nerves are depressed, partly from exhaustion and partly from a direct action on their fibres. The sensory nerves are little affected.

Circulation: Heart-action accelerated and arterial tension increased by medicinal, and depressed by toxic, doses. The *blood-pressure* rises during a convulsion, but is above normal independently of this from centric vaso-motor stimulation, the additional rise being due to muscle-spasm and asphyxia.

The *respiration* is greatly stimulated. Death may result from a tetanic condition of the respiratory muscles, resulting in asphyxia (cramp asphyxia), or more rarely from exhaustion.

Special senses: Vision and hearing are rendered more acute; tinnitus aurium may occur; during a convulsion the eyes are wide open and staring.

Digestion: From its bitter taste it excites the secretions of the gastro-intestinal tract, increasing appetite and promoting digestion. It increases peristaltic action.

Elimination: Absorption and elimination are rapid, the alkaloid appearing in the urine as strychnine and as strychnic acid.

Toxicology: Strychnine may be used with criminal intent, and gr. ss has proven fatal in the adult. The *symptoms* of poisoning appear usually in fifteen or twenty minutes, and are as follows in their order of development: sense of uneasiness, jerky respiration, stiffness of inferior maxilla, and shuddering; these are suddenly succeeded by tonic convulsions, especially of extensors, causing *risus sardonicus;* opisthotonos, the relative strength of the different muscles determining the position of the patient; pallor, succeeded by cyanosis from respiratory embarrassment. Consciousness is complete unless abolished by prolonged asphyxia. These spasms succeed one another on the slightest peripheral irritation, and may cause death in a period varying from a few minutes to several hours, either by asphyxia or exhaustion by directly paralyzing the motor nerves. Very large doses injected into the circulation may cause death quickly and almost without symptoms (by paralyzing the motor nerves). Given in ascending doses, the *physiological limit* is reached when it causes nervousness, restlessness, stiffness of the muscles of the throat and back, with muscular twitchings.

Diagnosis: Traumatic tetanus is the main condition from which its toxic effects are to be differentiated. The following points of difference may be tabulated:

	Strychnine Tetanus.	*Traumatic Tetanus.*
(1)	Duration short.	Duration longer.
(2)	Development sudden.	Gradual.
(3)	Extremities first involved.	Face first (trismus).
(4)	Intermission and muscular relaxation more marked.	Less marked; spasm almost constant, especially trismus.
(5)	Swallowing possible.	Impossible.

Treatment consists in (1) eliminating the poison, (2) checking the convulsions, (3) maintaining respiration, and (4) in keeping the patient absolutely quiet. The drug remaining

in the stomach may be rendered *partially* insoluble by *tannin*, after which the stomach is emptied by the stomach-pump. *Emetics* are contraindicated after the effect is once felt, because of the danger of producing convulsions through excessive irritation. The spasms may be *averted* by the joint use of *chloral* and *bromides;* but *if already present*, the temporary use of ether, or even chloroform, may be necessary. *Artificial* or *forced* inspiration is to be employed if cyanosis develops.

Therapeutics: Strychnine is used (1) in gastro-intestinal disorders as a stomachic tonic in *anorexia*, *chronic gastritis*, and *atonic dyspepsia*, in which conditions it should be given before meals; in *morning nausea* and the *vomiting of pregnancy* and *alcoholism*, which *may* be relieved; in *functional disorder* of the liver with *intestinal indigestion*, and as a tonic in cirrhosis; in constipation from inactivity of the muscular coat.

(2) In hæmic disorders, as anæmia, chlorosis, hemorrhagic diathesis, purpura, etc., it may prove a good *indirect* tonic.

(3) In relaxed conditions of the genito-urinary system, as in impotence, nocturnal emissions, incontinence of urine, etc., when atonic or functional and not dependent on organic defect; it is also occasionally used in amenorrhœa and neuralgic dysmenorrhœa.

(4) In paralyses, *especially those of peripheral origin*, as *lead-palsy* and *peripheral neuritis*, it is often of great value, and is best administered hypodermically in the affected region. It is of less value, but may do good, when the paralysis is of *centric* origin; but is positively contraindicated during the early or rigid stages, or when any acute process obtains. Amaurosis due to alcohol or tobacco, and amblyopia from disuse, as is seen in strabismus, may be cured by strychnine. In all paralyses the drug must be pushed to the production of slight physiological effects. Given hypodermically or in enemata, by stimulating respiration and circulation it is of great value in surgical shock and in asthenic conditions generally. It is partially antidotal to opium and chloral. In the dyspnœa of cardiac disease it is an efficient adjuvant to digitalis. Petit mal may be benefited by strychnine.

(5) As a *respiratory* stimulant in emphysema, chronic bronchitis, and in acute poisoning with respiratory depression; it forms a valuable addition to cough-mixtures when expectoration is delayed because of weakness.

(6) In chronic valvular disease, cardiac weakness due to functional or organic disease, in cardiac depression from acute disease, strychnine forms a most valuable *cardiac tonic.*

Administration: Strychnine is generally given in pill-form, except when large doses are required, when solutions should be employed to avoid inaccuracy of dosage. It should not be given in the same solution with tannic acid; *nor should it be combined with bromides* and *iodides,* which precipitate it partially from its solutions. Such combinations may cause the last portion to contain an overdose. It is very readily absorbed by the rectum, and the rectal dose should be the same as by mouth.

Brucine: Recent experiments seem to show that this alkaloid differs from strychnine in depressing the sensory nerves, being somewhat anæsthetic in strong solutions. It has little effect when taken by the mouth, owing to its rapid elimination, and is less powerfully convulsant than strychnine. It forms a beautiful scarlet or blood-red color with nitric acid.

IGNATIA.

Ignatia is the *seed* of *Strychnos Ignatia.* It contains the same active alkaloids as nux vomica, the strychnine being present in larger proportions ($\frac{1}{2}$% or more). Its *preparation* is—

Tinctura Ignatiæ, dose ♏x–xx.

Its action and uses, consequently, are those of nux vomica.

The drug is no longer official.

PICROTOXINUM, *U. S.* (Picrotoxin; Cocculus Indicus).

Picrotoxin is a neutral principle obtained from the *seed* of *Anamirta paniculata* (nat. ord. Menispermaceæ), an East Indian shrub.

Cocculus Indicus is the *dried berries* of *Anamirta paniculata.*

It owes its activity to the *neutral principle, picrotoxin,* which is a white, crystalline, bitter substance, somewhat soluble in water and freely so in alcohol and ether. Not being an alkaloid, it is not precipitated by substances containing tannic acid. It is official as picrotoxinum.

Physiological action and therapeutics: Like strychnine, picrotoxin is a tetanizing agent, having a selective action on the centres in the medulla (Biddle), and in large doses causes death by tetanic fixation of the respiratory muscles. It produces decided diaphoresis. In *poisonous doses* it causes violent convulsions, which are both cerebral and spinal, slowing of the pulse, intermittent respiration, and finally death. Small amounts increase blood-pressure. It is chiefly used locally as a decoction or ointment for the destruction of lice and the parasite of tinea versicolor. Lately it has been used in doses of gr. $\frac{1}{180}$ to $\frac{1}{60}$ for the *night-sweats* of phthisis. Otherwise it is little used internally.

Ergot and **Digitalis,** although muscular excitants, will be more properly considered elsewhere.

DEPRESSO-MOTORS.

PHYSOSTIGMA, *U. S.* (Physostigma; Calabar Bean).

Physostigma is the *seed* of *Physostigma venenosum* (nat. ord. Leguminosæ). Habitat: Tropical Western Africa. The seed is kidney-shaped and contains as its active principle an alkaloid, *physostigmine,* or *eserine.* Calabarine and other alkaloids have been isolated, but they are probably decomposition-products of eserine. Calabarine is believed to be a tetanizing agent. Eserine is sparingly soluble in water, but its official salt, the salicylate, dissolves in 130 parts of water.

Preparations: Tinctura Physostigmatis, dose ♏v–xx.

Physostigminæ Salicylas, dose gr. $\frac{1}{100}$–$\frac{1}{60}$.

Extractum Physostigmatis, dose gr. $\frac{1}{20}$–$\frac{1}{4}$.

Physiological action: The symptoms produced by full doses are giddiness, pallor and coolness of the skin, contracted pupils, a slow and full pulse, muscular tremors followed by

relaxation, weakness, and drowsiness, but no stupor; vomiting and purging may occur. Toxic doses add to these effects symptoms of respiratory embarrassment, a total loss of reflexes, and finally paralysis (dominant symptom).

Nervous system: The cerebrum is unaffected even by large doses; but the centres in the gray matter of the spinal cord are depressed, causing *diminution* or *complete loss of reflexes.* Depression of the motor nerves occurs only after large doses.

Circulation: Small doses slow the pulse-rate. Toxic doses may arrest the heart in diastole, but the heart generally continues to beat after respiration fails. This slowing is probably due to stimulation of the pneumogastric, which is depressed by large doses; this, however, has not been positively proved to be its mode of action. The arterial tension is at first raised, but by toxic doses is finally lowered.

Respiration is depressed, and in fatal cases death takes place from respiratory paralysis (centric depression).

Intestines: Peristalsis is decidedly increased by a direct action on the *muscular coat*, a tetanic condition being produced by large doses: this is followed by relaxation from over-stimulation and exhaustion.

Eye: The pupil is strongly contracted, probably by *local* influence—*i. e.*, by paralysis of the sympathetic terminals and oculo-motor stimulation. Thus it antagonizes the effects of atropine. This myosis is not constant, and is not of so long duration as the mydriasis of atropine. The ciliary muscle is stimulated, the drug thus acting in antagonism to atropine with regard to power of accommodation.

Muscles: Physostigma is a muscle-poison, acting either directly upon the muscle itself or upon its contained nerve-filaments.

Toxicology: The *prominent symptoms* are contracted pupils, embarrassed respiration, muscular weakness, and abolition of reflexes. The characteristic sign of poisoning by Calabar bean is the presence of muscular tremors associated with paralysis. Severe symptoms have been recovered from.

Treatment: Atropine tentatively is the proper antidote. Measures against shock, as artificial warmth, etc., and artificial respiration, are to be employed as necessity arises.

Therapeutics: Internally, it may be used with success in tetanus, strychnine-poisoning, and convulsive conditions generally. A good preparation of the drug will prove one of the best measures against tetanus. In chorea and bronchial catarrh with dyspnœa it has its advocates. In ophthalmology it is used to antagonize atropine or to alternate with it in breaking up adhesions, etc. Physostigma or its alkaloid may sometimes be used as an addition to purgative pills; if physostigmine is employed, its dose should not exceed $\frac{1}{40}$ of a grain, cautioning the patient against increasing the dose.

POTASSII BROMIDUM, *U. S.* (Potassium Bromide), KBr = 118.79.

Potassium bromide is prepared by the reaction of ferrous bromide and potassium carbonate, potassium bromide remaining in solution and crystallizing on evaporation. It is a colorless, crystalline, anhydrous salt, of saline taste, easily soluble in water, a property common to all the bromides in common use.

Physiological action: Bromides act as universal depressants to all bodily functions. They depress the brain, spinal cord, respiration, circulation, sexual function, and temperature.

Locally applied, potassium bromide obtunds the sensibility of mucous membranes and is slightly irritant.

Nervous system: Upon the cerebral cortex it exerts a marked sedative effect, and especially diminishes the irritability of the motor area. *Reflexes* are *diminished*, from paralysis partly of reflex centres and partly of afferent nerves and their end-organs, the receptive side of the cord being most affected. Painful and tactile sensations are diminished, but the *motor nerves* are *not affected*.

Circulation: The activity of the heart is lessened, the pulse becoming slower, with lengthened diastole, from direct sedative effect. On the vaso-motor apparatus its effects are still *sub judice*. Arterial tension is probably lowered.

Respiration is diminished in frequency, and a slight fall of temperature occurs. Exhalation of CO_2 is lessened.

Secretions are increased, but, unlike the iodides, it produces no lachrymation, salivation, or nasopharyngeal catarrh. Large doses may cause diarrhœa. The effects upon the urine appear to vary. It exerts a marked sedative effect on the genito-urinary tract, the vesical irritability being lessened and genital excitement allayed. The drug is rapidly absorbed, but slowly eliminated unchanged in all the excretions, principally those of the kidney, skin, and intestines.

Potassium bromide—toxicology: Acute fatal poisoning does not occur. A single large dose causes gastro-intestinal irritation, nausea, and vomiting, with great mental apathy, drowsiness, stupor, and some muscular weakness. After continued use *bromism* is produced, a chronic poisoning which may result in death. The symptoms of this condition are anæmia and malnutrition, mental weakness and aberration, somnolence, hallucinations, and even a mild form of mania; an eruption, generally acneform and occasionally eczematous; depression of circulation and respiration, with a fall in temperature; hoarseness, aphonia, loss of co-ordination, and a feeling of muscular weakness; absolute loss of sexual desire and impaired sensibility of the mucous membranes, as is well seen in the pharynx, titillation of which does not excite retching. The physiological limit is reached when mental dulness, the acne-rash, and the fetid breath appear. These symptoms subside on withdrawing the drug, and are less severe when it is administered with Fowler's solution or when the mixed bromides are taken. They are also lessened when gastro-intestinal antiseptics like salol are simultaneously exhibited. Death may occur in advanced bromism from *universal depression.*

Potassium bromide—therapeutics: This drug acts as a *hypnotic* in conditions of mental excitement, hysteria, and *nervous overexcitability* generally. Combined with chloral it is valuable in delirium tremens. In the restless forms of insanity it is well combined with chloral or cannabis indica, but is contraindicated in melancholia and in all conditions of exhaustion and asthenia.

As an antispasmodic it is valuable in the reflex *vomiting of pregnancy, nausea marina, uterine disorder,* or *migraine;* in

tetanus, probably constituting the best treatment when given in large doses in *strychnine-poisoning*; in *chorea*, *whooping-cough*, and *convulsions* generally as an adjuvant to other measures.

From its sedative effect on the genito-urinary organs it is useful in *nymphomania*, *chordee*, excessive venereal desire, *masturbation*, *spermatorrhœa*, etc. It is also of avail in the nervous *disturbances* of the *menopause*. Neuralgias may be benefited if not dependent on anæmia. Its greatest efficacy, however, is in the treatment of *epilepsy*. It succeeds better in *grand* than *petit mal*, but is often useful in the latter. It should be given in large doses until mild bromism is produced, and must be continued for a long period after attacks have ceased. It is well to combine antipyrin with the *mixed* bromides, adding a small amount of Fowler's solution to prevent the acne-rash. Tachycardia of functional origin or symptomatic of exophthalmic goitre is often relieved.

Administration: Dose gr. xv to ʒj or more, in elixirs or syrups; its saline taste may be made less evident by the addition of sodium bicarbonate. It should not be long continued in conditions of malnutrition or anæmia.

SODII BROMIDUM, *U. S.* (Sodium Bromide), NaBr = 102.76.

Sodium bromide, in its preparation, chemical and physical properties, and uses corresponds closely with potassium bromide. It is less disagreeable to the taste, less soluble, less depressing, and by some is considered to be less liable to cause symptoms of bromism.

AMMONII BROMIDUM, *U. S.* (Ammonium Bromide), NH_4Br = 97.77.

Ammonium bromide is formed by precipitating a solution of ferrous bromide by aqua ammoniæ, the desired salt remaining in solution. It is crystalline, but not permanently so, and is more often seen as a powder. It is analogous to the potassium compound, but is somewhat *less active* and *more disagreeable* to the taste, and causes more gastric irritation. By some it is said to be less depressing to

the heart, but probably all the symptoms of bromism may be caused by it. Its physiological action is not fully understood. It does not so readily produce acne. It may be used to fulfil the same indications as potassium bromide, and especial efficacy is claimed for it in *pertussis* and *acute rheumatism*.

STRONTII BROMIDUM, *U. S.* (**Strontium Bromide**), $SrBr_2 + 6H_2O = 354.58$.

This salt appears in very deliquescent crystals, readily soluble in water and alcohol. It does not produce gastric derangement like the other bromides, but is said to exert a beneficial effect on digestion. It is used in somewhat larger dose and for the same indications as potassium bromide; it is less apt to produce symptoms of bromism.

LITHII BROMIDUM, *U. S.* (**Lithium Bromide**), LiBr = 86.77.

Lithium bromide, an expensive salt with no particular advantages, contains a larger proportion of bromine than other bromides. It is said to have proved efficacious in some cases of epilepsy in which other bromides failed. Dose gr. xv to ʒss.

Acidum Hydrobromicum Dilutum, *U. S.*, is a 10% solution of gaseous hydrobromic acid (HBr = 80.76) in water, acting much like the bromides, but being more irritant to the stomach; it should be well diluted. Indications as for bromides. It is also used as a corrigent to quinine, preventing the headache and tinnitus aurium so often caused by that drug. Dose in its official dilution fʒj–ij.

CURARE, or WOORARA.

Curare is an unofficial drug of uncertain origin, being derived from different varieties of *Strychnos*, but containing no tetanizing principle. It contains an alkaloid, *curarine*, the dose of which is gr. $\frac{1}{100}$ to $\frac{1}{40}$ or even larger by mouth, or gr. $\frac{1}{200}$ to $\frac{1}{150}$ hypodermically. The dose of the crude drug is gr. $\frac{1}{20}$ to $\frac{1}{4}$.

Physiological action: Curare is comparatively innocuous by mouth because of its slow absorption. Hypodermically, its only action is to paralyze the *terminal motor filaments*, with an incidental diminution of the reflexes, the *muscular fibres* and *sensory nerves* preserving their irritability. Death is caused by paralysis of the respiratory muscles.

Therapeutics: Although chiefly employed in physiological experimentation, it has been used in tetanus, hydrophobia, strychnine-poisoning, and muscular cramps and spasms. In all these conditions it can only be of use by lessening the exhaustion dependent upon the spasms.

CONIUM, *U. S.* (Conium).

Conium is the full-grown *fruit* of *Conium maculatum* (nat. ord. Umbelliferæ) gathered while yet green. Habitat: Europe and Asia; naturalized in North America. Its active principle is *coniine*, a transparent oily fluid, of bitter taste and of peculiar mouse-like odor. Coniine is one of the *volatile* alkaloids (the others being lobeline, nicotine, and sparteine). It is found in varying proportions in the drug: this, together with the volatile character of the active principle, accounts for the uncertain action of the drug.

Preparations: Extractum Conii, dose gr. $\frac{1}{4}$–iij.

Extractum Conii Fluidum, in which the coniine is fixed by acetic acid, is the best preparation, in doses of ♏j–xv.

Squibbs' Fluid Extract of Conium is a good preparation, the commencing dose being ♏x, to be increased until effects are produced.

In fact, whatever preparation is used it is safer to begin with the minimum dose and increase it in this way. Of coniine itself the dose is ♏$\frac{1}{16}$–$\frac{1}{8}$.

Physiological action: The symptoms produced are weakness and heaviness of the extremities, beginning in the legs, ptosis, disordered vision, and giddiness. Large doses cause respiratory failure.

Nervous system: The cerebral hemispheres are unaffected except by asphyxia produced during the poisoning; the characteristic effect is *paralysis of motor nerves, affecting*

first their end-organs, the muscles retaining their irritability after death. Sensation and the spinal reflex centres are perhaps slightly affected by large doses. The pupils are dilated, but not constantly so. The drugs which paralyze the *motor nerves* are belladonna, lobelia, conium, pelletierine, and isopelletierine.

Respiration: The nerves supplying the muscles of respiration are paralyzed, thus causing death. The circulation is depressed. The temperature is slightly reduced. Elimination takes place by the urine, and the secretions are only slightly affected by the drug.

Toxicology: Toxic doses produce nausea, vertigo, ocular disturbances, as ptosis, diplopia, and dilated pupils, muscular and respiratory paralysis, coma, convulsions, and death. The treatment consists of *cardiac* and *respiratory stimulation*, especially *artificial respiration*, external warmth, etc.

Therapeutics: Conium has been used medicinally in *chorea*, *local spasms* (as blepharospasm), and in *acute mania* with great motor excitement. In all these conditions it must be pushed to the production of its physiological effects.

GELSEMIUM, *U. S.* (Gelsemium).

Gelsemium is the *rhizome* and *roots* of *Gelsemium sempervirens* (nat. ord. Loganiaceæ). This is the yellow or Carolina jasmine. It contains as its active principle the alkaloid *gelsemine*, in combination with *gelseminic acid* (Wormley).

Preparations: Tinctura Gelsemii (15%), dose ♏x–xx or more.

Extractum Gelsemii Fluidum, dose ♏v–xv.

The latter is the favorite preparation. A drachm of it has caused serious symptoms, and two drachms death.

Physiological action: Small amounts produce few symptoms or none; medicinal doses cause languor, muscular fatigue, dizziness, ocular disturbances, and frontal headache; *large doses* are followed *quickly* by an aggravation of these symptoms, with strongly dilated pupils, *diplopia*, *ptosis*, and sometimes *internal strabismus*, *falling of jaw*, weakness of pulse,

and lessened respiration. *Toxic doses* add to these effects the following: inco-ordinate movements, coldness of surface, and unconsciousness, followed by death from paralysis of respiration.

Nervous system: The cerebrum is unaffected. The *motor tract* of the *spinal cord* is paralyzed, this paralysis being at times preceded by a period of spinal excitability with convulsions. The depression of respiration is due to an effect on the respiratory centre (Wood). The ocular symptoms noted above are due to paralysis of the peripheral endings of the oculo-motor and abducens nerves respectively.

Therapeutics: This drug may be used with success in spasmodic conditions, as tetanus, spasmodic and hysterical cough, laryngismus stridulus, and asthma; in *neuralgias*, especially of the *facial* and *ovarian* types; in the *early stages* of *pneumonia* and *pleurisy*, in which conditions it does good by lessening the frequency of the respiration and depressing the general circulation, thus lessening the liability to pulmonary stasis (Bartholow).

Toxicology: Cases of poisoning are to be treated by cardiac and respiratory stimulants. In administering the drug give it until muscular weakness, slight ptosis, or double vision is complained of.

LOBELIA, *U. S.* (Lobelia; Indian Tobacco).

Lobelia is the *leaves* and *tops* of *Lobelia inflata* (nat. ord. Lobeliaceæ), collected after a portion of the capsules have become inflated. Habitat: North America. Its sole active principle is *lobeline*, a *liquid* alkaloid.

Preparations: Extractum Lobeliæ Fluidum, dose ♏j–v.

Tinctura Lobeliæ (20%), dose ♏x–xx.

Physiological action: Lobelia produces, in large doses, burning of fauces, œsophagus, and stomach; vomiting, purging, and other symptoms of gastro-intestinal irritation; slow pulse, cold sweating, and *profound muscular depression*. Toxic doses add to these effects collapse, stupor, coma, and death, which is at times preceded by convulsions. The muscular paralysis is due to a *direct* depressant action on the

motor nerves; the respiratory depression is centric (dominant action).

Therapeutics: Its uses are few, the chief being as an antispasmodic in asthma. An infusion (℥j to Oj) is recommended as a local application in the eruption produced by poison-ivy. As an emetic it is far too harsh, and is no longer used. It has been used as a stimulating expectorant.

Toxicology: For symptoms of poisoning, see above. The treatment consists in copious draughts of warm solutions of *tannic acid*, its antidote, with stimulation by alcohol, ammonia, strychnine, and external heat.

TABACUM, *U. S.* (Tobacco).

Tobacco is the commercial, dried *leaves* of *Nicotiana Tabacum* (nat. ord. Solanaceæ). Habitat: Tropical America; cultivated. Its active principle is *nicotine*, a *volatile*, liquid, and very potent *alkaloid*, colorless, transparent, and having the odor of tobacco. It is freely soluble in water. When tobacco is burned nicotine does not appear in the smoke, *pyridine* and *collodin* being formed. It is said that collodin is less active, and is present in greater amounts in cigar-smoke, while in that from pipes pyridine preponderates.

Preparations: *Tabacum* alone is official. Extemporaneous infusions, decoctions, and wines may be used.

Physiological action: Like lobelia, tobacco is a nauseant, depressant, and an antispasmodic. The symptoms of the two drugs correspond closely, but a greater toleration for tobacco can be acquired. It increases the secretions of the salivary and intestinal glands, of the kidneys, and of the skin. It slows and depresses the heart and lowers the arterial tension. Death is due to respiratory, and occasionally to cardiac, failure. Its continued use by smokers often leads to chronic pharyngitis, gastric disorder, nervous depression, amaurosis either functional or due to retinal atrophy, and "irritable heart." These effects are especially marked in the young, and even mental deterioration seems to follow its use. Nicotine itself is a very rapid poison, death having resulted

almost immediately from a toxic dose. The indications in poisoning are the same as for lobelia.

Therapeutics: Although its use is not to be recommended on account of the danger entailed, it has been employed as a depressant antispasmodic in asthma, tetanus, strychnine-poisoning, and intestinal obstruction. Locally, it has been used in infusion or decoction as a parasiticide; but is dangerous and has caused death. Smoking, when indulged in moderately, seems in some to stimulate, in others to quiet, mental activity.

NITRITE GROUP.

This group of drugs acts in a dominant way upon the *spinal cord* and *circulation*. It includes amyl nitrite, the nitrites of sodium and potassium, and nitroglycerin, the last chemically a nitrate, but probably converted into a nitrite in the blood.

AMYL NITRIS (Amyl Nitrite).

Amyl nitrite is a liquid containing about 80% of amyl (principally isoamyl) nitrite ($C_5H_{11}NO_2 = 116.78$), together with variable quantities of undetermined compounds. It is pale yellow, oily, and of very great volatility, and has a banana-like odor, aromatic taste, and a neutral or slightly acid reaction. It is formed by the reaction of nitric acid on amylic alcohol (fusel oil).

Physiological action: The effects of this drug are typical of those of the group. Inhaled in moderate amounts, it is very quickly absorbed and produces almost immediately the following peculiar train of symptoms: a sense of fulness, distention, and pain in the head, flushing of face, rapid heart-action, violent palpitation, and labored respiration, with a rapid lessening of reflexes. The pulse becomes *full* and *very soft*. Xanthopsia (a yellow coloring of objects seen) may occur. These symptoms pass away in a few minutes. Toxic doses cause pallor of the skin, muscular relaxation, irregular respiration, and death by *asphyxia* (centric). Although gen-

erally administered by inhalation, it is readily absorbed by all channels except the skin. The effects *seriatim* are as follows:

Circulation: The *heart* is stimulated, its rate being greatly increased and its individual beats strengthened; but after toxic doses cardiac paralysis ensues. The *blood-pressure* is notably diminished from vaso-motor paralysis, principally by a direct action on the muscular coat of the vessel-wall. The cardiac effects are due to (1) a probable initial stimulation of the nervo-muscular apparatus of the heart; (2) paralysis of the vagus; and (3) the sudden relief of resistance from the dilating vessel-walls.

Nervous system: Motor paralysis and loss of reflexes occur, due to depression of the motor part of the spinal cord (dominant action). It is *not anæsthetic.*

Blood: The hæmoglobin of the blood is converted into a substance, probably methæmoglobin; but this action is *only partial.* The color of arterial blood approaches that of venous, and in poisoning both become chocolate-colored. Owing to this *lessened oxidizing power* of the blood the *temperature is depressed.*

Amyl nitrite—therapeutics: It is used as an *antispasmodic* in the following conditions:

In *angina pectoris*, in which, by overcoming the accompanying increase of arterial tension, it gives marked and immediate relief whatever may be the causative condition.

In *asthma*, the attacks of which may generally be relieved, especially when of purely bronchial type with no underlying cardiac or emphysematous condition.

Epilepsy: In cases in which an *aura* precedes, giving an opportunity for its administration, it will abort the attack; in the constantly recurring spasms of the status epilepticus it is invaluable, theoretically, by lessening the arterial spasm of the motor area which is supposed to cause the convulsion. The "nitrite-of-amyl pearls" are very convenient for this purpose. They are delicate glass capsules containing the drug, and may be carried by the patient, broken on his handkerchief, and inhaled.

In spasmodic conditions generally, as in *tetanus*, strych-

nine-poisoning, puerperal convulsions, uræmia, etc., it may prove valuable.

In the heightened arterial pressure of renal disease it is used; but nitroglycerin is preferable from the longer duration of its effects.

In *migraine*, when due to arterial spasm, and in *nervous dysmenorrhœa*, it may prove palliative.

It is also used as a *cardiac stimulant* in sudden syncope, profuse hemorrhage, and the cardiac failure of chloroform-narcosis; but care should be exercised not to increase the existing cardiac depression by too large a dose; dose ♏ij–v, by mouth or inhaled.

SPIRITUS GLONOINI, *U. S.* (Spirit of Nitroglycerin; Spirit of Glonoin).

Spirit of glonoin is an alcoholic solution of *Glonoin* [glyceryl (or propenyl) trinitrate, or nitroglycerin; $C_3H_5(NO_3)_3$ =226.58], containing 1 % by weight of the substance.

Nitroglycerin (also called trinitroglycerin) is a colorless, oily liquid, of a specific gravity of 1.600, formed by the action of a mixture of *nitric* and *sulphuric acids* on glycerin. It is a violent explosive, and is used in medicine in a 1 % *alcoholic solution*, known as Spiritus Glonoini, the dose of which is gtt. ss–iij. Efficient tablet triturates are also employed.

Physiological action: Nitroglycerin acts upon the circulation, blood, spinal cord, and muscles as does amyl nitrite; but *differs in its slower action, less marked vaso-motor depression, and greater tendency to produce headaches.* It takes effect in from five to ten minutes, and these effects are not protracted beyond an hour, so that in order to maintain a constant effect it must be frequently repeated. Nitroglycerin is in reality a nitrate; but it is highly probable that it is decomposed in the blood, circulating and acting as a nitrite. The physiological limit of the drug is reached when it produces intense *frontal headache.*

Therapeutics: Its uses are those of amyl nitrite (which see), with the exception, of course, of epilepsy and angina pectoris, in which the volatility of the amyl compound makes

it preferable. Glonoin is more efficient when it is desirable to maintain a steady reduction of arterial tension.

POTASSII NITRIS (Potassium Nitrite), KNO_2.

SODII NITRIS, *U. S.* (Sodium Nitrite), $NaNO_2 = 68.93$.

The **nitrites of potassium** and **sodium** are crystalline, deliquescent, and freely soluble in water, in which respect they have the advantage over nitroglycerin, to which they are closely analogous in their effects. They have the same general effects as the other nitrites, except that they are slower in action and their effects are more lasting. They are liable to contamination by *nitrates*, and are said to produce disagreeable eructations. They are eliminated as *nitrates*. Their uses correspond to those of the preceding drug. Dose gr. ij–iij.

Sweet spirit of nitre (spirit of nitrous ether) in large doses produces the cyanosis and other symptoms characteristic of the other nitrites, coupled with the effects produced by alcohol.

CARDIAC STIMULANTS.

Cardiac stimulants are drugs used to promote the force of the circulation. No general rule for their method of action can be laid down.

AMMONIA.

Ammonia is a colorless, very irritant *gas*, very alkaline, and very soluble in water. It is obtained as a waste-product in the manufacture of coal-gas. It enjoys a wide range of therapeutic uses, but may be best considered as a cardiac stimulant.

Preparations: Aqua Ammoniæ Fortior (28 % ammonia), external use only: a powerful corrosive poison (see *Toxicology*).

Aqua Ammoniæ (10 %),
Spiritus Ammoniæ (10 %), } well diluted, dose ♏x–f℥ss.

Spiritus Ammoniæ Aromaticus (contains ammon. carbonat., 3.4 %; aq. ammoniæ, 9 %; flavored with the oils of lavender

flowers, nutmeg, and lemon), a favorite and agreeable antacid, stomachic, and stimulant; dose f℥ss–j.

Linimentum Ammoniæ (aq. ammon., 35%; ol. gossip. semin., 60%; alcohol, 5%).

Liquor Ammonii Acetatis (spirit of Mindererus) contains 7% of the salt, and is used principally as a vehicle; dose f℥ss–ij.

Ammonii Carbonas (sal volatile), dose gr. v–x.

Ammonii Chloridum (ammonium muriate or sal ammoniac); we have an official *troche*, gr. ij in each; dose gr. v–x. A stimulating expectorant.

Ammonii Phosphas, dose gr. x–xxx; this has the action of the other phosphates.

The *nitrate* is official for pharmacopœial purposes only; while the *benzoate*, *bromide*, *iodide*, and *valerianate* produce the effects of the other constituents; these salts are therefore not properly treated of here. All are official.

Physiological action: *Locally*, solutions of ammonia act as powerful irritants, causing painful vesication of the skin and mucous membranes. *Inhaled*, ammonia causes irritation and inflammation of the air-passages. *Swallowed* in strong solutions it produces vomiting, epigastric pain, bloody diarrhœa, and *other symptoms of gastro-intestinal irritation*, with at times convulsions of spinal origin (due to action on the motor side of the cord). Death may rapidly ensue from œdema of the glottis; from respiratory depression; or long afterward from pyloric stricture or other resulting structural changes.

Circulation: To this function ammonia is a rapid, diffusible stimulant, increasing the heart-action, probably by stimulation of the cardiac accelerators: it also increases the blood-pressure, *not* by stimulation of the *general* vaso-motor system, for it occurs after spinal section, but perhaps by a direct action on the peripheral nervo-muscular structures.

The *respiration* is accelerated by *direct stimulation* of the *respiratory centre*. The secretion of the bronchial mucous membrane is increased, and, indeed, the drug appears to exert a selective action on mucous membranes generally. It is not a hepatic stimulant. Ammonia is readily absorbed, however administered, and exists as such in the blood. It is

quickly oxidized, and is eliminated by the urine as *nitric acid* and *urea*, thus giving the urine an *acid* reaction when ammonia itself, or its tartrate, carbonate, or chloride, is administered.

Therapeutics: Ammonia is used—

As a *cardiac stimulant* in syncope from cardiac disease or hemorrhage, in chloroform-narcosis, surgical shock, snake-bite, or hydrocyanic-acid poisoning, or in cardiac failure occurring in infectious diseases; its action is very evanescent, and frequent repetition is necessary. For inhalation in sudden syncope the spirit, and for administration by mouth or for hypodermic use the aqua, is preferred, well diluted.

As a *blennorrhetic expectorant* in acute bronchitis or pneumonia after subsidence of the acute stage (carbonate preferred), and in chronic bronchitis with profuse expectoration (chloride).

In *hepatic disorders*, whether functional or due to structural changes, as beginning fatty and cirrhotic liver, catarrh of the bile-ducts, etc., the chloride is efficacious, its modus operandi being, however, not clear.

In *acute exanthemata* with circulatory depression and high temperature the liquor ammon. acetatis is much used as a mild febrifuge and stimulant.

In *catarrhal* conditions of the *stomach* or *intestines* the chloride does good, but the continued use of this or any other strong saline is not advisable.

In gastric acidity with vomiting and headache the carbonate in solution in liq. ammon. acetat. is a valuable remedy; also in combating the after-effects of acute alcoholism.

In *cystitis* the ammonia salts above mentioned are useful, and the benzoate is particularly valuable by acidifying the urine and disinfecting the mucous membrane of the bladder.

Toxicology: Poisoning may occur from the ingestion of the stronger ammonia-water. The symptoms are those of corrosive poisoning: abdominal pain, vomiting, bloody purging; at times convulsions with or without consciousness, at others stupor and coma without convulsions. The odor of ammonia can often be detected upon the breath or in the air of the room. The *treatment* consists in the immediate admin-

istration of dilute acids, as vinegar, lemon-juice, etc., preferably mixed with a *bland oil*, and followed by respiratory and cardiac stimulants; tracheotomy if œdema of the larynx threatens life.

ALCOHOL, *U. S.* (Alcohol).

Alcohol is a liquid composed of about 91 % by weight, or 94 % by volume, of Ethyl Alcohol ($C_2H_5OH = 45.9$) and about 9 % by weight of water.

Alcohol Absolutum, *U. S.*, *Absolute Alcohol*, is *ethyl alcohol*, containing not more than 1 % by weight of water.

An **alcohol** is an *organic compound*, the hydrate of some organic radical. (Thus, methyl hydrate, CH_3OH, is methyl alcohol, or wood alcohol; C_2H_5OH is ethyl hydrate or ethyl alcohol, or *alcohol*.) Alcohol is obtained by *fractional distillation* from the liquids in which it exists, having been formed in these by *vinous fermentation* of *grape-sugar*, or *glucose*. This substance is changed under the action of a ferment (the yeast-plant, or *Torula cerevisiæ*) directly into alcohol and carbonic acid. The glucose exists already formed in grape-juice and other fruit-juices; but is usually obtained by conversion of starch, with subsequent fermentation.

Alcohol Deodoratum, *U. S.*, *Deodorized Alcohol*, is a liquid composed of about 92.5 % by weight, or 95.1 % by volume, of ethyl alcohol ($C_2H_5OH = 45.9$), and about 7.5 % by weight of water.

Alcohol Dilutum, *U. S.*, *Diluted Alcohol*, contains about 41 % by weight, or 48.6 % by volume, of absolute ethyl alcohol; made by mixing equal volumes of alcohol and water. This is used for pharmaceutical purposes.

Official alcohol, ethyl alcohol (C_2H_5OH), is a colorless, inflammable, and volatile liquid, having a strong affinity for water, and reacting to sulphuric acid, with the production of ether and water. Consisting of so large a percentage of unoxidized C and H, alcohol is evidently capable of considerable oxidation and of liberating energy. The ultimate results of oxidation are CO_2 and H_2O.

Physiological action: The effects of alcohol are (1) *primary*,

which follow when topically applied or when circulating unchanged in the blood; and (2) *secondary*, which result from long-continued use.

Locally, alcohol applied to the skin is slightly irritant, especially if evaporation be prevented; abstracts water from the tissues and hardens the epidermis; when evaporating it produces a cooling and slightly anæsthetic effect.

Internally, in *small doses well diluted*, it stimulates glandular secretion by (1) causing a superficial congestion of the mucous membrane, and (2) by a direct stimulation of the orifices of the glands, causing an outpouring of their secretion. Hence the appetite and digestive powers are promoted. When, however, too concentrated or in too large an amount, it precipitates the pepsin secretion, causes nausea, vomiting, and loss of appetite, interferes with digestion, and produces certain pathological changes, to be described later.

Large doses of alcohol cause mental, physical, and emotional excitement in the first stage, with depression in the later stages; death may occur from general weakness, sudden pulmonary congestion, cardiac or respiratory failure, intercurrent apoplexy, or acute Bright's disease.

Nervous system: The cerebral effects vary with the size of the dose. They are characterized by *mental exhilaration*, especially of the *emotional faculties*, often spoken of as *stimulation;* but it is rather a blunting of the higher mental powers of reason and judgment by which the emotional are generally controlled: the phases of intoxication are too familiar to need enumeration. Somnolence and stupor follow, often very quickly when large doses are taken. The other cerebro-spinal effects in their order of appearance are —further *disorders* of *intellection*, resulting in any phase of intoxication or brutality; disorders of *motion* and *sensation:* the sensory disturbance may take the form of dysæsthesia, paræsthesia, or anæsthesia, and generally begins in the lower extremities (occasionally the face) and advances upward: these show an effect on the basic ganglia of the brain and the spinal centres; *lack* of *co-ordinating power* from (1) disordered cerebellum and (2) impaired muscular sense; finally, *death* from respiratory paralysis, due to involvement of the medulla.

As a general rule, then, the highest centres are first affected, and the others in the order of their importance.

Circulation: The *heart-action* is stimulated in frequency, or in force and frequency: in adynamic states the force of the pulsation is often increased and the frequency lessened. Thus in medicinal doses alcohol is a stimulant to the circulation; but toxic doses tend to depress the heart's action. Upon the *vaso-motor system* alcohol acts to dilate the cutaneous vessels by vaso-motor paresis; as results, we have flushing of the surface, sensations of heat, and sweating.

The *respiration* is at first quickened, but later is depressed, and in fatal cases death takes place from paralysis of the centres in the medulla.

The *temperature* is lowered slightly, for the following reasons: (1) the cutaneous circulation is increased and there is a greater loss of heat from radiation and diaphoresis; (2) the oxygenating power of the blood is lessened; (3) there is lessened muscular activity. This fall of temperature is not of importance therapeutically; but it is evident that alcohol is not an aid in resisting prolonged exposure to cold, but the opposite.

Elimination: Alcohol is eliminated in small amounts by the kidneys and skin; but nearly all of it is "burnt up" in the system to form CO_2 and H_2O, leaving the body by way of the lungs. Medicinal doses are probably destroyed completely.

Nutrition: Alcohol is available for immediate oxidation; hence it is an *immediate food* up to f℥j to f℥ij daily. Other substances ingested at the same time may be stored up as body-tissue, to be consumed on occasion. Hence alcohol tends *indirectly* to produce fat.

The **value of alcohol as a food** has caused much discussion and has been the subject of a considerable amount of experimentation. The evidence to-day seems to indicate that alcohol is a wasteful and unsuitable food when taken in health; that in diseases like typhoid fever it is an exceedingly valuable food, in addition to taking the part of a medicine, fulfilling the role of acting: (*a*) as a food; (*b*) as an aid in the assimilation of other foods, like milk; and (*c*) as a cardiac stimu-

lant; in *typhoid* it also has a distinct antipyretic action. In proper dose it seems to check tissue-waste. It appears to be established that *small quantities* of alcohol taken habitually are not productive of injurious results; that alcoholic beverages taken in moderate quantity aid in the digestion of other foods; and that the malted liquors, like beer, ale, and porter, and wines, are much less apt to cause harm than distilled spirits. The alcohol should in such cases be taken in diluted form.

If the alcohol is taken *in excess* in *diluted form*, as in beer, ale, porter, etc., it produces extensive *fatty* infiltration, and later on fatty degeneration of the viscera, especially of the liver and kidneys. If taken in *concentrated* form, as whiskey, brandy, rum, or gin, it causes cirrhosis, particularly of the stomach, liver, and kidneys, and also of the heart and blood-vessel-walls. Gin is much more irritating than the others, and is very apt to produce hepatic cirrhosis. Sweetened liqueurs (cock-tails, etc.) are particularly injurious, and absinthe seems most injurious of all. In connection with the alcoholic habit, it must not be forgotten that many pharmaceutical preparations are strongly alcoholic; that a tablespoonful of a tincture made with diluted alcohol is equivalent to a dose of whiskey plus the active principles of the drug; and that it is not of infrequent occurrence to trace the alcoholic habit to the use of compound spirit of lavender or other alcoholic preparation.

Secondary effects: When habitually used alcohol has certain characteristic effects, mostly due to an interstitial hyperplasia.

Stomach: The continued irritation of any but very small doses causes finally a *decrease* in its secretory power: there is an increased production of connective tissue, the glands are obliterated, and a chronic gastritis results.

Liver: Alcohol is mostly absorbed in the stomach, and is thus carried immediately by the portal circulation to the liver: here, again, constant irritation causes growth of connective tissue and consequent gland-obliteration, and *cirrhosis of the liver* results. On both stomach and liver alcohol acts more harmfully when taken fasting, because of its con-

centration. *Fatty liver* may also result from the alcoholic habit.

Vaso-motor changes: Alcohol causes a constant paresis of the superficial vessels, one of the results of which is drunkard's acne. It is also a potent factor in the production of atheroma of the vessel-walls.

Nervous system: Here too, probably, the effects are due to increased connective tissue (neuroglia). Among other conditions thus brought about are *amaurosis*, alcoholic *neuritis*, *epilepsy*, *general paresis*, alcoholic *tremor*, *delirium tremens*, and *sclerosis* of the *brain* and *spinal cord*.

Delirium tremens, or *mania à potu*, is a form of chronic alcoholism. It frequently develops abruptly; but never after a single debauch. The premonitory symptoms are anorexia, alcoholic tremors (which are worse in the morning, and are improved by alcohol), depression of spirits, and insomnia. The characteristic symptoms of active mania à potu are hallucinations and delusions, the so-called "horrors," in which the mental images take the form of animals, serpents, rats, etc., and which are always *unpleasant*. Delirium tremens usually terminates in recovery; the first attack always does. It may go on to permanent insanity or end in death. Alcoholic insanity differs from acute mania in being aggressive only when the patient thinks others are attacking him; he becomes aggressive only in apparent self-defence.

The *treatment of delirium tremens* is directed toward eliminating any alcohol remaining, quieting the patient, and nourishing the system. For the first indication, the stomach may be emptied by the pump or an emetic, preferably ipecac; the bowels are emptied by a brisk purge. Bromides, chloral, and morphine may be employed for the second indication, taking care not to push the bromide too far because of depression, and to give morphine in single doses because of the danger of acquiring the habit. Strychnine and digitalis may be necessary to sustain the heart, while tincture of capsicum, in doses of ♏x to f℥ss frequently repeated, stimulates the stomach to retain food and relieves the craving for drink. Usually, whiskey will only aggravate the trouble, and it is better to withdraw it at once.

Diagnosis of acute alcoholism: Intracranial hemorrhage, opium-narcosis, uræmic and diabetic coma, and cerebral concussion may closely simulate profound alcoholic coma. Diagnosis of these conditions is by no means easy, and indeed is often impossible in the absence of a history of the case. Too much weight is not to be placed on the odor of laudanum or alcohol on the breath, nor on the condition of the pupils: *nothing is positively diagnostic.*

In *alcoholic coma* the odor of alcohol, or of some of its excretory products, is upon the breath; the pupils are usually somewhat dilated and equally so; the pulse is rapid and soft; the skin moist and relaxed; the respiration is not much affected; and the temperature is lowered. In *apoplexy* there are usually signs of unilateral involvement: the pupils are unequal; one side is more or less paralyzed; there is facial palsy, with more or less blowing respiration on one side; the skin is warm and dry; the pulse slow and full; the temperature raised, with frequently a difference in the two axillæ; the odor of alcohol upon the breath is not diagnostic, as a drunken man may die of apoplexy. In *opium-poisoning* both pupils are pin-point in size; the skin is warm, except in advanced poisoning; the pulse is slow and full; the respirations *very slow*, but regular; and the odor of laudanum may be upon the breath. In *uræmia* the skin is dry; the odor of the breath urinous; the pulse slow and hard; the urine contains albumin and casts; and the patient is more apt to have convulsions (these may occur in poisoning from alcohol). In *diabetic coma* the history of the case and the examination of the urine will establish the diagnosis.

Treatment of acute alcoholism: Evacuate the stomach if necessary; employ warmth to the extremities and faradism to the respiratory muscles; use cardiac stimulants in addition to the hot bath.

Therapeutics of alcohol: In *adynamic conditions*, as continued fevers, given in f℥ij–f℥ss doses frequently, it really acts as a *food*, as a stimulant, as an aid to digestion, and as an antipyretic.

In *typhoid fever* alcohol forms a most useful drug, whiskey or brandy being selected according to whether the patient is

constipated or has diarrhœa. Some clinicians begin its use, in f℥j–ij doses every two hours, early; while others wait until the pulse softens. It is borne in large doses, and should be pushed as long as it makes the patient less nervous and as long as it reduces the pulse and temperature. The odor upon the breath is the physiological limit. It is preferably given *mixed with milk*, as it aids in its digestion. In the *convalescence* of typhoid dry wines are more suitable.

In *acute inflammations* with *cardiac depression*, particularly pneumonia, it is a valuable stimulant.

In *ordinary colds*, whiskey or other alcoholic stimulant often forms a valuable adjunct to quinine and the hot foot-bath. Often a cold can be aborted by the use of hot lemonade with f℥ss–ij of whiskey. Alcohol probably acts in these cases by relieving internal congestion.

In *atonic dyspepsia*, in small doses with or after meals, it is of benefit in some cases, but should not be too long continued, less a habit be engendered; and the fact that, like all aids to gastric digestion, its continued use may lead to ordinary dyspepsia should also be borne in mind. The stomach becomes dependent upon them, and when they are withdrawn dyspepsia ensues.

In the summer diarrhœa of children, cholera infantum, and diarrhœal disorders generally brandy is particularly serviceable because of its astringency.

In *poisoning* from *snake-bite* the administration of alcohol should be carried to the point of narcosis.

Chloroform-inhalation should be preceded by f℥j or f℥ij of whiskey or brandy, which are also used with great advantage hypodermically in cardiac failure, or in any sudden depression.

In *streptococcus infection* it forms the most reliable treatment, and may be used in connection with the antitoxin. In *puerperal septic infection* the same treatment is the best.

Alcohol in large doses forms one method of treating diphtheria.

In *pulmonary* and other forms of *tuberculosis* alcohol does good as a digestive aid and *food*. It should be given in

small doses with the meals; as soon as digestion becomes disordered, it is doing harm, and its use should be stopped.

In *delirium tremens* it acts as a food and cardiac tonic, and is often very valuable, especially in that type of the disease characterized by inanition.

In all forms of *syncope*, except that following ether- or chloroform-narcosis. Alcohol is not a vaso-motor and not a marked respiratory stimulant; therefore it is not so useful as other drugs in *shock*.

Insomnia in some cases may be relieved by the administration of an alcoholic beverage just before retiring.

Vomiting is often checked by effervescent wines.

Locally, alcohol is used as a prophylactic against bedsores or chapped nipples, doing good by hardening the skin, and as an evaporating lotion in bruises, sprains, etc. It has been highly recommended in *erysipelas* as a local application.

As an addition to the water used in giving *sponge-baths*, it assists evaporation and in addition stimulates the skin. Whiskey frequently forms a most valuable liniment.

Administration: In prescribing alcohol remember that patients at the extremes of life, childhood and old age, bear the drug poorly. Certain conditions, notably shock following injury, venomous bites, and severe hemorrhage, call for large doses. Habit causes lessened susceptibility to the drug. It should never be prescribed for any great length of time, lest the alcoholic habit be formed. For *immediate effect*, whiskey or brandy is given, *undiluted* and *hot*. As an aid to digestion, alcohol is given in *diluted form*, with the food.

Preparations: The *official* are:

Spiritus Vini Gallici, U. S., Brandy. An alcoholic liquid obtained by the distillation of fermented grapes, and at least four years old. It contains from 46 to 55% by volume of alcohol, is more constipating than whiskey, and owes its flavor to various ethers, such as œnanthic and acetic. The best brandy is obtained by distilling French wines, and is called Cognac. American brandy is obtained on a large scale in California.

Spiritus Frumenti, U. S., Whiskey. An alcoholic liquid, obtained by the distillation of the mash of fermented grain

(usually mixtures of corn, wheat, and rye), and at least two years old. The cheapest source of starch in this country is corn, wheat, or rye; in the manufacture of whiskey the starch is converted into glucose by the addition of a certain proportion of barley-malt, which contains *diastase*. The process is called *mashing*, and in it the starch is converted into glucose at certain temperatures, the diastase acting as the converting agent. *Yeast* is added to the entire mash and *fermentation* takes place, the glucose splitting up into alcohol and carbon dioxide. The fermented mash is subjected to *distillation* and the product is crude whiskey. The highly rectified product is the alcohol of commerce; if aged for a number of years, it constitutes whiskey, which usually contains about 50% of alcohol by volume and is then of *proof* strength. Crude whiskey is contaminated by a percentage of *fusel oil*, or *amyl* alcohol, which varies somewhat with the source, and which becomes converted into ethers by the aging process. Crude whiskey is very much more injurious than the same product properly mellowed by age.

Vinum Album, U. S., White Wine. An alcoholic liquid, made by fermenting the juice of fresh grapes, the *fruit* of *Vitis vinifera* (nat. ord. Vitaceæ), freed from seeds, stems, and skins.

Vinum Rubrum, U. S., Red Wine. An alcoholic liquid, made by fermenting the juice of fresh colored grapes, the fruit of *Vitis vinifera* (nat. ord. Vitaceæ), in presence of their skins.

Grape-juice contains among other principles grape-sugar and acid potassium tartrate, together with calcium tartrate and other salts. Subjected to fermentation, the sugar is changed to alcohol and carbon dioxide, the potassium bitartrate precipitating as it becomes insoluble in the increasing amount of alcohol. The color of wine is produced by the skins; the astringency, by the presence of the seeds. A wine is *sweet* when the quantity of sugar is so large that some of it has escaped fermentation. If the proportion of sugar has been small and has completely fermented, the wine is *dry*. A *light* wine contains a small amount of alcohol; a *strong* (*generous*) wine, a larger percentage. A *sour* wine is

characterized by an acid, a *rough* wine by an *astringent*, taste (due to tannic acid).

Ordinary wines are *still*. *Sparkling* wines contain carbon dioxide (champagnes). Both white and red wines should contain not less than 12%, nor more than 17%, of alcohol by volume (*U. S. P.*). The *aroma*, or *bouquet*, of wines depends upon the presence of various ethers, such as œnanthic and caproic, which develop during fermentation and during the aging process. Any domestic wines which answer to the official requirements may be used; the California wines are frequently fortified by the addition of alcohol. No wine can be made stronger than 20% by fermentation alone, as the growth of the yeast-cell is checked. In the aging process, wines and whiskies lose some of their water, with a corresponding reduction in quantity but with an increase in the percentage of alcohol. The class of official preparations known as *Vina*, or *Wines*, are made with a menstruum of white wine; they are not so permanent as the tinctures.

Vinum Portense, or Port Wine, is a heavy, sweet wine; while *Vinum Xericum* is Sherry Wine, and is dry. *Champagne* is a sparkling wine which contains CO_2, because it is bottled before fermentation ceases; it may be sweet or dry.

Spiritus Juniperi Compositus, U. S., Compound Spirit of Juniper. This is practically *gin*, though an artificial product. Gin is made from rye or barley, with the addition of juniper berries. These impart to the spirit *diuretic* properties, merely through the irritation produced by the oil. Gin-drinking is particularly apt to cause cirrhosis of the liver as well as of the kidney.

Spiritus sacchari tosti (spirit of burnt sugar), or *rum*, is made from fermented molasses; *arrac*, from fermented rice. Whiskey, brandy, gin, and rum may be said to average 50% of alcohol by volume.

The **malt liquors** are beer, ale, and porter. *Domestic beers* average from 4 to 6% in alcoholic strength. They are made by a slow fermentation (lager beer). *English ales* contain from 5 to 9% of alcohol, and are made by a more rapid form of fermentation (top fermentation). *Porter* and *brown stout* are also stronger in alcohol and extractive than is beer. All

of these malt liquors should be old enough to be free from *yeast*.

Malt liquors are *indicated* particularly when mild stimulation is needed for a protracted period of time; wines, in the convalescence of fevers and as a stimulant at meal-time; the ardent spirits, during the height of fevers, etc. When it is advisable to vary the flavor and increase the nutritive power alcohol may be given as *mulled wine*, *wine-whey*, *milk-punch*, or *egg-nog*.

Mulled wine is made by beating up an egg with three or four ounces of sherry wine and adding an equal quantity of boiling water. *Wine-whey* is made by mixing eight ounces of sherry with a pint of boiling milk, straining off the coagulated casein and sweetening to taste. *Milk-punch* is made by adding from one to two fluidounces of one of the ardent spirits to a glassful of milk, with spices and sugar. *Egg-nog* contains the yolk of an egg beaten up with a cupful of milk and from one to two tablespoonfuls of whiskey, brandy, or rum. The mixture is sweetened and served with the white of an egg beaten into a froth.

DIGITALIS, *U. S.* (Digitalis; Foxglove).

Digitalis is the *leaves* of *Digitalis purpurea* (nat. ord. Scrophularineæ), collected from plants of the second year's growth. Habitat: Europe; but it is cultivated in this country: the European leaves are the best. The active principles are still in dispute. It contains four *glucosides:* (1) *digitalin*, which probably most nearly represents the drug, and is soluble in alcohol, but not in water; (2) *digitalein*, soluble in both water and alcohol; (3) *digitonin*, which resembles saponin in its action, but slightly differs chemically, and is soluble in water, but only slightly so in alcohol; and (4) *digitoxin*, a very active constituent, insoluble in water and only sparingly so in alcohol. Digitonin probably represents the diuretic action of the drug, and being insoluble in alcohol, but soluble in water, it is present in the infusion and not in the tincture; the former is therefore the better diuretic preparation.

Preparations: Pulvis Digitalis, dose gr. j.
Extractum Digitalis, dose gr. ¼.
Extractum Digitalis Fluidum, dose ♏j–iij.
Tinctura Digitalis (15%), dose ♏v–f℥ss.
Infusum Digitalis (1.5%); f℥j = about gr. vij of powdered drug: is flavored with cinnamon; dose f℥j–f℥ss.
The unofficial *digitalin* of commerce is of uncertain strength and varying composition; dose about gr. $\frac{1}{60}$.
Physiological action: The most important effects of digitalis are upon the—
Circulation: Digitalis in *therapeutic doses* produces a *strong, slow, full* pulse and raises the blood-pressure. In toxic dose, the effects are increased: the pulse becomes *dicrotic* and then *irregular*, the pressure falling. The full pulse is due to direct stimulation of the heart and its contained ganglia; prolonged diastole is caused by stimulation of the pneumogastrics. Digitalis contracts the walls of the bloodvessels, and the rise of blood-pressure is in part due to this and in part to the action on the vaso-motor centres. Death occurs usually through *systolic* arrest, a *tetanic* condition from overstimulation of systole; rarely, from *diastolic* arrest, in which case pneumogastric stimulation stops the heart. The dicrotic pulse is caused by an abortive attempt at diastole; finally, the systolic spasm becomes permanent. The systolic contraction of the heart is so powerful that the apex becomes white and all the blood is literally squeezed out of it, so that the heart becomes entirely empty. This fact, together with the lengthened diastole and the stimulation of the cardiac trophic nerve, the pneumogastric, makes digitalis such a useful remedy.
Nervous system: This is not affected by medicinal doses; after very large or toxic doses some cerebral disturbance and *lowered reflex excitability* occur. These symptoms may go on to the production of stupor, coma, delirium, and convulsions, caused by *cerebral* anæmia. The diminution of the reflexes is due to stimulation of Setschenow's centre; later on, to direct paralysis of the spinal cord. It is also a *depressor* of *motor nerves* and of *muscular tissue*.
Gastro-enteric: Large doses are irritant, causing nausea,

vomiting, at times diarrhœa and other symptoms of gastro-enteric irritation. Prolonged use may cause loss of appetite. In acute poisoning empty the stomach if necessary, give diffusible stimulants, as whiskey or ammonium carbonate, and place the patient in the recumbent position.

The *temperature* is distinctly lowered by large doses, but this is not of therapeutic importance.

The *urine* is *increased* in amount by digitalis, the *urea being diminished*, and the other urinary solids increased. Its mode of action as a diuretic is disputed: by some it is held to be entirely due to increased blood-pressure in the kidneys; by others, that there is a distinct stimulation of the Malpighian tufts (Brunton). It is probably indirect. Clinical experience proves it to be a rather uncertain diuretic.

Digitalis stimulates *uterine contractions* and lessens sexual appetite.

The *slow, full* pulse is the physiologic limit of the drug.

Cumulative action: By many it is held that after continued administration of the drug sudden alarming symptoms may be developed. Others deny this, and claim that in the strictest sense it is *not* cumulative, but that these effects are due to the slow elimination of the drug, so that the doses overlap each other as it were, and that the same would be true of many other drugs not considered cumulative.

Therapeutics: The clinical indications depend for the most part on its effects on the circulation. Digitalis is indicated—

In *mitral disease*, either stenosis or insufficiency; when there is an *excess* of *blood* on the *venous* side, the symptoms of which are congestion of the lungs and viscera and rapid, feeble, palpitating, or irregular heart—in these conditions digitalis *slows* and *steadies* the pulse and gives the auricle a chance to empty itself.

In aortic disease its sphere is more limited. In *stenosis with compensatory hypertrophy* it is not indicated, and may prove dangerous in large doses; but *when this stenosis has secondarily affected the mitral valve digitalis is useful.* In general it is indicated in rapid and weak heart-action with lowered arterial tension.

Digitalis produces good effects in four ways: (*a*) it prolongs

diastole and reduces the number of beats, thus resting the heart; (*b*) its stimulant action is felt by the trophic fibres of the pneumogastrics as well as by the motor; (*c*) it increases systole to such an extent that all the blood leaves the chambers; while (*d*) the blood-supply to the heart itself is increased and its own nutrition improved.

Digitalis is also of value in *irritable heart* from excessive exertion, as seen in oarsmen, soldiers, etc.—a condition of muscular hypertrophy. From its double diuretic action it is valuable in renal dropsies, especially that of acute nephritis, and also does good in the chronic varieties: for this purpose the infusion should be given. In *cardiac dropsies* it is particularly valuable. In exophthalmic goitre digitalis relieves the tachycardia and palpitation. In adynamic conditions, as typhoid, it is often very useful. In poisoning by certain drugs which arrest the heart in diastole and greatly diminish the blood-pressure, as aconite or muscarine, it is used with advantage. In *pneumonia* and other *acute inflammations* it has been used in the early stages with the view of lessening exudation, but is of doubtful efficacy; later it is often indispensable as a stimulant, especially in alcoholic cases. In *passive hemorrhages*, the *hemorrhagic diathesis*, and *purpura* it may be beneficial. In *menorrhagia* and *metrorrhagia* it will only prove serviceable when the condition is due to cardiac disease. In spermatorrhœa it is supposed to act as an anaphrodisiac. Hypodermic injections of its tincture, ℥xv–xxx, are valuable in sudden *cardiac depression* from any cause, as during operation or acute hemorrhage; but it is more irritating and slower in action than the tincture of strophanthus, which is often preferred.

Digitalis poultices over the lumbar region in the uræmic state, the patient not being able to swallow or vomiting repeatedly, seem to do good; this is due probably more to the moist heat applied than to the drug, very little of which is absorbed.

In all cases it is necessary to consider the *slow absorption* and *elimination* of digitalis. It is usually necessary to give it for a day or two in small doses, frequently repeated, before the effect becomes evident. As digitalis is not a respiratory

stimulant and its effects are so slowly manifested, the drug is inferior to others in shock and collapse.

Contraindications: Digitalis should be used *with care* in the following conditions: *fatty heart; aneurism* and cerebral endarteritis, in which conditions the increased blood-pressure might rupture the already weakened wall and cause fatal hemorrhage; in any valvular lesions *with compensatory hypertrophy*, or when such hypertrophy is evidently taking place. *In all cases in which it increases præcordial distress.* This is particularly so when the left auricle is dilated from the prolonged strain thrown upon it in mitral regurgitation.

In *high fevers* digitalis does *not* act, and an undesirable powerful action may result if the temperature drops suddenly after continuous administration of the drug.

Toxicology: The characteristic symptoms of poisoning by digitalis are *gastro-intestinal* and *circulatory*, nausea, vomiting, diarrhœa, profound depression, and marked pallor of face, with a pulse which, while it may be full, strong, and slow in the recumbent position, becomes *rapid*, *weak*, and *irregular* when the patient assumes a sitting posture; stupor, coma, delirium, and convulsions. These symptoms may follow the continued use of the drug, and are said to be more apt to develop (1) after tapping in ascites or hydrothorax, which relieves pressure in the lymphatics and facilitates absorption; (2) after quick defervescence from some acute disease; or (3) when its diuretic action is not marked.

Chronic poisoning has resulted from the prolonged exhibition of digitalis. The *symptoms* are anæmia, disturbances of digestion, anorexia, persistent diarrhœa, vertigo, mental confusion, and occasionally even delirium.

The *treatment* consists in the immediate withdrawal of the drug, keeping the patient in the recumbent position, and the administration of diffusible stimulants, as alcohol and ammonia. The minimum fatal dose of digitalis is not known; large single doses have been recovered from.

STROPHANTHUS, *U. S.* (Strophanthus).

Strophanthus is the *seed* of *Strophanthus hispidus* (nat. ord. Apocynaceæ), deprived of its long awn. Habitat: Central

and Western Africa. The drug is used as an arrow-poison by the natives, and is said to be quickly fatal. The seeds yield an intensely bitter glucoside, *strophanthin*, which is converted by sulphuric acid into glucose and strophanthidin.

Physiological action: Its most obvious effects, and the most interesting from a therapeutic standpoint, are circulatory. In *medicinal doses* (♏v to x of the 5% tincture) it slows the action of the heart, increases its capability for work, and raises the blood-pressure. Its cardiac effects are probably due to a direct stimulation of the heart itself, while the increased arterial tension is secondary to this stimulation, together with some local stimulation of the arterial constrictors.

Poisonous doses cause at first a slow, full pulse, with a rise in the arterial pressure; nausea and vomiting; diuresis; then death from heart-failure or paralytic asphyxia.

Upon the *nervous system* the drug acts very slightly; it is a muscular paralyzer, first increasing the tonicity of the muscular fibre, and then destroying it, the muscle passing directly into a state of post-mortem rigidity (a true muscle-poison). Death generally results from cardiac depression, but possibly at times from paralysis of respiration.

Its *diuretic effects* are disputed; but the weight of opinion seems to be that it acts as such in both health and disease, and especially in cardiac disorders. The position of strophanthus as a diuretic and cardiac stimulant seems to be intermediate between digitalis and caffeine. Digitalis is most reliable in its effect on the heart, and least reliable in its effect on the kidney; while caffeine is the best diuretic, and least certain in its action on the heart (Wood). Large doses cause irritation of the mucous membrane of the alimentary tract, but less than digitalis. Strophanthus is eliminated in the urine.

Therapeutics: Strophanthus may be used to fulfil the same indications as digitalis (*q. v.*), differing, however, from that drug in being much quicker of action and less protracted, and perhaps less certain. Thus it may be substituted for digitalis when a quick effect or a change of medication is desired. It is less irritating and more prompt when given

hypodermically than digitalis. Some clinicians have reported a cumulative action.

Strophanthus was not official in the U. S. P. of 1880. The tincture is in use (5%), dose ♏v–x, or ♏ij–iij frequently repeated. Strophanthin is too powerful a drug for general use.

CONVALLARIA, *U. S.* (Convallaria).

Convallaria is the *rhizome* and *roots* of *Convallaria majalis* (nat. ord. Liliaceæ). The "lily of the valley" is an indigenous plant, also growing in Europe and Northern Asia. It contains two glucosides—*convallarin*, which is a purgative principle; and *convallamarin*, which represents the drug in its effects upon the circulation.

Physiological action: The rationale of its action is still obscured by a number of experiments with diverse results. It acts, however, at first to slow the pulse-rate, to raise the arterial pressure, and probably to stimulate the respiratory function. Later, after large doses, it depresses all these functions, thus resembling digitalis to a degree, but being less energetic and passing less readily into the toxic stages. It acts as a diuretic, probably *indirectly*, by increasing the blood-pressure.

Therapeutics: It is recommended in dropsies of all kinds and in valvular lesions of the heart, probably fulfilling the indications for digitalis.

The *fluid extract* (Extractum Convallariæ Fluidum, *U. S.*) is given in doses of from 5 to 15 minims.

SPARTEINÆ SULPHAS, *U. S.* (Sparteine Sulphate).

Sparteine sulphate is the neutral sulphate of an alkaloid obtained from Scoparius. Sparteine is a volatile liquid alkaloid from *Sarothamnus scoparius*, or broom-plant. It is colorless, extremely bitter, insoluble in water, but soluble in alcohol, ether, and chloroform. Its sulphate, the form in which it is used, is freely soluble in water.

Physiological action: This is little understood at present. It seems to increase the contractile energy of the heart and to

exercise a peculiar stimulating influence upon its action when *irregular*, with very little or no effect on the vascular tension. It increases the amount of urine; but whether it represents the entire diuretic power of its parent drug, or whether it has any direct kidney-effects, is not clear. It depresses the central nervous system and kills by respiratory paralysis. Death is preceded by convulsions.

Therapeutics: It has been employed in *valvular disease*, *asthma*, and conditions characterized by *cardiac depression, with dropsy;* but it seems particularly adapted to the *functional* or *nervous disorders of the heart.* Like other members of this group, it is recommended in Graves' disease, and may do good.

Dose gr. $\frac{1}{4}$–$\frac{1}{2}$. Two grains in the twenty-four hours, in divided doses, will usually produce its characteristic effect.

ADONIDIN.

Adonidin is a *glucoside* derived from *Adonis vernalis*, a European plant (nat. ord. Ranunculaceæ). Its effects resemble digitalis. Small doses slow the heart's action and increase the blood-pressure, while large doses depress both. It is irritant to the digestive tract, but only in very large doses.

Therapeutics: The indications for this drug, resembling digitalis as it does very closely in its effects, may be considered the same as for that drug. It may be substituted, and is generally administered in the form of a 2% to 4% infusion of the whole herb, the dose of which is f℥ss every two or three hours.

Dose of adonidin gr. $\frac{1}{8}$–$\frac{1}{4}$ three times a day.

CAFFEINA, *U. S.* (Caffeine; Theine).

Caffeine (*theine*) is a feebly basic, proximate principle, obtained from the dried *leaves* of *Thea sinensis* (nat. ord. Ternstrœmiaceæ), or from the dried *seeds* of *Coffea arabica* (nat. ord. Rubiaceæ), and found also in other plants. Among other drugs containing a large percentage of caffeine are *Guarana*, U. S., a dried paste chiefly consisting of the

crushed or powdered *seeds* of *Paullinia Cupana* (nat. ord. Sapindaceæ; habitat, Northern and Western Brazil); *Kola*, the *nut* of *Kola acuminata*, a tree growing in Africa; *Maté*, the *leaves* of *Ilex paraguayensis*, grown in Brazil. *Chocolate*, made from the prepared *seed* of the *Theobroma Cacao*, contains theobromine, which is closely related to caffeine; the latter is probably methyl-theobromine. Caffeine and theine are identical. The commercial article is chiefly prepared from damaged tea or from the sweepings obtained in the tea-houses of London. Caffeine occurs in white, silky, odorless crystals, soluble in 100 parts of water, the solution being feebly basic in reaction, but forming salts with acids.

Preparations: Caffeina, the alkaloid itself, dose gr. j–v.

Caffeinæ Citrata, dose the same.

Caffeinæ Citrata Effervescens, contains 10% of caffeine.

Physiological action: In small doses caffeine is a stomachic tonic, promoting the appetite and increasing the digestive power. In larger amounts it causes cerebral excitement, with stimulation of the higher mental powers (whereas opium stimulates the imaginative). Still larger doses cause mental confusion, hallucinations, muscular trembling followed by stiffness and then relaxation, and even delirium. It is, then, a *true stimulant to the cerebral cortex*. In animals convulsions and in man muscular tremulousness (a direct *muscle-poison*) are produced, the exact origin of which is not known. Probably they are due to stimulation of the *spinal centres* and to muscular depression.

Circulation: This function, upon which the physiological effects are especially interesting in view of the therapeutic uses of the drug, is at first stimulated and later depressed. The heart's action is at first rendered more rapid and the arterial pressure is raised; but later the pulse becomes slower and irregular and the blood-pressure falls. No exact explanation of these effects can at present be offered; but probably they are due in large part to a direct stimulation of the cardiac nervo-muscular apparatus with some action on the vessel-walls. Toxic doses depress both circulation and respiration and lower the temperature.

It acts as a *powerful diuretic*, the amount of urine being

decidedly increased. The effect upon the solids eliminated is still under discussion.

The *diuretic effect* is almost wholly due to the action of the drug on the secreting structure; it is the most reliable diuretic, but is much inferior to digitalis as a cardiac stimulant.

Respiration: Caffeine stimulates respiration by a direct action on the centre.

Elimination: Small doses are entirely destroyed in the system; large amounts are partially eliminated in the urine.

Nutrition: Experiments in regard to the effect of caffeine on protoplasmic change are at present contradictory.

Therapeutics: In *migraine* and other nervous headaches, with or without gastric derangement, it is an uncertain remedy; in many cases, however, acting well.

In *opium-narcosis* it is a standard remedy, either in the alkaloidal form or as black coffee.

In adynamic conditions generally it may be used in either form as a cardiac stimulant.

In cases of *respiratory depression.*

In all forms of *cardiac inefficiency* the indications for its use are the same as for digitalis.

In *renal* and *cardiac dropsies* it is valuable, and in ascites of hepatic origin it succeeds when any diuretic is of avail. It differs from digitalis in the promptness and comparatively brief duration of its effects, and is less apt to cause gastro-intestinal disturbance.

Its complete destruction in the system would seem to indicate that it is in some degree a supporting element or *food.*

Toxicology: Acute poisoning by caffeine is rare. The symptoms are great restlessness, frequent urination, muscular tremors, faintness, and finally collapse. Its *antagonists* are tannic acid chemically, and opium physiologically; the *treatment* is wholly symptomatic.

Chronic coffee-poisoning is not so infrequent. The symptoms are anæmia, insomnia, intense periodic headaches, gastro-intestinal disturbance (frequently diarrhœa), great nervousness with mental depression. The use of coffee is to be stopped at once.

Administration: Caffeine is one of the few alkaloids not suitable for hypodermic use because of its large dose. It is usually given in powder-form, in doses of 3 grains. Because of the well-known tendency to produce wakefulness, the doses should be given in the earlier part of the day.

CARDIAC DEPRESSANTS.

ANTIMONIUM (Antimony).

Antimony and its salts now enjoy much less reputation than formerly.

Preparations: The preparations of antimony most in use are—

Antimonii et Potassii Tartras (tartar emetic or tartarized antimony), dose gr. $\frac{1}{16}$–j.

Vinum Antimonii (tartar emetic gr. 1.8 to f℥j), dose ♏x–f℥j.

Syrupus Scillæ Compositus (tartar emetic gr. j to f℥j).

Antimonii Oxidum, Antimonii Sulphidum, and Antimonii Sulphidum Purificatum are official "for pharmacopœial use." Antimonii Sulphuratum, Pilulæ Antimonii Comp., and Pulvis Antimonialis are official, but no longer used.

Physiological action: Tartar emetic may be taken as a type of the antimonial preparations. *Locally*, it is an irritant, and if continued may produce an eruption of papules, vesicles, and pustules resembling smallpox. In therapeutic doses it causes a slowing of the pulse, with clamminess of the skin. The emetic dose produces a soft, slow pulse, nausea, and vomiting, with free sweating. In sufficient dose it acts as a gastro-intestinal irritant, producing violent and protracted vomiting (which in rare cases may be absent even in poisoning), profuse sweating, violent muscular cramps, a weak, thready pulse, abdominal pain, violent choleraic diarrhœa with finally bloody stools, profound depression, collapse, convulsions, and death from general exhaustion.

The nausea and vomiting are due in part to gastro-intestinal irritation, and in part caused by a direct action on the vomiting-centre. The muscular cramps are probably caused

by the depletion of the circulation from the violent purging; the convulsions are likewise due to cerebral anæmia. The sweating is due to cutaneous relaxation. Two grains have caused death in an adult; gr. $\frac{3}{4}$ in a child. If given in gradually increasing doses, marked tolerance may be established. For emetic action, see *Emetics*.

Circulation: Tartar emetic is a direct depressant of the heart-muscle, which does not respond to stimulation after death; and this, together with a direct paretic effect on the vaso-constrictors, causes extreme diminution of the vascular tension.

The *spinal cord* is depressed especially, it is claimed; the sensory side is affected and the reflexes are consequently diminished.

Respiration also is depressed by a *direct* action on its centre, and *indirectly* by the venous congestion and blood-changes.

Secretions: Antimonial preparations increase secretions generally, and especially those of the skin, bronchi, and intestinal tract, and, like other metallic salts, are probably eliminated by the intestine.

Therapeutics: Tartar emetic is employed as a nauseant, emetic, sudorific, and expectorant, and locally as a counter-irritant. Practically, its use is now limited to the dry stages of laryngitis, bronchitis, and asthma, in the first two of which it produces secretion, and in the last relaxes spasm as well. It is rarely employed, because of the great depression which is apt to follow its use.

Toxicology: The symptoms have been fully described; they are those of gastro-intestinal irritation, cardiac depression, and collapse. Poisoning by antimony may closely simulate cholera; but in rare cases there is neither vomiting nor purging. Small doses administered for some time produce the same symptoms more gradually, and finally death from general exhaustion. The *post-mortem lesions* usually show decided evidence of gastro-intestinal inflammation. The antimony may be recovered from the body and identified by the customary chemical tests. The *treatment* consists of *tannic acid*, which forms an insoluble tannate; the hypodermic exhibition of morphine and free stimulation.

VERATRUM VIRIDE, *U. S.* (Veratrum Viride).

Veratrum viride is the *rhizome* and *roots* of *Veratrum viride* (nat. ord. Liliaceæ), an indigenous plant known as American or swamp hellebore, Indian poke, poke-root, green hellebore, etc. It contains two alkaloids, *jervine* and *veratroidine*, which differ physiologically in some respects.

Preparations: Extractum Veratri Viridis Fluidum, dose ♏j–iv.

Tinctura Veratri Viridis (40%), dose ♏iij–x.

Norwood's tincture is one-tenth stronger; not much used.

Physiological action: *Jervine* is a white powder, insoluble in water, ether, and alcohol, but soluble in chloroform. It acts directly to *depress the cardiac muscle, does not affect the vagus, and lowers arterial pressure* both by cardiac depression *and by vaso-motor paralysis:* the pulse-rate is diminished. Reflex excitability is also diminished by direct depression of the spinal reflex centres. Respiration is affected, and death occurs after large doses from paralysis of this function.

Veratroidine, which may yet be found to be a compound substance, and closely resembles *veratrine*, causes emesis, and at times catharsis, by its local irritation. Like its companion alkaloid, it lessens the reflexes and paralyzes respiration. It acts as a direct paralyzant to the heart-muscle, and *indirectly through the vagus*, and *does not* affect the arterial tension except by depressing the heart, having *no effect on the vaso-motor system:* before death the tension rises greatly from respiratory embarrassment, the drug acting as a marked respiratory depressant.

The *parent drug itself* in moderate doses causes languor, muscular weakness, and inco-ordination, and quiets the circulation, lessening the pulse-rate and lowering the arterial tension. It combines the action of its two alkaloids, lowering arterial tension by a direct action on the heart-muscle, on the pneumogastric, and on the vaso-motor centres; causing muscular relaxation by depression of the spinal cord; free sweating by cutaneous relaxation. Cases of poisoning are rare, as the emetic action of the veratroidine protects to a great degree against this, and the patient responds easily to

stimulation. This renders it the safest and most manageable of all the cardiac depressants.

Therapeutics: Veratrum viride may be used to depress the circulation and lessen inflammatory exudation in acute inflammations, as in the early stages of pneumonia, pleurisy, etc.; but it is contraindicated in asthenic conditions generally because of the depression produced. It should be given guarded by small amounts of opium to prevent vomiting. It may be employed in cardiac hypertrophy, when this is more than compensatory. By its depressant action on the vaso-motors it invites the blood away from an inflamed lung, besides quieting the circulation. Veratrum viride is never employed in practice as a spinal depressant.

Toxicology: In toxic cases the recumbent position must be strictly enforced, with elevation of the foot of the bed, and large draughts of warm water given to wash out the stomach. Opium and free stimulation with alcohol or ammonia by the rectum or hypodermically, and general warmth to the body, complete the treatment, which is generally successful. Large amounts have been recovered from, and the minimum fatal dose is not known.

Administration: Veratrum viride should be given preferably as the tincture, combined with tincture of opium, and in gradually increasing and frequent doses until its physiological effects upon the circulation are manifested.

VERATRINA, *U. S.* (Veratrine).

Veratrine is a mixture of alkaloids obtained from the *seed* of *Asagræa officinalis* (nat. ord. Liliaceæ). When pure it is crystalline. It is extremely irritant when applied to any surface. It acts upon the circulation similarly to veratrum viride; but it is also a motor paralyzer, and at times causes convulsions before the paralysis (a muscle-poison); it probably also paralyzes the sensory nerves. Its therapeutic uses are very limited.

ACONITUM, *U. S.* (Aconite).

Aconite is the *tuber* of *Aconitum Napellus* (nat. ord. Ranunculaceæ). Aconite, commonly called wolf's bane or monk's

hood, is a plant of Europe and Asia. It resembles horseradish, and when mistaken for this has caused fatal poisoning. It is differentiated from horseradish by its lack of odor when scraped and the brown color of its cortex. It has a bitter, acrid taste, with a benumbing after-effect on the mouth and tongue. It contains as its active principle an alkaloid, *aconitine*, in combination with aconitic acid. The preparations sold as aconitine vary greatly in potency. Aconitine is a bitter, acrid, odorless, whitish-yellow powder, producing numbness of the mucous membranes; it is partially soluble in water, and its salts are readily dissolved by water, alcohol, and chloroform.

Preparations: Extractum Aconiti, dose gr. $\frac{1}{8}$–$\frac{1}{4}$.

Extractum Aconiti Fluidum, dose ♏j–iij.

Tinctura Aconiti (40%), the best preparation, dose ♏ss–v.

Fleming's tincture is twice as strong as the official, and is chiefly used externally. Duquesnel's aconitine is crystalline; its commencing dose is gr. $\frac{1}{300}$.

Physiological effects: *Topically*, aconite produces numbness and tingling by its effect on the sensory nerve-endings.

Nervous system: The cerebrum is unaffected by ordinary doses; the reflexes are diminished, largely from paralysis of the peripheral sensory nerves, but partly perhaps from paralysis of the motor nerves as well. Epileptiform convulsions, if they occur after poisonous doses, are due to cerebral anæmia. The sense of numbness and tingling is due to a direct action on the sensory nerve-terminals.

Circulation: This is depressed, the pulse-rate becoming at first slow, then weak and rapid, and finally irregular from direct action upon the contained motor apparatus of the heart. The primary slowing is attributable to stimulation of the inhibitory apparatus (?). Arterial pressure is greatly lessened—whether from any specific action is not clear.

Respiration is depressed and temperature lowered: the former from a centric action; the latter from increased sweating and heat-dissipation. The sweating is due to depression of the circulation and to cutaneous relaxation. The secretion of urine is increased, and the drug is presumably eliminated therein.

Large doses produce local numbness and tingling (later becoming general), motor weakness, a sense of constriction of the throat, occasionally nausea and vomiting, and always salivation, diaphoresis, and diuresis, with circulatory and respiratory paralysis and lowered temperature. After *toxic doses* the effects are augmented; and there are added collapse with cold, clammy perspiration, stiffness and pallor of the face, dilated (or contracted) pupils, and finally CO_2 narcosis, with death from respiratory or cardiac paralysis, preceded it may be by convulsions; usually the mind is clear to the end.

Toxicology: Aconite is a very dangerous poison, as it usually paralyzes the sensory nerves of the stomach to such an extent that vomiting becomes impossible. It is a rapidly acting poison: death usually occurs in three hours. Tingling of the entire body-surface, and especially of the mouth, face, and extremities, is the diagnostic symptom. The *indications* are immediate evacuation of the stomach, recumbent posture, heat locally, *free* stimulation, and artificial respiration if the respiratory function fails.

Therapeutics: From its benumbing effects on the sensory nerves the tincture is a valuable local application in all painful affections of nerves, and internally is especially efficacious in the trifacial variety. It may be employed in local itching, as in *pruritus vulvæ*. It is of use in chronic rheumatism, gout, and other painful diseases. By reducing the activity of the circulation aconite is of value in—

Acute tonsillitis and *pharyngitis*, in which conditions it is almost specific, acting as an analgesic to the painful parts, as well as an antiphlogistic.

In *acute pulmonary inflammations*, as bronchitis, pneumonia, etc., aconite acts beneficially during the early stages.

In *acute pleurisy* and *peritonitis*, before effusion takes place, it is doubly serviceable from the analgesia produced.

In *febricula* and *exanthemata* it reduces temperature, and may palliate or exert a prophylactic influence against the complications of the latter. In these cases it must be borne in mind that very small doses sometimes produce decided effects on the pulse in children.

In the *reflex vomiting* of pregnancy, given before meals.

Urethral chill after catheterization may be prevented; but with careful attention to asepsis this will seldom occur. It is also recommended in septic conditions (as puerperal fever), facial erysipelas, overacting heart, and intestinal fluxes; but is not so much used for these purposes as formerly.

PULSATILLA, *U. S.* (Pulsatilla).

Pulsatilla is the *herb* of *Anemone Pulsatilla* and *Anemone pratensis* (nat. ord. Ranunculaceæ), collected soon after flowering. It is found in both hemispheres, and contains an acrid oily principle, which is easily converted into *anemonin*, a volatile, camphoraceous product, and anemonic acid, which is physiologically inert. The dose of the powder is gr. ij to iij. No other preparations are official, but of a non-official tincture the dose is f℥ss.

Physiological action and therapeutics: Pulsatilla is an irritant to the skin and mucous membranes, and a depressant to the circulation, respiration, spinal centres, and peripheral nerves. It dilates the pupils and causes diuresis and diaphoresis, and is eliminated by the urine. It thus closely resembles aconite. It has proved useful in *acute catarrhs* of the *nasal*, *facial*, *laryngeal*, and *bronchial mucous membranes*, but probably only in the *early stages*, like other depressants, and is contraindicated in inflammations of the gastro-intestinal tract, because of its irritant tendencies. It has a good reputation in epididymitis and functional amenorrhœa and dysmenorrhœa. Many clinicians report that pulsatilla has entirely failed in their hands.

ARNICA.

Arnicæ Flores, *U. S.* (Arnica Flowers).

The *flower-heads* of *Arnica montana* (nat ord. Compositæ).

Arnicæ Radix, *U. S.* (Arnica Root).

The *rhizome* and *roots* of *Arnica montana* (nat. ord. Compositæ). Habitat: Europe, Northern Asia, Northwestern America; in mountainous localities. Both flowers and roots contain a volatile oil and *arnicin*.

Preparations: The number of official preparations is in inverse ratio to the therapeutic importance of the drug. They are—

Tinctura Arnicæ Florum (20%), dose ♏x–f℥ss.
Tinctura Arnicæ Radicis (10%), dose ♏xx–f℥ss.
Extractum Arnicæ Radicis, dose gr. iij–v.
Extractum Arnicæ Radicis Fluidum, dose ♏v–x.
Emplastrum Arnicæ (⅛ extract).

Physiological action and therapeutics: *Locally*, arnica and its preparations are irritant, producing a decided eczema on delicate skins, and marked symptoms of gastric irritation when taken internally. Of its systemic effects very little is known. It appears to be a decided cardiac depressant, having, however, less effect on the vaso-motor system than most drugs of this class. It is not used to any extent internally. The tincture of the flowers is used locally. No fatal cases are recorded, though decided poisoning has occurred in a number of instances; the symptoms have varied considerably. Coma, delirium, diaphoresis, and diuresis approaching collapse have been noted.

STAPHISAGRIA, *U. S.* (Staphisagria).

Staphisagria is the *seed* of *Delphinium Staphisagria* (nat. ord. Ranunculaceæ), stavesacre or licebane, a flowering plant of Southern Europe. The seeds contain an alkaloid, *delphinine*, which acts locally as a rubefacient and even irritant; and internally as a cardiac and respiratory depressant and paralyzer of voluntary muscles (motor nerves). It kills by arrest of respiration. The principal symptoms produced are dyspnœa, salivation, and vomiting. The seeds contain other alkaloids of unknown activity. It has been recommended in rheumatism, dropsy, vomiting of pregnancy, etc.; but its chief use is as a parasiticide ointment (℥j–ij of seeds to ℥j) in *phtheiriasis* and *scabies*.

ACIDUM HYDROCYANICUM (Hydrocyanic Acid).

Pure hydrocyanic acid (HCN) is a colorless, transparent, inflammable liquid, extremely deadly even when inhaled,

which accident, owing to its extreme volatility, may occur when carelessly handled (prussic acid). It is readily produced in small amount in a number of vegetable substances, especially the bitter almond, peach-kernel, wild cherry, and cherry-laurel. It is not used in medicine.

Preparations: Acidum Hydrocyanicum Dilutum, a 2 % *watery solution*, is formed by the reaction of potassium ferrocyanide and sulphuric acid, or by precipitating silver cyanide from its solutions by means of hydrochloric acid. Under the influence of light it decomposes and deteriorates. Dose ♏j–iv.

Potassii Cyanidum, dose gr. $\frac{1}{16}$–$\frac{1}{8}$.

Potassii Ferrocyanidum, used only as above indicated.

Oleum Amygdalæ Amaræ (natural) contains hydrocyanic acid if unpurified, varying in amount, and developed from a principle called *amygdalin*, under the influence of *emulsin*, a ferment. It is *about five times as strong* as the official dilute acid, and the dose is accordingly ♏$\frac{1}{4}$–$\frac{1}{2}$. Much of the commercial article is artificially prepared benzoic aldehyde, C_6H_5COH, chemically identical with oil of bitter almond, and contains no HCN.

Physiological action: *Locally* applied, the drug causes numbness, and may be absorbed by the mucous membranes.

Nervous system: Small doses produce simply a calming effect upon the cerebrum, while larger ones cause giddiness, confusion, and convulsions which have been shown to be of cerebral origin, not occurring in parts below a section of the spinal cord. The motor and sensory nerves and the spinal centres are depressed.

Circulation: Small doses simply quiet the heart, while toxic doses stop it in diastole, apparently from a direct effect on its muscle and contained ganglia. The vaso-motor system is paralyzed after a brief period of stimulation. Blood-changes occur, the exact nature of which is not clear. There is at first excessive oxidation of the blood, the venous becoming of arterial hue, and later excessive carbonization. Outside the body a mixture of this drug with blood produces cyano-hæmoglobin, which has little or no ozonizing power. This may take place in the body, and be one of the causes of death.

Respiration: Ten to fifteen minims produce disturbance of this function, rendering it labored and irregular. Toxic doses cause death by paralysis of the respiratory centre. The muscles, both voluntary and involuntary, are affected by the drug, and lose partially or *in toto* their power of electric excitability after death. Elimination is rapid by the saliva, kidneys, and lung, so that those who barely escape toxic effects rally very quickly.

Toxicology: After overwhelming doses death may take place almost immediately, with hardly any prior symptoms. In the slower forms three stages are recognized (Wood): (1) a very brief period characterized by *depression of all the organic functions*, especially respiration and circulation; (2) a *convulsive stage*, in which the pupils are dilated, convulsions with spasmodic evacuations occur, and unconsciousness supervenes; (3) a stage of asphyxia, paralysis, and collapse. The most diagnostic points are the suddenness of the development of the unconsciousness and other symptoms, and possibly the recognition of the odor of prussic acid upon the breath. The *treatment* is generally of no avail. Evacuation of the stomach, ammonia by inhalation and hypodermically, the use of the hot and cold douche, and artificial respiration are indicated, remembering that either a fatal termination or recovery may be expected quickly.

The **cyanides** produce similar symptoms, though they act more slowly, because the cyanide is decomposed in the stomach with production of hydrocyanic acid. The only other form of poisoning which resembles that of prussic acid is that of nitrobenzole ($C_6H_5NO_2$), or *oil of mirbane*. In large doses this may cause death as quickly and in a similar manner as hydrocyanic acid. Taken in small quantity the symptoms are often delayed for some time; then cyanosis begins, with circulatory and respiratory depression, stertorous breathing, and profound unconsciousness. The patient usually dies from centric respiratory arrest.

The *treatment* is essentially the same as that for prussic acid—cardiac and respiratory stimulants, with perhaps hypodermoclysis. Oil of mirbane may be identified by the odor alone—it resembles that of oil of bitter almond, but has a

peculiar rank flavor. It is used largely in the arts as a cheap substitute for the latter, as in perfuming soap. Poisoning has occurred from the use of such soap in washing the hands. Chemically, nitrobenzole is converted into aniline by oxidizing agents. In cases of poisoning its odor is persistent, while that of hydrocyanic acid is so evanescent that it may entirely escape observation.

Therapeutics: *Hydrocyanic acid* is used as an antispasmodic and analgesic in a variety of conditions, as in *gastrodynia* and neuralgic abdominal conditions, and in checking persistent vomiting; in the coughing of bronchitis, pulmonary tuberculosis, and the spasmodic cough of pertussis and asthma; it is a favorite ingredient of cough-mixtures, generally in some combination with opium; to allay irritability of the cutaneous nerves in neuralgia, urticaria, and prurigo; locally, f℥j–ij to water Oj.

Administration: The dose of the official preparation is 1 to 3 minims gradually increased, remembering that it is unstable and apt to vary in strength.

POTASSII CYANIDUM, *U. S.* (Potassium Cyanide).

Potassium cyanide is formed by heating potassium ferrocyanide with potassium carbonate (U. S. P.). It is noncrystalline, of characteristic odor and taste, deliquescent, and readily soluble in water. Being converted by the stomach acids into prussic acid, its physiological and toxic effects are the same, and it may be substituted therapeutically. Five grains have proven fatal; dose should not exceed gr. ⅛.

Oleum Amygdalæ Amaræ is to be carefully discriminated from the *expressed oil* of almond, the dose of which is ad libitum. Of **Aqua Amygdalæ Amaræ** (1 : 1000) (bitter almond water) the dose is f℥ij–f℥ss.

VEGETABLE ACIDS.

The official **vegetable acids** are tartaric, citric, and acetic, the last only being liquid, the others solid. They are all slight cardiac depressants, and from their "refrigerant"

effects—which are by no means very marked—may be considered here. They affect secretion as do the mineral acids, increasing the alkaline and decreasing the acid secretions of glands with which they come in contact. Thus the salivary and intestinal secretions are increased. They all increase and slightly acidify the urine, and after continued use are apt to derange the digestion.

ACIDUM CITRICUM, *U. S.* **(Citric Acid),** $H_3C_6H_5O_7H_2O$.

Acidum citricum, citric acid, is the familiar acid of *lemon-* or *lime-juice.* It is generally used in the form of lemon-juice (succus limonis, the juice of *Citrus limonum*). Citric acid is made from lime-juice by saturating the boiling liquid with calcium carbonate; the resulting calcium citrate is insoluble in boiling water and subsides. It is collected, decomposed by sulphuric acid with the formation of calcium sulphate as a precipitate, and the solution is evaporated until it crystallizes. It is the mildest of the acids, non-toxic in man, and a certain prophylactic against and specific for *scurvy.* It has been used with good effect in *acute rheumatism,* but is inferior to the alkalies and salicylates.

Citric acid in the form of *lemon-juice* is also used in *torpidity* of the *liver,* in *catarrhal jaundice,* and as hot lemonade at the beginning of a cold. Neutralized with potassium bicarbonate, lemon-juice forms the mixture formerly official as *Mistura Potassii Citratis,* which is a useful basis of refrigerant fever-mixtures and which is superior to the preparation at present official as Liquor Potassii Citratis, made from citric acid instead. In all its therapeutic uses it should be remembered that lemon-juice is distinctly more efficacious than any mixture containing citric acid only, and should be preferred. Whenever mistura potassii citratis is ordered (neutral mixture) the pharmacist is required to prepare it from fresh lemon-juice.

ACIDUM TARTARICUM, *U. S.* **(Tartaric Acid).**

Acidum tartaricum, tartaric acid, is the acid of *grape-juice,* and is prepared from *argol,* or *crude cream of tartar,* which is

impure potassium bitartrate, which deposits on the sides of the casks during the fermentation of wine. It is the only one of the vegetable acids which yields a precipitate (cream of tartar, or potassium bitartrate) with solutions of neutral potassium salts. It is cheaper than citric acid, and may be substituted for it. Tartaric acid is distinctly more irritant than citric acid, and a few fatal cases are recorded. It produces the gastro-enteritis caused by irritant poisons, with cardiac depression. The *treatment* consists in the administration of milk, alkalies, mucilaginous drinks, etc. The *after-treatment* is directed to the effects of the irritant on the gastro-intestinal mucous membrane. Its chief use is in the Seidlitz Powder (*q. v.*) and other effervescing draughts; citric acid is preferable for most of its indications.

ACIDUM ACETICUM, *U. S.* (Acetic Acid).

Acidum aceticum, the official acid, is a liquid containing 36% of absolute acetic acid ($HC_2H_3O_2 = 59.86$) and 64% of water, and is used as a mild caustic to warts and exuberant granulations. Acetic acid may be made by distilling vinegar, which is prepared by allowing a dilute alcoholic liquid to trickle over beech-wood shavings until the alcohol has been oxidized to aldehyde and finally to acetic acid. Most of the commercial acid is made by subjecting oak-wood to a temperature short of carbonization (dry distillation), thereby avoiding the formation of empyreumatic substances. Acidum Aceticum Dilutum contains 6% of the same, and is the only preparation employed internally. Acidum Aceticum Glaciale is nearly absolute acetic acid, is a crystalline solid at or below 59° F., and is employed as a caustic only. The dilute acid is somewhat used as a refrigerant. *Locally*, it is a cooling and pleasant application in febrile conditions and in superficial cutaneous inflammations, as sunburn, while injections of vinegar and water are said to be useful in vaginal gonorrhœa. *Vinegar* is one of the best applications in post-partum hemorrhage; it is applied directly to the womb by means of a sponge.

OXALIC ACID.

Oxalic acid is not much used in medicine, and is interesting chiefly from its toxic effects. It is prepared by acting on sawdust with a mixture of potassium and sodium hydrates at a temperature of 200° C. Oxalic acid occurs in small colorless, prismatic crystals, which may be distinguished from magnesium sulphate by their *sour taste;* and from zinc sulphate by the astringent, nauseating taste of the latter. The acid is frequently used to remove ink-stains, and fulfils a variety of purposes in the arts. In *medicine* it has been recommended as an emmenagogue in doses of gr. ¼ three times a day, given in syrup of lemon. It is a powerful germicide and is extensively used to disinfect the hands of the surgeon: the hands are first carefully cleaned, then immersed in a solution of potassium permanganate. This stains them a deep mahogany color, which is removed by dipping them into a solution of oxalic acid (saturated). The acid is finally removed by thorough washing in sterile water.

Oxalates appear in the urine of patients suffering from neurasthenia; they are probably caused by deficient tissue-metabolism.

Toxicology: The poison is taken either as the *acid itself* or as *acid potassium oxalate* (or "essential salt of lemons"). The symptoms produced are intense burning in the region of the œsophagus and stomach, abdominal pain, vomiting of an acid, generally bloody, mucus, collapse, and in some cases paralysis. The autopsy shows erosions and perhaps perforation of the stomach, and an excess of oxalate crystals in the kidneys. The *antidote* is *lime* or chalk in the most quickly available form, as whitewash; or the precipitated calcium carbonate or syrup of lime may be administered. Alkalies are to be carefully avoided, as they render the acid more soluble.

ASTRINGENTS.

Astringents are medicines which produce corrugation and contraction of the tissues by their local action. They are employed as tonics, as correctives to relaxation of tissues,

and to prevent excessive secretory or hemorrhagic discharges. They are divided into vegetable and mineral astringents.

VEGETABLE ASTRINGENTS.

The **vegetable astringents** include a large number of drugs acting as above indicated, and possessing this power by virtue of *tannic acid* or its derivative, *gallic acid.*

ACIDUM TANNICUM, *U. S.* (Tannic Acid), $HC_{14}H_9O_9 = 321.22$.

Tannic acid is derived from nutgall by the action of *washed* ether, the water being the solvent agent. It is a yellowish-white, *non-crystalline* powder of astringent taste, and is easily soluble in water, alcohol, and glycerin. It precipitates albumin, gelatin, and the *alkaloids*, and with iron salts forms ink. It is a *glucoside*, being changed by dilute mineral acids into glucose and gallic acid, and is *gallic anhydride*, or gallic acid minus 1 molecule of water.

Preparations: Acidum Tannicum, dose gr. j–xv.

Glyceritum Acidi Tannici (20% in glycerin).

Trochisci Acidi Tannici; each contains gr. j.

Unguentum Acidi Tannici (20% in benzoinated lard).

Physiological action: Its effects throughout are due to a *local* action. It coagulates tissue-albumin, lessens the calibre of superficial vessels, and causes diminished secretions wherever applied. It checks peristalsis. It is absorbed after conversion into gallic acid, is reconverted into tannic acid in the blood (?), where it exists as an albuminate, and is eliminated by the kidneys and intestinal canal as tannic, gallic, and pyrogallic acids. Injected into the blood, it causes multiple thrombosis.

ACIDUM GALLICUM, *U. S.* (Gallic Acid), $HC_7H_5O_5 + H_2O = 187.55$.

Gallic acid is obtained by the hydration of tannic acid, either slowly by exposure to the atmosphere (in contact with water) or quickly through the agency of dilute sulphuric acid. It is *crystalline*, slightly soluble in cold water, but readily so in alcohol, and should be given in alcoholic solu-

tion, from which it is not precipitated by water. Acidum Gallicum, dose gr. v–xv.

Tannic acid differs from gallic acid as follows: It is less irritant, and therefore preferable for internal administration with a view to *remote* astringency, although some writers deny to it anything but a local astringency. Its local effects are similar to, but less in degree than, those of tannic acid. The following table expresses these differences and others:

Tannic Acid.	*Gallic Acid.*
Non-crystalline.	Crystalline.
Soluble in water.	Slightly soluble.
Not readily absorbed as such.	Readily absorbed.
Precipitates albumin and gelatin.	Does not.
Locally astringent.	Remotely (?) astringent.

Therapeutics: From their different physiological action various differences result in their use. Thus, *tannic acid* is valuable in hemorrhages and increased secretions where local application is possible, as in *hæmatemesis* and *intestinal hemorrhages*, either from simple or typhoid ulcers or from portal congestion, but not in those resulting from acute inflammation; in *epistaxis* and *oozing from large* surfaces, as a styptic; in gastric catarrh from relaxed conditions of the mucous membrane; in *diarrhœas* when acute stages have subsided, and especially in *chronic diarrhœa*, *chronic dysentery*, and the *colliquative diarrhœa* of phthisis, generally with opium; in *mercurial stomatitis*, *elongated uvula*, and *relaxation of the palate*, as a mouth-wash or gargle; in the various forms of *conjunctivitis* and *keratitis;* in chapped nipples and soreness of the feet, to harden the skin: for the former glycerite of tannin is especially good; as an *antidote to all the alkaloids* and *to tartar emetic:* with the former it forms an insoluble tannate; in *hemorrhoids* it is a good ingredient in ointments; in *catarrh of the cervix* and *body of the uterus* tampons of glycerite of tannin, or iodoform and tannin in powder-form, are particularly valuable; in the chronic vulvitis or chronic otorrhœa of children glycerite of tannin is of service.

Gallic acid is used as follows by those who consider it to have a remote action:

In *pulmonary* and *renal hemorrhage;* in the *hemorrhagic diathesis,* as evidenced by menorrhagia, hæmaturia (when not malarial), epistaxis, or purpura, it should be given, alternating but not combined with iron compounds, or combined with ergot and digitalis; in chronic bronchitis with profuse expectoration; in the *colliquative sweating* of pulmonary tuberculosis it is often used, combined with belladonna or hyoscyamus or alternating with zinc oxide.

PYROGALLOL, *U. S.* (Pyrogallol; Pyrogallic Acid), $C_6H_3(OH)_3 = 125.7$.

A **triatomic phenol,** obtained chiefly by the dry distillation of gallic acid. It occurs in white, shining plates or fine needles, readily soluble in water and alcohol. In animals large doses have produced vomiting, dyspnœa, coma, convulsions, and death. Pyrogallol has been used in *psoriasis* and *parasitic skin diseases* in the form of a stimulating ointment; it stains the skin deep brown.

The following vegetable astringents owe their activity principally to the tannic acid they contain:

GALLA, *U. S.* (Nutgall).

Galla is an excrescence on *Quercus lusitanica* (nat. ord. Cupuliferæ), caused by the punctures and deposited ova of *Cynips Gallæ tinctoriæ* (class Insecta, order Hymenoptera). Habitat: the Levant. It yields its properties to water and alcohol, more readily to the former. Two varieties are recognized, black and white galls, the latter being inferior in strength. Tannic acid is present to the extent of about 60%, gallic acid 3%. The preparations are—

Tinctura Gallæ (20%), dose f℥j–iij.

Unguentum Gallæ (20%).

Nutgall is not much used internally. It is used as a gargle, and as an enema in chronic dysentery due to ulcerations in the lower end of the large intestine; as an ointment for hemorrhoids and in certain irritable skin lesions, notably urticaria.

KRAMERIA, *U. S.* (**Krameria**; **Rhatany**).

Krameria is the *root* of *Krameria triandra* and of *Krameria Ixina* (nat. ord. Polygaleæ). Habitat: Peru and Bolivia; *K. tomentosa*, New Granada. The cortical portion is most efficient. It contains kramero-tannic acid (about 20%), and has an astringent, slightly bitter, and sweetish taste. The dose of the powder is gr. xx–xxx. Its *preparations* are—

Trochisci Krameriæ, each containing gr. j.

Extractum Krameriæ, dose gr. v–xv.

Extractum Krameriæ Fluidum, dose ♏xx–f℥j.

Syrupus Krameriæ (⅛ fl. ext.), dose f℥j–iij.

Tinctura Krameriæ (20%), dose f℥j–f℥ss.

It is a favorite remedy in diarrhœa, especially the summer diarrhœa of children, and in dysentery, intestinal hemorrhages, etc.: it is administered by mouth, or, when the lesion is in the lower intestinal tract, by enema.

CATECHU, *U. S.* (**Catechu**; **Cutch**).

Catechu is an extract prepared from the *wood* of *Acacia catechu* (nat. ord. Leguminosæ), a small East Indian tree. It is *composed* of *catechu-tannic acid* 50%, catechin (an extractive) 30%, and other ingredients. Its uses are those of krameria, but it is more powerful from its larger percentage of tannic acid; also used as an urethral injection in chronic urethritis, for which purpose the compound tincture is diluted with water. Like krameria, it is often employed in combination with other measures. *Gambir* is similar in composition and properties. The official preparations of catechu are—

Catechu (powdered), dose gr. x–℈ss.

Trochisci Catechu, in each gr. j.

Tinctura Catechu Composita (contains cinnamon), dose f℥ss–ij.

KINO, *U. S.* (**Kino**).

Kino is the inspissated *juice* of *Pterocarpus marsupium* (nat. ord. Leguminosæ), an East Indian tree. It occurs, in

brittle, reddish-brown fragments, breaking in angular forms, and having a very astringent taste. It contains *kino-tannic acid*. Tinctura Kino (10%) is official, dose f℥j–ij, and it contains 15% of glycerin to prevent precipitation. Of the powder the dose is gr. x–xxx. It is a favorite remedy in intestinal hemorrhages and fluxes, and is employed as an injection in leucorrhœa, gonorrhœa, and gleet.

HÆMATOXYLON, *U. S.* (Hæmatoxylon).

Hæmatoxylon is the *heart-wood* of *Hæmatoxylon campechianum* (nat. ord. Leguminosæ). This tree is indigenous in Central America; naturalized in the West Indies. The wood contains tannic acid, hæmatoxylin, hæmatein, which is used as a dye, etc. It is used for the same purposes as its sister remedies. The red color imparted to the stools may arouse suspicions of hemorrhage. It is particularly advocated in cholera infantum and the diarrhœa of phthisis. It has an official extract, given in gr. x–xxx doses.

GERANIUM, *U. S.* (Geranium; Crowfoot or Cranesbill).

Geranium is the *rhizome* of *Geranium maculatum* (nat. ord. Geraniaceæ). Habitat: North America. Geranium contains tannic and gallic acids, gum, resin, starch, etc. It is an excellent astringent, well borne by the stomach, and can be substituted for the more expensive foreign drugs in any of their uses, as in enema, injection, gargle, or internally. Dose of the powder, gr. xx–xxx; of the fluid extract, f℥ss–j.

HAMAMELIS, *U. S.* (Hamamelis; Witchhazel).

Hamamelis is the *leaves* of *Hamamelis virginiana* (nat. ord. Hamamelaceæ), collected in autumn. *Hamamelis virginiana* is an indigenous shrub: the bark may also be used. It contains tannic acid and other principles. It is used as an astringent, and is thought by some to have hæmostatic properties peculiar to itself. It is particularly useful in hemorrhoids, both locally and internally, and to fulfil any indication for tannic acid. Hamamelis has an official fluid extract, dose f℥ss–j. The so-called *spirit of witchhazel* is made by adding

about 10% of alcohol to an aqueous distillate of the leaves, which enjoys much the same reputation among the laity formerly possessed by tincture of arnica.

QUERCUS ALBA, *U. S.* (White Oak).

The **bark** of *Quercus alba* (nat. ord. Cupuliferæ). Habitat: North America. The bark contains querco-tannic acid, 6–11%, which turns blue with ferric salts. It is used as an astringent, and fulfils the indications for tannic acid. It has no official preparations, and a decoction may be used. As a cheap source of tannic acid, the infusion or decoction may be used when an astringent wash or a bath is indicated for the entire surface of the body.

Rhus Glabra, *U. S.* The *fruit* of *Rhus glabra* (nat. ord. Anacardiceæ). Habitat: North America. Sumach. This drug owes its acidity to *malic acid*, present as calcium and potassium malates, and is used as an agreeable astringent, acid addition to gargles in *acute* and *subacute pharyngitis*. It is frequently combined with potassium chlorate. Dose of the official fluid extract f℥ss–ij.

Rosa Gallica, *U. S.*, Red Rose. The *petals* of *Rosa gallica* (nat. ord. Rosaceæ), collected before expanding. Habitat: Asia Minor and Southern Europe; cultivated. The petals contain quercitrin and volatile oil, and are used as a mild aromatic astringent.

Preparations: Extractum Rosæ Fluidum, dose f℥j–ij; Syrupus Rosæ (12½% fluid extract), dose f℥j; Mel Rosæ (12% fluid extract), dose f℥j; Confectio Rosæ, a useful excipient for pills.

Rosa Centifolia, *U. S.*, Pale Rose. The *petals* of *Rosa centifolia* (nat. ord. Rosaceæ). Pale rose contains volatile oil and tannic acid.

Oleum Rosæ, U. S., is a volatile oil distilled from the fresh *flowers* of *Rosa damascena* (nat. ord. Rosaceæ).

Aqua Rosæ, U. S., and *Aqua Rosæ Fortior*, U. S., are

obtained as by-products in the manufacture of oil of rose, and are used as flavors.

Rubus, *U. S.*, Blackberry. The bark of the *root* of *Rubus villosus*, *Rubus canadensis*, and *Rubus trivialis* (nat. ord. Rosaceæ). The bark of the root of the indigenous blackberry; a useful astringent, due to the tannic acid it contains. Dose of the official *fluid extract*, f℥j. *Syrupus Rubi* contains 25% of the fluid extract.

Castanea, *U. S.*, Chestnut. The *leaves* of *Castanea dentata* (nat. ord. Cupuliferæ), collected in September or October, while still green. The official *fluid extract* has enjoyed a reputation as an efficient antispasmodic in pertussis. Dose f℥j–ij.

Agaric (Agaricus albus; Boletus laricis). Agaric, or larch fungus, is a fungus derived from *Polyporus officinalis*. It contains *agaric acid*, which is used to control *night-sweats* in doses of gr. $\frac{1}{16}$–$\frac{1}{4}$. Large doses of agaric produce purging, but no poisonous effects.

These and many others contain tannic acid, and may be used in the form of a decoction.

MINERAL ASTRINGENTS.

Mineral astringents are a class of metallic salts having many actions and uses in common, but differing widely in other respects. As astringents their uses correspond to those given above.

ARGENTUM (Silver).

Preparations: Metallic silver is inert.

Argenti Iodidum, *U. S.*, AgI = 234.19; dose gr. j–ij.

Argenti Nitras, *U. S.*, $AgNO_3$ = 169.55; nitrate of silver, an anhydrous salt occurring in colorless rhombic crystals freely soluble in water. It has a metallic, astringent taste, and gives a white precipitate (silver chloride) with soluble chlorides; dose gr. $\frac{1}{4}$–$\frac{1}{2}$.

Argenti Nitras Fusus, *U. S.* (lunar caustic); for external use.

Argenti Nitras Dilutus, *U. S.*, "mitigated stick," equal parts of silver and potassium nitrates; for external use.

Argenti Oxidum, *U. S.*, $Ag_2O = 231.28$; a brownish powder slightly soluble in water; dose gr. j.

Argenti Cyanidum, *U. S.*, AgCN = 133.64; pharm. use.

Incompatibles and antidote of silver: Silver salts are incompatible with hydrochloric, sulphuric, tartaric, and sulphurous acids *and their salts;* with alkalies, alkaline carbonates, and astringent solutions. The *antidote* is *common salt* (sodium chloride) in large amounts in *tepid* water, which acts to form the insoluble silver chloride and as an emetic.

Physiological action: *Locally*, the nitrate of silver, which is the preparation most used, is a mild caustic, forming silver albuminate and limiting its own action, the skin becoming brown, changing to black.

Nervous system: In small doses it is a tonic and antispasmodic; in large doses it causes headache, vertigo, loss of memory, nervous depression, etc., by a *centric action*, and hypodermically may paralyze.

Circulation: Heart not affected; silver salts probably are absorbed into the blood as albuminates. Small doses increase the secretions of the gastro-intestinal tract and of the liver; large doses or long-continued use causes catarrhal symptoms, and may even result in erosions and ulcers of the stomach.

Toxicology: Large doses of silver nitrate cause abdominal pain, with purging and vomiting of white curds (silver chloride), which rapidly become darker; the lips may be stained white, becoming brown and then black; nervous symptoms develop, such as headache, vertigo, unconsciousness, epileptiform convulsions, and finally death from asphyxia. The *treatment* consists in the immediate administration of sodium chloride, the chemical antidote, evacuation of the stomach, and symptomatic treatment.

Chronic argyria is a term applied to a train of symptoms following the prolonged use of the drug. Owing to its slow elimination by the kidneys and intestines, it becomes deposited

in the tissues, and when this deposit is exposed to the light, as in the skin or mucous membranes, a slate or bluish color is developed. Parenchymatous or fatty degeneration of the liver and kidneys may also take place. The *treatment* of this condition consists in administering potassium iodide to cause elimination, with baths of sodium hyposulphite, or in local applications of potassium cyanide. These measures usually fail. Prophylaxis is important. Never continue the use of silver salts more than six weeks at a time.

Therapeutics: *Locally*, the nitrate is used in *acute tonsillitis* in early stages; a strong solution (ʒss to f℥j) may abort or at least greatly alleviate.

Ulcers of the mucous membranes, as of the mouth, tongue, cervix uteri, and endometrium, whether syphilitic or otherwise, may be benefited by strong solutions or the "stick."

In *indolent ulcers* or *sinuses* as a stimulating application. In *irritable* ulcers the "stick" forms a protecting pellicle and relieves pain; in *vaginal gonorrhœa* it may be used in strong solutions, and is sometimes injected into the male urethra to abort gonorrhœa, with doubtful results; in *cystitis* dilute solutions are often indicated. In *granular urethritis* a deep injection of ♏v–x of a gr. x to f℥j solution may cure; *pruritus vulvæ* is cured by application of a solution (gr. xx to f℥j) to cervix, vagina, or external genitals, depending on the seat of the cause of the reflex excitement; in *conjunctivitis* weak solutions (gr. j to f℥j) or the mitigated stick, if of the granular variety. There is danger of deposits of silver salts on corneal ulcers, and consequent opacities, hence zinc salts are preferable; *cystic tumors*, *hydrocele*, and *interstitial thyroid tumors* may be cured or diminished by the injection of ♏ij–x of a 20-grain solution, first having withdrawn the fluid, if any.

Internally, nitrate of silver is used in the later stages of *cholera infantum* as an astringent; in the *summer diarrhœa* of children; in *chronic dysentery*, either by mouth or by high enemata (gr. xx–xxx to water Oj); in *chronic diarrhœas*, as of tuberculosis, generally with opium; in *nervous dyspepsia* and *chronic gastritis*, in which *gastralgia* and symptoms of fermentation are prominent; in *gastric ulcer* the nitrate

stimulates healing and relieves pain; in *chorea* as an antispasmodic it may improve; the progress of *locomotor ataxia* may apparently be stayed. Pepper recommends its use in gr. $\frac{1}{4}$ doses during the entire attack of *typhoid fever*.

Administration: Silver nitrate is decomposed so readily that few substances are compatible with it. For intestinal medication it is best prescribed in the form of pills, which may be coated with *keratin*, so as not to dissolve in the gastric contents. To produce the best effect on the gastric mucous membrane the nitrate is ordered in solution in distilled water (gr. $\frac{1}{4}$ to f℥j) and diluted with about 2 ounces of water before it is taken; if the stomach contains much mucus, it may be washed out by administering a few grains of sodium bicarbonate dissolved in a glassful of hot water half an hour before giving the nitrate. Silver nitrate is essentially a *sedative, alterative astringent* to mucous membranes.

BISMUTHUM (Bismuth).

Official salts: Bismuthi Citras, *U. S.*, Bismuth Citrate.

Bismuthi et Ammonii Citras, *U. S.*, Bismuth and Ammonium Citrate.

Bismuthi Subcarbonas, *U. S.*, Bismuth Subcarbonate.

Bismuthi Subnitras, *U. S.*, Bismuth Subnitrate.

The *subcarbonate* and *subnitrate* of bismuth are practically insoluble and identical in action.

The *subnitrate* is in more general use. It is a white, odorless, almost tasteless, very heavy, insoluble powder. *Locally*, the insoluble salts of bismuth exert a protective, antiseptic, sedative, and astringent action; this is especially marked on the mucous membranes, and makes them peculiarly valuable in acute and subacute inflammations of the entire gastrointestinal tract. The heavy character of the powder renders the action persistent.

Formerly, cases of *poisoning* were reported from large doses; but it is more than probable that these effects were caused by contamination with arsenic. The peculiar local action of the subnitrate has led to its use locally to abraded surfaces, and a number of cases are recorded in which its

application to large surfaces was followed by toxic symptoms. These were, particularly, the appearance of a stomatitis with blue or black spots on the gums, often involving the entire mucous membrane of the mouth; diarrhœa, and in severe cases albuminuria with epithelial casts. There is often a garlicky odor to the breath. The *insoluble* salts are non-toxic when given internally; the *soluble* ones, such as the citrate and ammonio-citrate, are capable of causing violent intestinal irritation. *Fatal cases* show fatty degeneration of the liver, heart, and kidneys, the metal appearing in the urine during life. The stools are colored dark green or black during its administration.

The bismuth salts are *used* in allaying irritation of mucous membranes; in *vomiting;* in *diarrhœas,* where carbolic acid (♏j) frequently forms a useful addition; in many *inflammations* of the *gastro-intestinal tract,* where their tendency to produce constipation must not be lost sight of. They have been used in *gonorrhœa, leucorrhœa,* and *coryza.*

Bismuth subnitrate is best exhibited in the form of powder. It may be administered in capsules, or in the form of mixture, remembering its very heavy character. Dose gr. v–xxx.

The *citrate of bismuth and ammonium* is soluble, more rapid in action, more astringent, and much more irritant. Its use is rarely indicated. Dose gr. j–iij in solution.

CUPRUM (Copper).

Preparations: Cupri Sulphas, *U. S.,* Blue Vitriol or Blue Stone, dose gr. ¼–v.

Copper sulphate is obtained by roasting the native sulphide, and occurs as a by-product in silver-refining. It is in the form of prismatic blue crystals, effloresces slightly and becoming covered by a white powder. It has a styptic taste, and is freely soluble in water.

Copper acetate occurs in bluish-green rhombic prisms, and resembles the sulphate.

Incompatibles and antidotes: The alkalies, alkaline carbonates, mineral salts, iodides, and vegetable astringents are incompatible with copper salts. Acute poisoning is rare

because the salts act as emetics. The antidotes are *albumin* (white of egg, flour, etc.), forming an insoluble albuminate, or *potassium ferrocyanide*, which forms copper ferrocyanide; after the use of either, the stomach should be emptied by the stomach-pump or an emetic.

Physiological action: Metallic copper is inert. *Locally*, its salts are astringent and mildly caustic to mucous membranes and abraded surfaces.

Nervous system: In small doses it is a *tonic;* but in large doses it causes headache, vertigo, inco-ordination, cramps, stupor, with perhaps convulsions and paralysis.

Circulation: It probably exists in the blood as an albuminate; large doses are cardiac depressants.

Poisonous doses produce symptoms of gastro-enteric irritation and collapse—viz., vomiting, abdominal cramps, diarrhœa with greenish or bloody stools (in chronic poisoning it resembles lead, causing cramps and constipation), coldness of skin, rapid and shallow breathing, cardiac depression, and any of the cerebral symptoms mentioned above. The *urine* is frequently black from altered hæmoglobin, and if the patient live for twenty-four hours, jaundice is not an uncommon symptom. Fatty degeneration of the liver may be found after death. Copper sulphate is exceedingly rapid in its action. The *antidote*—milk, eggs, and potassium ferrocyanide—should be given quickly, followed by evacuation of the stomach. *Chronic poisoning* may result from the inhalation of fumes in certain arts or from eating food cooked in copper vessels. The symptoms are those of bronchial or gastro-intestinal irritation, with or without cerebral symptoms.

Therapeutics: *Locally*, its sulphate may be used in *indolent ulcers* to stimulate granulations; in *granular eyelids;* in *gonorrhœa* after acute stage, as injection, gr. j to f℥j; in *scabies* and *tinea*, as lotion or ointment.

Internally, it is occasionally of service in *chronic diarrhœa* and *dysentery*, gr. $\frac{1}{10}$, combined with opium and gradually increased to gr. $\frac{1}{4}$, very efficient; in vomiting of pregnancy, gr. $\frac{1}{16}$, it acts as an anti-emetic. In *neuralgia*, *chorea*, and *epilepsy* it is seldom used. Copper sulphate forms the most efficient antidote to *phosphorus-poisoning;* gr. v, the

emetic dose, should be given at once, and repeated if necessary. It combines with phosphorus to form an insoluble copper phosphide, acting as an emetic at the same time. For its emetic action, see *Emetics*.

ZINCUM (Zinc).

Metallic zinc is inert. Its salts act in a way analogous to, but much milder than, copper.

Preparations: Zinci Acetas.

Zinci Carbonas Præcipitatus, pharmacopœial use.

Zinci Chloridum, caustic.

Liquor Zinci Chloridi (50% chloride).

Zinci Iodidum, dose gr. ss–ij.

Zinci Oxidum.

Zinci Sulphas (white vitriol), dose gr. j–xxx.

Unguentum Zinci Oxidi.

Zinci Valerianas, dose gr. j–ij.

Zinci Bromidum and Zinci Phosphidum are considered under *Bromum* and *Phosphorus*, respectively.

Oleatum Zinci, for external use.

Incompatibles and antidotes: Zinc is incompatible with alkalies and alkaline carbonates, nitrate of silver, and vegetable astringents, all of which precipitate zinc salts. In poisoning, which only occurs after the more powerful salts, the milder acting as emetics, the proper antidotes are albumin, mucilaginous drinks, soap, and opium.

Physiological action: The soluble salts (chloride, sulphate, and acetate) are readily absorbed, probably as albuminate, and are more active than the insoluble. Elimination takes place by the secretions of the liver, intestines, and kidneys, and, although slow, is comparatively much more rapid than that of silver, lead, or copper. Locally, they act by coagulating albumin, the chloride being a strong escharotic and disinfecting its own slough, the sulphate acting much more mildly, and solutions of proper strength are mild astringents. *Acute poisoning* is rare because of emetic action. It resembles acute poisoning by copper: the symptoms are pain, nausea, vomiting, purging, and death from violent gastro-

enteritis. Eggs and milk are to be given; soap, alkalies or their carbonates are the chemical antidotes. *Chronic poisoning* may cause a train of symptoms similar to chronic plumbism—constipation, colic, muscular weakness, or multiple neuritis. Both forms of poisoning rarely occur.

Therapeutics: *Zinc sulphate* is used as an emetic (see *Emetics*). The emetic dose is gr. xxx. It is also used in bronchitis with profuse expectoration as a remote astringent; in nervous disorders, as chorea, epilepsy, etc., as an antispasmodic and nervous tonic, but not so much as formerly. *Locally*, it is used as an astringent wash or injection in *conjunctivitis*, *otorrhœa*, and *gonorrhœa* in gr. j–vj to f℥j solutions, and as a stimulant to sluggish granulations.

Zinc acetate is used similarly to the sulphate, but weaker.

Zinc chloride is a favorite escharotic for the destruction of lupus, epithelioma, malignant and indolent ulcers, and malignant growths generally. It is commonly used with flour (1 to 3, 4, or 5 parts), and is known as Canquoin's paste.

Zinc oxide is used internally in *gastralgia*, *chronic diarrhœa*, *dysentery*, etc.; in *night-sweats of phthisis* as a remote astringent, gr. j–ij, combined with hyoscyamus or belladonna it is often very effectual; in *spasmodic asthma* and *whooping-cough* as an antispasmodic.

Locally, as the official ointment or some of its modifications, it is of great value in eczema, erythema, impetigo, herpes, and other skin disorders. It is used for its *drying* and *alterative* effects.

Zinc valerianate has met with success in *hysterical headache*, *cough*, or *aphonia*, and in *neuralgia* which is reflex from pelvic disorder.

PLUMBUM (Lead).

Preparations: Metallic lead is not official. The official salts are—

Plumbi Acetas, Sugar of Lead; the salt selected for internal use; dose gr. ss–iij.

Liquor Plumbi Subacetatis (Goulard's extract), 25%.

Liquor Plumbi Subacetatis Dilutus, 3% liq. plumb. subacetat.

Ceratum Plumbi Subacetatis (Goulard's cerate) contains liq. plumbi subacetat. 20%, ceratum camphoræ 80%.

Plumbi Carbonas, white lead, chiefly used in Unguentum Plumbi Carbonatis, which is 10% in benzoinated lard.

Plumbi Iodidum, dose gr. ss–iij.

Unguentum Plumbi Iodidi, 10%.

Plumbi Nitras, externally only.

Plumbi Oxidum, litharge.

Emplastrum Plumbi contains one-third of the oxide in olive oil, and is the basis of most plasters.

Unguentum Diachylon, externally, 60% of the above.

The *acetate* is most used. It is made by dissolving litharge in crude acetic acid. It occurs in colorless efflorescent crystals freely soluble in water.

Incompatibles: The sulphate, carbonate, and iodide of lead are insoluble, and hence solutions of lead are chemically incompatible with solutions of sulphates, carbonates, carbonic acid, or iodides; also incompatible with albumin.

Physiological action: *Locally*, the soluble salts act as astringents, sedatives, and irritants, and decrease secretions. They are *absorbed* as albuminates, like other metallic salts, and depress the circulation, lessening the force and frequency of the heart. They *may* act as *remote* astringents as well, checking hemorrhage and decreasing secretions; but this is denied by some authorities. Lead is *eliminated* chiefly by the kidneys, and in suspected cases of poisoning the metal may be found in the urine.

Toxicology: Toxic effects may appear in two forms, *acute* and *chronic*. *Acute poisoning* is rare, because of self-emesis, but may take place after large doses (℈j+) of the acetate. The *nitrate* is the most soluble and poisonous, the *subacetate* ranks next in virulence, while the least poisonous, but the salt most frequently producing acute symptoms, is the *acetate* (sugar of lead). The *symptoms* are a *sweet*, *metallic* taste, intense cramps, vomiting of *white* material ($PbCl_2$), and black purging (sulphide); finally, failure of heart and respiration. An ounce of the acetate has produced death in several instances.

The proper remedies are the *soluble sulphates* (Epsom or Glauber salt), or *alum*, soap, and albumin to precipitate, followed by the use of the stomach-pump; opium.

Chronic poisoning, or *chronic plumbism*, on the other hand, is quite common. It may originate in various ways—in workers in lead, from paints containing lead, from silk thread weighted with lead, from hair-dyes and hair-restorers, cosmetics, and especially from *pure* water running through lead pipes; pure water containing CO_2 dissolves lead, forming a soluble bicarbonate, while ordinary drinking-water is protected by the formation of an insoluble sulphate and silicate on the inner surface of the pipe, etc.—and may take any of the following forms:

Colica pictonum, or *painters' colic*, the characteristic symptoms of which are *retracted abdomen*, *pains* radiating from the umbilicus and supposed to be due to over-excitation of the intestinal ganglia, *obstinate constipation* with clay-colored stools, a corded pulse, nausea, vomiting, marked anæmia, jaundice, and a blue line on the gums. Tremors and chorea, epilepsy, headache, saturnine asthma, multiple palsies and neuritis, anæsthesia, nephritis, pruritus, and amblyopia may exist.

Lead arthralgia, a painful condition of the joints, supposed to be caused by deposition of urates in the joints from deficient oxidation.

Lead encephalopathy, a rare form, characterized by headache, delirium, convulsions, coma, and death. This is especially apt to appear from the use of hair-dyes and washes containing lead.

Lead-paralysis, a frequent variety of the disease. It is a peripheral neuritis, more often affecting the extensor than the flexor muscles, and the upper than the lower extremity ("wrist-drop" or "toe-drop" is caused).

The *nephritis* is of the chronic interstitial variety, marked by low specific gravity of the urine, reduced quantity of the latter, the appearance of casts and of albumin. The heart and bloodvessels often share in the fibroid change.

A symptom which may accompany any of these forms of *chronic* poisoning, and is seen especially in uncleanly persons,

is a *blue* or *slate-colored line* along the gums. Death may occur from malnutrition, paralysis of the respiratory muscles, or from coma.

The *symptoms are caused* as follows: the *corded pulse* is due to the intense colic in the small intestine, which forces the blood from the intestinal vessels; the *blue line* on the gums is due to a deposition of lead as the black sulphide; the *wrist-drop* is due to paralysis of the extensors, in most cases caused by a peculiar peripheral neuritis, though in other cases an anterior poliomyelitis exists.

The *treatment* is *prophylactic* and *eliminative*. The former consists in the avoidance of any source of contamination and by directing workers in lead *carefully* to *clean their hands* before meals. Sulphuric-acid lemonade and albumin (milk) are also to a degree prophylactic. *Elimination* is effected by the soluble sulphates mentioned above, potassium iodide, and sulphur baths. For the palsy galvanism is indicated, a peculiarity being that voluntary movement lasts longer than electrical excitability, and returns first. The treatment otherwise is directed against the symptoms, such as colic, constipation, etc. In poliomyelitis produced by lead-poisoning strychnine acts as a specific.

Therapeutics: As mentioned above, lead acetate is almost the only salt used internally. It has been found useful in *chronic diarrhœa*, *dysentery*, *cholera*, and *yellow fever*, acting by its local astringency; in *bronchitis* and *colliquative sweating*, by virtue of its supposed remote astringency; in *aneurism*, from its combined *sedative* and *astringent* effects; in *hæmatemesis* from gastric ulcer; valuable in *hæmoptysis;* probably one of the best remote hæmostatics.

Locally also the acetate is a favorite, although the oxide and carbonate are used, as in *eczema* and other irritative skin lesions; in *superficial inflammations*, as lead-water and laudanum; in *burns* the lead solutions relieve pain, and white lead may be used over small areas. Lead water is not to be employed as a collyrium.

The subacetate, in the form of liquor plumbi subacetatis or *Goulard's extract*, is diluted with water, and is then used as lead-water for its local sedative and astringent effect.

ALUMEN (Alum).

The **official alum** is a *double sulphate* of *aluminium* and *potassium;* it is crystalline, slowly efflorescent, and soluble in water; when heated it gives up its water of crystallization and is called "dried" or "burnt alum."

Preparations: Alumen, the above, or Potash Alum, dose gr. x–3ss.

Alumen Exsiccatum, *U. S.*, Dried Alum,
Alumini Hydras, *U. S.*,
Alumini Sulphas, *U. S.*,
} external use.

Incompatibles: The alkalies and their carbonates, soluble lead salts, and tannic acid are the principal incompatibles.

Physiological action: Alum acts locally as an *astringent* by causing coagulation of albumin, and in large doses as a *gastro-intestinal irritant.* It is *slowly* absorbed, and is supposed to act as a remote astringent, causing contraction of the tissues and capillaries.

Therapeutics: Alum is used as a direct astringent in *hæmatemesis* and *intestinal hemorrhage* due to passive congestion, no active inflammatory process being present; in *chronic dysentery* and *diarrhœa*, generally in combination.

Locally, it is used as an astringent to painful *ulcers, hemorrhoids,* or *fissures;* in *conjunctivitis* as alum-whey, etc.; in *night-sweats,* alum baths may check excessive perspiration. In *large doses* alum causes violent gastro-enteritis with painful vomiting, purging, and finally death. Its continued use in small quantities is probably injurious. Alum has been used extensively to produce a pure white color in lard, and especially in flour. It is a most efficient precipitant of suspended impurities in water, but renders the water unfit for drinking.

For additional uses see *Emetics.*

It is believed by some to act as a remote astringent in bronchorrhœa and hæmoptysis; but *insufflation* of the powder is preferable. It is a very efficient agent in lead-colic, acting as a soluble sulphate, and in some unknown way when there is no lead in the intestinal tract.

The *acetate of aluminium* has recently found favor as a

non-irritating antiseptic lotion in *superficial inflammatory processes.*

CERII OXALAS, *U. S.* (Cerium Oxalate),
$C_2(C_2O_4)_3+9H_2O=704.78$.

Cerium oxalate is a white, granular powder, permanent in the air, insoluble in water and alcohol, used in doses of gr. j–iij as a remedy in controlling nausea. It is especially recommended in the nausea and reflex vomiting from uterine disturbance, as in pregnancy. It has been used in the treatment of seasickness.

TONICS.

FERRUM, *U. S.* (Iron), Fe = 55.88.

Iron is an essential element in the hæmoglobin of the red blood-cells, is thus a *food*, and is found to exist in small proportions in most food-products, especially beef. Whenever, from *insufficient ingestion or assimilation of iron or from its abnormal discharge or excretion*, as in hemorrhage, an insufficiency of this element occurs, a condition of *anæmia* is established. If in a patient in this condition the causes of deterioration be checked and iron be given, a rapid increase in the blood-elements takes place, and the patient returns to a healthy condition. In health its administration probably causes little effect.

Physiological action: The organic salts are absorbed directly into the blood, the acid radical being oxidized, while salts of the mineral acids may be absorbed unchanged. Soluble preparations are probably converted into the chloride by the acids of the gastric juice. Iron probably exists in the blood as an albuminate, and is conjectured to act by converting the respired oxygen into ozone, a more efficient form for purposes of oxidation—*i. e.*, it is an *adjuvant to the processes of oxidation* in the body. The red blood-disks are increased in number and the hæmoglobin in amount under its use.

Secretions: Iron preparations are astringent, decreasing the secretions generally, and especially the gastro-intestinal, thus

causing constipation, with stools stained black by the sulphide. The *urea*, however, is increased as a result of increased tissue-metamorphosis. It is eliminated by the bile, urine, and fæces.

Therapeutics: The main indication for the use of iron is *anæmia*, particularly the form attended with a marked diminution of hæmoglobin without a corresponding decrease in the number of red blood corpuscles (*chlorosis*). Many conditions dependent to a greater or less degree on anæmia are greatly benefited by the use of this blood tonic, especially *neuralgia*, *hysteria*, *chorea*, and occasionally *epilepsy*. Iron preparations are also used as *stomachics* and *astringents;* they should be administered on a full stomach.

The *chief contraindication* to the use of iron is found in *plethora*. In many cases the astringent effects of iron produce constipation and, indirectly, headache.

Preparations: The preparations of iron differ in their general properties as to *astringency* and *chalybeate* effect, while some of them possess peculiar properties. The chalybeates readily yield iron to the red blood-corpuscles. Reduced iron, the carbonate in its various forms, such as Vallet's mass, Blaud's pill, and the saccharated carbonate, with the soluble citrate and tartrate, are the best *chalybeates*. The most *astringent* preparations are Monsel's solution (liquor ferri subsulphatis) and ferrous sulphate (green vitriol). Preparations possessing peculiar properties are the iodide, the syrup of ferrous iodide, the hydrated oxide (antidote to arsenic), and the tincture of ferric chloride.

The following preparations are important enough to require detailed notice:

Ferrum Reductum, *U. S.*, Reduced Iron, obtained by passing hydrogen gas over heated subcarbonate of iron: it is a tasteless, gray powder, insoluble in water, but very soluble in sulphuric acid, and very prone to oxidize; it is a mild chalybeate of very slight astringency, and suitable for prolonged administration in chlorosis, etc.; dose gr. iij–vj.

Ferri Oxidum Hydratum, *U. S.*, Ferric Hydrate, prepared officially by the reaction of ferric sulphate and ammonium hydrate: when dried it is not used medicinally, but, freshly

precipitated as a moist reddish-brown magma, it is an *antidote to arsenic*, given ad libitum for this purpose. In an *emergency* the hydrated oxide of iron may be prepared by precipitating any solution of a *ferric* salt with water of ammonia; the tincture of ferric chloride is usually at hand. The bulky precipitate is collected on a strainer, washed quickly to remove the excess of ammonia and administered *at once*.

Ferri Oxidum Hydratum cum Magnesia, *U. S.*, Ferric Hydrate with Magnesia: similar to the above preparation, but precipitated by magnesia instead of ammonia. From its slightly purgative action it is preferable as an antidote to arsenic. Dose ℥ss or more, frequently repeated. The pharmacopœia directs that a diluted solution of ferric sulphate and a mixture of magnesia and water should be kept in separate bottles by the pharmacist, to be mixed for immediate use; straining is unnecessary.

Ferri Carbonas Saccharatus, *U. S.*, Saccharated Ferrous Carbonate, prepared by the double reaction of ferrous sulphate and sodium bicarbonate in the presence of sugar to prevent oxidation: a valuable preparation, as it retains its ozonizing power; dose gr. v–xxx.

Massa Ferri Carbonatis, *U. S.*, Mass of Ferrous Carbonate, Vallet's Mass, contains half its weight of ferrous carbonate: prepared as above.

Ferri Sulphas, *U. S.*, Ferrous Sulphate, $FeSO_4 + 7H_2O$ = 277.42, when impure called *green vitriol* or *copperas:* prepared for medicinal purposes by dissolving iron in dilute sulphuric acid by the aid of heat; occurs as greenish-blue crystals of styptic taste, and soluble in water; in the air these effloresce, absorb oxygen, and become pale—viz., *ferric* sulphate is formed; heated, they give up water of crystallization, and the dried sulphate (Ferri Sulphas Exsiccatus, *U. S.*) is formed. It is an active chalybeate, but too astringent for continued use. It has also been used as an emmenagogue and quite extensively as a deodorant and disinfectant. Dose gr. j–v.

Liquor Ferri Tersulphatis, *U. S.*, Solution of the Tersulphate of Iron: very styptic; employed to form the hydrate

for arsenic-poisoning and locally as an astringent. It contains ferric sulphate, $Fe_2(SO_4)_3 = 399.2$.

Liquor Ferri Subsulphatis, *U. S.*, Monsel's Solution, is a solution of a basic ferric sulphate. It is useful as an internal astringent in gastric and intestinal hemorrhage (dose ♏ v–xv), and topically applied it is one of the best styptics. In dilution it is a valuable application in inflammations of mucous membranes. Its use to control hemorrhage is attended by the disadvantages common to the use of all styptics, namely, of forming a clot which conceals bleeding still going on underneath and of forming an excellent culture-medium for infection.

Tinctura Ferri Chloridi, *U. S.*, Tincture of Ferric Chloride, is one of the efficient iron salts, having a marked styptic taste and astringent effect, and in large doses causing irritation. It contains an ether, to which it probably owes its slightly *diuretic effect* and its specific astringent effect on the genito-urinary tract. It is used with good effect in *erysipelas*, and has its advocates in *diphtheria* and *scarlet fever*. As it is particularly destructive to the teeth, care should be taken in prescribing it. Dose gtt. xv–xxx, well diluted with water, taken through a glass tube.

Liquor Ferri et Ammonii Acetatis, *U. S.*, Solution of Iron and Ammonium Acetate, Basham's Mixture, is said to be very valuable in the anæmia of chronic nephritis. Dose f℥ss.

Syrupus Ferri Iodidi, *U. S.*, Syrup of the Iodide of Iron, is a transparent, pale-green liquid, combining the effects of iodine and iron, not constipating, and is a standard remedy in scrofulous and tuberculous conditions, especially in children; dose gtt. x–xxx.

Ferri et Potassii Tartras, *U. S.*, Iron and Potassium Tartrate, occurs as transparent red crystals, wholly soluble in water, prepared by the addition of ferric hydrate to potassium bitartrate. Like the preceding preparation, it is non-constipating, which, with its agreeable flavor and its compatibility with alkalies, renders it valuable for children.

Ferri Phosphas Solubilis, *U. S.*, Soluble Ferric Phosphate, is a mixture of ferric phosphate with sodium citrate, the

latter presenting the phosphate in a soluble form. Dose gr. v–x.

Ferri Pyrophosphas Solubilis, *U. S.*, Soluble Ferric Pyrophosphate; greenish scales, freely soluble in water: a valuable chalybeate; dose gr. ij–x; probably a mixture of sodium citrate with ferric pyrophosphate, and rendered soluble by the presence of the sodium salt.

Ferri Hypophosphis, *U. S.*, Ferric Hypophosphite: supposed by some to be especially valuable in nervous lesions, generally in combination with other hypophosphites; dose gr. x–xxx.

Liquor Ferri Nitratis, *U. S.*, Solution of Ferric Nitrate: in addition to its tonic action this is a good astringent, and as such is employed in intestinal and other fluxes when associated with anæmia.

Syrupus Ferri Bromidi, *U. S.*, Syrup of Ferrous Bromide, combines the action of iron and bromide, and is especially indicated in chorea with anæmia.

Ferri Citras, *U. S.*, Ferric Citrate, is very slowly soluble, and may be prescribed in pill-form. It appears in the form of garnet-red scales.

Ferri et Quininæ Citras, *U. S.*, Citrate of Iron and Quinine: a valuable tonic, combining the effects of its two components; dose gr. v–x.

Vinum Ferri Amarum, *U. S.*, Bitter Wine of Iron, contains the preceding as its active ingredient, and is a good bitter tonic; dose f℥j–ij.

Ferri et Ammonii Citras, *U. S.*, Iron and Ammonium Citrate, has antacid properties. It is but slightly astringent and *very soluble*.

Ferri et Ammonii Sulphas, *U. S.*, Ferric Ammonium Sulphate, Ammonio-ferric Alum: used in chronic diarrhœa and dysentery for astringent effect.

Ferrum Dialyzatum, a very valuable chalybeate: formed by the dialysis of a solution of ferric chloride. Its exact composition is unknown. It should not be used in combination. It is only slightly constipating, and is a good antidote for arsenic. Dose gtt. x–xx, followed by sodium chloride to insure its absorption.

Other preparations of iron, all possessing tonic properties,

are very numerous, but the foregoing are sufficient for practical purposes.

MANGANUM (Manganese).

The metal **manganese** is a normal constituent of the body, the blood, hair, etc., existing in minute portions, and has tonic properties when administered alone or in combination with iron in conditions of anæmia and cachexia, but is inferior to iron.

Official compounds: Mangani Dioxidum, *U. S.*, Manganese Dioxide; Black Oxide or Binoxide of Manganese, $MnO_2 = 86.72$. A grayish-black, amorphous, or crystalline powder, odorless, tasteless, and insoluble in water; dose gr. j–v.

Mangani Sulphas, *U. S.*, Manganese Sulphate, $MnSO_4 + 4H_2O = 222.46$: transparent, slightly rose-colored crystals, odorless, with a slightly styptic taste and soluble in water; dose gr. j–iij.

Therapeutics: These salts are used as above indicated, as a succedaneum to iron. By some they are regarded as resembling bismuth, and are given in *gastrodynia* and *pyrosis*: others attribute to them emmenagogue properties. The sulphate is thought to be cholagogue, and has been given in *jaundice* due to inflammation of the bile-ducts. Potassium permanganate is an antiseptic.

ACIDUM SULPHURICUM, *U. S.* (Sulphuric Acid).

Preparations: Acidum Sulphuricum, *U. S.*, Oil of Vitriol, contains 92½% of the absolute acid, $H_2SO_4 = 97.82$; is used externally as a caustic.

Acidum Sulphuricum Dilutum (*U. S.*): 10% strength in water; dose ♏x–xxx: it is inferior medicinally to

Acidum Sulphuricum Aromaticum (*U. S.*), which is of 20% strength, with alcohol, tincture of ginger and oil of cinnamon.

Physiological effects: Sulphuric acid is a powerful penetrating caustic, abstracting water from the tissues by its powerful affinity therefor, and carbonizing (charring) the flesh. Therapeutic doses of its weaker preparations are absorbed as

sulphate, and eliminated in that form by the kidneys, intestinal tract, and skin, upon which tissues it exerts an astringent effect.

Therapeutics: *Locally*, strong sulphuric acid is still somewhat used as a caustic in a paste with asbestos or charcoal in the treatment of *chancroidal* and other *ulcerations*. Diluted, and preferably as acidum sulphuricum aromaticum, it is used in *diarrhœas*, especially the profuse watery forms, and also in *cholera* and *cholera infantum*; also in the *colliquative sweating* of debilitated conditions; in hemorrhages as a *remote* astringent, probably ineffective; in lead-poisoning, in the acute form of which it is an efficient antidote, forming the insoluble lead sulphate; in chronic plumbism its efficacy is doubtful, but in the form of sulphuric-acid lemonade it may prove a prophylactic; as a solvent for cinchona salts. In Asiatic cholera it has been found an efficient prophylactic.

In administering sulphuric acid care should be taken of the teeth, and it should be *well diluted*, and taken through a glass tube, for even the weaker preparations are irritating.

Toxicology: After a poisonous dose of the strong acid we have two stages: immediately pain in the œsophagus, throat, and epigastrium is experienced, followed by violent vomiting, often of tarry matter, with symptoms of severe collapse, death ensuing in from two to ten hours. If the patient survives this stage, he suffers subsequently from ulcerations of the pharynx, larynx, œsophagus, and stomach, the parotids become inflamed from occlusion of Steno's duct, and an acute parenchymatous nephritis may develop.

The *blackened* slough makes the *diagnosis*. The *treatment* of the acute condition consists in the administration of the carbonates of magnesium and calcium or of the alkaline carbonates. Whitewash or *soap* may be the most available. These *antidotes* should be given freely in milk, water, or other diluent. Subsequent treatment is according to the nature of the sequelæ.

ACIDUM HYDROCHLORICUM, *U. S.* (**Hydrochloric Acid**).

Acidum Hydrochloricum, 31.9% of the gas (HCl=36.37); not much used medicinally; dose ♏v–x, well diluted.

Acidum Hydrochloricum Dilutum, 10% of gas; preferable form for administration by stomach.

Physiological action and therapeutics: This drug exhibits neither pronounced caustic nor astringent effects. Being a normal stomach acid, and having a stimulating effect on the intestinal glandular system, its administration *aids digestion* by prolonging the action of the pepsin ferment. Thus it is useful in *gastric dyspepsia*, and as the normal acidity of the stomach is not developed until at least half an hour after the ingestion of food, it may be given at a corresponding time, often in combination with pepsin. In *intestinal dyspepsia* combinations with nux vomica or some aromatic stomachic are valuable. These are the principal uses of this acid. The toxicology and treatment are the same as for other mineral acids.

ACIDUM NITRICUM, *U. S.* (Nitric Acid).

Acidum Nitricum contains 68% of the absolute acid, HNO_3=62.89; at first colorless, it changes on exposure to light to a yellowish color; for external use only.

Acidum Nitricum Dilutum, 10% strength, dose ♏xv–f℥j.

Physiological action: *Locally*, in strong solutions, nitric acid is a powerful chemical caustic; in weaker solutions, an astringent stimulant. *Internally*, in considerable dilution, it stimulates the intestinal glandular apparatus, and has a local astringent effect, checking watery discharges. It is absorbed as the nitrate, but its method of elimination is unknown.

Therapeutics: *Locally*, it is used as a caustic in chancres, venereal warts, etc.; care being taken to protect the surrounding healthy tissues with petrolatum, and to limit its action, when sufficient, by an alkaline lotion. Also used as caustic in cancrum oris and other phagedænic conditions. *Internally*, nitric acid is used in *dyspepsia*, especially of the intestinal type, with *torpidity of the liver;* and in *serous diarrhœas*, in which Hope's camphor mixture is a good prescription.

Toxicology: Nitric acid is a very powerful corrosive poison, causing deep, *yellow* sloughs, which are diagnostic. The symptoms and treatment are those of other mineral acids.

ACIDUM NITRO-HYDROCHLORICUM, *U. S.* (**Nitro-hydrochloric Acid**).

This **acid combination,** known also as nitro-muriatic, consists of nitric acid 18 and hydrochloric acid 82 parts, forming an orange-colored, chlorine-evolving liquid, which changes on standing to a yellow color. The acids are *decomposed:* nitrosyl chloride, NOCl, free Cl, and water are formed. Care should be taken to allow the completion of the process before the liquid is dispensed. It should be placed in glass-stoppered bottles but partly filled, and is incompatible with organic mixtures because of its free chlorine. Dose ♏iij–v, well diluted.

Acidum Nitro-hydrochloricum Dilutum contains 4 parts of nitric acid, 18 parts of hydrochloric acid, with water to make 100 parts. It is thus about 20% in strength. Dose ♏xx–xxx. The acids must be mixed in concentrated form, and the reaction must be *completed* before the liquid is diluted with water.

Physiological action: What becomes of the drug after ingestion is not clear. Like the acids of which it is composed, it seems to be an intestinal glandular stimulant, with a special action on the hepatic secretion.

Therapeutics: This acid is used in *intestinal dyspepsia* with hepatic congestion, the so-called "bilious" condition, and is very efficacious; in *chronic diarrhœa,* especially in those cases due to imperfect digestion, with consequent irritations from undigested or fermenting food, acting by aiding digestion; also in *syphilitic dyscrasia* and certain chronic skin diseases, in which it accomplishes good in the same manner. The diluted acid is a *specific* in the *oxaluria* of certain classes of neurasthenics (Wood).

Locally, as baths (f℥iij to Oij of water); as a local application to the region of the liver (f℥j–iij to the pint) it has been recommended in chronic diseases of the liver, as cirrhosis, fatty liver, etc. Toxicology same as for other members of this group.

ACIDUM LACTICUM, *U. S.* (**Lactic Acid**).

An **organic acid,** usually made by subjecting milk-sugar or grape-sugar to the lactic fermentation; composed of 75% by

weight of absolute lactic acid ($HC_3H_5O_3$=89.79) and 25% of water. Dose ♏v–xv.

It exists as a normal acid in stomach digestion, and has been administered as an aid to the pepsin ferment in dyspepsia.

PHOSPHORUS, *U. S.* (Phosphorus).

Phosphorus is a non-metallic element, solid at ordinary temperatures, *igniting* at about 100° F. and melting at 111° F. It is translucent, colorless when pure (generally slightly yellow), and has a peculiar garlicky odor. It is obtained from bone-ash (calcium phosphate) by removing the lime with sulphuric acid and reducing the residuum with charcoal at high temperatures. It is insoluble in water, soluble in oils, ether, and alcohol, and freely so in chloroform.

Preparations: Phosphorus, never given in substance, dose gr. $\frac{1}{100}$–$\frac{1}{80}$.

Oleum Phosphoratum, 1% in ether and expressed oil of almond, dose ♏j–iij.

Elixir Phosphori, each ʒj contains about gr. $\frac{1}{64}$.

Pilulae Phosphori, each contains gr. $\frac{1}{100}$.

Zinci Phosphidum, dose gr. $\frac{1}{20}$–$\frac{1}{10}$.

The various hypophosphites do not have the effects of phosphorus, and are considered later.

Physiological action: *Locally*, this drug is an irritant, producing inflammation, ulceration, and even gangrene. Constant *inhalation* by workmen having carious teeth may cause necrosis of the lower jaw, the point of entrance always being a defective tooth. When taken *internally* it varies decidedly in its effects with the size of the dose. Medicinal doses stimulate the nervous system and act as a tonic, repairing waste; stimulate the circulation; elevate and then slightly lower the temperature; and have a direct effect on bone-formation. Phosphorus is absorbed in its own form, dissolved in some fatty substance, and is eliminated by the liver and general glandular system. It leaves the body in the form of hypophosphorous acid. The *therapeutic limit* of the drug is reached when a matchy taste develops. It is also apt to produce digestive disturbances.

Toxicology: The symptoms *develop tardily* in from three to twelve hours. They are—general wretchedness, vomiting, at first of food, and bile with alliaceous odor and luminous in the dark, later perhaps coffee-colored from exuded blood; purging (the stools also being phosphorescent and often clay-colored) and abdominal pain; *jaundice* of the non-obstructive variety develops on the second day. Later, pronounced *nervous* disturbances occur—headache, giddiness, sleeplessness, somnolence, wild maniacal, sometimes erotic delirium, and coma: when these are marked a fatal termination may be expected. Death ensues from general exhaustion. The *urine* is generally scanty and albuminous, and may contain glucose; when jaundice develops it reacts to the biliary acids and coloring-matters. It may contain leucin and tyrosin. Death generally occurs not earlier than the second day, and may be postponed much longer; it has resulted from gr. jss.

Phosphorus-poisoning closely resembles acute yellow atrophy of the liver in its symptomatology and course. In both a curious *remission* may occur about the second day, the symptoms then reappearing and going on to a fatal termination. Epigastric and hepatic tenderness persists during the remission. The odor upon the breath, and phosphorescence of the vomited matter and stools, and the primary enlargement of the liver may aid in diagnosis.

Post-mortem changes: The *liver* is enlarged, friable, and pale, with fatty degeneration of its parenchyma, followed in protracted cases by atrophy. The *gastro-intestinal mucous* membrane is swollen, opaque, and light-colored from a general adenitis, but is seldom eroded. The *kidneys* undergo changes analogous to those of the liver. The *blood* becomes dark, loses its power of coagulation, and ecchymoses occur in all parts of the body.

Treatment: Avoid all fatty substances, which dissolve phosphorus and aid in its absorption; give *copper sulphate* (gr. v) as emetic, for it is also a chemical antidote by forming a black copper phosphide; after thorough emesis and thorough purgation the same drug may be given in small doses combined with opium as an *antidote* merely; then *old French* or *acid oil of turpentine*, which contains *oxygen*, the essential

antidote, may be given if available. Usually, in this country, we rely entirely on copper sulphate as a chemical antidote, as the French oil of turpentine is seldom obtainable. After the phosphorus has begun to act, the treatment is symptomatic.

Therapeutics: Three classes of disease call for the use of phosphorus—viz., diseases of bone-formation, of the nerves, and chronic affections of the superficial layers of the skin. Thus it is used in *rickets* and *osteomalacia* with markedly good results, generally in combination with iron; in *nervous exhaustion, neuralgia, cerebral softening,* and *myelitis* it is used with advantage; in *acne indurata, psoriasis,* the *furuncular diathesis,* and *lupus* it is a valuable succedaneum to arsenic. It certainly stimulates bone-formation, and in this differs essentially from the phosphates, which furnish merely bone-constructing material.

Administration: The official phosphorated oil being already a solution, is readily absorbed, and should be used with care. Phosphorus pills, made by the manufacturer, should only be used if they have a decided odor of phosphorus when crushed. The phosphide of zinc acts as a phosphorus compound, and although it is one-fourth phosphorus, only one-half of this is available. Hence the dose is eight times that of phosphorus (gr. $\frac{1}{20}$–$\frac{1}{12}$), although Prof. Seguin gives as much as gr. $\frac{1}{6}$–$\frac{1}{4}$.

ALTERATIVES.

This term has been applied to a class of drugs which have been found empirically to have a slow but certain effect in certain diseases or diatheses, the rationale of their action being unknown. Their immediate effects in ordinary doses are slight; but in larger or continued dosage they may depress very decidedly the nutrition and general condition of the body.

ACIDUM ARSENOSUM, *U. S.* (Arsenous Acid).

Arsenic, or arsenous acid (formerly called arsenious acid), when first sublimed from its ores occurs in glassy, colorless,

transparent masses, which on keeping become milky-white externally. It is soluble in water, has a faintly sweetish taste, and volatilizes without fusing at a temperature of 400° F. or less. It is also called *arsenous* (or *arsenious*) *oxide* or *white arsenic*.

Preparations: The metal arsenicum is not official. The following are:

Acidum Arsenosum, dose gr. $\frac{1}{40}$–$\frac{1}{20}$.

Liquor Acidi Arsenosi (1%), dose ♏ij–viij.

Arseni Iodidum, dose gr. $\frac{1}{30}$–$\frac{1}{10}$.

Sodii Arsenas, dose gr. $\frac{1}{12}$–$\frac{1}{3}$.

Liquor Sodii Arsenatis (1%), solution of sodium arsenate; dose ♏ij–x.

Liquor Potassii Arsenitis (Fowler's solution) contains of arsenous acid 1%, of pot. bicarb. 2%, and of tinct. lavand. comp. to color 3%. It is most used. Dose ♏ij–viij.

Liquor Arseni et Hydrargyri Iodidi (Donovan's solution) contains 1% each of arsenous iodide and the red iodide of mercury; dose ♏v–x.

Physiological action: In moderate doses arsenic *stimulates digestion* and *promotes nutrition*. Aside from this, its effects are not obvious unless long continued, in which case dryness of the throat, nausea, pain in the stomach, perhaps diarrhœa, conjunctival and nasal irritation, and a peculiar facial œdema, especially noticeable beneath the eyes, may develop. The last is a signal for suspending the administration of the drug. This selective action on the mucous membranes takes place however the drug be administered. If continued longer or in too large medicinal doses, a *chronic poisoning* with an increase of the symptoms supervenes, and digestive disorders, conjunctivitis, œdema, dropsy, cutaneous eruptions with falling of the nails and hair, and albumin and tube-casts in the urine (nephritis), and local paralyses may result. Large doses are supposed to be taken not only with impunity, but are said to be followed by good results when used habitually by the so-called arsenic-eaters of Styria.

Arsenic—toxicology: The symptoms develop in from fifteen minutes to one hour: they are faucial constriction, burning pain in the œsophagus and stomach, succeeded by violent

spasmodic abdominal pain and persistent vomiting; purging, the stools at first bilious, but later serous, with mucoid flakes and sometimes blood, excessive thirst, and suppression of urine soon follow; then ensue collapse, with small feeble and rapid pulse, embarrassed breathing, coldness of the extremities and cyanosis, and finally death, preceded by coma. In some cases a remission of these symptoms occurs; but the urinary symptoms, the epigastric and hepatic tenderness, and the intense thirst continue, and the above symptoms are again developed, with pronounced nervous symptoms, tremblings, cramps, and convulsions, fever, skin eruptions, and finally a fatal termination in from two to six days. *Atypical cases* may present as dominant symptoms: *coma*, immediate *collapse*, *violent serous purging*, and other symptoms resembling Asiatic cholera.

Sequelæ: In cases which recover there may be developed (1) inflammatory conditions of the alimentary tract in any part; (2) a widespread multiple neuritis, the muscles presenting the reaction of degeneration associated with various sensory disturbances; (3) in some cases perhaps an actual lesion of the spinal cord (poliomyelitis): the affected muscles generally recover. A remarkable overgrowth of hair has been noted.

Lesions: At the autopsy the *gastro-intestinal mucous membrane* is found swollen, congested, and in places covered by a plastic exudation, and, as the contents of the intestinal tract, a fluid resembling the discharges of cholera; actual *fatty degeneration of the liver*, *spleen*, and *kidneys;* in some cases congestion of the broncho-pulmonary mucous membrane has been noted. The *tissues*, and especially the nervous organs, are found to *contain arsenic*. (During life, after elimination of the drug has ceased, the administration of potassium iodide will cause it to reappear in the secretions.) This storing of the drug in the tissues takes place however administered, and diffusion may take place *post-mortem*.

Treatment: In recent cases immediate evacuation of the stomach, preferably by the stomach-pump, is indicated. One of the following antidotes should then be freely administered: (1) *Freshly precipitated ferric hydrate* (*q. v.*), which

forms an insoluble arsenate of iron; (2) ferri oxidum hydratum cum magnesia; (3) dialyzed iron, followed by common salt or some alkali. Demulcent drinks, opiates, and stimulants, *p. r. n.*, complete the treatment.

Chronic arsenical poisoning results in those who work with the preparations of arsenic in the arts; from the use of arsenical dyes, especially some of the cheap green and brown shades; from wall-paper and toys colored with the same dyes. The symptoms are those of irritation of the mucous membrane of the respiratory tract, if the drug has been inhaled: dryness of the nose and throat, dry cough; to these are added diarrhœa and gastric irritation; nervous disturbance of motion and of sensation; eruptions and pigmentation of the skin.

Therapeutics: *Locally*, arsenous acid is a powerful caustic, and is used as such, either pure or mixed in varying proportions with sulphur, in the treatment of lupus, indolent sinuses, etc. The danger of absorption is said to be less when freely applied. *Internally*, it is much used in certain nervous conditions, as *chorea*, *migraine*, *neuralgia*, and *neurasthenia;* in chronic diseases of the superficial layers of the skin, as psoriasis, pityriasis, pemphigus, and certain chronic forms of eczema, but *never until all acute symptoms are past;* in *irritative dyspepsias*, *gastric ulcers*, etc., *small doses* (♏j–ij of Fowler's solution) *before meals* may relieve the symptoms and promote digestion; *anæmias*, and especially the *pernicious form*, may be greatly benefited—best combined with iron in chlorosis; in *malarial poisoning* (especially the chronic forms) not yielding to quinine, and not in the acute stage, but only when paroxysms have ceased or become infrequent and irregular: it should be given in large doses; *multiple lymphadenomata* and other glandular swellings have been known to disappear under its use. Arsenous acid is also used for its alterative effect on *mucous membranes*, such as those of the pharynx, larynx, and entire respiratory tract. In *rheumatoid arthritis* it is a valuable remedy; also in acute and chronic *rheumatism*. It has also been employed in *alopecia*.

In the *chorea of childhood*, Fowler's solution is usually administered in ascending doses until the physiological action

is made manifest; its use is then suspended for a day or two, when the patient is again placed on a smaller dose.

Administration: The dosage will depend, as has been seen above, upon the condition to be reached. Thus, malarial poisoning and glandular enlargements will require considerable doses, while only small ones will be tolerated in certain gastric conditions. The liquor sodii arsenatis is said to be less irritating to the stomach, but Fowler's solution or the acid itself is the form most used. Donovan's solution will receive notice under Mercurial Preparations.

HYDRARGYRUM, *U. S.* (**Mercury**), **Hg = 199.8.**

Mercury, or quicksilver, is a volatile metal, liquid above —40° F., exceedingly heavy (sp. gr. 13.5), but otherwise of negative properties. It is obtained from its native sulphide or cinnabar.

Preparations: Massa Hydrargyri (blue mass), one-third metallic mercury; dose gr. j–x.

Hydrargyrum cum Creta (gray powder) contains mercury 38 parts, creta præparata 57 parts, and clarified honey 10 parts; dose gr. v–ʒss.

Unguentum Hydrargyri (blue ointment), 50% mercury.

Emplastrum Hydrargyri and Emplastrum Ammoniaci cum Hydrargyro are unimportant.

Hydrargyri Chloridum Mite (calomel), dose gr. ss–xv. Calomel is an ingredient of the compound cathartic pill. Black wash (lotio nigra) is made by adding calomel ʒj to lime-water Oj, the black oxide being formed.

Hydrargyri Chloridum Corrosivum (corrosive sublimate), dose gr. $\frac{1}{32}$–$\frac{1}{8}$. In yellow wash (lotio flava) we have the yellow oxide of mercury, formed by adding ʒss of corrosive sublimate to Oj of lime-water.

Hydrargyrum Ammoniatum (white precipitate) is contained in Unguentum Hydrargyri Ammoniati, 10%.

Hydrargyri Cyanidum, dose gr. $\frac{1}{30}$–$\frac{1}{8}$.

Hydrargyri Iodidum Rubrum, dose gr. $\frac{1}{32}$–$\frac{1}{4}$.

Liquor Hydrargyri et Arseni Iodidi (Donovan's solution).

Hydrargyri Iodidum Flavum, dose gr. ¼–j.

Liquor Hydrargyri Nitratis, a caustic.

Unguentum Hydrargyri Nitratis, citrine ointment.

Hydrargyri Oxidum Flavum (yellow precipitate) is an ingredient of Unguentum Hydrargyri Oxidi Flavi, 10%, and of Oleatum Hydrargyri, 10%—a very useful preparation.

Hydrargyri Oxidum Rubrum (red precipitate), used only in Unguentum Hydrargyri Oxidi Rubri, a 10% ointment.

Hydrargyri Sulphidum Rubrum is cinnabar, dose ʒss.

Hydrargyri Subsulphas Flavus (turpeth mineral) is an emetic (see *Emetics*).

Physiological action: Mercury in its liquid state is inert, but workmen exposed to its vapors may develop salivation or mercurial palsy. Its compounds, however, are all active, and when *locally* applied produce effects varying from a very slight irritation to a violent causticity. *Internally*, single small doses cause very few symptoms beyond a slight stimulation of the secretions generally. Larger medicinal doses, continued, cause a train of symptoms called *salivation* or *ptyalism*. The milder symptoms are tenderness and tumefaction of the gums, which bleed on the slightest abrasion; soreness of the entire mouth, swelling of the tongue, and greatly increased secretion of the salivary and buccal glands, with a peculiarly fœtid breath and strong metallic taste in the mouth. Swelling and inflammation of the salivary glands, a deep-red line along the gums, and in extreme cases falling of the teeth and necrosis of the maxillæ, may occur. Added to this we may have a low fever, *diarrhœa*, neuralgia, nervous disorders, and a general debilitated condition. The blood undergoes decided changes, its power of coagulation being lessened by a diminution of its fibrin and other solid portions. The nutrition of the body is lowered by large doses, but small ones probably have a tonic effect, at least in certain dyscrasiæ.

Workers in mercury after long-continued inhalation of its vapor may become the victims of a *mercurial tremor* simulating paralysis agitans, or of a spasmodic condition resembling *chorea*. Other nervous symptoms often accompany this, as loss of memory, vertigo, and at times local paralysis, prob-

ably due to a peripheral neuritis. A *mercurial cachexia* has been noted, with a train of symptoms simulating *scurvy*.

The cathartic, emetic, and antiseptic effects of mercurial preparations will be considered under their respective headings.

Administration: Mercury may be given by the stomach, by inunction, by sublimation, and by hypodermic injection. For *continued internal* use the yellow (green or proto-) iodide is often selected; calomel may also be given in small doses. The latter is the preparation most apt to cause diarrhœa; it is a *cholagogue purgative* in large dose or in minute quantities frequently repeated. During the third stage of syphilis the bichloride is used in combination with iodides; it is least apt to produce salivation. For *hypodermic administration*, the bichloride is also selected in spite of its pronounced irritating properties; gr. $\frac{1}{16}$–$\frac{1}{12}$ may be given in aqueous solution, preceded by a hypodermic injection of cocaine. In emergencies, when a syphilitic tumor of the brain threatens life, mercury may be given by all of the routes: by the mouth (calomel), by the skin (the bichloride hypodermically), and by inunction (blue ointment). The mercurial preparations differ greatly in their poisonous properties, and this largely in proportion to their solubility. The bichloride is the most irritating and poisonous. The nitrate, the yellow and red iodides, the ammoniate, the yellow and red oxides, and the yellow subsulphate are next in order as to irritant properties. The mildest preparations are calomel, the oleate, the ointment, mercury with chalk and blue mass. These are less apt to produce poisoning by single large doses, but very easily cause ptyalism in small doses frequently given.

Toxicology: The bichloride is the most corrosive preparation. The symptoms which appear *rapidly* are those of extreme gastro-intestinal irritation, intense pain in the œsophagus and stomach, vomiting, purging of bilious matter and finally *bloody mucus*, albuminous and even bloody urine, with collapse and death. It is a very fatal poison, and *antidotes* must be used quickly. The best of these is *white of egg*, followed by evacuation of stomach and bowel. Soap is a partial antidote. The *after-treatment* is that of any form of

corrosive poisoning. The *post-mortem lesions* are due to its violent caustic effect; ulceration of the gastric and intestinal mucous membrane is commonly found; there may be perforation.

Elimination: Mercury has been found in all the tissues and secretions. After its spontaneous elimination has ceased it will appear after the administration of potassium iodide, showing that it is stored somewhere in the tissues.

Absorption seems to take place readily enough, but elimination is sometimes very irregular. For this reason patients who are on a protracted course of the drug require careful supervision.

The *bichloride* is probably absorbed as an albuminate, while the alkaline juices of the intestine convert *calomel* into the *black oxide*, which is in turn dissolved by some of the fatty contents of the bowel and so absorbed. *Metallic mercury* in the form of blue mass or mercury with chalk is probably also absorbed as the black oxide. It is customary to prescribe calomel in small doses (gr. $\frac{1}{8}$–$\frac{1}{10}$), frequently repeated with gr. i–ij of sodium bicarbonate, as it acts more powerfully in this manner than in single large dose.

Therapeutics: We will consider here the antiphlogistic and antisyphilitic uses of the drug, leaving until later its other uses. In small doses mercury increases the number of red corpuscles and has a *tonic* effect. By decreasing the fibrinous elements of the blood, mercury may be useful in lessening plastic exudate in inflammations of the serous membranes, as *pleurisy*, *peritonitis*, *pericarditis*, and *iritis*. Its value in endocarditis and pneumonia is less certain. The pseudomembranous forms of laryngitis are especially benefited. For this antiphlogistic effect it should be administered during the stage of exudation, and it is valueless in subacute inflammations. Calomel and the mass are the favorite forms. In *syphilis* its action is specific, and its administration should be begun as soon as the diagnosis is made, and continued during the secondary stage in dosage just sufficient to maintain a mild influence on the system. In the *tertiary lesions* it is indicated in combination with potassium iodide when an immediate effect is required on local lesions, as those of the

brain or liver, which threaten life. Otherwise the iodide is used alone by many authorities. In the cachexia of syphilis it has been proven to increase the number of red blood-cells. An an antisyphilitic remedy mercury is employed in various ways—by mouth in the form of calomel or blue mass, by inunctions of the oleate or ointment, by fumigations of calomel, cinnabar, or the black oxide. In the later lesions the bichloride and the iodides are supposed to be especially efficacious as adjuvants to potassium iodide.

In the *secondary stage* the administration of mercury should be pushed until constitutional symptoms are produced and the dose then reduced to a point just sufficient to control the disease. Usually one-half of the dose necessary to reach the physiological limit is required (White and Martin). The *constitutional effects* to be observed are tenderness of the gums when the teeth are forcibly brought together, ptyalism, and diarrhœa. It is well to alternate the internal administration with the use of blue ointment.

IODUM *U. S.* (Iodine), I = 126.53.

Iodine is a soft, friable substance, somewhat volatile at ordinary temperatures, of a chlorinous odor, melting at 225° F., with the emission of a beautiful violet vapor. It is soluble in glycerin, alcohol, and ether, but is practically insoluble in water.

Therapeutics and toxicology: *Locally*, it is a powerful irritant, and even a mild caustic. The tincture stains the skin, causes a brief smarting sensation, and finally desquamation. *Medicinal doses* produce a sensation of heat in the epigastrium, a general increase of the secretions, with an especially marked effect on the mucous secretion of the respiratory tract and that of the salivary glands. If too long continued, it gives rise to a train of symptoms known as *iodism*, as subacute gastro-enteritis, headache, giddiness, and other evidences of cerebro-spinal disorder, *coryza*, *sore throat*, *frontal headache*, salivation, a skin eruption, generally of *acne*, and sometimes atrophy of the mammæ or testes. The circulatory effects are feeble, but it probably lessens vascular spasm, although

perhaps not to a sufficient degree to render it of therapeutic importance.

Taken in *toxic doses* it produces the symptoms of violent gastro-enteric poisoning, with profound collapse and sometimes convulsions. The ejected matter is brown or, if the stomach contained starchy food, blue. The *post-mortem lesions* include fatty degeneration of some of the viscera. Its injection into cavities has given rise to severe symptoms. Gr. xx are said to have caused death, while ʒij have been recovered from. The *antidote* is starch in any available form.

Iodine is readily *absorbed*, exists in the blood as an alkaline iodide, and is *eliminated* principally in the urine, but also in other secretions. Its elimination is apt to be irregular, so that it may show a tendency to accumulate in the system.

Therapeutics: Iodine is seldom used alone internally. With potassium iodide, as in Lugol's solution, it is employed as a *resolvent* in thyroid enlargements and scrofula; in the latter, combined with iron and cod-liver oil, it is considered especially beneficial; as an *alterative* in secondary and tertiary syphilis, but it is inferior to its potassium salt.

Topically, the tinctures are favorite applications in glandular hypertrophy, parasitic skin diseases, chronic painful joint-affections, and as a counter-irritant in pleuritic and other pains. Deep injections have been employed with gratifying results in bronchocele and hydrocele, after aspiration of the contents, with the purpose of producing adhesive inflammation; and by some practitioners in phthisical cavities.

POTASSII IODIDUM, *U. S.* (**Iodide of Potassium**), **KI = 165.56.**

Potassium iodide is prepared by the addition of an excess of iodine to an aqueous solution of potassa, and the subsequent conversion of a contaminating potassium iodate into potassium iodide by heating with charcoal. It is a white anhydrous salt, rather deliquescent in moist air, *soluble grain for minim in water*, and soluble also in alcohol. Its aqueous solution dissolves iodine (see *Lugol's Solution*, below).

Physiological action and therapeutics: Its physiological effects are analogous to, but less energetic than, those of iodine. *Locally*, it is an irritant. *Internally:* large doses may cause gastro-intestinal irritation; it increases the secretions, with the exception of that of the mammæ, which it decreases. It is used in *rheumatism*, the *subacute* and *muscular* varieties being especially benefited by it, while in gout and rheumatoid arthritis it may be tried; in neuralgias, especially the sciatic variety, which may be cured; in *asthma*, given between the paroxysms, it seems to prevent their recurrence in some cases, especially in the cases associated with bronchitis and emphysema (perhaps antisyphilitic); in *chronic inflammations* with *serous accumulations*, as chronic pleurisy or pericarditis, it appears to promote absorption; in *aneurism* it has a good reputation, but being only slightly sedative to the circulation, its method of action is not clear; in *chronic metallic poisoning*, especially by *lead* or *mercury*, it is very efficient, forming *soluble* double salts with the metal deposited in the tissues, and thus aiding in their elimination. In the latter, if not used with care, it may cause serious salivation; in *tertiary syphilis*, as in the osseous, visceral, or nervous lesions of that disease, it is our main reliance. It is also employed in *chronic Bright's* disease and in *hepatic torpor*.

It is also used as an antidote to poisoning by the *alkaloids*, with which it forms insoluble precipitates.

Potassium iodide—administration: The ordinary dose is gr. x three times daily, to be gradually increased; but in lesions liable to cause fatal results, as in gummata of the brain or liver, much larger doses are given, up to ʒj–ij per diem. The *saturated solution*, which is practically grain for minim, is a convenient method for administering and increasing the dose. Given in milk or accompanied by small doses of Fowler's solution, it is less apt to cause acne, which is sometimes an unpleasant complication. It is always well to remember that small doses sometimes occasion very decided symptoms.

Preparations of iodine and its combinations:

Iodum.

Unguentum Iodi, 4%.

Ammonii Iodidum, dose gr. iij–x.
Sodii Iodidum, dose gr. v–xxx.
Strontii Iodidum, dose gr. v–xxx.
Potassii Iodidum, dose gr. x–xxx or more.
Unguentum Potassii Iodidi, 12%.
Liquor Iodi Compositus (Lugol's solution) contains iodine 5 and potassium iodide 10 parts in 100; dose ♏v–xv.
Tinctura Iodi, 7%, chiefly for external use.
Syrupus Acidi Hydriodici, 1% of the acid, dose ♏xx–xl.
The iodides of zinc, silver, arsenic, and lead are official, and have been mentioned under the corresponding metals.
Other iodides: Hydriodic acid and the iodides of sodium and ammonium produce effects similar to potassium iodide, and may be substituted for it; but they probably have no advantages, and the ammonium salt is more irritating. Strontium iodide is less irritating to the digestive tract.

IODOFORMUM, *U. S.* (Iodoform), $CHI_3 = 392.56$.

Iodoform (formyl teriodide or tri-iodo-methane, CHI_3) occurs in yellowish scaly crystals, of disagreeable odor, insoluble in water, but freely soluble in alcohol, ether, chloroform, and oils. It contains 96% of iodine. Iodoform may be made by passing chlorine gas through a solution of potassium bicarbonate in alcohol and water, to which iodine has been previously added; iodoform separates in small crystals.
Physiological action: Topically, in powder or in strong solution, it produces considerable anæsthesia. It is readily absorbed from wounds, less readily from the gastro-intestinal tract. Large doses are *depressant to the nervous, circulatory, and respiratory functions.* It is supposed to owe its activity to a liberation of iodine in the tissues. Elimination takes place slowly, for the most part in the urine.
Iodoform—toxicology: When too freely applied to a large abraded surface poisoning may result. A variety of types of poisoning are recognized, as first pointed out by Schede. They are as follows: (1) febrile type; (2) characterized by fever with gastro-intestinal irritation; (3) profound circulatory depression; (4) the same with fever; (5) immediate

collapse and death; (6) meningeal type. Care should be taken not to confound this condition with delirium tremens. The *treatment* consists in the immediate withdrawal of the drug, and stimulating and sustaining measures generally. *Post-mortem lesions:* Widespread fatty degeneration.

Therapeutics: Iodoform is not much used internally. *Locally*, in surgical conditions, it has made itself indispensable, acting as an *anæsthetic stimulant*, and *antiseptic*. The explanation of its efficacy in the latter direction is not clear, but probably it is only of value when decomposed by the discharges from a wound, liberating iodine, which acts as an antiseptic. In its own form it is *not* a germicide. It is used in all varieties of ulcers, especially if painful, in surgical wounds, and in painful rectal conditions, in gr. v–x suppositories: in tubercular conditions, such as tubercular laryngeal ulcers, its topical use is of value, while in cold abscesses its injection may prove curative. It is further used in a variety of surgical conditions too numerous to mention here. We have an official ointment (10%).

IODOLUM (Iodol).

Iodol is a brownish crystalline powder, resembling iodoform in its solubility, but differing from it in being odorless and tasteless. Its iodine percentage is stated by various authors at from 85% to 90%. It is more slowly absorbed than iodoform, and hence is less liable to cause poisoning. It may be used locally as a pleasant substitute for this drug.

Soziodol, or Di-iodo-para-phenol-sulphuric Acid, is a white powder, soluble in hot water and containing more than 50% of iodine. It has been used as a local remedy in *eczema* and *impetigo*, and has a range of usefulness somewhat resembling that of iodoform. It has a slight antiseptic action.

ARISTOL.

Aristol contains 45.8% of iodine: chemically it is di-thymol-di-iodide; of doubtful germicidal value; it is non-irritating, and has been used locally in inflammations of the nose and

upper air-passages, and in psoriasis, lupus, and syphilitic skin lesions.

OLEUM MORRHUÆ, *U. S.* (Cod-liver Oil; Oleum Jecoris Aselli).

Cod-liver oil is a fixed oil obtained from the fresh *livers* of *Gadus Morrhua*, or of other species of Gadus (class Pisces; order Teleostei; family Gadidæ). Habitat: North Atlantic Ocean. The "shore oil" as used in medicine is a yellow, thick oil, not rancid, and of a peculiar and to most people disagreeable odor and taste. Its composition is quite complex, the most important constituents being *fatty acids, several biliary principles, gaduin* (which is not an active principle), and traces of *iodine, bromine, phosphorus*, and other substances. By the addition of ammonia trimethylamine is formed (see *Ergot*). Cod-liver oil is soluble in ether, chloroform, and carbon disulphide.

Physiological action: Like other fats, cod-liver oil is absorbed by the small intestine and acts as a nutrient, producing an increase of the body-weight; its biliary ingredients probably aid in its absorption, but its effects are greater than those of other fats, and its complex nature probably gives it some *alterative powers*. Like other fats, it is difficult of digestion, and if the absorptive powers be overtaxed it may cause diarrhœa and other symptoms of digestive disorder.

Therapeutics: Cod-liver oil is looked upon as the most useful agent at hand in the treatment of *tuberculous* and *scrofulous* conditions. In the early stages of pulmonary tuberculosis it is an essential, and in some cases apparently curative, element of treatment. In all tuberculous manifestations, whether glandular, osseous, articular, or ulcerative, it is of value, but less so the more advanced the case and the older the patient. In conditions of *anæmia* or defective nutrition it is serviceable, especially in children; thus in *rickets* this drug is of great value, and likewise in *syphilitic cachexia;* and to this effect on the general nutrition may be attributed also its beneficial action in nervous affections, neuralgias, skin disorders, and chronic rheumatic conditions.

Administration: Dose for a child one year old f℥j, for an adult f℥ss or more three times daily. The physiological limit is reached when the oil causes digestive disturbance. Various expedients are resorted to in order to disguise its taste. It may be taken with a pinch of salt, or in suspension in whiskey; it may be given in the form of emulsion, flavored with oil of peppermint; in capsule. The time for administration is about two hours after a meal. If all other methods fail and the oil is not tolerated by the stomach, it may be given by *inunction*, by itself or mixed with 25% of soap liniment. Inunctions of cod-liver oil are best given at night, the oil being rubbed into the skin of the abdomen, and a flannel binder worn over night. Children, fortunately, soon learn to tolerate and even to like it. When after repeated trials it is not accepted by the stomach, or when no gain in weight results, it is doing no good.

ACIDUM PHOSPHORICUM AND ITS SALTS.

Phosphoric acid has been used as an alterative in *scrofulous affections* and *rachitis*, but is inferior to its salts. The official acid should contain not less than 85% by weight of absolute orthophosphoric acid (H_3PO_4=97.8). It is used as Acidum Phosphoricum Dilutum (10%), the dose of which is ♏xv–f℥j.

CALCII PHOSPHAS PRÆCIPITATUS, *U. S.* (Precipitated Calcium Phosphate), $Ca_3(PO_4)_2$=309.33.

Calcium phosphate forms more than 50% of bone, and is also an essential part of the soft tissues; a diet from which it is excluded causes sickness and death. Thus, its use is clearly indicated where there is deficiency of bone-formation, as is seen in *rachitis and osteomalacia*, and it has been found of value in delayed union after fracture, in caries, and in other diseased conditions of bone. It is also used in chronic phthisis, tuberculosis generally, the anæmia of pregnancy, and certain syphilitic lesions, especially gummata and periostitis.

Calcii Phosphas Præcipitatus was recognized as official in the U. S. P. of 1880, the dose of which is gr. x or more, *t. i. d.*; but this, owing to its insolubility, is inferior to the

lacto-phosphate of calcium (Syrupus Calcii Lacto-phosphatis, *U. S.*), which is much used as an ingredient in emulsions of cod-liver oil.

THE HYPOPHOSPHITES.

The **hypophosphites** of calcium, potassium, sodium, and iron are official. They are seldom employed alone, but together in

Syrupus Hypophosphitum, dose f℥j–ij.

Syrupus Hypophosphitum cum Ferro, dose f℥j–ij.

Acidum Hypophosphorosum Dilutum, contains 10% of absolute hypophosphorous acid, $HP(OH)_2$ = 65.88.

These *syrups*, which have been imitated in many proprietary preparations, are useful tonics, furnishing an *easily oxidizable series of salts* which may be *readily converted into phosphates* in the body. They do not represent the activity of *phosphorus* compounds. Like the phosphates, they may be used in anæmia, rickets, mollities ossium, neurasthenia, debilitated conditions generally, and tuberculosis, in the last of which the claim of curative action made for them is not now believed.

SARSAPARILLA, *U. S.* (Sarsaparilla).

Sarsaparilla is the *root* of *Smilax officinalis*, *Smilax medica*, *Smilax papyracea*, and of other undetermined species of Smilax (nat. ord. Liliaceæ). It has been considered to be diuretic, diaphoretic, and alterative, but physiological experimentation has proven it practically inert. It is used principally as a vehicle for potassium iodide, in the form of Syrupus Sarsaparillæ Compositus, in syphilitic disorders. Its other *preparations* are:

Decoctum Sarsaparillæ Compositum contains sarsaparilla, guaiac wood, glycyrrhiza, and mezereum; dose f℥iv–vj.

Extractum Sarsaparillæ Fluidum, dose f℥ss–j.

Extractum Sarsaparillæ Fluidum Compositum contains sarsaparilla, sassafras, glycyrrhiza, and mezereum; dose f℥ss–j.

Syrupus Sarsaparillæ Compositus. Made with the fluid

extracts of sarsaparilla, glycyrrhiza, and senna, flavored with oil of sassafras, anise, and gaultheria. Dose f℥ss.

GUAIACI LIGNUM, *U. S.*, GUAIACI RESINA, *U. S.*

The **wood** is the *heart-wood* of *Guaiacum officinale* and of *Guaiacum sanctum* (nat. ord. Zygophylleæ). Habitat: West Indies and Northern South America. It contains the **resin** in the proportion of 60% or more. Guaiac is a very complex substance, but no satisfactory active principle has been discovered. The resin represents the full activity.

Physiological action and therapeutics: *Guaiac* has a sialagogue effect from its acrid taste; it also stimulates the hepatic (?) and intestinal secretions. It is absorbed and acts as a diaphoretic (?), expectorant, and alterative. Its continued use may cause gastro-enteric irritation. It is used in *subacute* and *chronic rheumatism*, in which it has a reputation; in *tonsillitis*, which it may abort, but more often fails; and is probably more successful in cases dependent on the "rheumatic diathesis." It has been used in syphilis, but is of doubtful efficiency.

Mezereum, *U. S.*, Mezereum. The *bark* of *Daphne Mezereum*, and of other species of Daphne (nat. ord. Thymelaceæ). Habitat: Europe. Mezereum contains the glucoside *daphnin*, with an acrid resin and oil. It is intensely irritant, and in consequence the drug has been reserved almost entirely for *external use*. *Internally*, it has been used as an alterative in conjunction with sarsaparilla. A fluid extract is officially recognized, the dose of which is ♏j. *Externally*, an ointment is used as a stimulant and irritant.

Jambul, Jambul. The *bark* of *Eugenia Jambolana*, a native tree of East India and Queensland. The chemical nature of the active principle which appears present in the bark, seeds, and rind of the fruit, has not been determined. The use of the *fluid extract* in doses beginning with ♏x, has been followed by reduction of the sugar excreted in cases of diabetes, and in some instances by a total disappear-

ance. In other cases jambul has had no effect; but as no unfavorable results have followed its administration, a careful trial is to be recommended in all cases of *glycosuria*.

Sassafras, *U. S.*, Sassafras. The *bark* of the root of *Sassafras variifolium* (nat. ord. Laurineæ). This bark contains an official volatile oil, *Oleum Sassafras*, which in turn owes its flavor to *saffrol*, $C_{10}H_{10}O_2$, now obtained on a large scale from oil of camphor. It is classed among the alteratives, but is almost solely used as a flavoring agent. Combined with oil of wintergreen and other volatile oils it constitutes the popular *sarsaparilla* flavor.

Taraxacum, *U. S.*, Taraxacum (Dandelion). The *root* of *Taraxacum officinale* (nat. ord. Compositæ), gathered in autumn. Habitat: Europe; naturalized in North America. It contains *taraxacin*. Official preparations are an *extract* (gr. xxx–lx) and a *fluid extract* (fʒj–ij). Dandelion root is supposed to possess cholagogue and diuretic properties, and may be used in cases of *dyspepsia* with *hepatic* torpor.

ICHTHYOL.

Ichthyol is found in the shops as the ichthyo-sulphates of sodium and ammonium, both of which combine in all proportions with fats and petrolatum. Ointments of 10% to 20% strength are most used. Both ichthyo-sulphates are soluble in water, the former having an alkaline, the latter a weak acid, reaction; both have a peculiar bituminous taste and smell.

Physiological action and therapeutics: Locally, ichthyol is an irritant and a valuable stimulant to sluggish granulations. It is said to have a decidedly alterative effect on the *skin* and *subjacent tissues*. It is used in various skin affections, as *chronic eczema*, *chronic urticaria*, etc.; in *painful rheumatic*, *gouty*, and *traumatic joint-conditions*. In *erysipelas*, applied in 50% strength after thorough disinfection, it is said to act very effectively and quickly; also mixed with collodion.

COLCHICUM.

Colchici Radix, *U. S.* (Colchicum Root).

The *corm* of *Colchicum autumnale* (nat. ord. Liliaceæ).

Colchici Semen, *U. S.* (Colchicum Seed).

The *seed* of *Colchicum autumnale* (nat. ord. Liliaceæ).

Colchicum autumnale is a small plant of Europe. The so-called root is a *corm* or bulb. Both parts have a bitter, acrid taste, and contain an alkaloid, *colchicine*, soluble in both alcohol and water, upon which their activity undoubtedly depends.

Preparations: Extractum Colchici Radicis (an acetic extract), dose gr. j–ij.

Extractum Colchici Radicis Fluidum, dose ♏ij–x.

Vinum Colchici Radicis (40%), dose ♏x–xx.

Extractum Colchici Seminis Fluidum, dose ♏ij–x.

Tinctura Colchici Seminis, } 15%, dose f℥ss–jss.
Vinum Colchici Seminis, }

Physiological action: The effects of *moderate* medicinal doses of colchicum preparations are more or less *gastric* and *enteric disturbance*, as evidenced by abdominal uneasiness and pain, mild purgation, anorexia, and at times nausea, cardiac depression, and occasionally diaphoresis. A general stimulation of secretions takes place, but the effect upon the urinary solids is disputed, it being held by some that the elimination of urinary solids is increased, by others that it is unaffected. The flow of urine is generally increased. *Excessive* doses cause symptoms of irritant poisoning, nausea, persistent vomiting, purging (occasionally bloody), and severe abdominal pains; convulsions may occur, and there is always profound cardiac depression. Consciousness is preserved to the last, and death takes place from exhaustion or cardiac paralysis. Colchicum kills by producing excessive intestinal irritation. The mucous membrane of stomach and bowel is found greatly swollen and ecchymosed in fatal cases.

Toxicology: The smallest fatal dose of colchicum is not

definitely recorded. Of the wine of the root f℥ijss and f℥iijss have proved fatal. The *treatment* consists in evacuation of the stomach and intestines, if this has not spontaneously taken place, and the administration of *tannic acid* as a chemical antidote, *opium* and *demulcents* in the later stages to allay irritation, and stimulation as necessity arises.

Therapeutics: The use of colchicum is purely empirical, its therapeutic value having no apparent connection with its physiological effects, so far as these are known. In *acute gout* in sufficient doses to excite the skin, kidneys, and gastro-enteric tract, but with care to avoid the production of vomiting and pronounced diarrhœa (of the wine of the root, gtt. x–xx every four hours), it will diminish the pain and swelling and shorten the duration of the attack. In the intervals of the attacks, taken in smaller doses and less frequently, it is a good prophylactic, and is well combined with potassium iodide. In *subacute rheumatism* and the so-called *rheumatic gout* colchicum in the same combination is very serviceable. In the constipation and functional disturbances of the liver of the gouty diathesis combinations of colchicum and salines are of value.

THE ANIMAL ALTERATIVES.

Thyroid extract: An extract prepared from the thyroid gland of animals, notably the sheep. It has been known for some time that excision of the thyroid gland (as in extirpation of the gland in the surgical treatment of goitre) was followed by a condition allied to myxœdema, a disease clinically characterized by mucoid degeneration of the subcutaneous tissues, atrophy of the thyroid gland, and mental impairment. When only one-half of the gland was removed this train of symptoms did not occur. It has been clinically found that this artificial myxœdema disappeared under the administration of extract of thyroid gland. Used in *myxœdema* and *cretinism*, in which it frequently acts as a specific, producing some effect in all cases; in *goitre* (particularly that of mountainous districts); and in *obesity* with decided results. Thyroid extract is *contraindicated* in *exophthalmic*

goitre, which seems to be caused rather by a perversion of the normal activity of the gland.

The active principle is at least in part *thyro-iodine*, though this probably does not represent the full activity.

Thyroid gland, its extract, or various preparations are given to the point of physiological tolerance, beginning with gr. $\frac{3}{4}$–ij, and increasing rapidly. The *therapeutic limit* is indicated by *tachycardia*, *oppression*, *exophthalmos*, and *irritability*. No serious results have followed the administration of large doses to animals.

Diphtheria antitoxin has reduced the death-rate from this disease in a most striking manner. It should be *used early*, in *large doses*, as a true micrococcus infection exists at this time; later on, a septicæmia is added to this and the serum becomes powerless. *Dose*, hypodermically, to a child of one year, 500–1000 units; to a child of three years, 1500 units; and to an adult, 3000 units. Medicinal and local treatment should be combined with the use of the serum.

Tuberculin is an impure toxin generated by the tubercle bacillus. When injected into phthisical patients it causes a rise of temperature by adding toxin to that already present; this is accompanied by rapid destruction of the degenerated tissue, with liberation and expectoration of débris swarming with tubercle bacilli. Its injection has frequently been followed by miliary tuberculosis. Tuberculin is of no therapeutic value, but the rise of temperature following its injection is made use of to diagnose tuberculosis in cows afflicted with the disease.

Tetanus antitoxin prevents tetanus in the rabbit, but seems of little value in man. When the symptoms establish the diagnosis it is usually too late to be of any use. Its injection has been followed by death. [Cases have also been reported in which its *early use* has seemed beneficial.—Ed.]

Streptococcus antitoxin is of value where a real streptococcus infection exists, and should be combined with the ordinary treatment by stimulation.

Nuclein (nucleinic acid), usually prepared from yeast, is a remedy producing a hyperleucocytosis of the blood, and is useful in infectious diseases when this effect is desirable. It may be given by mouth, but is more efficient when employed hypodermically. Nuclein has been used in *tuberculosis*, in *septic puerperal* diseases, in *typhoid fever*, and in *pneumonia*.

ANTIPERIODICS.

These are remedies which, by affecting the nutrition of the body or by a direct paralyzing effect on the malarial organism, check malarial paroxysms.

CINCHONA, *U. S.* (Cinchona).

Cinchona is the *bark* of *Cinchona Calisaya*, *Cinchona officinalis*, and of hybrids of these, and of other species of Cinchona (nat. ord. Rubiaceæ), yielding, when assayed by the process of the Pharmacopœia, not less than 5% of total alkaloids, and at least 2½% of quinine.

Cinchona Rubra, *U. S.*, Red Cinchona. The *bark* of *Cinchona succirubra* (nat. ord. Rubiaceæ), containing not less than 5% of its peculiar alkaloids.

Habitat: In the Andes of tropical South America, at an altitude of 2300–8000 feet; cultivated in India (Himalaya and Neilgherry Mountains), Java, Jamaica, and other countries; also in South America.

Constituents: The alkaloids of cinchona are *quinine*, *quinidine*, *cinchonine*, and *cinchonidine*, while two others, *quinicine* and *cinchonicine*, have been produced artificially by heating quinine and cinchonine respectively, and are amorphous. Several other unimportant alkaloids have recently been discovered and more or less thoroughly investigated. Quinine and cinchonine exist in combination with *kinic acid*. Cinchona also contains *cinchotannic* and *kinovic acids*, starch, and a trace of a volatile oil.

Varieties: Cinchona Flava (Calisaya or yellow bark) contains a large proportion of quinine and very little cinchonine.

Cinchona Rubra (the red bark) contains a considerable proportion of each.

Pale bark and Carthagena or Columbian bark are weaker in alkaloids, but are used in the manufacture of the latter.

Preparations and doses: Of the *yellow bark* the following preparations are official:

Extractum Cinchonæ, dose gr. v–x.

Extractum Cinchonæ Fluidum, dose ♏v–x.

Tinctura Cinchonæ, 20%, dose f℥j–ij.

Infusum Cinchonæ, 6% with 1% of aromatic sulphuric acid; dose f℥j–ij.

Of the *red bark* only the following:

Tinctura Cinchonæ Composita (Huxham's tincture), a 10% tincture, containing also bitter orange-peel and serpentaria, and constituting a valuable tonic and antipyretic; dose f℥j–f℥ss.

The other preparations mentioned above are seldom used, the following *alkaloids* and their salts being preferred:

Quinina.

Quininæ Sulphas, gr. j–xx.

Quininæ Bisulphas,
Quininæ Hydrobromas,
Quininæ Hydrochloras,
Quininæ Valerianas,
} practically equal to the sulphate.

Quinidinæ Sulphas,
Cinchonina,
Cinchoninæ Sulphas,
Cinchonidinæ Sulphas,
} dose from one-fourth to one-third greater than of the sulphate.

Properties of quinine and cinchonine: Quinine, either in an amorphous white powder or in the crystalline form, is without odor, very bitter, and practically insoluble in water (1670 parts). Of its salts the bisulphate is most soluble, dissolving in 10 parts of water, the hydrobromate in 16, the hydrochlorate in 34, while the sulphate, the salt most frequently used, is again practically insoluble (740 parts), and hence is commonly given in pill, powder, or capsule. If a solution is desired, aromatic sulphuric acid dissolves the sulphate, minim for grain, and the bisulphate, minim for gr. ij.

Cinchonine is a white crystalline substance, somewhat less

bitter than quinine, but, like the latter, practically insoluble in water. It is also very insoluble in ether, and is thus separated from quinine, which is easily soluble in that menstruum.

Incompatibles: The preparations of cinchona are rendered insoluble by, and are therefore incompatible with, the alkalies and their carbonates, tannic acid, and iodine preparations, while ferric salts precipitate their tannin and form ink.

Physiological action: *Locally*, to mucous membranes and to surfaces denuded of their epidermis, quinine and its salts are actively irritant. *Internally*, in sufficient dosage, the size of which varies greatly with the susceptibility of the individual, a train of symptoms called *cinchonism* is produced. The initial symptoms of this condition are *tinnitus aurium*, some deafness, and a sense of fulness in the head. After large doses these symptoms become more marked, and severe headache, disorders of vision, cutaneous eruptions, giddiness and a staggering gait, delirium, convulsions, and even collapse may occur.

Nervous system: The symptoms produced by quinine would seem to indicate cerebral congestion, but this has not been proven. However this may be, the tinnitus aurium seems to be due to congestion of the middle ear. Temporary and even permanent deafness may result under its protracted medicinal use. The convulsions are epileptiform. In animals the reflex excitability of the spinal cord is diminished or abolished, probably by stimulation of a centre supposed to preside over the reflexes, and known as Setschenow's inhibitory centre.

In *frogs* small doses increase the reflexes, probably by stimulating the peripheral sensory nerves; larger doses decrease them, by stimulating Setschenow's (inhibitory) centre; toxic doses abolish them by paralyzing both the sensory nerves and the sensory cord.

Circulation: Large doses decrease the force and frequency of the heart's action by a direct action on its motor ganglia, while very large doses produce dilatation of the blood-vessels. Blood-changes occur; the amœboid activity of the white corpuscles is decidedly lessened and their number is

diminished; the red corpuscles are decreased in size, and the power of their hæmoglobin to carry oxygen and ozone is impaired.

Digestive tract: Upon the stomach quinine acts as a simple bitter, increasing the appetite and digestive powers; but in very large doses it may prove irritant enough to produce nausea and vomiting. It is absorbed *only by the stomach*, the alkaline secretions of the intestinal tract precipitating it and preventing its absorption.

Temperature: In health the temperature is very slightly affected, but in fever it is lowered promptly and decidedly, probably from a diminished heat-production dependent upon lessened oxidation.

Eye: Quinine may cause blindness when given in large doses; this is usually a transient condition, but true atrophy of the optic nerve has followed its use in animals.

Antiseptic action: The activity of the malarial plasmodia is lessened or they actually disappear from the blood under its use. It also exerts a preventive influence upon putrefactive and allied processes.

As has been already noted, quinine is an excito-motor, with a special action upon the uterine muscle; but probably it only acts after labor-pains have begun, and is incapable of originating them.

Absorption and elimination: As has already been stated, quinine is absorbed entirely, or, for the most part, by the stomach. In the blood it is apparently held in solution by the loosely combined CO_2 present, and it is eliminated largely by the urine. Under ordinary circumstances most of the quinine is eliminated in forty-eight hours.

Therapeutics. *Malarial conditions:* Quinine has been used in a great variety of conditions, but its greatest value has been found in these, for which it is in most cases a specific. In the regular intermittent type it may be used as a *specific* and *prophylactic*. There can be no doubt of its prophylactic value in doses of gr. ij, two or three times daily. Various methods of administration have found favor when the paroxysm has already occurred. Some advocate continued dosage of gr. v–x three times daily; but it is preferable to give it in

frequently repeated small doses for twelve hours before the expected paroxysm, or in large doses six and eight hours before that time. In any case it is well to continue its use for several days after the paroxysms have ceased, and to induce a slight degree of cinchonism on the seventh day, when a relapse is most likely to take place. In mild or severe malarial poisoning its efficiency is greatly increased by preceding it with a mercurial purge.

In the *pernicious form* no delay is permissible, and the patient should be cinchonized as rapidly as possible, it being necessary to give at least as much as ʒss–j during the day; and the hypodermic exhibition of the bisulphate is strongly urged, together with its administration by rectal injection.

Chronic malaria is marked by an irritable stomach, irregular chills, anæmia, and enlargement of spleen and liver. Quinine is indicated during the chill; arsenic (Fowler's solution) with purgatives and tincture of ferric chloride during the intermission. In the cachexia following intermittent, remittent, or irregular malaria, *arsenic* and *iron* should be used in preference to quinine.

In a variety of conditions characterized by *periodicity* quinine is very valuable. Thus, neuralgias, chorea, hæmaturia, asthma, hay fever, and hiccough may in many cases be cured by quinine, although large doses may be necessary. In chorea and neuralgic headaches it is advisable to determine carefully the presence of any malarial taint before administering this drug, for otherwise they may be made worse by its use. In the irregular and chronic forms of malaria its action is less certain, and it often fails. In *bilious* or *remittent* fever it may be given freely. In conditions of septic intoxication, septicæmia, pyæmia, and puerperal fever it has been much in vogue, but evidence of its utility is wanting. As an *antipyretic* in typhoid, typhus, and other continued fevers it will undoubtedly lower temperature, especially after crisis or lysis has taken place, but it has been largely superseded by the more recent antipyretics. As a *stomachic tonic* it is used in dyspepsia, especially of the fermentative varieties; while in debilitated conditions generally combinations of small doses (gr. j–ij) with iron are of great value. In *fer-*

mentative diarrhœas it may also do good. *Acute coryza* may be aborted by its use in some cases, and chronic bronchitis is often greatly benefited.

Locally, quinine inhalations have been advocated in hay asthma and whooping-cough, but have not demonstrated the claims made for them.

Administration and contraindications: Because of its extremely bitter taste quinine is best administered in *freshly prepared* pills or in capsules. Hypodermically it is particularly efficient, but exceedingly irritating, and in pernicious forms of malaria may necessarily be so administered. It should be slightly acidulated with tartaric or other acid to prevent its immediate precipitation by the alkaline reaction of the blood. This form of administration is only used in emergencies, as great irritation, abscess, gangrene, and even tetanus have followed its hypodermic injection.

Quinine should be used with care when any gastro-enteric inflammation exists, and is absolutely *contraindicated* in *inflammations of the middle ear*. It is also contraindicated in inflammation of the *kidneys* and *bladder* and in *skin diseases* of an *inflammatory* type. Cases of idiosyncrasy are not uncommon. Two grains may produce in susceptible individuals a troublesome rash and symptoms of apparent syncope, with the sensation as though the patient were dying. Combinations with dilute hydrobromic acid or chloral are said to diminish the unpleasant subjective sensations of cinchonism.

Quinidine: Quinidinæ Sulphas, in which form alone this alkaloid is official, acts chemically like the sulphate of quinine, but exhibits different refractive qualities. It is weaker than quinine by about one-third, and its effects and uses are similar to those of its sister alkaloid.

Cinchonine; **Cinchonidine**: The **Sulphate of Cinchonine** is a bitter crystalline salt soluble in 54 parts of water. As a *tonic* and antiperiodic it resembles quinine, but requires about one-third larger dosage.

Cinchonidinæ sulphas: Of the properties and powers of this salt little is at present known. It seems a reliable substitute for quinine.

Chinoidinum: This preparation, known as chinoidin or quinoidin, is a blackish resinous substance obtained by evaporating the mother-liquor from which the alkaloids have been obtained by crystallization. It is cheap, and efficient according as it contains more or less of the active principles.

Warburg's tincture: Warburg's tincture is now prepared by a modification of a very complicated formula, and owes its efficiency to aromatics and stimulants and a large percentage of sulphate of quinine. It is much used as an antiperiodic in malarial fevers, and is said to be particularly efficient in the severe and malignant forms, in which, after free purgation, it is given in two or three doses of f℥ss each before the expected paroxysm, and induces profuse perspiration. It is a useful tonic in f℥j doses three times a day.

EUCALYPTUS, *U. S.* (Eucalyptus).

Eucalyptus is the *leaves* of *Eucalyptus globulus* (nat. ord. Myrtaceæ), collected from the older parts of the tree. This tree is a native of Australia, but is cultivated in other countries. The drug contains *tannic acid*, *resin*, and a *volatile oil*, the last of which is its active principle, present in greater amount in the leaves, and has a pungent, aromatic odor and taste.

Physiological effects: The effects of eucalyptus are not fully understood. In large doses the oil causes mental exhilaration, and excessive doses produce sensory disturbances, as numbness, sense of weight in limbs, etc., and some motor palsy, probably by paralysis of the spinal centres, as the peripheral nerves retain their irritability. Death is said to be caused in animals by paralysis of the respiratory centre. The oil (Oleum Eucalypti, *U. S.*, or its active principle, Eucalyptol, *U. S.*, $C_{10}H_{18}O$) is an antiseptic and more or less irritant, and possesses the general stimulant properties of the volatile oils. Like oil of turpentine and the terpenes in general, it is eliminated by the kidneys, skin, and respiratory tract. Upon the latter it exerts a *stimulant expectorant* effect. It imparts the odor of violets to the urine.

Therapeutics: Eucalyptus is used empirically. It meets with success in mild malarial attacks, probably like other volatile oils, not as a specific, and is an *excellent stimulant expectorant* in *acute* and *chronic bronchitis*. The usual form for administration is the oil in doses of ♏v–x, in capsule, every two hours. Eucalyptol is also used with an idea to remote disinfection in offensive discharges of the broncho-pulmonary and genito-urinary passages.

The cultivation of the trees is said to render malarial districts more inhabitable.

Oleum Eucalypti, *U. S.*, Oil of Eucalyptus. A volatile oil distilled from the fresh *leaves* of *Eucalyptus globulus*, *Eucalyptus oleosa*, and some other species of Eucalyptus (nat. ord. Myrtaceæ). The oil contains *Eucalyptol*, $C_{10}H_{16}O$, and two terpenes of the formulæ $C_{10}H_{14}$ and $C_{10}H_{16}$.

Eucalyptol, *U. S.*, Eucalyptol, $C_{10}H_{18}O = 153.66$. This is the active principle of oil of eucalyptus.

Both the oil of eucalyptus and eucalyptol are irritant when applied *locally*. *Internally*, small doses produce a peculiar intoxication, while larger doses are followed by marked constitutional disturbance. Both remedies *directly paralyze* the *spinal cord* and *medulla*, *directly depressing* the *heart*. *Medicinally*, eucalyptus or its active principle possesses decided *antiperiodic* properties, though much inferior to quinine. It is perhaps the most useful of all *stimulating* expectorants, and is eliminated by lungs, skin, and kidneys. The dose of the oil or of eucalyptol is ♏v–x, enclosed in capsule.

Acidum Picricum (Picric Acid, Tri-nitro-phenol, $C_6H_2(NO_2)_3$-OH) occurs in the form of yellow, shining crystals, soluble in water and alcohol. It has some antiperiodic virtues in doses of gr. $\frac{1}{8}$ three times a day. Picric acid in aqueous solution forms an exceedingly delicate test for albumin in the urine; unfortunately, it also precipitates other substances, such as some of the alkaloids.

ANTIPYRETICS.

Antipyretics are drugs which so modify nutrition as to lower febrile temperatures.

ACIDUM SALICYLICUM, *U. S.* (Salicylic Acid).

Salicylic acid may be obtained from the methyl salicylate of oil of wintergreen or oil of birch. Most of it, however, is formed artificially by the combination of carbonic acid and phenol. It occurs as permanent, fine, needle-shaped crystals, odorless, tasteless, or with a somewhat astringent after-taste, and an acid reaction. It is practically insoluble in cold water (450 parts), but freely so in alcohol, ether, and glycerin.

Acidum Salicylicum, dose gr. x–ʒj (never used internally).

Lithii Salicylas, dose gr. xx–xl.

Sodii Salicylas, dose gr. xx–ʒj.

Physostigminæ Salicylas (see *Physostigma*), dose gr. $\frac{1}{80}$.

Physiological action: As might be inferred from its origin, salicylic acid resembles carbolic in some of its effects. Given in sufficient doses, it causes symptoms somewhat resembling *cinchonism*—tinnitus aurium and a feeling of fulness in the head, or, if more pronounced, deafness, ptosis, strabismus, partial blindness, and excessive sweating. In cases of poisoning, ptosis, restlessness, and severe headache, delirium (either wild or of a melancholic type), *olive-green urine*, and slow and labored respiration occur, ending in collapse and death.

Nervous system: Ordinarily the cerebral symptoms produced resemble those of quinina, and the delirium is not marked; they may be due to congestion. Salicylic acid seems to have some depressing effect on the motor nervous centres.

Circulation: Authorities differ about the cardiac effects of this drug, but in medicinal doses it has little or no depressing effect upon the circulation. Salicylic acid probably increases arterial pressure by stimulation of the heart and vaso-motor centres. It is claimed that excessive doses produce slow and labored pulse, probably by a direct action on the heart. In the blood it has been proved to have a depressing effect on the activity and emigration of the white blood-corpuscles.

Respiration is at first stimulated, later depressed.

Temperature: In health this function is not affected by moderate doses, but in febrile conditions in large doses it produces a considerable fall of temperature, which is preceded or accompanied by profuse sweating. To obtain this effect large doses (ʒj) must be given. Continued administration may cause gastric disturbance.

Absorption and elimination: Salicylic acid is probably absorbed as an alkaline (sodium) salicylate. It is eliminated chiefly by the urine unchanged or as salicyluric acid. Absorption is rapid, the acid appearing in the urine in from eight to ten minutes, but elimination is slow. The urine is colored green from an increase of the indican, or perhaps by pyrocatechin, and after excessive doses may be albuminous from renal irritation. The antiseptic effects of salicylic acid will be considered elsewhere. Salicylic acid or its salts increase the elimination of urea and uric acid, and probably in this way act beneficially in rheumatism.

Therapeutics: The most important use for salicylic acid at present is in the treatment of *acute articular rheumatism*. Given in doses of gr. x–xv every two or three hours, it reduces the temperature, relieves the pain, and greatly shortens the painful part of the attack; but there is doubt as to its efficacy in preventing relapses and cardiac complications; in fact, most authorities are inclining to the belief that it does not. It is advantageously combined with alkalies, and one of the *salts* is always selected for internal use.

In *gonorrhœal* and *subacute rheumatism* it is less efficient, but often proves valuable; while in *lumbago* and *myalgia* generally, and in chronic rheumatism and gout, especially the irregular forms, it is often serviceable. In *acute tonsillitis*, especially in those cases which seem to depend upon a rheumatic diathesis, it is often of signal service in small, frequently repeated doses. *Rheumatic iritis* has been reported cured by its use. In typhoid and other continued fevers and in the exanthemata it is now seldom used as an antipyretic. As it does not destroy the spirillum of relapsing or the plasmodium of malarial fever, it can in no sense be considered a specific in these conditions, but may do good by abating cer-

tain symptoms, especially the fever, although we now have better antipyretics.

Sodium Salicylate (Sodii Salicylas, *U. S.*, $NaC_7H_5O_3$=159.67) is the salt usually prescribed, salicylic acid itself being too irritating for general use. It is very soluble in water as well as in alcohol, and is usually given in aqueous solution. It has a disagreeable taste and frequently produces nausea.

Ammonium Salicylate (*U. S.*) is rapid in its action; *strontium salicylate* is least apt to derange the digestive tract. Any of the salicylates may be given in milk to disguise their taste and prevent gastric irritation.

SALICINUM, *U. S.* (Salicin).

Salicin is a glucoside obtained from several species of Salix and Populus (nat. ord. Salicaceæ). It occurs in permanent, odorless, prismatic crystals of bitter taste, and is soluble in 28 parts of water and 30 of alcohol, and insoluble in ether and chloroform. Hence it is generally given in capsule, wafer, pill, or in mixture.

Physiological action and therapeutics: The effects of salicin are not pronounced. Compared to salicylic acid, it is less irritant to the stomach, and perhaps less apt to cause unpleasant head-symptoms, and it is free from toxic effects. Part of it at least is converted into salicylic acid in the blood. It is eliminated unchanged and as salicylic and salicyluric acids. It is useful in *acute rheumatism*, accomplishing the same results as salicylic acid, but acting much more slowly. When the latter drug causes gastric irritation or cerebral symptoms this will prove a very efficient substitute in doses of gr. xv–xx every two or three hours. It is also used as a bitter tonic, as an antifermentative in diarrhœas, and occasionally as an antiperiodic.

OLEUM GAULTHERIÆ, *U. S.* (Oil of Gaultheria; Oil of Wintergreen).

Oil of gaultheria is a volatile oil distilled from the *leaves* of *Gaultheria procumbens* (Wintergreen; nat. ord. Ericaceæ), consisting almost entirely of methyl salicylate ($CH_3C_7H_5O_3$=

151.64), and nearly identical with volatile oil of betula. Oil of wintergreen (teaberry) is a volatile oil, heavier than water, of a peculiar, agreeable odor, and consists of 90% of *methyl salicylate*. Its salicylate strength is five-sixths that of salicylic acid, and the dose should be proportionately larger.

Physiological action: The uses are identical with those of salicylic acid, and the oil forms (in capsule or in mixture) a reliable and easy method of administering the salicylates in *acute rheumatism*, the usual dosage being about f℥j daily in frequently repeated doses. Oil of birch and the artificial oil are often substituted for it, and are equally efficient. The odor of the oil appears in the urine after its use, and this secretion decomposes less rapidly. Hence the oil is used with a view of asepticizing the genito-urinary tract.

SALOL, *U. S.* (**Salol**), $(C_6H_5)C_7H_5O_3$=213.47.

Salol is salicylate of phenol, or salicylic acid in which 1 atom of H has been replaced by phenol. It is a white crystalline powder, with a slight odor of oil of wintergreen, tasteless, nearly insoluble in water, but soluble in alcohol and ether.

Physiological action: Salol is not dissolved in the stomach, but in the alkaline secretion of the intestinal tract it is slowly broken up into its two component parts, yielding 36 parts of carbolic and 64 parts of salicylic acid. In its effects it more closely resembles salicylic acid, producing ringing in the ears and other constitutional symptoms of that drug, but to a less degree and with almost no gastric disturbance, as it is not dissolved in the stomach. After large amounts the urine has the smoky color of carbolic-acid poisoning.

Therapeutics: Salol is a good *disinfectant*, and is used as such in the various forms of *stomatitis* and *pharyngitis*, while its similarity to salicylic acid renders it a valuable substitute for that drug in *acute rheumatism* and as an *antipyretic*. It is less certain, less efficient, and more poisonous than salicylic acid. It is used also to render the urine aseptic in cystitis, and at one time was in favor as an *intestinal antiseptic* in *typhoid fever* and *cholera*. It can be useful in these condi-

tions only by preventing the development of bacteria, as its dilution must be far too great for any actual germicidal effect; and even in strong solutions its germicidal powers are so weak as to render it probably inert in these conditions. Owing to its insolubility in the stomach, it may be used as a test of the peristaltic activity of that organ or of the presence of pyloric obstruction. When the stomach is healthy the urine should show the presence of salicyluric acid in from one-half to three-quarters of an hour; and if its appearance be delayed *beyond an hour*, a pathological condition is probable. Salol is *eliminated* in the form of the educts of both salicylic and carbolic acids.

Administration: Salol is generally given in pill or capsule, the dose being gr. v–x, repeated rather frequently. When its local action is desired in the mouth or pharynx tablets slowly dissolved in the mouth are useful.

BETOL, or NAPHTHOLOL.

Betol is another compound of the same series, and is analogous in composition to salol, the difference consisting in the substitution of *beta-naphthol*, instead of phenol for the H atom. It occurs in small whitish crystals, insoluble in water, but soluble in alcohol and fats, and having a high melting-point.

Physiological action and therapeutics: Like salol, betol passes undissolved and unabsorbed through the stomach, is converted into its component parts by the pancreatic secretion, and *acts as salicylic acid, of which it yields about 55%*. It is entirely non-toxic. Of its antiseptic properties and therapeutic uses the same may be said as of salol, though it is probably not so efficient because it contains less of the acid.

ACIDUM CARBOLICUM, *U. S.* (Carbolic Acid; Phenol), $C_6H_5OH = 93.78$.

Carbolic acid is a constituent of coal-tar, obtained by fractional distillation, and subsequently purified. Although this drug finds use chiefly as an antiseptic, yet its physiological effects and chemical composition demand for it notice in this

connection. Carbolic acid, known also as *phenol, phenic acid, phenyl hydrate,* and *phenyl alcohol,* is a coal-tar derivative. It is formed by adding a hot concentrated solution of potash to crude coal-tar, and then water, when it is converted into a light oil and a heavier alkaline liquid; the latter is neutralized with hydrochloric acid, separating crude carbolic acid. In this form it contains several analogous substances, chiefly *xylic* and *cresylic acids,* which possess very similar properties to itself.

Physical properties: When pure, carbolic acid is colorless, crystalline at ordinary temperatures, and has a characteristic odor and burning taste. The pure acid generally acquires a slight pinkish tinge on standing. It is *soluble in about 15 parts of water,* and freely so in *alcohol, ether, glycerin, and the fixed and volatile oils,* and *deliquesces* when exposed to moist atmospheres. It is neutral in reaction, but combines with salifiable bases. The acid is readily recognized by forming a violet-blue color with ferric salts.

Physiological action: *Locally,* phenol is a protoplasmic poison, destroying all organic tissues. It produces more or less *anæsthesia,* not only of the parts with which it comes in immediate contact, but also of the underlying tissues, and in its pure state produces white eschars followed by superficial gangrene. It is a direct poison to all the higher tissues. Its local application produces a white eschar, which changes to a dark red if the acid is removed at once.

Absorption and elimination: Carbolic acid is absorbed, and exists in the blood as an alkaline carbolate. It is eliminated by all the secretions as an alkaline carbolate, as well as certain products of its oxidation when small amounts are ingested, but mostly unchanged after large doses. The *urine* contains sulpho-carbolic and glyco-uronic acids in combination with alkalies; if the amount taken is large, unchanged carbolic acid is eliminated.

Nervous system: Poisonous doses produce in man vertigo, contracted pupils, and tremors, while in animals convulsions, apparently of spinal origin, and paralysis occur.

Circulation: The *heart* may be slowed or be normal from *direct* depression; the arterial pressure is at an early period

lowered by paralysis of the vaso-motor centre in the medulla; and the movements of the white blood-corpuscles are rendered more sluggish.

The *respiration* is rendered rapid and shallow by large doses, death usually occurring through respiratory arrest; some reduction of *temperature* takes place, but the drug has no value as an antipyretic. The *urine* derives a *dark-brown* color from the oxidation-products, and as this *smoky color* gives the first warning of poisoning from its external or internal use, the urine should be carefully watched and the drug withdrawn upon its earliest appearance.

Carbolic acid—toxicology: Poisoning may be slow or rapid. In the *slow variety*, which occurs from absorption after operations or dressings, the symptoms are smoky and albuminous urine, great feebleness and collapse, diminished circulatory and respiratory power, muscular weakness, and giddiness. In the *rapid form*, occurring after the ingestion of a concentrated fatal dose, the symptoms are impairment of sensation and motion, unconsciousness, dyspnœa, stertor, feeble and frequent pulse, collapse, tremors, and death. If the patient lives long enough, symptoms of gastro-enteric irritation may develop.

Carbolic acid may kill *very rapidly* (one minute); usually the fatal result is postponed for from one to eight or ten hours. The smallest fatal dose is f℥j, and comparatively large doses have been recovered from under active treatment.

The *diagnostic signs* are the characteristic *odor upon the breath*, *whitened patches* on the visible mucous membranes, and *discolored urine*.

The *treatment* consists in evacuation of the stomach by the *stomach-pump*, and the administration of some *soluble sulphate*, as magnesium or sodium sulphate, or dilute sulphuric acid. These form the comparatively harmless sulphocarbolates, and are antidotes even after the poison has been absorbed. Free hypodermic stimulation with ammonia, ether, or alcohol, and demulcent drinks during the later stages, complete the treatment.

Appearances post-mortem: After the ingestion of a fatal dose of the concentrated acid hard white areas of necrotic

tissue, surrounded by zones of inflammation, are found wherever the acid has been in contact; the hollow viscera are filled with imperfectly coagulated blood, and the liver and kidneys sometimes show fatty degeneration.

Preparations: Acidum Carbolicum, dose gr. j–iij.

Unguentum Acidi Carbolici, 10%.

Acidum Carbolicum Crudum, for disinfecting purposes.

Therapeutics: *Internally*, carbolic acid is employed for its *local effects* in *nervous vomiting* and *gastrodynia*, which are alleviated by the anæsthesia produced—gr. j–ij doses repeated frequently; in *diarrhœas*, especially of the irritative and fermentative varieties—generally combined with bismuth; in *gangrene of the lung*, which is said to be much benefited by its combined use internally and by inhalation.

Locally, the pure acid may be used as a caustic where extensive action is not desirable, as in condylomata, diphtheritic conditions, etc.; in weaker solutions it is a favorite ingredient in gargles and sprays. Burns and *painful* or *itching* ulcers may be relieved by its weak dilutions in oily menstrua (gr. x–xv to ℥j of petrolatum, etc.). Injections of 2% solutions into inflamed serous cavities, as in *synovitis*, have been employed with good effect; while the injection of a few drops of the pure acid into the tunica vaginalis after aspiration of the contents of a *hydrocele* is one of the methods of radical cure. The use of carbolic acid as an *antiseptic* will be mentioned later.

It is to be borne in mind that the *external* use of the acid, even in watery solution, may be followed by severe and even fatal poisoning; this may occur through the unbroken skin. It is probable, however, that some of the cases reported were due to the limited solubility of carbolic acid in water, and that the supposed solution contained globules of the pure acid in *suspension*, which then came into immediate contact with the skin or wounded surfaces. A solution of one part of carbolic acid in eight parts of cotton-seed or olive oil produces no constitutional effects if it is not applied too profusely or over too large an area; such an oily solution has been used with marked success in the treatment of *rhus toxicodendron* poisoning.

SODII SULPHOCARBOLAS, *U. S.* (**Sulphocarbolate of Sodium**), $NaSO_3C_6H_4(OH).2H_2O = 231.56$.

This salt, which we have seen is the harmless result of administering soluble sulphates in carbolic-acid poisoning, is a colorless, transparent salt, permanent in the atmosphere, soluble in 5 parts of water and also in glycerin and alcohol. The corresponding salts of magnesium, potassium, and calcium are also employed.

Physiological action and therapeutics: All of these possess weaker antiseptic properties than carbolic acid, but from their non-toxic effects are employed to fulfil many of the indications for which that drug is used. Thus, they are valuable in gastric and intestinal disorders, *vomiting* and *flatulence* being especially benefited, and as topical applications in inflammations of the mouth, nose, and pharynx. Dose gr. x–xx.

CREOSOTUM, *U. S.* (**Creosote**).

Creosote is obtained as a product of the dry distillation of wood-tar or from crude pyroligneous acid. It is a colorless, oily liquid, turning dark on exposure, and having a peculiar smoky odor, burning taste, and neutral reaction. It is soluble in 80 parts of water, and in all proportions in alcohol, ether, chloroform, benzine, and acetic acid. In composition it is very complex, containing *phenol*, *benzol*, *creosol*, and other derivatives of the guaiacol series. The pure drug is difficult to obtain, and crude phenol is often substituted for it—a sophistication which can be detected by its solubility in commercial glycerin, while creosote is not. The odor of carbolic acid also differs essentially from that of creosote; the latter has the odor of wood-smoke. Carbolic acid coagulates *albumin;* creosote does not.

Physiological action and therapeutics: Creosote possesses many qualities in common with carbolic acid. The symptoms of poisoning and the proper antidotes are the same as for that drug. It is rapidly absorbed and rapidly eliminated by the kidneys and the bronchial mucous membrane; upon the latter it acts as a stimulant expectorant. Creosote

appears in the urine mainly as creosol and guaiacol sulphates.

Its *uses* also correspond to those of carbolic acid; it is employed to *allay vomiting* and *gastralgia*, and is a good *astringent antiseptic* in *diarrhœas*. It is at present used in *pulmonary tuberculosis*, and, combined with proper hygienic measures, may cure in the early stages. It is especially useful in cases associated with free expectoration (Wood). *Locally*, it is used in varying degrees of dilution as a dressing for foul-smelling and indolent ulcers and in irritative skin diseases, and as a gargle in putrid sore throat. In dentistry it is much used as an analgesic in toothache.

Administration: The dose for internal administration is gtt. ss–ij, and should be taken frequently. It is best given in *pill*-form, and the dose gradually increased until *digestive disturbances* appear. Under all circumstances it must be given so as to reach the gastric mucous membrane in a *diluted* form, to avoid its corrosive action. Creosote is therefore best given after meals.

Aqua Creosoti, a 1% solution, is a convenient form for administration. This preparation may be used externally as a disinfectant and to allay itching; but carbolic acid is usually employed, because less expensive.

CREOLIN (Kreolin).

Creolin is a derivative of coal-tar. Its specimens vary in composition, some being soluble in water, while others form emulsions. It is a dark-brown, syrupy liquid, of tarry odor and somewhat biting taste.

Physiological action and therapeutics: Creolin is an antiseptic, and is said to be more powerful against non-spore-bearing than against spore-bearing organisms. It is absolutely innocuous to man when used in *1 to 2% solutions*. It may be a stimulant to indolent granulations. Solutions of 1% strength are useful substitutes for dressings of carbolic acid or bichloride of mercury when these prove irritant to the skin; and have been used extensively as vaginal douches.

Guaiacol, Methyl pyrocatechin, $C_6H_4.OH.OCH_3$. The active principle of creosote, which is in the form of a thick liquid. It has been used in a pure state and also as *guaiacol carbonate*. Both preparations are used for the same indications as creosote itself. Guaiacol seems to have a decided action in reducing the temperature not only of phthisis, but also of pneumonia and typhoid fever; ♏xx–xl are painted on the skin of the abdomen or chest (Guinard). The dose of guaiacol is ♏v, or ♏xx–xl daily, while that of guaiacol carbonate is gr. v. The latter is an almost odorless and tasteless powder.

Menthol, *U. S.*, Menthol, $C_{10}H_{19}OH = 155.66$. A stearopten (having the character of a secondary alcohol), obtained from the official oil of peppermint (from *Mentha piperita*), or from Japanese or Chinese oil of peppermint (from *Mentha arvensis*, var. piperascens, and *Mentha canadensis*, var. glabrata; nat. ord. Labiatæ). Menthol is a useful local anæsthetic, causing a sensation of cold, though the temperature really rises locally. It has a marked tendency to control superficial inflammations. In neuralgia, menthol applied to the seat of pain frequently gives great relief. A solution in albolene is employed as a spray in pharyngitis.

THYMOL, *U. S.* (Thymol), $C_{10}H_{14}O = 149.66$.

Thymol is a crystalline solid, or occasionally a liquid, obtained from oil of thyme (Oleum Thymi, *U. S.*) by fractional distillation. Oil of thyme is a volatile oil derived from *Thymus vulgaris* and other plants. Thymol is soluble in 1200 parts of water, and freely so in alcohol, ether, chloroform, and oils, and has a peculiar odor which to some individuals is unpleasant, and which attracts flies.

Physiological action and therapeutics: Thymol is a strong antiseptic, ranking just above carbolic acid in power, and resembling it in producing cutaneous anæsthesia. Taken by the mouth, it causes *tinnitus aurium*, partial deafness, some reduction of temperature, with at times nausea, vomiting, and diarrhœa. Although less toxic than carbolic acid, large doses

may cause violent delirium and collapse, accompanied by profuse sweating and a *dark-green* coloration of the urine. It may be used to fulfil the indications for carbolic acid, but is expensive and little used. As an antiseptic mouth-wash in *aphthous stomatitis* it is particularly valuable, and in 1 : 1000 solutions (made with alcohol) it is a good antiseptic and non-irritating to the skin.

RESORCIN, *U. S.* (**Resorcin**), $C_6H_4(OH)_2 = 109.74$.

Resorcin is a substance first obtained from the resins of galbanum and asafœtida, but now derived from phenol, to which it is closely related chemically. It is crystalline, colorless at first, but becomes reddish on exposure, and is freely soluble in water, alcohol, and ether.

Physiological action: In doses of gr. xx–xl resorcin causes giddiness, tinnitus aurium, profuse diaphoresis, and reduction of temperature, the latter, however, not being constant and of uncertain duration. After poisonous doses cerebral and sensory disturbances, unconsciousness, epileptiform convulsions, and collapse may follow.

Therapeutics: This drug is now seldom used as an antipyretic, being uncertain and unsafe in the dosage required to produce such effects. It is employed as an *antifermentative* and *analgesic* in *gastric ulcer*, gastralgia, and diarrhœal disorders: as a spray-inhalation it is of reputed efficiency in *pertussis* and *hay asthma*.

Externally, it may be employed in the same surgical conditions as carbolic acid, to which it is preferable because there is less danger of toxic effect and because it is more freely soluble in water. It has been particularly recommended in erysipelas, cystitis, chronic otitis, and leucorrhœa. For antiseptic purposes solutions of from 1 to 5% are used. Ointments of from 5 to 10% are also used for a variety of skin diseases.

BENZOINUM (**Benzoin**).

ACIDUM BENZOICUM (**Benzoic Acid**), $HC_7H_5O_2 = 121.71$.

Benzoin is the concrete *juice*, occurring in tears, obtained from incisions into the *bark* of *Styrax Benzoin* (nat. ord.

Styraceæ), a tree of Sumatra, Java, and Siam. It is a *balsamic resin*, being composed chiefly of *resin* and *benzoic acid*, with the occasional presence of *cinnamic* acid and *vanillin*. It also contains a *volatile oil*. It owes its efficiency chiefly to benzoic acid.

Preparations:

Adeps Benzoinatus,
Ammonii Benzoas,
Lithii Benzoas,
Sodii Benzoas,
Acidum Benzoicum,
} dose gr. x–xxx.

Tinctura Benzoini, 20%, dose ♏xx–xl.

Tinctura Benzoini Composita ("Friar's balsam," "balsam de Malta," "Turlington's balsam") contains benzoin, storax, balsam of Tolu, and aloes; dose f℥ss–ij.

Physical properties: Benzoic acid is obtained by sublimation from benzoin, or it may be made artificially from hippuric acid obtained by concentrating the urine of cattle; from *naphtalin*, $C_{10}H_8$, and from trichlormethyl-benzol, which is made from toluol, C_7H_8. The official acid should have the aromatic vanilla-like odor of benzoin. It takes the form of shining hexagonal scales, has a slightly aromatic odor, warm acid taste, and acid reaction. It is soluble in 500 parts of water, and freely so in ether, alcohol, and in 7 parts of chloroform.

Physiological action: *Locally*, benzoic acid is an irritant and protoplasmic poison, and is about equal to salicylic acid as a germicide. In therapeutic doses it is followed by very few symptoms, and its chemistry in the body is not clearly understood. In *large doses* it increases the circulatory and respiratory force, and is supposed to produce a greater fall of temperature than salicylic acid. It stimulates the cutaneous and bronchial secretions. Its chief effect of interest is in *acidifying the urine*, which is accomplished by its conversion into *hippuric acid*, which takes place in the kidneys, and probably at the expense of the uric acid, which is therefore decreased. It produces none of the unpleasant effects of salicylic acid.

Therapeutics: This drug is a standard remedy in *cystitis* and whenever there is a tendency to the *formation of phos-*

phatic calculi. It has also been advocated in *acute rheumatism,* in which it is less efficacious and better borne than salicylic acid; in *diphtheria,* locally and internally; and in *chronic bronchitis* as a stimulating expectorant. Its antiseptic properties will be noted elsewhere.

Sodium benzoate is a white, amorphous, freely soluble powder, having a faint odor of benzoin, a sweetish astringent taste, and a neutral reaction. It has been used in the same conditions as benzoic acid—viz., rheumatism, cystitis, and diphtheria, in the last of which it is given in large doses.

Lithium benzoate: This salt has been introduced for use in the *uric-acid diathesis.* The theory of its action is that the formation of uric acid is lessened by the benzoic acid, and that the lithium element forms with the remainder the more soluble lithium urate, and hence is more readily eliminated. It is better borne by the stomach than benzoic acid. It is also antiseptic.

ANTIPYRINUM (Antipyrin; Phenazonum, *Br. P.*).

Antipyrin is derived by a complicated patented process from *pyrrol,* a coal-tar derivative. Chemically, it is *phenyl-dimethyl-pyrazolon,* and occurs as a somewhat bitter grayish crystalline solid, easily soluble in water, alcohol, and chloroform.

Physiological action: Given in medicinal doses (gr. v–x) in fevered patients, antipyrin produces a fall of temperature which reaches a maximum in from two to five hours, lasts five to eight hours, and is generally accompanied by sweating and slight depression. Owing to its slow elimination the duration of its antipyresis is greater than that of other antipyretics of this group. After larger doses or continued administration it causes general malaise, a peculiar cyanosis of the skin, feebleness of the pulse, and frequently an eruption which may resemble urticaria, measles, or erythema, and may be accompanied by œdema, catarrhal inflammations of the mucous membranes (conjunctivitis, coryza, or laryngitis), and sometimes by constitutional disturbances. The *therapeu-*

tic limit is chilliness, languor, and *cyanosis*. In detail its effects are as follows:

Nervous system: Giddiness, somnolence, unconsciousness, coma, and epileptiform convulsions may occur after large doses, from some unexplained cerebral influence; the spinal cord is at first stimulated and then depressed, the reflexes becoming tardy or abolished, while both motor and sensory nerves are depressed.

Circulation: In sufficient dosage it is undoubtedly a cardiac depressant; the arterial pressure is at first increased and later decreased, a vaso-motor dilatation taking place.

Respiration: This function is not affected by moderate doses; by large ones it is depressed, dyspnœa and rapid breathing occurring in some cases.

Temperature: The lowering of temperature is due partly to diaphoresis, and *perhaps* to a *lessened heat-production*, resulting from a direct influence on the thermogenic centres. That the latter is a probable element is shown by the lessened elimination of nitrogenous waste in the urine under its use. Antipyrin is well borne by the stomach, especially when administered with wine or aromatics.

Therapeutics: Antipyrin may be therapeutically employed for the following: (1) to *reduce temperature* and abate accompanying symptoms in *typhoid*, *typhus*, *pneumonia*, the *exanthemata*, etc., whenever it is evident that the elevation of temperature of itself is harming the patient; (2) to *allay motor excitability* in chorea, epilepsy, dysmenorrhœa, after-pains of labor, etc., but there are better remedies; (3) to *relieve pain* in *migraine*, *neuralgias*, the *lightning-pains* of *locomotor ataxia*, etc.; in *rheumatism* it acts much like salicylic acid, reducing the temperature and relieving pain, but affording no security against relapses; (4) it is considerably used as a *substitute for morphine* in attempting the cure of the morphine-habit; it is a valuable *hæmostatic:* thus, spraying or sniffing it up the nose will often check epistaxis, and hæmatemesis and hæmoptysis are said to be benefited by its exhibition by stomach or inhalation, as the case may be.

Locally applied to mucous membranes, antipyrin causes a

vaso-constriction sufficiently pronounced and permanent to make it a useful application in local congestions.

Administration: Antipyrin may be given in solution, pill, or capsule. When given in fevers for antipyretic purposes it is best to administer it in alcohol, to counteract its depressing effects; dose gr. v–xv. It is to be remembered that medicinal doses have caused serious depression, and that the drug is to be used with care.

ACETANILIDUM, *U. S.* (**Antifebrin; Acetanilid**), $C_6H_5.NH.C_2H_3O$ = 134.73.

Antifebrin is an anilin derivative, and chemically is *acetanilid* or *phenylacetamid*. It is an odorless, slightly bitter, crystalline powder, *not very soluble in water*, but freely so in alcohol, ether, and chloroform.

Physiological action: Antifebrin resembles antipyrin in its action as far as this is understood; but produces less sweating, is less apt to cause cyanosis, respiratory disturbance, cutaneous eruptions, and collapse, although these are all reported to have occurred in some cases. Some experiments have been made tending to show that its antipyretic effect is due to a centric effect upon the heat-producing nervous centre. In healthy persons little or no decrease of fever is produced. It agrees well with the stomach, occasions no nausea, and often even promotes appetite.

Therapeutics: Antifebrin in gr. iv doses is about equal to gr. xv of antipyrin, and may be used as an antipyretic in the same conditions, acting with equal promptness and efficiency and for nearly the same length of time. It is not so efficient in rheumatism and motor disturbances, but may be used in migraine, neuralgias, etc. It is cheaper than antipyrin. Owing to its insolubility, it is generally given in capsule, wafer, or tablet form. Clinical experience proves that it is safer than antipyrin, but not so safe as phenacetin.

Phenocoll Hydrochloride: This coal-tar derivative is very soluble in water, and is quickly absorbed and quickly eliminated, so that it forms one of the safest of this class of anti-

pyretics. No cases of poisoning have been reported. The dose is gr. x–xv, in solution or capsule.

PHENACETIN.

Phenacetin is a tasteless, colorless, crystalline substance, only slightly soluble in water, but more soluble in alcohol.

Physiological action and therapeutics: It acts as an antipyretic, without producing vaso-dilatation, with a varying degree of diaphoresis, and probably from an effect on the nervous centres. Like antipyrin, it is analgesic and antispasmodic; but unlike that drug unpleasant results are seldom developed, and, being less poisonous and probably equally efficient, it is a valuable antipyretic, analgesic, and antispasmodic. (For uses of phenacetin, compare *Antipyrin.*)

THALLIN.

Thallin occurs in two forms, the sulphate and the tartrate, both yellowish-white crystalline powders with a bitter taste. The sulphate, commonly used, is soluble in 7 parts of water. In *ordinary doses* (gr. v) it produces a fall of temperature, at times accompanied by considerable sweating. After *larger doses* a great fall of temperature, profuse perspiration, and at times an erythematous eruption and cyanosis occur. The urine assumes a *greenish hue* under its use. The blood-pressure is diminished only by large doses. In some cases violent chills are developed during the reactionary rise of temperature, and vomiting and diarrhœa have been observed.

Therapeutics: Although dangerous in large doses, in repeated small doses (gr. ij–iij) it is an efficient antipyretic with very little danger, and may be used in acute rheumatism and conditions of high temperature. In 1 : 1000 solutions it is an antiseptic, and 1½% to 2½% solutions may be injected into the urethra with gratifying results in gonorrhœa and gleet.

KAIRIN.

Kairin is a chinolin derivative, crystalline, bitter, and easily soluble. In gr. v–x doses it exerts an antipyretic effect,

causes copious sweating, and is a cardiac depressant. It has no advantages over antipyrin and other drugs of this group, and although no deaths are reported from its use, the symptoms have been so alarming that it has fallen into disuse.

STOMACHIC BITTERS.

The **vegetable bitters** may be arranged in three classes: (1) *simple* or *pure bitters;* (2) *aromatic bitters,* which contain a *volatile oil* as well as a bitter principle; (3) the *astringent bitters,* which contain *tannic* and *gallic acids,* and are astringent as well as tonic.

Physiological action: Probably all bitter substances increase more or less the activity of the glands with which they come in contact, and thus promote digestion and increase appetite. The increased ingestion of food and improved assimilative powers affect the general nutrition, so that they are *indirect tonics.* In overdoses they are somewhat irritant, and may cause nausea and occasionally vomiting and diarrhœa.

Therapeutics: Bitters are chiefly of use when the appetite is poor and during slow convalescence from acute disease. They are contraindicated when there is inflammation or oversensitiveness of the alimentary tract.

SIMPLE BITTERS.

QUASSIA, *U. S.* (Quassia).

Quassia is the *wood* of *Picræna excelsa* (nat. ord. Simarubeæ). Habitat: Jamaica. It is odorless, but very bitter, and yields its activity, which is due to a neutral principle, *quassin,* to both alcohol and water.

Preparations: Extractum Quassiæ, dose gr. j–iij.

Extractum Quassiæ Fluidum, dose ♏v–xv.

Tinctura Quassiæ, 10%, dose f℥j–ij.

Quassin, the bitter principle, may be given in gr. ss doses.

Therapeutics: Like other simple bitters, the preparations of quassia may be used in *anorexia, atonic dyspepsia, chloro-*

sis, and *atonic conditions generally*. An *infusion* (℥j–ij to Oj) is an excellent injection in the treatment of "seat-worms."

GENTIANA, *U. S.* (Gentian).

Gentian is the *root* of *Gentiana lutea* (nat. ord. Gentianeæ), a perennial plant of the Alps. Water and alcohol extract its virtues, which reside in an intensely bitter principle called *gentio-picrin*, besides which gentian contains a fixed oil and *gentisic acid*, which is tasteless and inert.

Preparations, action, and therapeutics: An *extract*, *fluid extract*, and *compound tincture* are official, the last of which contains gentian, cardamom, and bitter orange-peel, and is probably more used than any other simple bitter (Tinctura Gentianæ Composita, f℥j–iv). Gentian is a very efficient bitter, and is said to be somewhat laxative in large doses. The indications for its use are the same as for *Quassia*, q. v.

CALUMBA, *U. S.* (Calumba; Columbo).

Calumba is the *root* of *Jateorrhiza palmata* (nat. ord. Menispermaceæ), a climbing plant of Mozambique. It contains two bitter principles, *columbin* and *berberine*, columbic acid, and starch, and yields its bitterness to alcohol and water.

Preparations, action, and therapeutics: Calumba, the powdered root, dose gr. x–xx.

Extractum Calumbæ Fluidum, dose ♏x–xx.

Tinctura Calumbæ, dose f℥j–℥ss.

Calumba is very slightly aromatic, is very well borne by the stomach, and may be used whenever a simple bitter is indicated, sharing with gentian the preference among bitter tonics of its class.

CHIRATA, *U. S.* (Chirata).

Chirata is the entire plant, *Swertia Chirata* (nat. ord. Gentianeæ). Habitat: Mountains of Northern India. Chirata contains a bitter principle, *chiratin*, and *ophelic acid*. It is one of the best of the simple bitters, resembles gentian, and may be used in the same ways.

The **preparations** are—

Chirata, dose gr. xx.
Extractum Chiratæ Fluidum, dose f℥ss.
Tinctura Chiratæ, 10%, dose f℥j–ij.

AROMATIC BITTERS.

As we have already seen, the essential constituents of drugs of this class are a *volatile oil* and a *bitter principle*. Most of them contain in addition more or less tannic acid.

SERPENTARIA, *U. S.* (**Serpentaria**; **Virginia Snakeroot**).

Serpentaria is the *rhizome* and *roots* of *Aristolochia Serpentaria*, and of *Aristolochia reticulata* (nat. ord. Aristolochiaceæ). Both plants are indigenous. They contain a *volatile oil*, *bitter principle*, resins, and tannin, and have an agreeable aromatic odor and a bitter, somewhat pungent taste.

Preparations: Extractum Serpentariæ Fluidum, dose ♏x–xxx.

Tinctura Serpentariæ, 10%, dose f℥j–℥ss.

Physiological action and therapeutics: Serpentaria is a *stimulant tonic*, with somewhat *diuretic* and *diaphoretic* properties. In large doses it may cause vomiting, purging, and other symptoms of gastro-intestinal irritation. It is an efficient tonic, and is often combined with stronger bitters, and also with cinchona, in the treatment of intermittents (see *Huxham's Tincture*) and in slow convalescence from fevers.

ANTHEMIS. *U. S.* (**Anthemis**; **Chamomile**).

Chamomile is the *flower-heads* of *Anthemis nobilis* (nat. ord. Compositæ), collected from cultivated plants. This is a small trailing plant of Europe, cultivated also in this country. It contains a *volatile oil*, a *bitter principle*, and a trace of *tannic acid*, and has a strong, peculiar odor, probably due to *anthemic acid*.

Physiological action and therapeutics: Chamomile is a good *stimulant* tonic, especially during convalescence. The usual method of administration is in *infusion*, dose f℥ij two or three times daily. In larger doses of the hot infusion it is an *emetic*. Of the powder the dose is ʒss–j.

Matricaria, *U. S.*, or **German chamomile**, the *flower-heads* of *Matricaria chamomilla* (nat. ord. Compositæ), is very similar in composition and properties; but its taste is more disagreeable, and it is seldom used in this country.

EUPATORIUM, *U. S.* (Eupatorium).

Eupatorium (boneset, thoroughwort) is the *leaves* and *flowering tops* of *Eupatorium perfoliatum* (nat. ord. Compositæ). This is a common indigenous plant, the leaves and flowering tops of which contain a bitter glucoside, *eupatorin*, tannic acid, and a small amount of volatile oil. It is usually given in infusion, but a *fluid extract* is official, the dose of which is ℥xx–f℥j.

Physiological action and therapeutics: Thoroughwort is a *stomachic tonic*, *expectorant*, and *diaphoretic*, and in large doses may prove emetic. It is a standard domestic remedy in the treatment of "cold" and *bronchitis*, for which it is given in hot infusion freely, and has been used in rheumatism with asserted good effect.

CASCARILLA, *U. S.* (Cascarilla).

Cascarilla is the *bark* of *Croton Eluteria* (nat. ord. Euphorbiaceæ). *Croton eluteria* is a small tree of the Bahama Islands. The drug yields its properties to alcohol and partially to water, and has an agreeable, aromatic odor, most noticeable when burning. It contains a crystalline, bitter principle, *cascarillin*, a *volatile oil*, a *resin*, and some *tannic acid*. It is a pleasant aromatic bitter, well borne by the stomach, and may be used for the same indications as serpentaria. The dose of the powder is gr. xx–xxx. No official preparations.

Absinthium: The *leaves* and *tops* of *Artemisia Absinthium* (nat. ord. Compositæ). Habitat: Europe, Asia, Northern Africa; naturalized. In small doses, absinth is a stimulating tonic. In continued doses, in the form of the liqueur "absinthe," it shows a peculiar tendency to produce nervous symptoms, attended by hallucinations, convulsions, and

impotency. This belongs also to this class, but is seldom used.

ASTRINGENT BITTERS.

Cinchona and its alkaloids have already been discussed: they are very valuable stomachics in small doses.

CORNUS.

Cornus is the *bark* of the *root* of *Cornus florida*, or dogwood, a small indigenous tree. The taste is bitter, astringent, and slightly aromatic. Its constituents are cornin, resin, and tannic and gallic acids.

Physiological action and therapeutics: It is a bitter, and is said to have antiperiodic effects as well. In too large doses it may prove irritant enough to cause gastric disorder.

Salix is the *bark* of *Salix alba* (white willow) and other varieties of Salix. It is chiefly of interest because of its neutral principle, *salicin*, which is a valuable antirheumatic and antiseptic.

PRUNUS VIRGINIANA, *U. S.* (Wild Cherry).

Prunus virginiana is the *bark* of *Prunus serotina* (nat. ord. Rosaceæ), collected in autumn. Wild cherry, officially *Prunus Virginiana*, but more properly *P. serotina*, is an indigenous tree, the bark of which contains a *bitter principle*, *tannic* and *gallic acids*, *amygdalin*, and *emulsin*. Amygdalin is a glucoside which, with emulsin, a ferment, in the presence of water yields on distillation a volatile oil containing hydrocyanic acid. Emulsin is an albuminous substance, and is coagulated by heat, so that the value of the bark is destroyed by boiling.

Preparations: Prunus Virginiana, powdered, dose ʒss–j.

Extractum Pruni Virginianæ Fluidum, dose fʒss–j.

Infusum Pruni Virginianæ, 4%, dose fʒj–ij.

Syrupus Pruni Virginianæ, 15%, dose fʒij–fʒss.

Physiological action and therapeutics: Wild cherry bark is a *somewhat astringent stomachic tonic*, and, owing to the hydrocyanic acid developed, a *nervous* and *circulatory sedative*. In the natural bark, however, this is present in a rather small

percentage, and it is doubtful whether this small proportion has any remedial value. The syrup and the fluid extract are much used as vehicles, and possess a certain tonic sedative effect which renders them of value in phthisis.

DIURETICS.

Diuretics are remedies which increase the renal secretion, either by a direct stimulating effect on the secreting cells or by increasing the blood-pressure generally or locally. The ingestion of large amounts of fluid may also prove diuretic by flushing out the kidneys. It is to be borne in mind that the secretions of the skin and intestinal tract may be affected vicariously, and when a purely diuretic action is required these should be avoided; but in practice it ordinarily matters little how the fluid is eliminated.

SCILLA, *U. S.* (Squill).

Squill is the *bulb* of *Urginea maritima* (nat. ord. Liliaceæ), deprived of its dry, membranaceous outer scales, and cut into thin slices, the central portions being rejected. Habitat: the shores of the Mediterranean. These bulbs resemble onions in their appearance, and are found in the shops sliced and dried. Two varieties, the *red* and the *white*, are recognized, but they are of equal efficiency medicinally. Squill contains as active principles *scillipicrin*, *scillitoxin*, and *scillin*, and yields its activity to water, alcohol, and vinegar.

Preparations: Pulvis Scillæ, dose gr. j–ij.

Extractum Scillæ Fluidum, dose ♏j–ij.

Tinctura Scillæ, 15%, dose ♏x–xx.

Acetum Scillæ, 10%, dose ♏xv–f℥ss.

Syrupus Scillæ (♏xxv–gr. j), dose f℥ss–j.

Syrupus Scillæ Compositus ("Coxe's hive syrup") contains squill and senega, *āā* 6; tartar emetic, $\frac{1}{6}$ part in 100 (about gr. j–f℥j); dose f℥ss–f℥ss.

Physiological action: In *small doses* squill increases the secretions of the bronchial and intestinal mucous membranes and of the kidneys, its diuretic action being the most constant, and probably due both to direct stimulation of the

renal cells and to the increased blood-pressure which it causes. Whether the actual elimination of urinary solids is increased is not clear. In *larger doses* it is a *gastric* and an *intestinal irritant*, causing nausea, vomiting, and purging. In *toxic doses* it produces symptoms of severe gastro-intestinal and renal irritation—viz., violent vomiting, purging, and abdominal pain, with bloody, suppressed, and albuminous urine—collapse, and death.

Therapeutics: Squill is used as a diuretic in conditions *not dependent upon nephritis*, in which disease it is distinctly contraindicated. It is one of the most irritant of all the diuretics in common use. Thus it is employed in *ascites*, in *chronic pleurisy*, or *pericarditis with effusion*, and in *cardiac dropsies*, in which it is combined with digitalis. Combinations of digitalis, squill, and calomel are much in favor in cardiac dropsy. Squill is also efficient as a blennorrhetic expectorant in subacute and chronic bronchitis, especially when the expectoration is viscid and tenacious.

Toxicology: Gr. xxiv of squill have proved fatal. Sufficient has been said of the symptoms. The *treatment* consists in evacuation of the stomach if necessary, the free administration of opium and demulcents, with warmth and stimulation as necessity arises. It is well to remember that hive syrup, or Coxe's hive syrup, the official *compound syrup of squill*, although used considerably by the laity, contains two powerful remedies, both poisonous in overdose: squill and tartar emetic (about gr. j to the fluidounce).

Hydrargyri Chloridum Mite, *U. S.* Calomel has been found a very efficient diuretic in some cases of Bright's disease, and in others it fails entirely to produce any effect. It is necessary to administer it in full doses (gr. vj–xij a day, in divided doses); the combination of gr. j of calomel with gr. j each of squill and digitalis acts very happily in many cases of cardiac dropsy.

SCOPARIUS, *U. S.* (Scoparius; Broom).

Scoparius is the *tops* of *Cytisus scoparius* (nat. ord. Leguminosæ). This is the common broom-plant, a native of

Europe, but cultivated in this country. The dried tops have a strong, peculiar odor and a bitter, nauseating taste. Broom contains a neutral principle, *scoparin*—which by some authorities is considered unimportant, by others to represent its diuretic and purgative properties—and *sparteine*, an alkaloid discussed under *Cardiants*. It has no official preparations, an extemporaneous decoction being most used.

Physiological action and therapeutics: In moderate doses scoparius is an efficient *hydragogue diuretic*, and in large doses may produce purgation and even vomiting. In *general dropsy* it proves a very valuable diuretic. Of a decoction (℥ss to Oj boiled down to Oss) f℥j–ij may be given every two hours.

APOCYNUM, *U. S.* (**Apocynum; Canadian Hemp; Dog's Bane**).

Apocynum is the *root* of *Apocynum cannabinum* (nat. ord. Apocynaceæ). This is an indigenous herb. It contains *apocynin* (resinous), *apocynein* (yellowish glucoside), *gallic* and *tannic acids*, a *bitter principle*, etc., and yields its virtues to both water and alcohol. The taste of apocynum is bitter, acrid, and nauseating. The root alone is official. It is generally prescribed in infusion (℥ss to Oj of water), the dose of which is f℥ij–f℥ss.

Physiological action and therapeutics: Canadian hemp increases the secretions of the skin, bronchi, and kidneys, and in large doses is an intestinal irritant, causing vomiting and purging. In dropsy it proves a powerful remedy.

TRITICUM, *U. S.* (**Triticum**).

Triticum is the *rhizome* of *Agropyrum repens* (nat. ord. Gramineæ), a perennial herb of Europe and North America, gathered in the spring and deprived of the roots. The rhizome has a sweetish taste, due to the presence of several sugars. It also contains *triticin*. Although but a *feeble diuretic*, it is of considerable value as a sedative to the genito-urinary tract, especially in *cystitis* with profuse mucous discharge. The best form of administration is an *infusion* or *decoction*. Of the official fluid extract the dose is f℥ss–f℥ss.

VASCULAR DIURETICS.

Drugs of this class produce diuresis by increasing the general arterial tension. Among them are such valuable diuretics as *digitalis*, *strophanthus*, and *caffeine*, which have already been fully treated of under *Cardiants*. Certain diaphoretics, to be later described, act, when the perspiration is lessened in any manner, to produce diuresis—*e. g.*, jaborandi.

Theobromine and **Diuretin.** The latter is a salicylate of theobromine and sodium; the former, the alkaloid obtained from the *seed* of *Theobroma cacao*, or the chocolate-plant. Theobromine resembles caffeine; the latter is methyl-theobromine, and this resemblance also extends to its cardiac, diuretic, and stimulant effects. No fatal cases of poisoning are reported, and the best results are claimed from large doses, as many as gr. xxx–c a day.

REFRIGERANT DIURETICS.

POTASSIUM.

Potassium salts—physiological action: Foremost among diuretics of this class are the *acetate* and *citrate* of potassium. As the effects of potassium salts are in a considerable measure due to the potassium element or modified by it, a good opportunity is here afforded for the study of these effects. *Locally*, some of the potassium salts, as potassa fusa, dissolve albumin and saponify fats, thus acting as caustics. *Internally*, they depress the spinal cord and lessen reflex excitability. They are all cardiac depressants, in *moderate* doses slowing the heart, while larger ones also lower arterial tension. Animals poisoned die by cardiac paralysis, the paralyzant effect being direct upon the heart-muscle. Potassium salts are poisonous to all the higher forms of tissue. However, in ordinary medicinal doses the depressing effect is slight and attended with very little danger. Given in large or continued doses they promote *oxidation* of the tissues, *markedly increase* the

urinary solids, and if too long continued cause emaciation and perverted nutrition; the blood contains less fibrin, and the venous blood is lighter in color. After large doses of the *nitrate* or *chlorate* the hæmoglobin is decomposed, methæmoglobin is formed, and the oxidizing power of the blood is diminished.

Secretions: The *acetate* and *citrate* of potassium, which are neutral at first, are partially oxidized in the blood, and are converted into *carbonates*—viz., *become alkaline after absorption*—and are said to be *alkaligenous*. These alkaligenous salts, and those whose solutions are already alkaline (*potassium hydrate, carbonate, tartrate*, and the *tartrate of sodium* and *potassium*), *increase the alkalinity of the blood, render the urine alkaline, and act as alkalies upon the glands with which they come in contact*, increasing the activity of those whose secretions are acid, and decreasing that of glands with alkaline secretions. The *nitrate, chlorate, sulphate*, and *bitartrate* have no such effect, being *permanently* acid or neutral, and are eliminated *unchanged*.

In large doses potassa, or the chlorate, nitrate, or carbonate, causes vomiting, purging, and other symptoms of gastro-intestinal irritation, accompanied by more or less marked nervous symptoms and collapse. Elimination of potassium salts takes place largely by the urine. Some of the preparations of potassium require detailed notice.

POTASSII CARBONAS, *U. S.* (Potassium Carbonate), $K_2CO_3 = 137.91$.

Potassium carbonate is prepared by purification of *pearlash*, which is an impure carbonate obtained from wood-ashes and other sources, or by calcining potassium bicarbonate, thus depriving it of one molecule of CO_2 and reducing it to the carbonate. It is a coarse white, granular powder of alkaline reaction, freely soluble in water, and deliquescing in moist air to an oily liquid. It is chiefly employed as an *antacid* and *diuretic*. In large doses it is a corrosive poison, the antidotes for which are *oils* and *dilute acids*. It is eliminated unchanged.

POTASSII BICARBONAS, *U. S.* (Potassium Bicarbonate), $KHCO_3 = 99.88$.

Potassium bicarbonate is made by passing CO_2 through an aqueous solution of purified pearlash until saturation is reached. It occurs in prismatic crystals, *permanent* in the air and easily soluble in water. The effects of this salt resemble those of the carbonate, except that it is better borne by the stomach, and it may be used as an *antacid*. It is a favorite in acute rheumatism and gout, in which conditions it is freely used up to ʒiss daily, with opium, if necessary, to relieve pain. It is eliminated as the carbonate.

POTASSII ACETAS, *U. S.* (Potassium Acetate), $KC_2H_3O_2 = 97.89$.

Potassium acetate is a white, extremely deliquescent salt, neutral in reaction and very soluble in water. It is formed by evaporating a solution of the bicarbonate in acetic acid. As noted above, it is alkaligenous, alkalizing the blood and urine, promoting diuresis, and increasing the solids of the urine, with the exception of the uric acid, which is diminished by the increased oxidation. Potassium acetate is eliminated as the carbonate. It constitutes one of the best forms of administration for the *alkaline treatment of acute rheumatism*, while in subacute forms combinations with potassium iodide are valuable. In the acute form it should be given freely, ʒj–iss daily. It is also of service in *catarrhal jaundice* and *functional disorder of the liver*, as a prophylactic against uric-acid calculus, and by alkalizing the urine it affords relief in *acute cystitis* and *urethritis*. It can be administered in lemon-juice.

POTASSII BITARTRAS, *U. S.* (Potassium Bitartrate), $KHC_4H_4O_6 = 187.67$.

Potassium bitartrate, also known as *cream of tartar*, or *acid potassium tartrate*, is obtained by purifying *argol*, which is deposited during fermentation on the sides of wine-casks. It has an acidulous taste, is insoluble in alcohol, and only

slightly soluble in water, in which, however, it may be easily dissolved by adding sodium borate. It is the most active diuretic of the potassium salts, and in large doses a hydragogue cathartic. Potassium bitartrate is eliminated unchanged. It is chiefly used in *general dropsies of cardiac or renal origin*, in which its double action as diuretic and cathartic renders it particularly valuable.

POTASSII CITRAS, *U. S.* (Potassium Citrate), $K_3C_6H_5O_7+H_2O=323.59$.

Potassium citrate is usually seen in the form of a granular powder, readily soluble in water, *deliquescent* on exposure.

The *medical virtues* of potassium citrate are those of a non-irritating, agreeable refrigerant *diaphoretic* and *diuretic*, together with those of a *sedative expectorant* of great value. It may be *given* in the form of the official *Liquor Potassii Citratis*, which is an aqueous solution containing about 9% of the anhydrous salt. This solution is always prepared extemporaneously by the action of citric acid on potassium bicarbonate in solution, and the liquid is sufficiently charged with carbonic-acid gas to make it very acceptable to a delicate stomach. *Mistura Potassii Citratis* (U. S., 1880) has long been known as *neutral mixture*, and is made by neutralizing fresh *lemon juice* with potassium bicarbonate. It is even more agreeable and efficient than the ordinary solution. Both the solution and the mixture are excellent bases for diaphoretic and diuretic mixtures. The dose of either preparation is f℥ss; that of potassium citrate, gr. v–xxx.

POTASSII NITRAS, *U. S.* (Potassium Nitrate), $KNO_3=100.92$.

Potassium nitrate, *nitre* or *saltpetre*, is obtained from natural or artificial *nitre-beds*, in which it has been formed by the oxidation of ammonia and its subsequent combination with the bases of the soil. It is a crystalline substance of saline and rather cooling taste, soluble in 5 parts of water and insoluble in alcohol, and decomposing when heated, with the liberation of nascent oxygen.

Physiological action and therapeutics: Applied to any raw surface or mucous membrane, saltpetre acts as a decided irritant, and it is due to this property that poisonous effects more often follow its ingestion than that of other salts. The symptoms of *poisoning* are severe epigastric burning pain, violent vomiting, at times of blood, purging, followed very shortly by collapse and great muscular weakness. Nervous symptoms may or may not be pronounced as in other gastro-intestinal irritations. Suppression of urine may occur. The *lesions* at autopsy are intense gastro-enteric inflammation, often to the extent of ulceration of the mucous membrane. Although probably no more depressing to the heart than other potassium salts, aside from the depression secondary to this inflammatory condition, it does seem to produce more renal irritation. The *treatment* consists in giving opium and demulcents after evacuation of the stomach and bowels. The salt is now seldom used, and is chiefly of interest from its toxic effects. It was formerly thought to do good in rheumatism.

POTASSII CHLORAS, *U. S.* (Potassium Chlorate), $KClO_3 = 122.28$.

Potassium chlorate is prepared by various processes. It occurs as a white, anhydrous, fairly permanent salt, of a cool, saline taste, and *soluble in 16.5 parts of water*. Absorbed, and to a very great extent at least eliminated unchanged, it does not differ decidedly in its effects from other potassium salts except in its irritant effects, which are similar to those of the nitrate. In *poisonous doses* it produces diarrhœa, vomiting, labored respiration, *cyanosis*, and circulatory depression. The *post-mortem* changes are those of violent irritation of the gastro-intestinal tract, swelling of spleen and liver, with evidence of acute nephritis; the blood is chocolate-colored, due to conversion of the hæmoglobin into *methæmoglobin*. The latter is the most characteristic change. *In continued doses it is apt to produce chronic parenchymatous nephritis.* It does *not* give up its nascent oxygen at the body-temperature, as was once supposed; and experiments

have shown that it is nearly all eliminated unchanged. Hence the theory of its oxidizing power is no longer held. Potassium chlorate is *eliminated* unchanged by all the secretions, including the *saliva*.

Therapeutics: Potassium chlorate has been extensively used in *diphtheria*, *scarlet fever*, and other conditions supposed to depend on the presence of toxic products in the blood, and is still considered valuable by some. It is to be scrupulously *avoided* in diseases attended with renal irritation. *Locally*, as a gargle or mouth-wash, it is of value in *simple and mercurial stomatitis*, *ozæna*, *subacute and chronic pharyngitis*, and fœtid ulcerations of the mucous membranes generally.

Saccharum Lactis, *U. S.*, Sugar of Milk, $C_{12}H_{22}O_{11} + H_2O = 359.16$, a peculiar crystalline sugar, obtained from the whey of cows' milk by evaporation, and purified by recrystallization.

Milk-sugar, a member of the carbohydrate group, is present to the extent of 4½–5 % in ordinary cows' milk and is prepared from this by evaporation and purified by crystallization. It occurs in white crystalline masses, soluble in 6 parts of water, and of such hardness that it forms a useful addition to powders which require minute subdivision (Dover's powder). Sugar of milk is present to the extent of 7 % in mother's milk; so that in artificial feeding, mixtures of cows' milk and cream require the addition of this sugar. It is much more readily assimilated by infants than is cane-sugar. Sugar of milk is not directly subject to the vinous fermentation, but yields alcohol and carbonic-acid gas after conversion into glucose by acids. It reduces Fehling's solution.

Medicinally, sugar of milk is laxative and a good hydragogue diuretic, acting with especial advantage in *cardiac dropsies*. The dose is ʒss–v daily.

BLENNORRHETICS.

Blennorrhetics are remedies which *promote secretions of mucous membranes*, and are used to restore a healthy action in cases of *deficient*, *abnormal*, or *excessive* secretion. They are

principally employed in such conditions of the *bronchial* mucous membrane (expectorants) and of the *genito-urinary* tract (blennorrhetic diuretics).

BUCHU, *U. S.* (Buchu).

Buchu is the *leaves* of *Barosma betulina* and of *Barosma crenulata* (nat. ord. Rutaceæ). Habitat: Southern Africa. These leaves have a bitter taste and aromatic odor, contain a *bitter extractive*, *volatile oil*, and a stearopten, *diosphenol*, and yield their virtues to water and alcohol.

Physiological action and therapeutics: Buchu is slightly diuretic and a gentle stimulant to secretions generally, with a sedative action on the urinary mucous membrane. It is used in chronic pyelitis, chronic cystitis, and chronic urethritis. From its bitter principle it may prove tonic. The *fluid extract* is official (dose f℥j), but an *infusion* is the usual form for administration.

PAREIRA, *U. S.* (Pareira; Pareira Brava).

Pareira is the *root* of *Chondodendron tomentosum* (nat. ord. Menispermaceæ), a climbing plant of Brazil. It contains an alkaloid, *pelosine* or *cisampeline*, identical with *buxine* and *beberine* obtained from *Buxus sempervirens* and *Nectandra Rodiæi;* also a resin, starch, etc. It imparts its activity to water, and the fluid extract (dose f℥j) and extemporaneous infusions are the proper preparations for use. It is a mild *tonic*, *laxative*, and *diuretic*, and an efficient *corrective* to chronic inflammation or irritation of the bladder associated with digestive disturbance and constipation. Extractum Pareiræ Fluidum, dose f℥j.

MATICO, *U. S.* (Matico).

Matico is the *leaves* of *Piper angustifolium* (nat. ord. Piperaceæ). Habitat: a shrub of Tropical America. It contains a pungent resin, tannin, *volatile oil*, and a crystalline principle, *artanthic acid*. Matico is an aromatic tonic and a stimulant alterative to diseased mucous membranes, especially

those of the bladder and bronchi. It has a reputation as a hæmostatic also. Dose of the powdered leaves, ʒss–iij; of Extractum Matico Fluidum, fʒss–ij; and of the 10% tincture, fʒj–ij.

UVA URSI, *U. S.* (Uva Ursi; Bearberry).

Uva ursi is the *leaves* of *Arctostaphylos Uva ursi* (nat. ord. Ericaceæ), a shrub of the Northern Hemisphere. It contains *tannic* and *gallic acids*, a bitter *principle*, and *arbutin* or *ursin*, which is a glucoside and the active principle of the drug. *Arbutin* occurs also in different species of *Chimaphila*, *Epigæa repens*, *Gaultheria procumbens*, and other Ericaceæ.

Physiological action and therapeutics: Arbutin is a mild diuretic, with an alterative effect upon the mucous membrane of the genito-urinary tract. It is partially decomposed in the kidneys, with the production of *glucose* and *hydrochinon*, and partly eliminated unchanged. It asepticizes the urine and retards decomposition. From its combined astringent, diuretic, and alterative effects it is of value in *chronic pyelitis* and *chronic cystitis*, and is especially recommended as a palliative when the latter is due to enlarged prostate. It is said in some cases to prevent bleeding from the kidneys. Arbutin is devoid of poisonous properties, but must be given in relatively larger doses than the leaf itself; therefore it seems probable that it is not the sole active principle. The *fluid extract* (Extractum Uvæ Ursi Fluidum) is official, and is given in fʒss–j doses.

OLEUM JUNIPERI, *U. S.* (Oil of Juniper).

Oil of juniper is a volatile oil distilled from the fruit or so-called *berries* of *Juniperus communis* (nat. ord. Coniferæ), a shrub of Europe naturalized in this country. These berries are of the size of a pea, and have a sweetish, aromatic taste resembling turpentine. They yield their activity, which depends upon a *volatile oil* (oleum juniperi), to boiling water and alcohol. Like other drugs of this class, the oil is *diuretic*, and being a terpene, $C_{10}H_{16}$, like oil of turpentine, is somewhat irritant to the gastro-intestinal tract, producing

strangury and bloody urine when given in large doses. It may prove *emmenagogue*. An *infusion* is occasionally used as a vehicle for potassii bitartras and other saline diuretics, and for its own action in chronic pyelitis, cystitis, etc. It is contraindicated in acute and subacute renal inflammation.

The **preparations** are as follows:

Oleum Juniperi, dose ♏v–xv.

Spiritus Juniperi, 5% of the oil, dose f℥ss–j.

Spiritus Juniperi Compositus (corresponds closely to Holland gin), dose f℥ij–f℥ss.

Gin is the most irritating of all alcoholic stimulants and the one most apt to produce chronic interstitial nephritis.

CHIMAPHILA, *U. S.* (Chimaphila; Pipsissewa).

Chimaphila is the *leaves* of *Chimaphila umbellata* (nat. ord. Ericaceæ), a small indigenous, perennial plant, and contains *tannin*, *arbutin*, and other principles. Arbutin is its most active principle, and its effects and uses are therefore the same as those of uva ursi—viz., *tonic*, *slightly astringent*, and *diuretic*. Of the *fluid extract* the dose is f℥j or more.

OLEUM ERIGERONTIS, *U. S.* (Oil of Erigeron; Oil of Fleabane).

Oil of erigeron is a volatile oil, distilled from the fresh *flowering herb* of *Erigeron canadense* (nat. ord. Compositæ). The oil has properties much like oleum terebinthinæ, and consists mainly of a terpene, $C_{10}H_{16}$, with a small percentage of an oxygenated oil. It is, however, weaker and more pleasant to the taste. It possesses *hæmostatic* and *diuretic* properties, and has been used in *chronic catarrhs of the genito-urinary organs*, in *dysentery*, and in *uterine hemorrhage*. Dose gtt. v–xxx, frequently repeated, in capsule.

TEREBINTHINA, *U. S.* (Turpentine).

A *turpentine* is a liquid or semi-solid vegetable juice which contains *resin* and *oil of turpentine*. There are two official turpentines:

Terebinthina, *U. S.*, a concrete *oleoresin* obtained from *Pinus*

palustris, and from other species of Pinus (nat. ord. Coniferæ), the *common American white turpentine*, obtained chiefly from the yellow pine, growing in the Southern States.

Terebinthina canadensis, *U. S.*, *Canada Turpentine*, Canada Balsam, Balsam of Fir, a liquid *oleoresin* obtained from *Abies balsamea* (nat. ord. Coniferæ), or American silver fir, growing in the northern portions of North America. Among the *non-official* varieties are Bordeaux, Venice, and Chian turpentines.

Properties: The turpentines are inflammable, insoluble in water, and quite soluble in alcohol and ether. By distillation they yield *resin* and *oil* of turpentine, both of which are official.

Oleum Terebinthinæ (Oil of Turpentine; Spirit of Turpentine): A volatile oil distilled from turpentine. This, the active principle of turpentine, is a colorless, volatile, inflammable liquid of a strong, penetrating odor and hot, pungent taste. It is insoluble in water, moderately soluble in alcohol, and freely so in ether. When exposed to the air it absorbs oxygen and converts it into ozone. It is the type of the *terpenes*, which have the formula $C_{10}H_{16}$, and have similar medicinal properties.

Physiological action: *Locally* turpentine is a powerful irritant. *Internally* in medicinal doses it produces gastric warmth, exhilaration, and a sort of intoxication: the pulse is increased in force and frequency. It is eliminated by the bronchi and kidneys, imparting its odor to the breath and an *odor of violets* to the urine. Poisoning by turpentine is rare, because in large doses the drug is eliminated by the bowel before absorption can take place. The symptoms produced by *too large doses* are abdominal pain, vomiting and diarrhœa, strangury, priapism, constant desire to urinate, suppression of urine or hæmaturia, complete unconsciousness, and a weak and rapid pulse. The lethal dose must be very large, and has not been determined. Its effects in detail are as follows:

Circulation and *respiration* are stimulated by small, and depressed by large, doses.

Genito-urinary system: After small doses few symptoms

are produced except some increase in the amount of urine, with perhaps lumbar pain, frequent micturition, and a sensation of smarting pain in the urethra during the act: the effects of larger doses have been stated above. Turpentine is eliminated by the bronchi and genito-urinary mucous membrane.

Therapeutics: *Locally*, oil of turpentine is much used as a counter-irritant *over large surfaces*, in the form of turpentine *stupes*, which may be made by wringing out cloths in hot water and then in turpentine or sprinkling them with turpentine. Another ready method of preparing turpentine stupes is to pour a tablespoonful of oil of turpentine on a pint of hot water and then dip the cloths in this, the latter retaining sufficient of the oil after they are wrung out. Turpentine stupes are valuable in *bronchitis* and *abdominal pain*, and applied over the bladder will often relieve retention of urine, especially when of nervous origin. Turpentine in amounts of f℥j–f℥ss is a valuable addition to enemata in cases where the rectum is impacted with fæces. *Internally*, it is used in *typhoid fever:* in two stages of this disease it is very valuable. In the second and third weeks the distressing tympanites may be markedly decreased by gtt. x of the oil every three or four hours, its action being a local stimulation of the muscular coat of the intestinal wall, while in convalescence, which is protracted and accompanied by diarrhœa (in which case ulceration may be suspected), this drug is a valuable stimulant, promoting healing. In other *ulcers of the stomach* and *bowels* it acts locally in the same way. In *chronic pyelitis* and *chronic cystitis* it does good. In *impotence, spermatorrhœa*, and *gleet* due to relaxed states of the parts, these conditions are not infrequently greatly benefited by moderate and continued doses. In *passive hemorrhages* from mucous surfaces, as *hæmaturia, purpura, scorbutus*, etc., it is generally useful. In adynamic conditions it is also useful as a general stimulant. Its use as a tæniacide will be mentioned later. In *flatulence, chronic intestinal catarrh*, and *subacute dysentery* it does good by stimulating peristalsis and by its supposed antifermentative action. Owing to its elimination by the bronchial mucous membrane it is used as a

blennorrhetic expectorant in *chronic bronchitis* and *emphysema*, and may palliate in *gangrene of the lung*.

COPAIBA, *U. S.* (**Copaiba; Balsam of Copaiba**).

Copaiba is the *oleoresin* of *Copaiba Langsdorfii*, and of other species of Copaifera (nat. ord. Leguminosæ). Habitat: Northern South America. Copaiba is a yellowish liquid of a peculiar terebinthinate odor and nauseating, burning taste. It is insoluble in water, but *soluble in alcohol, ether, and the fixed and volatile oils*. It is resolvable into a *volatile oil* and a *resin* (copaivic acid), both of which are official, but neither one represents the sole activity. To call it a balsam is incorrect, as it contains neither benzoic nor cinnamic acid.

Preparations: Of copaiba itself the dose is ℥xx–xl.

Oleum Copaibæ, dose ℥x–xv.

Resina Copaibæ, dose gr. x–xv.

Massa Copaibæ (copaiba 94, magnesia to 100 parts), dose gr. x–xx.

Physiological action: In *medicinal* doses copaiba produces no systemic effects. In *large* doses in susceptible persons it may cause fever, hot skin, gastro-enteric irritation, and not infrequently an *exanthematous eruption* very like measles. Its chief effects, however, are *local*. It is *diuretic*, the resin being even more so than the oil, and an *alterative* to the genito-urinary, and perhaps the bronchial mucous membrane. *Large doses* in susceptible persons may produce strangury and renal irritation, even to the extent of hæmaturia. Under its use it is to be remembered that the urine gives with nitric acid a white precipitate resembling albumin, but differing from it in being soluble in alcohol, and in not being precipitated by heat. It is *slowly eliminated*, its constituents appearing in the urine for some days after large doses.

Therapeutics: Copaiba is chiefly used in *subacute* and *chronic inflammations* of the *genito-urinary tract*. In *gonorrhœa* it finds its great popularity, and is indicated in the subacute stages. During the acute stage it is too stimulating, although used by some. It is also used, as are the other drugs of this class, in *chronic pyelitis* and *cystitis*, and by

some in chronic bronchitis and chronic diarrhœa. Ointments containing it often afford considerable relief in hemorrhoids.

Administration: Copaiba or its oil may be given in capsule or in an emulsion of some aromatic substance, the latter of which is said to agree better with delicate stomachs.

CUBEBA, *U. S.* (Cubeb).

Cubeb is the *unripe fruit* of *Piper Cubeba* (nat. ord. Piperaceæ), a climbing plant of Java; cultivated. These berries have a characteristic aromatic odor and a peculiar camphoraceous taste. Their important constituents are a volatile oil (Oleum Cubebæ, *U. S.*), resin, cubebic acid, and cubebin. The activity resides in the cubebic acid, resin, and volatile oil; cubebin is inert.

Preparations: Pulvis Cubebæ, dose ʒss–ij.

Oleum Cubebæ, dose ♏x–xxx.

Extractum Cubebæ Fluidum, dose ♏x–xl.

Oleoresina Cubebæ, dose ♏x–xv.

Tinctura Cubebæ, 20%, fʒij–iv.

Trochisci Cubebæ, No. j. Each troche contains gr. ½ oleoresin.

Physiological action: Cubeb exerts a stomachic effect much like pepper, which after large doses becomes an active irritant. Medicinal doses do not produce much systemic effect, but large ones may be slightly stimulant to the circulatory function. Its *characteristic effect*, however, is stimulation of the mucous membranes, with a special action on that of the genito-urinary tract. It is a *diuretic*, this property, it is said, residing in the *resin*, while a *carminative* effect is claimed for the oil. An eruption like that of copaiba may follow its use. In the form of *lozenges*, cubeb has long been employed to clear the voice in colds. In the form of *cigarettes*, smoke impregnated with the volatile principles has been found efficient to reach directly the bronchial mucous membrane.

Therapeutics: Its uses correspond closely with those of copaiba, with which it is often beneficially combined. It is less apt to derange digestion. Cubeb may be given in powder or syrup. The oleoresin nearly represents the drug, and may be given in emulsion.

OLEUM SANTALI.

Oil of santal or **sandal-wood** is a volatile oil distilled from the *wood* of *Santalum album* (nat. ord. Santalaceæ), an East Indian tree. It is yellowish, strongly volatile, of a very characteristic odor, and readily soluble in alcohol. It is used as a substitute for copaiba in *gonorrhœa*, succeeding best in the subacute stages; and is also of value in chronic bronchitis and chronic inflammations of the genito-urinary tract.

CATHARTICS.

Cathartics are drugs which act to *produce* or *increase* the evacuations from the bowels. They may act either by stimulating the glandular secretions of the mucous membrane or of the highly specialized glandular organs, the liver and pancreas, or by stimulating the muscular coat of the intestine, and thus increasing peristalsis. Different drugs have special actions on different parts of the intestine.

Cathartics are intended to act as adjuncts to *hygienic*, *dietetic*, and *mechanical* measures in the treatment of constipation. *Chronic constipation* may be due to a variety of causes, among which are irregular habits of life and of stool, overwork of the nervous or muscular systems, intestinal atony; various forms of metallic poisoning, the use of readily digestible articles of diet which leave no residue (such as milk), and to many other causes.

Acute constipation may be due to fæcal impaction, strangulated hernia, intussusception, pressure during pregnancy, mechanical occlusion of the intestine by a foreign body, as a gall-stone, etc. The use of laxatives under such conditions demands great caution.

Chronic constipation is *treated* (*a*) by selection of a *diet* which leaves sufficient residue to stimulate peristaltic action; (*b*) by *exercise* in the open air or *abdominal massage;* (*c*) by establishing a regular *habit of stool;* (*d*) by encouraging the patient to drink moderate quantities of *water;* (*e*) by the use of *laxative enemata;* (*f*) by the judicious use of *cathartics*.

Cathartics are *classified*, according to the vigor and method

of their action, as *laxatives, salines, purgatives, hydragogues, cholagogues,* and *mercurials.*

Cholagogues are laxatives which increase the flow of bile; they will not be considered under a special heading.

LAXATIVES.

Laxatives are cathartics which mildly produce evacuations, chiefly by an effect on the muscular coat and slightly on secretions. The following are thus classed:

Tamarindus, *U. S.*, the preserved *pulp* of the *fruit* of *Tamarindus indica* (nat. ord. Leguminosæ). This is a large East Indian and African tree. The dose of tamarinds is ℥ss–j or more. It is an ingredient of confectio sennæ.

Manna, *U. S.:* The concrete, saccharine *exudation* of *Fraxinus ornus* (nat. ord. Oleaceæ). Habitat: Sicily. Manna contains a *resin, fraxin,* a glucoside, and *mannite,* a sugar. It is chiefly used for children because of its agreeable taste.

Sulphur is official in three forms: *Sulphur Sublimatum* (S = 31.98), *Sulphur Lotum,* and *Sulphur Præcipitatum.* Sulphur often contains a little sulphuric acid; but oxidation and washing with dilute water of ammonia frees it from this impurity. The *precipitated form* is in the finest state of subdivision, and is often preferred in making ointments. Sulphur is often used in *rheumatism* in the form of mineral waters containing H_2S, which have attained considerable reputation; also in the treatment of syphilis and gout. There is no doubt about the efficiency of sulphur in the form of an ointment when used as a *stimulating* application in chronic skin diseases. The ointment forms one of the best remedies in the treatment of *itch,* killing the acarus. Sulphur is one of the ingredients of *compound licorice powder.* Washed sulpur (sulphur lotum) is a mild laxative. It slightly increases the secretions, producing stools which are *soft* and very *offensive* from sulphuretted hydrogen gas (H_2S). It is valuable in painful anal diseases, as *fissures, hemorrhoids,* etc., to relieve the pain attendant upon defæcation.

Oleum Ricini, *U. S.* (castor oil): A fixed oil expressed from the *seed* of *Ricinus communis* (nat. ord. Euphorbiaceæ), a tree of the East Indies, but cultivated as an annual plant in other latitudes. It is also obtained by decoction and by solution in alcohol, but the expressed oil is the best. It is a familiar light-yellow liquid of nauseating taste. It contains *palmitic* and *ricinoleic acids;* the latter peculiar to itself and constitutes the drastic element.

Castor oil acts in from four to six hours. It *stimulates peristalsis*, excites very slightly the glandular secretions, and is *not a cholagogue*. It has an *astringent after-effect*. It is used when a thorough evacuation, as of scybalous masses, is desired, and also in *diarrhœas* due to the ingestion of some irritating substance, and in *dysentery*. For these latter purposes it is combined with or followed by opium or some astringent. It is especially useful in *infantile diarrhœas*.

It is *not* a good remedy in chronic constipation, because of its constipating after-effect.

Castor oil is usually given alone, and is very nauseating to most persons; this effect is probably produced by the viscid oil adhering to the papillæ of the tongue. This can be overcome by preceding the oil with a drink of water or, better still, to serve it between two liquids: the pharmacist draws a small quantity of syrup of sarsaparilla into a glass, the castor oil is then added and the whole covered with a little soda water carefully drawn. In this manner the nauseating effect is entirely overcome. The oil may also be given in emulsion with similar freedom from taste. The seeds themselves contain a principle that is *decidedly poisonous*.

MAGNESIA, *U. S.* (Magnesia; Light Magnesia), $MgO = 40.26$.

MAGNESIA PONDEROSA, *U. S.* (Heavy Magnesia), $MgO = 40.26$.

MAGNESII CARBONAS, *U. S.* (Magnesium Carbonate), *approximately* $(MgCO_3)_4,Mg(OH)_2 + 5H_2O = 484.62$.

These preparations are all white powders, nearly insoluble in water, and may be classed with salines, though their action is much milder. They are *mild laxatives* and *antacids*. *Mag-*

nesia is said not to be laxative except when combined with acids forming soluble salts, so that when this effect is desired it should be followed by an acid, as citric acid or lemonade.

Magnesia Ponderosa (or heavy magnesia), the dose of which is the same as magnesia, ʒss–ij, has the same effects.

Magnesium Carbonate is more sedative to the stomach from evolution of CO_2 gas. Although laxative, the main use of these magnesia preparations is as antacids, and their chief indication is found when gastric acidity exists with constipation.

Pulvis Glycyrrhizæ Compositus contains senna 18, washed sulphur 8 parts, with licorice, oil of fennel, and sugar to 100 parts. The senna and sulphur are its active principles, while fennel acts as a mild antispasmodic. It is a deservedly popular laxative, but may cause griping. Dose ʒj–iv.

Cassia Fistula is the *fruit* of *Cassia Fistula* (nat. ord. Leguminosæ). This is an East Indian tree, which is naturalized in tropical America and Africa. Cassia fistula is chiefly used as an ingredient of confectio sennæ.

Oleum Olivæ, Oleum Amygdalæ Expressum, and **Oleum Lini** are laxatives, but are chiefly used in laxative enemata. The last may be used by mouth.

RHAMNUS PURSHIANA, *U. S.* **(Cascara Sagrada; California Buckthorn).**

Cascara sagrada is the *bark* of *Rhamnus Purshiana* (nat. ord. Rhamnaceæ). Habitat: Rocky Mountains and westward to the Pacific.

Extractum Rhamni Purshianæ Fluidum, dose ♏x–fʒj.

Cascara sagrada contains a crystallizable principle, probably a glucoside, a resin, and the usual constituents of plants.

Physiological action and therapeutics: Cascara is a particularly good stimulant of peristaltic action, especially that of the lower bowel. It also exerts a tonic effect on unstriped muscle. Hence it has become a standard remedy in chronic

constipation. Of the *fluid extract* ♏x–f℥ss may be given two or three times daily, beginning with the smaller dose and giving just enough to produce a free morning evacuation. It rarely produces griping, and may then be combined with belladonna or hyoscyamus to prevent this.

FRANGULA, *U. S.* (**Frangula**; **Alder Buckthorn**).

Frangula is the *bark* of *Rhamnus Frangula* (nat. ord. Rhamnaceæ), collected at least one year before being used. Habitat: Europe and Northern Asia. Frangula contains the glucoside *frangulin* and *emodin* (the latter also present in rhubarb). When green it has an emetic tendency. When dry it is cathartic and diuretic, and is also an anthelmintic of value; dose of *fluid extract* f℥ss–j.

SALINES.

Salines increase both secretions and peristalsis, producing loose, watery stools, with very slight irritation and without systemic depression. They act rather quickly, especially if taken on rising. Their purgative action is due *slightly to increased peristalsis*, but chiefly to *increased secretion* and to a *free outward* osmosis of the body fluids, which is not a true secretion of the glandular apparatus. The salines are *hydragogue* cathartics.

Magnesii Sulphas, *U. S.* (Sulphate of Magnesium or Sal Epsom), is a white, slowly efflorescent salt, very soluble in water, and having a nauseating, bitter taste, although usually well tolerated by the stomach; dose ℥ij–℥j.

Liquor Magnesii Citratis, *U. S.*, the dose of which is f℥vj–xij, and **Magnesii Citras Effervescens**, *U. S.*, in doses of ℥j–℥ss, are also much used. The former is effervescent from the reaction of citric acid and potassium bicarbonate, and is a pleasant and mild cathartic. The latter is a coarsely granular powder, deliquescent on exposure to the air, and soluble, with free effervescence, in water. It should be kept in closely corked bottles.

Potassii et Sodii Tartras (sal Rochelle) occurs as slightly efflorescent crystals, of mildly saline and bitter taste, and freely soluble in water; dose ʒss–j. It is frequently prescribed in the Pulvis Effervescens Compositus, or Seidlitz powder, which consists of Rochelle salt ʒij and sodium bicarbonate gr. xl in the *blue*, and tartaric acid gr. xxxv in the *white* paper, to be dissolved in water and taken while effervescing.

Sodii Phosphas, *U. S.* Sodium phosphate occurs in large, efflorescent crystals, which are readily soluble in water. Phosphate of sodium is a mild hydragogue cathartic with a special *cholagogue* action. It is a good saline laxative in *chronic constipation*, especially if this be attended by *hepatic torpor*. It is also a valuable nutrient alterative in the *diarrhœas* of bottle-fed children. Dose gr. x–ʒss.

Therapeutics: In *ascites*, *renal* and *cardiac dropsies* salines are very valuable by producing watery transudation from the intestines and lessening the work of the kidneys. They are especially efficacious in ascites if pressure be not too great; in uræmia, œdema of the brain, and cerebral hyperæmia, as depletants. In dysentery Epsom salt and Rochelle salt are much used. They lessen the hyperæmia of the mucous membrane and cause fæcal evacuations, with decrease of pain and distressing tenesmus. After abdominal operations, when the temperature is rising, they assist in the removal of deleterious matter, and do good by depletion, and are now commonly employed by most laparotomists. In anæmia with constipation they are advantageously combined with iron.

In *lead-constipation*, *lead-colic*, and *saturnine cachexia* magnesium sulphate is very valuable to prevent *reabsorption* of the lead from the bile, in which it is largely excreted. It accomplishes this by forming the insoluble lead sulphate, $PbSO_4$.

In *carbolic poisoning* magnesium and other soluble sulphates form insoluble sulphocarbolates and prevent absorption.

Other unimportant members of this group and their doses are—

Sodii Sulphas, sodium sulphate, or Glauber's salt, an ingre-

dient in many mineral waters, ℥ss or less. It is harsher in its action and offers no advantage over magnesium sulphate. It is largely used in veterinary practice.

Potassii Sulphas (Sulphate of Potassium), dose ʒss–ij.

Potassii Bitartras (or Cream of Tartar), a good diuretic, but weak laxative; dose ℥ss–j.

Few of these salines are now used as laxatives.

PURGATIVES.

Purgatives probably act by increasing both secretions and peristalsis, and are more vigorous in action than the laxatives; but this action is not sufficiently violent to produce actual inflammatory change in large dose.

RHEUM (Rhubarb).

Rhubarb is the *root* of *Rheum officinale* (nat. ord. Polygonaceæ). Habitat: Western and Central China. Its composition is not yet fully determined. It contains four resins—erythroretin, phæoretin, aporetin, and emodin—all of them cathartic; also chrysophan, chrysophanic, rheumic, and rheotannic acids, to the last of which is due its astringent after-effect. It owes its yellow color to chrysophan and chrysophanic acid, which occasionally tint the urine yellow.

Preparations: Rheum, powdered, dose gr. v–xx.

Pilulæ Rhei, each = gr. iij, with gr. j soap.

Extractum Rhei, dose gr. v–x.

Extractum Rhei Fluidum, ♏v–xxx.

Pilulæ Rhei Compositæ, containing in each rhubarb gr. ij, purified aloes gr. jss, myrrh gr. j, and oil of peppermint gr. $\frac{1}{10}$; No. j–iij.

Pulvis Rhei Compositus (Gregory's powder), dose ʒss–j.

Tinctura Rhei, 10%, dose f℥j–ij.

Tinctura Rhei Aromatica (rhubarb 20%, with cinnamon, cloves, and nutmeg), dose f℥ss–j.

Tinctura Rhei Dulcis (rhubarb 10%, with licorice, anise, and cardamom), dose f℥ij–iv.

Syrupus Rhei, dose f℥ss–j.

Syrupus Rhei Aromaticus dose gtt. x–f℥iv. An excellent laxative in the summer diarrhœas of children.

Mistura Rhei et Sodæ (contains ext. rhei fl., ext. ipecac. fld., sodii bicarb, and spt. menth. pip.), dose f℥ss–ij.

Physiological action: In small doses rhubarb is a *tonic astringent* and *stomachic;* in sufficient amount (gr. iv–vj) a *slow* and *mild cathartic,* only occasionally causing griping. Its mode of action is not perfectly understood, but it is probably cholagogue.

Therapeutics: In *intestinal dyspepsia* due to deficiency of the intestinal and hepatic secretions small doses do good; in *jaundice* from *catarrh of the duodenum* or *bile-ducts,* especially when occurring in children; in *summer diarrhœa* it has a secondary astringent effect, and nothing is more often used than the aromatic syrup or one of the tinctures. It is apt to impart a yellow color to the milk of nursing women and to the urine.

SENNA.

Senna is the *leaflets* of *Cassia acutifolia* (Alexandria Senna), and of *Cassia angustifolia* (India Senna) (nat. ord. Leguminosæ). Habitat: shrubs of Egypt and Arabia. The activity of senna resides in a glucoside, *cathartic acid:* it probably also contains *chrysophanic acid* and chrysophan, with other substances not well understood.

Preparations: Confectio Sennæ contains senna 10%, with tamarind, cassia fistula, prunes, fig, oil of coriander, sugar, etc.; dose ℥j–ij.

Extractum Sennæ Fluidum, dose f℥j–iv.

Infusum Sennæ Compositum ("black draught") contains senna 6%, manna and mag. sulph. *āā* 12%; dose f℥iv.

Syrupus Sennæ, dose f℥j–iv.

Pulvis Glycyrrhizæ Compositus (for which see *Laxatives*), dose ℥ss–ij.

Physiological action and therapeutics: Senna is a *prompt* and efficient cathartic, acting in about *four hours* to produce copious liquid stools, without any irritation. It is probably slightly cholagogue, and increases the secretion of the whole intestinal canal. It has a slight tendency to produce griping,

and aromatics are advantageously combined with it. Its uses are those of the class to which it belongs.

ALOE (Aloes).

Aloe Barbadensis, *U. S.*, Barbadoes Aloes. The inspissated juice of the *leaves* of *Aloe vera* (nat. ord. Liliaceæ).

Aloe Socotrina, *U. S.*, Socotrine Aloes. The inspissated juice of the *leaves* of *Aloe Perryi* (nat. ord. Liliaceæ). Three varieties are known to commerce: Cape, Socotrine, and Barbadoes aloes. The drug contains as its active principle a neutral substance, *aloin* (dose gr. ¼–ij), which may vary slightly in different varieties of aloes; also a resin, which is not purgative when pure.

Preparations:

Aloe, } dose gr. ij–xv.
Aloe Purificata, }

Extractum Aloës, dose gr. j–v.

Pilulæ Aloës, each = gr. ij each of purified aloes and soap.

Pilulæ Aloës et Asafœtidæ: one pill contains gr. 1⅓ of each and soap.

Pilulæ Aloës et Ferri, aloes and dried sulphate of iron, of each gr. j, with aromatic powder; used in amenorrhœa.

Pilulæ Aloës et Mastiches (Lady Webster's dinner pill), aloes gr. ij, mastic and red rose *āā* gr. ½ in each pill.

Pilulæ Aloës et Myrrhæ, aloes gr. ij, myrrh gr. j, and aromatic powder gr. ½ in each pill.

Tinctura Aloës, 10%, dose f℥ss–ij. }
Tinctura Aloës et Myrrhæ, 10% of purified aloes, myrrh, and licorice root, dose f℥j–ij. } seldom used.

Physiological action and therapeutics: Aloes is a *very slow cathartic* (ten to twelve hours), *acting mostly on the peristalsis of the large intestine*, but in large doses increasing the secretions of the liver and mucous membranes. It is said to cause congestion of the pelvic viscera. Aloes is contra-indicated in pelvic or rectal inflammation, and must be carefully used in pregnancy. Aloin is a favorite in intestinal dyspepsia with torpidity of the liver and of the muscular coat of the intestinal wall. It may prove an emmenagogue. It is fre-

quently combined with belladonna (or atropine) and strychnine (in the so-called A. B. and S. pill).

Juglans, *U. S.*, Juglans (Butternut). The inner *bark* of *Juglans cinerea* (nat. ord. Juglandaceæ), collected in autumn. Habitat: North America. The bark contains *nucin*. It is tonic and cathartic. *Dose*, of the official extract, gr. x.

Leptandra, *U. S.*, Leptandra, Culver's Root. The *rhizome* and *roots* of *Veronica virginica* (nat. ord. Scrophularineæ). Leptandra contains *leptandrin*, a crystalline principle, and is cathartic, cholagogue, and alterative. Dose gr. x–ʒss. The *fluid* extract (♏xx) and the *extract* (gr. x) are official.

DRASTIC PURGATIVES.

Drastics, or hydragogues, act very powerfully both upon the secretions and peristalsis, the more powerful and active producing in large doses severe gastro-enteritis and poisoning. They are all *hydragogue* cathartics.

JALAPA, *U. S.* (Jalap).

Jalap is the *tuberous root* of *Ipomœa Jalapa* (nat. ord. Convolvulaceæ). Its activity resides in a *resin* which is official, and consists of two portions, both cathartic, the one soluble in ether, the other insoluble. The latter is a glucoside known as *convolvulin*, and is probably the more active.

Preparations: Jalapa, powdered, dose gr. xv–ʒss.

Extractum Jalapæ, dose gr. x–xx.

Pulvis Jalapæ Compositus (about one-third jalap, two-thirds potassium bitartrate), used as cathartic and diuretic; dose ʒss–j.

Resina Jalapæ (see above), dose gr. ij–v.

Pilulæ Catharticæ Compositæ (see *Colocynth*).

Physiological effects and therapeutics: Jalap is a powerful hydragogue cathartic, acting very promptly. It is an hepatic stimulant, markedly increases the secretions of the intestinal glands, producing large watery stools, and may cause griping. It is much used in *ascites*, *general dropsy*, and *threatened*

uræmia, the compound jalap powder being a favorite prescription.

PODOPHYLLUM, *U. S.* (Podophyllum; Mandrake; Mayapple).

Podophyllum is the *rhizome* and *roots* of *Podophyllum peltatum* (nat. ord. Berberideæ). Habitat: North America. The official *resin* is an alcoholic extract of the root, and contains, besides *berberine*, podophyllotoxin, picropodophyllin, and podophyllinic acid. Resina podophylli contains all the active principles.

Preparations: Pulvis Podophylli, dose gr. xv–xx.

Extractum Podophylli, dose gr. i–ij.

Extractum Podophylli Fluidum, dose ♏v–xv.

Resina Podophylli (note the dose), dose gr. $\frac{1}{8}$–$\frac{1}{4}$.

Physiological action and therapeutics: Mandrake is a *powerful hydragogue cathartic*, but *slow* in its action; also an *hepatic stimulant*, and has a tendency to act upon the *upper intestinal tract*. Hence it is useful in intestinal indigestion and constipation dependent on deficient hepatic secretion and torpidity of the intestinal wall, in portal congestion, jaundice, and ascites. Death has been caused by the ingestion of a large amount.

CHELIDONIUM, *U. S.* (Chelidonium; Celandine).

Chelidonium is the entire plant, *Chelidonium majus* (nat. ord. Papaveraceæ). Habitat: Europe; naturalized in North America. It contains two alkaloids, chelerythrine and chelidonine, with chelidoxanthin and chelidonic acid. Dose f℥ss. It has no official preparations and is of no therapeutic importance. It is a hydragogue cathartic, and is said to be narcotic and diuretic.

IRIS, *U. S.* (Iris; Blue Flag).

Iris is the *rhizome* and *roots* of *Iris versicolor* (nat. ord. Irideæ). Habitat: North America. It contains a bitter resin, to which is probably due its activity. Iris stimulates the hepatic secretion and that of the intestinal glands, and in large doses causes violent vomiting and purging, with depres-

sion. It is used in (1) jaundice, especially of malarial origin; (2) functional disturbance of the liver (torpidity so called); (3) intestinal dyspepsia; and (4) dropsy. The following preparations are official:

Pulvis Iridis, dose gr. v–xv.

Extractum Iridis, dose gr. i–ij.

Extractum Iridis Fluidum, dose ♏iij–x.

EUONYMUS, *U. S.* (Euonymus).

Euonymus is the bark of the *root* of *Euonymus atropurpureus* (nat. ord. Celastrineæ). Habitat: United States. It contains a bitter principle, *euonymin*, a resin, etc. It produces a powerful stimulation of the hepatic secretion, and to a less extent of the intestinal, and may be, but seldom is, used for this purpose. It acts very slowly. An extract is official, the dose of which is gr. i–ij. Euonymin, dose gr. i–ij.

SCAMMONIUM, *U. S.* (Scammony).

Scammony is a resinous exudation from the living *root* of *Convolvulus scammonia* (nat. ord. Convolvulaceæ). Habitat: Western Asia. A resin called *scammonin* constitutes 80 to 90% of its weight, and is colorless, tasteless, and soluble in alcohol and ether. It is a powerful hydragogue cathartic, and seldom used alone. Of the drug the dose is gr. v–x; of its *resin*, which is official as resina scammoniæ, gr. iij–vj. It is most used in the compound extract of colocynth, of which this resin constitutes 14%.

COLOCYNTHIS, *U. S.* (Colocynth; Bitter Cucumber; Bitter Apple).

Colocynthis is the *fruit* of *Citrullus colocynthis* (nat. ord. Cucurbitaceæ), deprived of its rind. Habitat: Southern and Western Asia; Northern Africa. The fruit of this vine is a round gourd; the seeds should be rejected. It yields its active principle to water and alcohol, and contains a *resin*, colocynthin, a glucoside, and colocynthitin.

Preparations: Extractum Colocynthidis, dose gr. ij–v.

Extractum Colocynthidis Compositum (contains of the extract 16, purified aloes 50, resin of scammony 14 parts, with cardamom and soap to 100 parts), dose gr. j–xv.

Pilulæ Catharticæ Compositæ, a pill in very common use; contains of the above compound extract gr. $1\frac{1}{3}$, abstract of jalap and calomel āā, gr. j, and gamboge gr. $\frac{1}{4}$.

Physiological action and therapeutics: Even in very moderate doses this drug is a gastro-intestinal irritant, a powerful cholagogue, and a hydragogue. Owing to its liability to cause inflammation, it is used only in combinations, chiefly as the compound extract, which is a safe and efficient purgative. A number of cases of *fatal poisoning* are recorded from hypercatharsis produced by this drug.

CAMBOGIA, *U. S.* (Gamboge).

Gamboge is a *gum-resin* obtained from *Garcinia Hanburii* (nat. ord. Guttiferæ). Habitat: India. It is composed of about 75% of resin, gambogic acid, and about 20% of gum, is official only in the compound cathartic pill, of which it constitutes 10%, and is a gastro-intestinal irritant and hydragogue cathartic, but not a hepatic stimulant; dose gr. ij–v.

ELATERINUM, *U. S.* (Elaterin).

Elaterin is a neutral principle obtained from Elaterium, a substance deposited by the *juice of the fruit of Ecballium Elaterium* (nat. ord. Cucurbitaceæ). Habitat: Western Asia and Southern Europe; cultivated. *Ecballium elaterium* is the squirting cucumber.

Elaterin occurs in colorless, odorless, bitter crystals, insoluble in water and readily soluble in alcohol. It is a very violent hydragogue, powerfully irritant, and may cause death. It is also slightly diuretic. It is used in uræmia and as a revulsive in cerebral affections, also in general dropsy and ascites, but is unsafe. It is best given in combination. Dose of elaterin gr. $\frac{1}{20}$–$\frac{1}{12}$; of Trituratio Elaterini, which was the only official trituration in the U. S. P. of 1890, the dose is gr. $\frac{1}{4}$–j.

OLEUM TIGLII, *U. S.* (Croton Oil).

Croton oil is a fixed oil expressed from the *seed* of *Croton Tiglium* (nat. ord. Euphorbiaceæ). Habitat: India and Philippine Islands; cultivated. The purgative principle has not been isolated. A principle called *crotonoleic acid* is said to produce the irritant and drastic effects. It is a viscid, reddish-brown liquid, with a slight peculiar odor and bitter, acrid taste. It is soluble in ether and slightly so in alcohol.

Physiological action and toxicology: In doses of gtt. j–iij it is a very powerful hydragogue cathartic, acting slightly also as a diuretic. Larger doses, unless vomited, may cause fatal gastro-enteritis. It is unreliable, however, and at times large doses may not affect the bowels. It is the quickest of cathartics, often taking effect in from one-half to two hours. *Locally* applied, it causes a vesicular and pustular eruption somewhat resembling that of smallpox.

Therapeutics: Croton oil is extremely valuable as a revulsive cathartic in cerebral and uræmic conditions when swallowing is difficult or impossible (gtt. j–iij dropped on the tongue or taken in bread-crumb), and may be useful in very obstinate constipation and in severe dropsies if the general condition be good. A number of fatal cases of *poisoning* have been recorded.

MERCURIAL CATHARTICS.

Preparations: Hydrargyri Chloridum Mite (calomel), dose gr. $\frac{1}{10}$–xx.

Massa Hydrargyri (blue mass), dose gr. $\frac{1}{10}$–xx.

The **purgative action** of these mercurials is characteristically *slow*, ten to twelve hours elapsing before catharsis is produced. They are also *uncertain* in their action, and are often used in combination with or followed by other cathartics, generally salines. They act by *increasing the flow of bile into the intestine*, and probably by increasing the secretions of the mucous membrane and pancreas. Whether an actual increase in *bile-production* occurs is doubtful, their probable effect being to cause the gall-bladder to empty itself. Frequently repeated small doses (gr. $\frac{1}{10}$–$\frac{1}{4}$) are given when

exhibited with the view of acting on the liver. *Blue mass* resembles calomel in its action; but is weaker and more uncertain, and is seldom used as a cathartic.

Therapeutics: Calomel is used as a purgative when there is a deficiency of bile in the intestine; the indication is found when the stools are *clay-colored*. In small repeated doses (gr. $\frac{1}{10}$—$\frac{1}{2}$) it will often check obstinate vomiting. In other cases it causes vomiting. Calomel colors the stools *green*. It was formerly frequently employed as an *antiphlogistic*. It has mild *diuretic* and *anthelmintic* properties.

ANTHELMINTICS.

Anthelmintics are remedies which promote the expulsion of worms from the intestinal tract; *vermifuges* expel parasites; *vermicides* kill as well as expel them. They act in one of three ways: (1) mechanically; (2) by some intoxicating influence; (3) by an actual poisonous effect.

The **general precautions** to be observed in the case of treatment for any form of worm consist in the thorough evacuation of the gastro-intestinal tract. A light supper is given on the evening previous to the administration of the anthelmintic; the latter is preferably given in the morning before breakfast. A liquid diet is preferable, so as to empty the intestinal tract, and in obstinate cases it may be necessary to withhold all food for a short time. If no cathartic is given with the drug, the latter should be reinforced by a brisk purgative three or four hours after its administration. In all cases it is necessary to remember that poisonous symptoms may be produced by almost all of the anthelmintics.

The **parasites** which we are ordinarily called upon to treat are—(1) *Ascaris* or *Oxyuris vermicularis*, the so-called "seat-worm," which inhabits the large intestine, especially the rectum, and in females may inhabit the vagina; (2) *Ascaris lumbricoides*, or "round worm," which exists in all parts of the alimentary tract; and (3), most important of all, *Tæniæ*, of which three varieties are known—*Tænia solium*, *Tænia mediocanellata*, and *Tænia bothriocephalus latus*. The first two are by far the most common in this country.

Treatment for oxyuris: For the expulsion of this parasite *enemata* of the following are available and efficacious; (1) infusions of quassia; (2) decoction of aloes; (3) weak solutions of carbolic acid; (4) plain water or salt and water frequently repeated. As a safeguard against autoinfection by mouth from the fingers strict cleanliness of the hands must be enforced.

For the **Ascaris lumbricoides** the following remedies are employed:

SANTONICA, *U. S.* (Santonica; Levant Wormseed).

Santonica is the unexpanded *flower-heads* of *Artemisia pauciflora* (nat. ord. Compositæ). Habitat: Persia and Asia Minor. Among other elements it contains a neutral principle, crystalline, colorless, odorless, and *practically insoluble in water*, called *santonin*, which represents the virtues of the drug.

Preparations: Pulvis Santonicæ, dose gr. x–ʒss.

Santoninum, *U. S.*, dose gr. ij–iv; for child two years old, gr. $\frac{1}{4}$–$\frac{1}{2}$.

Sodium Santoninate is freely soluble, and is not safe to employ as a vermifuge.

Physiological action and therapeutics: In ordinary medicinal doses santonin produces no obvious effect. Large doses may cause *gastro-enteric irritation* and *chromatopsia*. Objects in the visual field are generally colored yellow, but occasionally green, blue, or even red. The urine is colored yellow. Toxic doses cause severe cerebral symptoms, but such toxic effects are rare. The only use of santonica and its principle, santonin, is for the expulsion of round worm. Santonin is probably a *vermicide*. For this purpose it should be given on an empty stomach and followed by a brisk cathartic. Quite a number of fatal accidents following the ingestion of from one to six grains of santonin are recorded. One of the early symptoms of poisoning seems to be a peculiar pallor, with a blue color about the eyes.

SPIGELIA, *U. S.* (Spigelia; Pink Root, or Carolina Pink).

Spigelia is the *rhizome* and *roots* of *Spigelia marilandica* (nat. ord. Loganiaceæ). Habitat: United States. Spigelia contains a bitter principle, a resin, and a volatile oil. The dose of the powdered root is ʒj–ij. An *extract* is official in doses of fʒj–ij.

Physiological action and therapeutics: The effects of this drug in poisonous dose are dilatation of the pupils, cardiac depression, delirium. Two cases have ended in death. By some it is considered the best remedy for the round worm. The method of administration is similar as for santonin. Frequently the Fluid Extract of Senna and Spigelia (U. S. P., 1870) is selected, which combines a laxative action with that of an anthelmintic. It is no longer official. Spigelia seems to stupefy the worm and must be aided by a cathartic.

Chenopodium, *U. S.:* The *fruit* of *Chenopodium ambrosioides*, and variety anthelminticum (nat. ord. Chenopodiaceæ). Habitat: United States. It is a very efficient anthelmintic. Oleum chenopodii is the only preparation used; dose gtt. v–xv; for a child of two years, gtt. iv–viij.

Azedarach: This drug is the *bark* of the *root* of *Melia azedarach* (nat. ord. Meliaceæ), or bead tree, of Syria, Persia, and India. It is said somewhat to resemble spigelia. Repeated doses (fʒss–j) of a *decoction* over a period of some days are claimed to be effectual.

Treatment to expel tæniæ: In the treatment of tæniæ the preliminary measures are as important as the drugs themselves. The patient should fast for from twenty-four to forty-eight hours, and a thorough purgative should be taken. Then the drug selected should be administered, followed in a few hours by another brisk cathartic. No case is to be considered cured until the head is discovered by a careful examination.

The **following drugs are used to expel tæniæ:**

ASPIDIUM, *U. S.* (Aspidium; Male Fern).

Aspidium is the *rhizome* of *Dryopteris Filix-mas* and of *Dryopteris marginalis* (nat. ord. Filicis). Habitat: *D. Filix-mas*—Canada, Rocky Mountains, Northern Asia, Europe; *D. marginalis*—United States. Its activity is supposed to depend on *filicic acid*, which can be extracted with ether. The other constituents are unimportant. Used with the preliminaries mentioned above, it is an efficient remedy against all tæniæ. Dose of the oleoresin, which is the most efficient preparation, f℥ss–ij.

GRANATUM, *U. S.* (Pomegranate).

Granatum is the *bark* of the *stem* and *root* of *Punica Granatum* (nat. ord. Lythrarieæ). Habitat: India and Southwestern Asia; cultivated. Its active principle is *pelletierine*, or pelleterine, which is also used, and is of equal efficiency; it also contains three other alkaloids—iso-, methyl-, and pseudo-pelletierine. Pomegranate causes some intestinal disturbance and generally purges, failing in which it should be followed by a brisk cathartic. It is a very certain tæniafuge, and is generally administered in the form of a decoction of the fresh root (f℥ij–Oj). Of pelletierine the dose is gr. iij–v; in larger doses its effects are said somewhat to resemble curare (motor-nerve depressant).

KAMALA, *U. S.* (Kamala).

Kamala is the *glands* and *hairs* from the *capsules* of *Mallotus philippinensis* (nat. ord. Euphorbiaceæ), a small tree of Asia and Australia. Kamala contains *rottlerin*, and is made up of resins to the extent of 75%. It imparts its virtues to alcohol, and, having no official preparations, may be used as a tincture. It is fairly efficient. The dose of the powder is ℥j–ij.

CUSSO, *U. S.* (Kousso: Brayera).

Cusso is the *female inflorescence* of *Hagenia abyssinica* (nat. ord. Rosaceæ.) Habitat: India, China, Philippine Islands, Australia. Cusso contains kosin, a bitter resinous principle. Its efficiency as a tæniafuge is established; the

worm is usually killed. It produces no poisonous symptoms in large doses. Dose of the powder ʒss; of the official *fluid extract*, fʒss–jss; of a 6% infusion (not official), fʒviij.

PEPO, *U. S.* (Pumpkin Seed).

Pepo is the *seed* of *Cucurbita Pepo* (nat. ord. Cucurbitaceæ). Habitat: Tropical Asia and America; cultivated. It is one of the most efficient tæniafuges, and possesses the advantage of being perfectly harmless. It is given in ʒij–iv doses of the seeds pounded in a mortar with some excipient so as to form a paste; or made into an infusion. With proper preliminary precautions failure seldom attends its use.

Other remedies used as **tæniafuges**:

Oleum Terebinthinæ, *U. S.*, in doses of fʒss, may be used and is effective, but has the disadvantage of sometimes causing symptoms of genito-urinary irritation.

Cocoanut: The milk and meat of two cocoanuts, taken raw after the usual preparations (see above), have proved efficient, perhaps from their mechanical effects.

Ailanthus, a non-official drug, the oleoresin or a decoction of the fresh bark of which may be employed.

EMETICS.

Emetics are medicines employed to produce vomiting (emesis). They may be either *local* or *general*.

Local or *reflex emetics* are drugs which by locally irritating the gastric filaments of the vagus institute an impression which is transmitted to the vomiting-centre in the medulla, and thus establish *reflex vomiting*. *Systemic* or *general* emetics act *directly* upon the vomiting-centre in the medulla after absorption into the blood.

The activity of emetics is increased when fever or gastritis exists; decreased, often decidedly, in cerebral disease or narcotic poisoning.

Indications and contraindications for emetics: Emetics are used to empty the stomach of deleterious substances, as poisons, etc.; to expel substances forcibly from the pharynx

and œsophagus (foreign bodies, false membrane); to relax spasm, as in laryngismus stridulus and in certain hysterical conditions; as nauseants to increase secretions; to produce revulsion, or shock (as in hysteria and insanity). They are contraindicated in pregnancy, hernia, congestion of the brain, acute inflammation of the stomach, and cerebral endarteritis.

LOCAL EMETICS.

These comprise certain metallic salts, chiefly sulphates, and certain vegetable drugs.

Cupri Sulphas (copper sulphate, *blue stone*, or *blue vitriol*), gr. v, repeated if necessary in fifteen minutes, is a prompt emetic, and produces only slight depression; it is especially valuable in *narcotic* and *phosphorus*-poisonings, in the latter of which it is antidotal as well as emetic.

Zinci Sulphas (zinc sulphate, or *white vitriol*) corresponds in action to copper sulphate in doses of gr. x–xxx, and is considered by some safer and more prompt; it is not antidotal to phosphorus. The dose may be repeated.

Alumen (alum, sulphate of aluminum and potassium), ʒj in syrup, acts as a safe but slow emetic (one-half to three-quarters of an hour). It has been recommended in croup.

Hydrargyri Subsulphas Flavus (turpeth mineral), dose gr. ij–v; it is tasteless, and produces emesis with very little nausea and only moderate depression; used in croup, and quite slow in its action.

Sinapis Alba, or **Sinapis Nigra** (white or black mustard in the form of *mustard flour*), ʒj–ij in water, causes emesis without prostration. Indeed, it is a cardiac and respiratory stimulant. Its chief advantage, however, lies in the fact that it is so generally available. It is very efficient, but sometimes even violent in its action.

Syrupus Scillæ Compositus, containing tartar emetic (gr. j to f℥j), senega, and squill, is much used as a nauseant and emetic in doses of ♏x–ʒss; known also as hive syrup. It must be very carefully used.

Mechanical measures: Mechanical irritation of the pharynx with a feather or a finger, unless its sensibility be too much

obtunded, will produce vomiting. Tepid water in large draughts may often prove valuable when other means are not at hand.

SYSTEMIC EMETICS.

IPECACUANHA, *U. S.* (Ipecac).

Ipecac is the *root* of *Cephaëlis Ipecacuanha* (nat. ord. Rubiaceæ). This is a small shrub of Brazil. Ipecac contains an alkaloid, *emetine*, as its active principle, in combination with *ipecacuanhic acid*.

Preparations: Pulvis Ipecacuanhæ, dose gr. $\frac{1}{4}$–ʒss.

Extractum Ipecacuanhæ Fluidum, dose ♏ $\frac{1}{4}$–fʒss.

Pulvis Ipecacuanhæ et Opii (Dover's powder) (see *Opium*).

Trochisci Ipecacuanhæ; seldom used; each = gr. $\frac{1}{3}$.

Trochisci Ipecacuanhæ et Morphinæ; each = gr. $\frac{1}{12}$, with morphine sulphate gr. $\frac{1}{40}$.

Tinctura Ipecacuanhæ et Opii (see *Opium*).

Syrupus Ipecacuanhæ, 7% of fluid extract; dose ♏ x–fʒss.

Vinum Ipecacuanhæ, 10% of fluid extract; dose ♏ x–fʒiij.

Physiological action: Ipecac may well be considered in its entirety in this connection, although it has other uses and actions than as an emetic. *Locally*, it is an irritant to the skin and mucous membranes. In *small doses* it is a stomachic tonic. *Larger doses* increase the secretions of the salivary glands, bronchi, stomach, skin, and liver, the bile being unaltered in its composition. The circulation is but little affected, but the respiration is slightly depressed and the surface temperature is lowered. It acts as a mixed emetic, both influencing the medulla and irritating the terminal filaments of the vagus. For this purpose the dose varies (gr. iv to xxx), but it is preferably given in doses of gr. xxx until emesis is produced. It is very mild and certain in its emetic action.

Therapeutics: Ipecac is used as an emetic, stomachic, tonic, anti-emetic, and blennorrhetic expectorant. As an *emetic* it is used in gastric irritation caused by undigested food; in sick headaches and acute indigestion, which may often be aborted;

in membranous croup, laryngismus stridulus, lodgement of foreign bodies, etc., for its mechanical effect.

As a stomachic tonic it is a favorite in doses of gr. $\frac{1}{10}$–$\frac{1}{6}$ in combination with other drugs. In the same dosage it is also valuable to check vomiting, the cases in which it succeeds being of nervous origin, as the vomiting of pregnancy, seasickness, sick headache, etc. As an expectorant in hay fever and in the acute stages of coryza and bronchitis it does good by increasing the secretions. Empirically, ipecac has been found valuable in *acute dysentery;* large doses (gr. x–xx), combined with opium so that it may be retained, ameliorate the tenesmus and abdominal pain and give the patient great relief, and have seemed to decrease the mortality of epidemics. It is also employed in *chronic dysentery* and *diarrhœal diseases.* If no good effect be produced after a trial of two or three days, it is best abandoned. Carried to the point of producing nausea, it seems to have antihemorrhagic powers, and is especially recommended in *uterine hemorrhage* and *hæmoptysis.*

Incompatibles: The *tannate of emetine* is extremely insoluble; hence tannic acid and drugs containing it should not be combined with ipecac. Lead and mercury salts and vegetable acids are also incompatible. It is assisted in its action by all emetics and nauseants.

APOMORPHINÆ HYDROCHLORAS, *U. S.* (**Apomorphine Hydrochlorate**), $C_{17}H_{17}NO_2HCl = 302.79$.

Apomorphine is morphine from which one molecule of water has been taken by heating morphine and hydrochloric acid under pressure. It occurs as a white powder, readily absorbing moisture from the air and becoming green in the process. *Apomorphinæ hydrochloras* is easily soluble in water, and is slowly decomposed by boiling water.

Physiological action and therapeutics: This salt is our best example of a *purely systemic emetic,* acting equally well by stomach or hypodermic exhibition, and acting promptly (generally in from five to twenty minutes), with frequent repetition of the vomiting, which occurs with but little nausea. It

depresses the circulation and respiration, and in fatal doses causes death by respiratory paralysis. Neither the circulation nor the respiration is appreciably affected by medicinal doses. After large doses convulsions followed by paralysis may ensue. The emesis is *entirely centric*. Its only use is as an emetic (gr. $\frac{1}{8}$ by mouth, gr. $\frac{1}{15}$ by hypodermic injection), and it may be used when sudden emetic action is desired or when swallowing is difficult or impossible, but it does not succeed well in profound narcosis. Gr. $\frac{1}{15}$ has caused death in the adult. In very small doses apomorphine is a valuable relaxing *expectorant*, and may be used in both *acute* and *chronic* bronchitis.

SANGUINARIA, *U. S.* (Sanguinaria).

Sanguinaria (blood-root) is the *rhizome* of *Sanguinaria canadensis* (nat. ord. Papaveraceæ), collected in autumn. Habitat: North America. It yields its virtues, which reside in an alkaloid, *sanguinarine*, to both alcohol and water, and deteriorates by keeping. Another alkaloid is also present, but has not been named.

Preparations: Extractum Sanguinariæ Fluidum, dose ℥iij–v.

Tinctura Sanguinariæ, 15%, dose ℥x–xx.

Physiological action: *Locally*, it is a decided irritant, causing violent sneezing when inhaled, and acro-narcotic poisoning when taken by the stomach in large doses; it exerts an escharotic action upon fungous granulations. *Large doses* cause collapse, with coldness of the surface, cold sweating, dilated pupils, and diminished reflexes; they depress the circulation and respiration and cause death by respiratory paralysis. It acts as a *mixed* emetic, both local and systemic, with great nausea and depression, and is now seldom used for that purpose. The secretions of the stomach and intestines are increased, and the bile is rendered more fluid and increased in amount.

Therapeutics: In *atonic dyspepsia*, *duodenal catarrh*, and *catarrh of the bile-ducts* sanguinaria is serviceable in small doses as a tonic; in *acute bronchitis*, *later stages*, in combina-

tion as an expectorant; in chronic rhinitis with hypertrophy as an insufflation; in functional amenorrhœa as an emmenagogue; and in chronic syphilitic and tubercular affections as an alterative.

Antimonii et Potassii Tartras (tartar emetic), dose gr. ss–j; gr. ij have proven fatal; it is too depressing to use except in an emergency, and acts as a mixed emetic.

DIAPHORETICS.

Diaphoretics are remedies employed to increase the secretory activity of the skin. They are employed therapeutically (1) as revulsive agents in the formative stages of certain diseases, acting by eliminating certain deleterious waste-products and by relieving internal congestion; (2) to hasten absorption in general dropsy and serous accumulations, as pleurisy, pericarditis, ascites, etc.; (3) to eliminate *poisonous* materials from the blood, notably urea in uræmia; and (4) to aid in the subsidence of certain diseases which naturally end with a sweat.

Non-medicinal measures: Certain measures for producing sweating are in vogue, as the hot-air or Turkish bath, the hot-vapor or Russian bath, and hot-water baths, either general or of portions of the body, as the foot-bath. Exercise, warm temperatures, and the ingestion of large amounts of hot fluids also favor sweating.

The *hot-water bath* is given at a temperature of 110°–115° F., the patient immersed in it for ten to fifteen minutes and afterward wrapped in blankets. A *hot pack* may be given if the hot bath is inconvenient; a *cold pack* also acts as a diaphoretic, if the sheet used to wrap about the patient is wrung out of cold water and the patient is well covered with blankets. A *hot vapor-bath* is given at a temperature of 120° F. If the Russian bath is not available, the same effect may be obtained by applying a mackintosh closely about the patient, who is seated on a chair; a vessel of hot water is placed underneath the chair and the water kept hot by a spirit lamp. The *hot-air* (Turkish) *bath* may be improvised by

the same arrangement, omitting the hot water and regulating the temperature so as to rise between 160° and 200° F. Many diuretics act as diaphoretics if the patient is well covered and kept warm so as to favor sweating.

Classification: Diaphoretics are generally classified as: (1) *Stimulating, direct*, or *simple*, which enter the circulation and produce a direct stimulating effect upon the secreting tissues or their peripheral nerves: this class includes the diffusible stimulants and aromatic substances generally, and certain narcotics, notably opium and camphor. (2) *Nauseating*, which act by relaxing the orifices of the glands and allowing of a freer transudation of fluids through them—*e. g.*, *ipecac* and *tartar emetic*. (3) *Refrigerant*, which produce sweating by reducing the force of the circulation and restoring the secretion of the skin, which like that of other organs is checked in the early stages of febrile conditions.

STIMULATING DIAPHORETICS.

PILOCARPUS, *U. S.* (Pilocarpus; Jaborandi).

Pilocarpus is the *leaflets* of *Pilocarpus Selloanus* (Rio Janeiro Jaborandi) and of *Pilocarpus Jaborandi* (Pernambuco Jaborandi (nat. ord. Rutaceæ). Pilocarpus is a Brazilian shrub. The leaves have a characteristic odor and a strong aromatic taste, and owe their activity to *pilocarpine*, an alkaloid of bitter astringent taste and soluble in all the ordinary menstrua. Another alkaloid, *jaborine*, has been isolated: it is a derivative of pilocarpine and antagonistic to it, in many respects resembling atropine. The leaves contain also a volatile oil.

Preparations: Pilocarpus, powdered, dose gr. xx–℥j.

Extractum Pilocarpi Fluidum, dose ♏xv–f℥j.

Pilocarpinæ Hydrochloras ($C_{11}H_{16}N_2O_2.HCl = 243.98$), dose gr. $\frac{1}{8}$–$\frac{1}{3}$.

Physiological Action.—The diaphoretic action of pilocarpus or its alkaloid, *pilocarpine*, upon which its activity depends, is due to a *direct stimulation* of the *secretory nerves at their periphery*. After the hypodermic administration of

the drug sweating begins quickly, reaches its maximum in one-half to three-quarters of an hour, and lasts from two to four hours. The total amount is often very large, and there is found to be a large increase in the amount of urinary solids, especially *urea*, in its composition. The saliva is also often greatly increased, this increase being in inverse ratio to that of the perspiration. The explanation of this sialagogue effect is not clear, but it is due to stimulation of either the gland-cells or the nerve-endings. The secretions of the stomach and bronchi are also increased, in some cases that of the mammæ; and if the dose be too small to produce sweating, diuresis may occur. Children require proportionately very large doses to produce sweating. Other effects of jaborandi are slowing of the pulse with increased arterial tension, reduction of temperature when sweating begins, and great contraction of the pupil with increased intraocular tension, the myosis being due to peripheral influence. It increases the power of uterine contractions when labor has begun. It also stimulates the nutrition of the hair.

Therapeutics: Pilocarpus is serviceable in *pleurisy with effusion*, a very efficient means of promoting absorption; in *general œdema*, efficient but depressing; in *uræmia* and *puerperal convulsions* this and hot-air baths are our main reliance; in *pulmonary œdema*, cases of which have been successfully treated by this drug; in *muscular rheumatism*, often greatly beneficial. In *alopecia* continued small doses may promote growth of hair. In *diphtheria* pilocarpus was at one time used with the idea of throwing off the membrane by the exudation produced. It is, however, too depressing.

Administration: The hypodermic administration of the hydrochlorate of pilocarpine, in doses of gr. $\frac{1}{8}$–$\frac{1}{3}$ in watery solution, is preferable.

LIQUOR AMMONII ACETATIS.

Solution of ammonium acetate, or spirit of Mindererus, (spiritus Mindereri) is made by adding to dilute acetic acid enough ammonium carbonate to neutralize. When freshly made it contains about 7% of acetate of ammonium and

free carbonic acid. It has been frequently employed as a *refrigerant diaphoretic* and *diuretic*, often in combinations with camphor, opium, or sweet spirit of nitre, but its action in these directions is feeble. It has slightly stimulating properties, and may be used in adynamic fevers, and in frequent large doses it is often of value in relieving the effects of acute alcoholism. Dose f℥ss–j every two hours in sweetened water, as it is disagreeable to the taste.

SPIRITUS ÆTHERIS NITROSI, *U. S.* (**Spirit of Nitrous Ether**).

This preparation, commonly known as **sweet spirit of nitre**, and already mentioned under *Ether*, is a *5 % solution of ethyl nitrite in alcohol*. It is a pale-yellow, volatile, inflammable liquid of pleasant, ethereal odor and sharp burning taste.

Physiological action and therapeutics: In therapeutic doses it produces no effect beyond *mild diaphoresis* and *diuresis*, with a slightly stimulant effect on the nervous system. In convulsive diseases of children it seems to be antispasmodic. Inhaled in large doses it produces a train of symptoms similar to those of the *nitrites* (*q. v.*), and may even cause death. It is much used, chiefly in the *febrile affections of childhood*, as a *refrigerant diaphoretic* and *diuretic*, and is especially useful when nervous symptoms and a tendency to convulsions are present. Dose ♏x–f℥j.

NAUSEATING DIAPHORETICS.

As mentioned above, practically only two drugs of this class are used for this purpose, **ipecac** and **antimony**.

Antimony, as tartar emetic in doses of gr. $\frac{1}{12}$–$\frac{1}{6}$, may be used in the early or sthenic stages of acute inflammations.

Ipecac: The various preparations of this drug, and preeminently Pulvis Ipecacuanhæ et Opii (Pulvis Doveri), Dover's Powder, have for a long time been used in this way and with excellent results in the early stages of "*cold*," which may often be "broken up" by the timely use of this drug combined with a hot foot-bath and a large, hot, alcoholic draught; also in *muscular* and *acute rheumatism*, in which it allays the pain and produces sweating; thereby

presumably assisting in the elimination of deleterious matters; for this purpose gr. v should be given every three or four hours. In *suppression of menstruation* with very severe pain it is often particularly efficient.

REFRIGERANT DIAPHORETICS.

All **cardiac depressants**, as *aconite*, *veratrum viride*, and the *vegetable acids*, belong to this class. The citrate of potassium is constantly employed in this way, either as the *effervescing citrate* or the *neutral mixture* (mistura potassii citratis), and is preferable to the more powerful depressants.

Alcohol: Alcohol in full dosage, especially when taken in hot drinks, causes dilatation of the cutaneous vessels and a more or less profuse perspiration. It is a domestic remedy of value, and is much used, combined with Dover's powder or a hot foot-bath, in "*cold*," *rheumatism*, and *dysmenorrhœa*.

EXPECTORANTS.

Expectorants are remedies used in inflamed conditions of the mucous membranes to modify secretion in some way. There are two classes of expectorants, which are to be employed judiciously according to the stage of inflammation. In the so-called "dry" or early stages of bronchial inflammations the sedative expectorants, by nauseating and by lowering arterial tension, give rise to a relaxation of the tissues which favors secretion, just as is the case with diaphoretics. In the later subacute or chronic conditions an entirely different class, the *stimulating expectorants*, are indicated. In pneumonia expectorants are contraindicated; and in all inflammations of the broncho-pulmonary mucous membrane, narcotics, as opium, hyoscyamus, and other depressing drugs, some of which no doubt decidedly modify secretions, are to be used with caution, especially in children and the aged.

NAUSEATING OR SEDATIVE EXPECTORANTS.

Two of the three sedative expectorants in common use, **ipecac** and **antimony**, are also diaphoretic. Lobelia is also

somewhat used for this purpose. All of these have been treated of at length, and a few words only are necessary as to their expectorant properties.

LOBELIA.

Lobelia is used only when there is a tendency to *bronchial* and *laryngeal spasm*, as in *asthma*, either iodiopathic or secondary to some other condition, in *whooping-cough*, and in *laryngismus stridulus*. It is a somewhat dangerous remedy, and is now seldom used, especially for children.

ANTIMONY.

Generally used in the form of **tartar emetic**. It also is too depressing for ordinary use, but is sometimes of great value in aborting an attack of acute bronchitis, for which purpose it has to be carried to the point of producing decided nausea or even vomiting. Its employment for children is contraindicated except in the most minute dosage. The *wine of antimony* may also be employed.

IPECAC.

Ipecac is the depressing expectorant most commonly used. Syrup of ipecac is a standard remedy in the early stages of acute bronchitis, given in frequently repeated, moderate doses (ℳxx–xxx), although any other preparation may be used. It is perfectly safe, and is the best one of these drugs to be used for children.

GRINDELIA, *U. S.* (Grindelia).

Grindelia is the *leaves* and *flowering-tops* of *Grindelia robusta* and of *Grindelia squarrosa* (nat. ord. Compositæ). Habitat: North America, west of the Rocky Mountains. It contains a *volatile oil*, *resin*, and probably an alkaloid. The *fluid extract* is official in doses of fʒss–j.

Physiological action: The taste of grindelia is pungent and persistent, and it produces in the stomach a sensation of

warmth, at first stimulating the appetite and digestion, but, if continued, deranging them. It depresses the heart and lowers arterial tension (?), but after therapeutic doses these effects are very slight. Impairment of sensation and mobility and diminution of reflexes are produced by large doses. Toxic effects are rare. It is eliminated by the kidneys and pulmonary mucous membrane, and partakes of the character of a mixed sedative and stimulating expectorant.

Therapeutics: Grindelia is used principally in respiratory conditions where *bronchial spasm* is a prominent feature, as in *asthma*, in which its utility is very great, and in *whooping-cough*. It may also be used in subacute and chronic bronchitis, and is said to be a successful stimulant of the urinary tract in chronic pyelitis, chronic cystitis, etc.

Pulsatilla. This drug, which has already been mentioned in another connection, is also a valuable sedative in the very early stages of acute bronchial inflammation. It should never be used when gastro-intestinal irritation is present.

STIMULATING EXPECTORANTS.

Some drugs which are employed as expectorants of this group have been already mentioned among the blennorrhetic diuretics, notably *oil of turpentine*.

SENEGA, *U. S.* (Senega; Senega Snake Root).

Senega is the *root* of *Polygala Senega* (nat. ord. Polygaleæ). Habitat: United States. The cortical portion of the root alone is active, the woody part being inert. The dried root has a faint, peculiar odor, and a taste at first sweet and mucilaginous, but later acrid and irritating. It yields its virtues to both water and alcohol, and owes its activity principally to *polygalic acid* or *senegin*.

Preparations: Extractum Senegæ Fluidum, dose ℥ij–v.

Syrupus Senegæ, dose f℥j–ij.

It is also present (8% of fluid extract) in the *Compound Syrup of Squill* (q. v.).

Physiological action and therapeutics: *Locally*, senega is an irritant, and in large doses may prove emetocathartic. In *small doses* it freely stimulates secretions generally, with a special action on the pulmonary mucous membrane. It is chiefly given as a stimulating expectorant in subacute and chronic bronchitis. In combination with the nauseating expectorants, as in syrupus scillæ compositus, which contains tartar emetic, it is sometimes prescribed in the acute stages. It has been used as an emmenagogue and diuretic.

AMMONII CHLORIDUM, *U. S.* (Ammonium Chloride or Muriate; Sal Ammoniac), NH_4Cl = 53.38.

Ammonium chloride is formed by neutralizing *gas-liquor* (water which has been used to wash illuminating-gas, and contains the carbonate, hydrosulphate, and sulphate of ammonium) with hydrochloric acid and purifying the product. It occurs in white, translucent, tough masses, odorless, but having a sharp saline taste. It is partially deliquescent, somewhat soluble in alcohol, and freely soluble in water.

Physiological action and therapeutics: Locally, this salt is an irritant to the skin and mucous membranes, and in large doses purges and occasionally produces emesis. After absorption it is an alterative, diminishing the plasticity of the blood and increasing the urinary solids, with the exception of uric acid, which is somewhat diminished. It differs from other ammonium preparations in producing, in medicinal doses at least, very slight circulatory effects, and in large doses it appears to be depressant. It exerts a special action on mucous membranes, producing nutritive changes and epithelial exfoliation. It is eliminated chiefly by the urine, but in small proportion by all the secretions.

Ammonium chloride is chiefly used in the *later stages of acute* and in *chronic bronchitis*. It is also used in *muscular rheumatism*, *neuralgias* (especially in *migraine* and *ovarian neuralgias*), and *hepatic torpor*, and good effects have been claimed for it in hepatic abscess. Dose gr. v–x three times daily, or for children gr. j–ij. For *neuralgias* large doses, gr. xx–xxx, repeated in an hour, are given.

ALLIUM, *U. S.* (Garlic).

Allium is the *bulb* of *Allium sativum* (nat. ord. Liliaceæ), a small perennial plant indigenous to Southern Europe and cultivated in this country. The *bulb* is the portion used. Its physical properties are too well known to require comment. It yields its virtues to water, vinegar, and alcohol, and owes its efficiency to an *essential oil*, which is very volatile and irritating. Garlic locally is irritant and rubefacient, and is used for these purposes externally. It is also claimed to be a cardiac and nervous stimulant. It is especially valuable in the *acute bronchitis* of children, and has also been employed as an expectorant in *subacute* and *chronic bronchitis*, and as a *stomachic* and *diuretic* in other conditions. Its preparations are—

Allium, dose ʒss–ij.
Syrupus Allii, dose fʒj–ij.

BALSAMUM PERUVIANUM, *U. S.* (Balsam of Peru).

Balsam of Peru is a balsam obtained (by incisions into the *bark*) from *Toluifera Pereiræ* (nat. ord. Leguminosæ), a tree of Central America. It occurs as a thick, reddish-brown fluid of pleasant odor and warm acrid taste. It is soluble in alcohol. It contains *resin*, benzyl cinnamate, benzyl benzoate, and *cinnamic* and *benzoic acids* as its essential elements, and several other constituents. In doses of gtt. x–xxx it is used as a *stimulating expectorant* in *catarrhs of the respiratory tract*, and to some extent in those of the genito-urinary tract, but is not nearly so much used *internally* as is balsam of tolu. In *surgery* it has a distinct place as a stimulant application to sluggish granulations, although recently antiseptic properties have been denied it. It is given in emulsion.

BALSAMUM TOLUTANUM, *U. S.* (Balsam of Tolu).

Balsam of Tolu is a balsam obtained (by incisions into the *bark*) from *Toluifera Balsamum* (nat. ord. Leguminosæ), a Central American tree. It is at first a thick, viscid fluid, like balsam of Peru, but hardens with time into a resinous solid. It has a fragrant odor, a warm sweetish taste, and is

quite soluble in alcohol and essential oils. Its composition, effects, and uses are practically the same as those of balsam of Peru, but its more agreeable flavor renders it preferable to the latter for internal use. Its *tincture* and *syrup* are much used as vehicles. Of the former the dose is f℥j–ij; of the latter, f℥j–f℥ss.

PIX LIQUIDA, *U. S.* (Tar).

Tar is an empyreumatic oleoresin obtained by the destructive distillation of the *wood* of *Pinus palustris*, and of other species of Pinus (nat. ord. Coniferæ). *Pinus palustris* is the yellow pine of the South. The physical peculiarities of tar are well known. It is soluble in alcohol, ether, volatile oils, and fixed oils, and contains *resin*, *oil of turpentine*, etc. When distilled it yields *pyroligneous acid* and *oil of tar* (from which creasote is obtained), the residuum being *pitch*. The preparations are—

Oleum Picis Liquidæ, external use.

Syrupus Picis Liquidæ, f℥j–ij.

Unguentum Picis Liquidæ, tar and suet, and yellow wax.

Physiological action and therapeutics: Tar resembles the turpentines in action. *Locally* it is a decided stimulant, and in ointments and soaps is used in eczema, psoriasis, scabies, and other skin diseases. Its *internal use* may lead to some gastric irritation, and in large doses to irritation of the kidneys and some increase of the urine. As the *syrup* or as *tar-water* internally or inhaled as a vapor it is employed as an expectorant in laryngitis and bronchitis.

TEREBENUM, *U. S.* (Terebene), $C_{10}H_{16}$ = 135.7.

Terebene is a liquid consisting chiefly of pinene, and containing not more than very small proportions of terpinene and dipentine. It is a colorless volatile oil, of a not unpleasant terebinthinate odor, formed by the action of strong sulphuric acid upon oil of turpentine. It is a valuable stimulating expectorant, and is employed with good effect in *subacute* and *chronic bronchitis*, probably acting on the broncho-pulmonary and genito-urinary mucous membranes much like oil

of turpentine. It should be administered in emulsion or capsule in doses of ℿv–xv.

TERPINI HYDRAS. *U. S.* **(Terpin Hydrate),**
$C_{10}H_{18}(OH)_2+H_2O=189.58.$

Terpin hydrate, also a derivative of turpentine, is the hydrate of the diatomic alcohol terpin, and is a crystalline solid of very slight taste and odor. Its effects, uses, and method of administration are the same as those of terebene, but it is probably inferior to that drug.

EMMENAGOGUES.

Emmenagogues are remedies employed to promote the menstrual discharge. Absence of this function, or *amenorrhœa*, may be dependent on or associated with a variety of constitutional conditions, as anæmia, plethora, constipation, wasting disease, etc., relief of which may bring on the menses. Drugs employed for this purpose are called indirect emmenagogues, and may be still further subdivided into *tonic* and *purgative emmenagogues*. *Direct* or *stimulating emmenagogues* act not, as in the case of blennorrhetics, specifically and by appearing in the secretion, but by causing congestion of the pelvic organs.

TONIC EMMENAGOGUES.

Ferrum: Iron with its compounds is by far the most important member of this group. The association of amenorrhœa with anæmia is very common, and is the indication for the use of this drug. It is given in full doses, and it is often well to combine it with purgatives or stimulating emmenagogues.

Manganum: Manganese, either as the *binoxide* or the *permanganate of potassium*, is employed in the same way as iron, and probably produces similar effects, although some claims have been made that it directly stimulates uterine contraction, viz., that it is a direct emmenagogue. Dose of either preparation gr. j–ij. The binoxide is preferable, as it causes less gastric disturbance.

Myrrha: Myrrh has been employed for emmenagogue purposes, but its efficacy is doubtful. It is generally used in combination with iron or aloes.

Acidum oxalicum: Oxalic acid (not official) has lately been used in cases of amenorrhœa with at least partial success. The dose is gr. ¼ three times a day, in solution. Gr. ½ is said to have been followed by symptoms of poisoning.

PURGATIVE EMMENAGOGUES.

Aloes: This drug, as is shown under *Cathartics*, exerts a specific action on the peristalsis of the large intestine, and part of this irritation seems to be transmitted to the neighboring uterus. It is a useful emmenagogue in cases associated with constipation and atonic conditions generally. It is to be given in sufficient doses daily to produce a moderately laxative effect, and it is well to administer a large dose at the proper time for the menstrual period. When plethoric amenorrhœa exists, which is probably rare, salines and depleting drugs are indicated.

DIRECT OR STIMULATING EMMENAGOGUES.

SABINA, *U. S.* (Savine).

Sabina is the *tops* of *Juniperus Sabina* (nat. ord. Coniferæ), a small evergreen shrub of Southern Europe. Its activity depends upon an official volatile oil (*Oleum Sabinæ*), which has a strong, peculiar, heavy odor and a burning, nauseating taste.

Physiological action and therapeutics: *Locally*, the oil of savine is an irritant to the skin and mucous membranes. In *medicinal doses* it produces a feeling of warmth in the stomach, with perhaps nausea, and slightly stimulates the circulation and secretions. In doses large enough to be *toxic* the symptoms produced are those of acro-narcotic poisoning—viz., nausea, vomiting, purging, abdominal pain, suppression of urine, or hæmaturia, with such nervous symptoms as unconsciousness and at times convulsions. Collapse and death

ensue. The lesions produced are those of gastro-intestinal inflammation.

It has a very decided effect on the uterus, *instituting* or *increasing its contractions*, and in pregnancy may cause abortion, but in sufficient dose to produce this effect seriously endangers life. It is useful in *amenorrhœa* and *menorrhagia* when dependent upon a relaxed condition of the organs.

Preparations: Extractum Sabinæ Fluidum, dose ℥iij–viij.
Oleum Sabinæ, dose ℥j–v.
Ceratrum Sabinæ, seldom used.

RUTA (Rue; not official).

Rue is the *leaves* of *Ruta graveolens*, or garden rue, a shrub of Europe. Its activity depends upon a *volatile oil*, oleum rutæ, also non-official, and it also contains a neutral principle, *rutin*. It is a decided irritant, its effects and uses resembling those of savine. It is also used somewhat as a *carminative*, an effect which it owes to its aromatic volatile oil. Dose of the oil, gtt. ij–v.

PETROSELINUM (Parsley).

Parsley is the *root* of *Petroselinum sativum*, or *garden parsley*, which contains a volatile oil known as *apiol* or *parsley camphor*. This is a colorless or yellow oil, with a strong characteristic odor, soluble in alcohol, ether, and chloroform, but not in water. It has been successfully used in *functional amenorrhœa* and *neuralgic dysmenorrhœa*. Dose gtt. iij–vj, *b. i. d.*, in capsule for three or four days previous to the expected menstrual period.

TANACETUM, *U. S.* (Tansy).

Tanacetum is the *leaves* and *tops* of *Tanacetum vulgare*, the common garden tansy (nat. ord. Compositæ). Habitat: Asia and Europe; naturalized in North America; cultivated. It is sometimes employed in the form of a decoction ("tansy tea") or of its volatile oil as a stimulant emmenagogue, or more often for criminal purposes. It is a very unsafe

remedy, sufficient doses causing symptoms of gastro-intestinal irritation and epileptiform convulsions.

Hedeoma, *U. S.*, Hedeoma (Pennyroyal). The *leaves* and *tops* of *Hedeoma pulegioides* (nat. ord. Labiatæ). Habitat: North America. This plant owes its activity to a volatile oil, official as *Oleum Hedeomæ*. It is a stimulating emmenagogue of uncertain power.

POLYGONUM HYDROPIPEROIDES.

Polygonum hydropiperoides, known also as *water-pepper* or *smartweed*, is an indigenous plant growing in moist places, and containing *polygonic acid* and other principles. It is a diaphoretic, diuretic, and expectorant, and in excessive doses a gastro-intestinal irritant. It is a stimulant emmenagogue and aphrodisiac, and has been employed in *functional amenorrhœa* and *functional impotence*, as well as in diarrhœa and dysentery, and for its diuretic properties.

Cantharides and other *stimulating diuretics* are also employed as emmenagogues. Combinations of iron, cantharides, aloes, and guaiac are favorite prescriptions for this purpose.

OXYTOCICS.

Oxytocics are remedies used during or immediately after labor to energize uterine contractions. Practically, the only drug used for this purpose is ergot, although similar powers are claimed for quinine and certain other remedies.

ERGOTA, *U. S.* (Ergot).

Ergot is the *sclerotium* of *Claviceps purpurea* (class Fungi), replacing the grain of rye, *Secale cereale* (nat. ord. Gramineæ). This is then known as "spurred rye" (*Secale cornutum*). The *composition* of ergot is very complex, and the identity of its active principle has not been made out. It contains sclerotic acid, scleromucin, sclererythrin, scleroiodin, picro-

sclerotin, ergotic and sphacelic acids, and a variety of other constituents. Sclerotic acid is probably its active principle. Ergot yields its activity to both water and alcohol, and *ergotin*, which is in reality nothing more than a watery extract, represents the drug.

Preparations: These should be *freshly made*, as both the powder and its derivatives deteriorate decidedly on exposure:

Ergota, powdered, dose ʒss–ij.

Extractum Ergotæ, dose gr. v–ʒss.

Extractum Ergotæ Fluidum (most used), dose fʒss–fʒss.

Vinum Ergotæ, 15%, dose fʒij–fʒij.

Ergotin, which is not official, is really an aqueous extract, and may be used when a solid preparation is desired. Bonjean's is best. Dose gr. iij–x.

Physiological action: To the therapeutist the chief interest lies in its effect upon the circulation and the uterus. Ergot induces contraction of unstriped muscle wherever found, with a specific action on that of the uterus and the intestine. In the *impregnated* uterus ergot has the power of *initiating* contractions, and of greatly increasing their force when already begun; while in the unimpregnated it also produces contractions, as is seen from the pain produced and its effect on hemorrhagic and other morbid processes of the uterus.

Circulation: Upon this function its effects are quite noticeable: it slows the pulse, probably by a direct action on the heart, and causes a contraction of the arterioles through stimulation of the vaso-motor centre, which results in an immense increase of arterial pressure. It is a pure centric *vaso-motor* stimulant. In some cases, at least, the intestinal peristalsis is very greatly stimulated.

Toxicology: Two varieties of poisoning may occur—acute and chronic, to the latter of which the term *ergotism* is applied. The symptoms of a single overdose are nausea and vomiting; dizziness; dilatation of the pupils; marked *fall of temperature;* circulation at first stimulated, later on depressed; increased peristalsis. The chronic form of poisoning, or *ergotism*, results generally from eating ergotized grain, and has never occurred to any extent in this country,

but epidemics of it occur from time to time in Europe. Two forms are recognized—*convulsive* and *gangrenous* ergotism. In either form the initial symptoms are generally identical—itching, formication and other subjective sensations of the feet. Then in the *convulsive* variety symptoms of gastro-enteric irritation appear, followed in a short time by violent and painful *tonic contractions* of the flexor muscles, at first with intermissions, but later becoming more or less tetanic, and finally resulting in death from exhaustion. In the *gangrenous* form are added sensation of weight in the limbs, subjective or real coldness of the surface, *anæsthesia*, and finally an atrophic gangrene of the extremities or of the nose, ears, etc.

In the *acute poisoning* rarely anything more than abortion is produced. When this is threatened, quiet, a recumbent position, and nervous sedatives are indicated. In the chronic form many die.

Therapeutics: In *obstetrical practice* ergot is employed in the following conditions:

Its *most common* use is in labor *after the delivery of the placenta*, to insure full uterine contraction, the expulsion of clots, and to prevent post-partum hemorrhage. By some it is given as early as the second stage, but there is a possibility of its rendering the delivery of the placenta difficult. By others it is administered as soon as the head is born. In *uterine inertia* small doses have been administered, it having first been ascertained that no mechanical impediment to a natural and speedy delivery exists either in the mother or the child. The *dangers* of administering ergot before delivery of the child are that it may set up a *tetanic contraction* of the uterus, which may result in its rupture or suffocation of the child by interfering with the placental circulation.

Ergot is employed *to arrest bleeding* in a variety of conditions where no local measures are available, as in *menorrhagia* and *metrorrhagia*, whether from fibroids, endometritis, or other causes; in the *hemorrhagic diathesis* combinations with digitalis and gallic acid will often prove valuable; also in purpura, epistaxis, hæmoptysis, hæmatemesis, etc., but its efficiency is not great. It has been recommended to reduce an enlarged spleen or liver in malaria and in goitre. In

cerebral congestion, if hemorrhage can be positively excluded —which in most cases is impossible—and in *congestion of the spinal cord*, it may give satisfaction, and should be administered in large doses (f℥ss–j of the fluid extract, *t. i. d.*). Some deny it any efficacy in both of these conditions, and from the uncertainty of diagnosis in *cerebral* conditions its use in the former is probably unsafe. Ergot has also been used with asserted success in neuralgias, epilepsy, whooping-cough, leucæmia, varicose veins, enlarged prostate, aneurism, and numerous other conditions. It has been employed in vascular relaxation with over-secretion—in colliquative diarrhœas, night-sweats, diabetes insipidus, and other forms of polyuria.

GOSSYPII RADICIS CORTEX, *U. S.*

Cotton root bark: The *bark* of the *root* of *Gossypium herbaceum*, and of other species of Gossypium (nat. ord. Malvaceæ). This remedy, which is said to be used as an abortifacient by the negro women of the South, probably possesses feeble oxytocic properties, and it has not come into favor to any extent as a uterine stimulant. It has been used to some extent in amenorrhœa and dysmenorrhœa. The dose of the fluid extract is f℥ss–ij. It is asserted that this preparation is inert, and that the full activity of the drug can only be obtained in a freshly prepared decoction.

USTILAGO (Corn Ergot).

Ustilago maydis (corn smut or corn ergot) is a fungoid growth on *Zea mays*, or Indian corn. It occurs as irregular masses growing on all parts of the plant, but more frequently on the ears, composed of black gelatinous matter enclosing dark nodular spores. Its odor is disagreeable and its taste unpleasant. It probably contains *sclerotic acid*, and its effects are supposed to be those of ergot, for which it has been substituted. Dose of the fluid extract f℥j–ij.

HYDRASTIS. *U. S.* (Hydrastis).

Hydrastis is the *rhizome* and *roots* of *Hydrastis canadensis* (nat. ord. Ranunculaceæ), *golden seal, yellow root, orange*

root, a small native plant. It contains a white alkaloid, *hydrastine*, a yellow one, *berberine*, and probably a third, *xanthopuccine*, besides starch, sugar, etc. The exact status of this drug is not clear, recent experiments having shown it to be allied to strychnine. At present it seems best to consider it in this connection.

Preparations: Glyceritum Hydrastis, 100%.

Extractum Hydrastis Fluidum, most used, dose f℥ss–ij.

Tinctura Hydrastis, 20%, dose f℥ss–j.

Physiological action: Hydrastis is a stomachic bitter, with a *particular stimulant effect on the hepatic* and intestinal secretions. Given to frogs, the alkaloid, *hydrastine*, heightens the reflexes and excites motor irritability, producing tetanic convulsions; but these effects are much *less in degree* and *longer* of *duration* than those of strychnine. The *circulatory* effects are disputed: probably the heart is slowed and the arterial pressure raised as by digitalis, with a later depression of the vaso-motor system. It is said to be diuretic; it possesses the power to produce contractions in the non-pregnant uterus, and is said to have produced abortion.

Berberine is an active depressant in large doses, but is not used in practical medicine.

Hydrastin is a commercial, *impure* article, which contains the alkaloids hydrastine, berberine, some resin, and perhaps other principles.

Hydrastine is a universal muscle-poison, acting on striped and unstriped muscle alike, first *stimulating* and then depressing the muscle of the heart, arteries, intestine, uterus, and general muscular system. Thus it raises the blood-pressure, increases peristalsis, induces uterine contraction, and in poisonous dose causes death from cramp-asphyxia or from centric respiratory arrest coupled with that of peripheral origin. Its dominant action is stimulation of the motor cord; it acts as an alterative to mucous membranes.

Therapeutics: Hydrastis is used as a tonic in *dyspepsia* and *chronic gastritis;* also in *duodenal catarrh*, *catarrhal jaundice*, and *constipation*, from its stimulant effect on the hepatic secretion. Locally, *cystitis* is said to be benefited by its use, while *gonorrhœa* in the declining stages and *gleet* are im-

proved by injections of the fluid extract (♏xv–f℥j), as are otorrhœa, leucorrhœa, and other mucous discharges. *Menorrhagia* and *metrorrhagia* are often decidedly benefited by the fluid extract in repeated doses, either alone or combined with ergot.

Hydrastininæ Hydrochloras, *U. S.*, Hydrastinine Hydrochlorate. This is the salt of an artificial alkaloid made by oxidizing hydrastine. Hydrastinine has a well-defined oxytocic action. Poisonous doses arrest the motor system, the motor cells in the brain, cord, the motor nerves, and the muscles themselves. In large dose it is a *depressant* to the entire heart in systole. The blood-pressure is elevated by moderate doses, and the heart, the vaso-motors, and the vessel-walls stimulated; the pulse is slow and full. The reflexes are at first increased and then diminished.

Therapeutics: Hydrastinine is used to *check bleeding* from the *uterus;* it seems to exert a well-defined alterative action on the uterine mucous membrane, and is useful in all forms of metrorrhagia. It has also been recommended as a *cardiac tonic* and as an antispasmodic in *epilepsy*.

Quinine and its salts are the most reliable remedies to stimulate contractions of the uterus during labor. Quinine probably acts constitutionally rather than on the uterus itself, and intensifies the natural contractions. A few observers claim that it produces abortion in normal pregnancy; but this is denied by the great majority of clinicians. It may prevent abortion when threatened by malaria. The dose is gr. x–xx, given in divided doses of gr. v each.

Kola (Kola-nut, Guru-nut), the *seed* of *Sterculia acuminata*, and of other species of Sterculia, has been recommended as an oxytocic. By virtue of the caffeine it contains it stimulates the entire system, produces wakefulness, and indirectly counteracts uterine inertia. The dose is stated at ♏xxx of the fluid extract.

IRRITANTS.

Irritants are remedies employed to produce hyperæmia or inflammation of the parts to which they are applied. Ac-

cording to the intensity of their action they are divided into *rubefacients*, which simply produce redness of the skin; *vesicants* or *epispastics*, which cause an exudation of serum beneath the cuticle; *suppurants*, which cause pustulation; and *escharotics*, which cause actual tissue-destruction.

Physiological action: The *modus operandi* of counter-irritants is not altogether clear. Clinical experience for ages, however, has shown their value, which probably depends upon some reflex effect upon the vaso-motor supply or the trophic nerves, by which the vascular supply of internal organs is modified and inflammatory processes are checked.

Therapeutics: These measures are used (1) for the relief of pain, either by an immediate action upon the painful nerve or by affecting its blood-supply reflexly; (2) to modify sthenic inflammatory processes; (3) to promote absorption of serous accumulations, as in pleurisy, pericarditis, and chronic joint-diseases; and (4) to produce a general tonic effect upon the circulatory and nervous systems, as by mild counterirritation by the actual cautery over considerable areas.

Contraindications: Counter-irritants are not to be used in acute conditions characterized by high arterial and febrile excitement, lest they add to these by the general febrile disturbance they themselves cause: nor, again, in cases where decided asthenia exists, lest they produce a destruction of tissue, which, owing to the weakened condition, will not readily be repaired.

RUBEFACIENTS.

This class of irritants is employed when a local analgesic effect is required or a local stimulation of the capillary system, and also as a mild, general, but not permanent, stimulant in depressed conditions of the system. They are particularly valuable as pain-allaying measures. When too long continued they may prove destructive to tissue—viz., epispastic or escharotic—and this is to be guarded against in asthenic conditions.

SINAPIS ALBA, *U. S.* (White Mustard).

SINAPIS NIGRA, *U. S.* (Black Mustard).

Mustard is the *seed* of *Brassica alba* (nat. ord. Cruciferæ) and the *seed* of *Brassica nigra* (nat. ord. Cruciferæ). Habitat: Asia and Southern Europe; cultivated. The seeds of *Brassica alba* are larger, of a yellowish color externally, and have a less pungent taste than those of *Brassica nigra*.

The two varieties differ somewhat in composition. By the action of *myrosin*, an albuminous ferment, upon *sinigrin* (potassium myronate), a principle peculiar to *black* mustard, in the presence of water, a very pungent *volatile oil* is formed. It does not pre-exist in the seeds. The *white* seeds yield no volatile oil, but by the action of the *same ferment* upon *sinalbin* an *acrid fixed principle* (acrinyl thiocyanate) is produced, having somewhat similar properties. The activity of the ferment is checked by heat and acids, and somewhat by alcohol, so that cold, or at most tepid, water is the proper menstruum for both varieties. The *volatile oil* and the *acrid fixed principle*, then, are the active constituents of the two varieties of seeds.

Preparations: Sinapis Alba is only used externally; no official preparations.

Sinapis Nigra, powdered, as emetic internally; dose ʒj–ij.

Charta Sinapis.

Oleum Sinapis Volatile is used only in Linimentum Sinapis Compositum.

Physiological action and therapeutics: *Internally*, in small doses, mustard is a stomachic and cardiac stimulant: in large doses it produces vomiting, while very large amounts cause gastro-intestinal inflammation. *Locally*, mustard is an irritant, the degree of its activity depending on the dilution in which it is used and the duration of its employment. These effects vary from those of a very mild rubefacient to vesication, and even the production of sloughing.

Its *internal use* is for the most part limited to the production of emesis (see *Emetics*). *Locally*, it is very much employed as a *sinapism* for mild cutaneous irritation in a variety of painful and inflammatory conditions. It is an active irri-

tant, but is very easily controlled by judicious admixture with flour, Indian meal, or flaxseed.

CAPSICUM, *U. S.* (**Capsicum; Cayenne, Red, or African Pepper**).

Capsicum is the *fruit* of *Capsicum fastigatum* (nat. ord. Solanaceæ). Habitat: probably tropical America; cultivated. It contains *fixed* and *volatile oils* and a principle called *capsaicin*.

Preparations: Emplastrum Capsici.

Extractum Capsici Fluidum, dose ♏ss–j.

Oleoresina Capsici, dose ♏¼–j.

Tinctura Capsici, dose f℥ss–j.

Physiological action and therapeutics: *Locally*, capsicum is an excellent rubefacient, and if its use is prolonged it may vesicate. It is less used than mustard, because more diffusible and more apt to produce irritation of distant parts.

Many other spices, as cloves, cinnamon, black pepper, ginger, etc., are used as counter-irritants, either alone or in some combination generally known as "spice plasters."

PIX BURGUNDICA, *U. S.* (**Burgundy Pitch**).

Burgundy pitch is the prepared *resinous exudation* of *Abies excelsa* (nat. ord. Coniferæ), or Norway spruce, occurring in the shops as a yellowish brittle substance, of a taste and odor resembling turpentine. At the surface temperature of the body, however, it is plastic and adhesive.

Preparations: Emplastrum Picis Burgundicæ, 90%, in yellow wax.

Emplastrum Picis Burgundicæ cum Cantharide, or "warming plaster," which sometimes vesicates. It is also used as a basis for several other plasters.

Physiological action and therapeutics: Burgundy pitch is a gentle irritant, producing only mild inflammation and seldom vesicating, although at times a vesicular eruption may follow its use. In its various *emplastra* it is employed in *chronic joint* and *pulmonary conditions* and in *muscular* rheumatism, especially lumbago.

PIX CANADENSIS (Canada Pitch).

Canada pitch is the prepared resinous *exudation* of *Abies Canadensis*, or hemlock spruce. It resembles the preceding in appearance, but is somewhat darker in color and possesses very little odor or taste. Its effects, which are due, as in Burgundy pitch, to a *contained resin* and *volatile oil*, and its uses correspond to those of that drug, but it is softer at the body temperature and is a less convenient application. Its only preparation is—

Emplastrum Picis Canadensis, which contains 9 parts of pitch, with 1 part of yellow wax to give it consistency.

OLEUM TEREBINTHINÆ.

The use of *turpentine stupes* has already been spoken of. In stronger solutions oil of turpentine is a powerful and painful irritant. The preparations are—

Oleum Terebinthinæ, dose ℥x–f℥ss.

Linimentum Terebinthinæ, "Kentish ointment."

Linimenta or Liniments.

This class of preparations is used for its local stimulant effect in rheumatic and neuralgic pains.

Cups

are used to abstract blood from congested areas by their counter-irritant effect. *Wet cups* are employed for local bleeding; *dry cups* are applied to the chest in pleurisy, pulmonary congestion, and threatened pneumonia.

VESICANTS, OR EPISPASTICS.

The theory of their action has already been discussed. Their chief uses are (1) as *derivatives* or *revulsants* for the cure of *acute* or *chronic inflammation;* (2) as *analgesics;* (3) to *promote absorption* of collections of fluids; (4) in *nervous conditions* to break up a train of morbid associations; and (5) for the cure of certain diseases of the *skin*. The drug most used for **vesication** is

CANTHARIS, *U. S.* (Cantharides).

Cantharides, commonly known as Spanish fly, is a dried insect, *Cantharis vesicatoria* or *Lytta vesicatoria* (class Insecta; order Coleoptera), found in Southern Europe. The odor of the insects is described as resembling that of mice, and their taste as acrid, burning, and urinous. They contain as their active principle *cantharidin*, which is odorless, tasteless, and insoluble in water, but rendered soluble in this menstruum by other constituents of the drug, so that *cantharidin* yields its virtues to water and also to alcohol. It sublimes at 100° C.

Preparations: Pulvis Cantharidis (seldom used), dose gr. j–ij.

Tinctura Cantharidis, 5%, dose gtt. j–v.

Ceratum Cantharidis, "blistering plaster," 32%.

Charta Cantharidis, "blistering paper."

Collodium Cantharidatum, about 60% cantharides.

Emplastrum Picis Cantharidatum (warming plaster) contains 8 parts of cerate of cantharides and 92 parts of Burgundy pitch.

With the exception of the *tincture*, these preparations are all used for *blistering*. This takes place in from six to eight hours; but it is advisable to allow the blister to remain from four to six hours, and to follow its use by the application of a flaxseed poultice. "Cantharidal collodion" is easily applied, and is valuable in refractory patients because not easily removed.

Physiological action: *Locally* to the skin, in which way it finds its chief use, *cantharis* is an active irritant, causing redness, burning pain, vesication, and, if too long maintained, even sloughing of the deeper tissues. Its effects upon the mucous membranes are similar.

Internally: when ingested in large doses it causes violent gastro-enteritis. The drug is eliminated by the kidneys, and there again proves irritant, in *small doses* increasing the amount of urine, and perhaps causing pain on urination, while *large doses* may be followed by hæmaturia, bloody purging, strangury, priapism, intense erotic desire, excru-

ciating pain, and death from collapse. The aphrodisiac effect is not constant. Cantharis is freely absorbed from its own blister, and when so used may cause these symptoms, and should be employed with care when any kidney lesion exists.

Cantharides—toxicology: The *effects* of toxic doses are *severe gastro-enteric and genito-urinary irritation.* The *treatment* consists in evacuation of the stomach, if this has not already taken place, and the administration of opiates and demulcents, avoiding, however, all oily substances, in which cantharidin is easily soluble: gr. xx are said to have proved fatal. The *lesions* after death are those of intense inflammation of the entire alimentary tract and an acute desquamative nephritis.

Therapeutics: Its occasional use as a diuretic and emmenagogue has already been noted. *Locally*, it is a favorite, and the most efficient vesicant; it is used to fulfil any of the indications for blistering, bearing in mind the possibility of its causing genito-urinary irritation in patients with renal disorder.

Cantharis vittata, or potato fly (indigenous to the United States), and other varieties of Cantharis are used as substitutes for *Cantharis vesicatoria.* They contain cantharidin and possess similar properties to the official drug.

Aqua Ammoniæ Fortior. This drug, applied to the skin on flannel or under a watch-glass to prevent evaporation, will produce vesication very quickly (five to ten minutes); but it is extremely painful, and should seldom be used except in an emergency. As ordinarily applied it is an efficient rubefacient.

ESCHAROTICS.

Escharotics, caustics, or *cauterants* are drugs employed to destroy the structure or vitality of tissues. They are employed (1) to effect the removal of morbid growths, as warts, condylomata, lupus, cancer, etc.; (2) to destroy as far as possible the virus in wounds made by rabid or venomous animals; (3) to cure *violent* inflammations, as in gonorrhœa, ophthalmia, malignant pustule, etc.; and (4) to stimulate indo-

lent ulcers and sinuses. They vary greatly in the character and intensity of their action, from the production of a mere film, as by lunar caustic, to the widely destructive action of some members of the group.

ARGENTI NITRAS FUSUS, *U. S.* (Moulded Silver Nitrate; Lunar Caustic).

This preparation, which has already been described, *does not liquefy*, and so affects the tissues to which it is applied *only superficially* and forms a *protecting pellicle* over them. It is very frequently used to stimulate granulations and destroy them when exuberant, and in a great variety of inflammatory conditions. Nitrate of silver is also frequently used in *solution* to stimulate granulations.

POTASSA, *U. S.* (Potassa), KOH = 55.99.

Caustic potash is prepared by evaporating liquid potassa. When fused it is cast into moulds, forming sticks of a grayish or brown color, very deliquescent, and having a caustic, saltish taste. These contain certain impurities which are insoluble in alcohol, while potassa itself is freely soluble in this menstruum and in water. In this way a pure white salt is obtained, known as *alcoholic potassa*.

Physiological action and therapeutics: Potassa is a very powerful caustic. When applied to the skin it melts, abstracts water from the tissues, and forms a dirty grayish slough which is very permeable, so that its action extends to a considerable depth. A dilute acid may be employed to check its action. It causes great pain. It may be used to meet any of the indications for the more powerful cauterants, as in the destruction of *chancres, poisonous bites, malignant pustule, lupus, rodent ulcers*, and *epithelioma*.

Potassa cum calce, or *potassa with lime*, contains equal parts of these ingredients. It occurs in sticks or in an alcoholic paste called "Vienna paste." It is milder, less deliquescent, and more easily limited than potassa, and is more often used.

SODA, *U. S.* (Soda; Caustic Soda), NaOH = 39.96.

Caustic soda is prepared in an analogous way to potassa. Its physical properties are also for the most part similar; but it is less translucent, and, although deliquescent, it does not remain permanently liquid, but after a time effloresces. "London paste" is composed of equal parts of caustic soda and lime. The *uses* of caustic soda are the same as of *Potassa*.

ACIDUM ARSENOSUM, *U. S.* (Arsenous Acid), $As_2O_3 = 197.68$.

Arsenic has already been described at length. It remains only to consider its action and uses as a *caustic*. Applied to the tissues, it is a very powerful but slow and extremely painful escharotic, producing intense inflammation of surrounding tissues. It affects the tissues as an irritant, destroying their vitality, rather than in a chemical manner. Absorption of a serious nature may take place from a raw surface. However, the more freely it is applied the less the danger of absorption seems to be, and when used over areas of any size it must be used freely. Various pastes and ointments have been employed, varying only in the substances used to render its effects milder and less painful. It is occasionally used in lupus, epithelioma, and other dangerous conditions.

ZINCI CHLORIDUM, *U. S.* (Zinc Chloride), $ZnCl_2 = 135.84$.

Zinc chloride is only slightly less powerful than potassa, and seems to possess to a degree the power of *disinfecting its own slough*, so that the subjacent tissues are left in a healthy granulating condition after the slough separates. Its use is free from danger as regards absorption. The indications for its use are those mentioned under *Potassa*, and it is also an excellent stimulant to sluggish ulcers and sinuses.

It may be employed in *an alcoholic* or *a watery solution*, in either of which menstrua it is freely soluble; but it is more generally used as Canquoin's paste, which is made by mixing it with equal parts of wheaten flour and a little water;

the proportions, however, of the chloride are varied according to the effect desired.

BROMUM, *U. S.* (Bromine), Br = 79.76.

The element **bromine** is a dark-red liquid, volatilizing in exceedingly pungent fumes, which are very irritating to the broncho-pulmonary mucous membrane. It is caustic to the taste and of a disagreeable odor, and is freely soluble in ether, less so in alcohol and water.

Physiological action and therapeutics: It affects the tissues chemically, decomposing hydrogen compounds and forming hydrobromic acid. Owing to its liquid form and volatility it is a rapid and thorough caustic, and possesses deodorant and disinfectant properties. It is seldom used as a caustic, the occasion for its use being limited chiefly to hospital gangrene and to cancer of the uterus. In weak solutions it may be inhaled in small amounts in offensive catarrhal conditions, as ozæna.

ACIDUM CHROMICUM, *U. S.* (Chromic Acid), $CrO_3 = 99.88$.

Chromic acid (chromic anhydride) is made by the addition of sulphuric acid to a solution of potassium bichromate. It occurs in deep-red, acicular crystals, easily *deliquescing* to a deep-red liquid, and very soluble in water, forming an orange-yellow solution.

Physiological action and therapeutics: Applied to living tissues, it rapidly oxidizes and decomposes them, its cauterant action being very active, but less painful than that of other members of this group. Internally, it is a violent corrosive poison, and death has taken place from absorption following its external use. It finds its chief use in the hands of the dermatologist for the destruction of syphilitic condylomata and other dermal growths. It is also used as a caustic applied to the nose and throat, where it is necessary to limit the action to a small area. A heated applicator is dipped into the acid and a small bead will form at the tip from fusion of a few of the crystals.

Incompatibles: When mixed with easily oxidizable substances, as strong alcohol, glycerin, etc., it is liable to cause combustion, or even an explosion, so great is its oxidizing power.

HYDRARGYRUM.

Hydrargyri Chloridum Corrosivum (corrosive sublimate) in saturated solutions may be used as a mild caustic in chancroidal and other conditions. It is less powerful in its action than liquor hydrargyri nitratis. This preparation is made by dissolving Hg or its red oxide in an excess of nitric acid. It is a clear, acid, highly corrosive liquid, contains free nitric acid, and is said to possess peculiar efficacy in syphilitic conditions.

ACIDUM NITRICUM, *U. S.* (Nitric Acid).

Nitric acid is a powerful caustic, useful for the cauterization of small areas. It is applied with a glass rod or a splinter of wood, as it attacks and destroys most metallic substances. It is very penetrating, a drop or two being sufficient. When enough tissue has been destroyed its action is limited by neutralizing it with an alkali. Like that of other mineral acids, its action is apt to extend beyond the point of application.

Other agents employed as caustics: Sulphuric, hydrochloric, and the stronger and glacial acetic acids are also caustics of a varying degree of activity, but, with the exception of glacial acetic, are seldom used for this purpose. The *sulphates* of zinc and copper and *dried alum* are employed as mild caustics to exuberant granulations. The *actual* and *galvano-cauteries* are much used for this purpose, and are indicated in very chronic inflammation; in chronic meningitis the actual cautery is applied to the back of the neck after the tissues have been rendered insensible by the application of ice and salt.

SUPPURANTS.

Oleum Tiglii. Croton oil, applied with friction to the skin, produces an inflammation accompanied by a pustular erup-

tion. For purposes of counter-irritation it is applied, either undiluted or mixed with one or two parts of olive oil or oil of turpentine, to the chest in chronic bronchitis and allied conditions, and to rheumatic joints.

Unguentum Antimonii. This preparation produces effects similar to those of oleum tiglii, and may be used in similar conditions, but is a more painful application.

In this subdivision may also be considered two drugs which, although they do not possess vesicant, rubefacient, or escharotic action, are much used by the dermatologist.

Sapo Mollis, *U. S.*, Soft Soap (**Sapo Viridis,** Green or Soft Soap). Green soap is prepared from potassa and the fixed oils, and is chemically a combination of the oleate, stearate, and palmitate of potassium. Officially it is prepared from linseed oil and potassa. It is a soft, greenish soap of the consistency of jelly, and is very soluble in water and alcohol. Owing to the potassa it contains it is an irritant, and constitutes an invaluable preparation for local application in the scaly skin diseases, as in the scaly forms of *eczema*, and in *scabies*. As an alkali it is an efficient antidote to *acid-poisoning*, and possesses the advantage of being generally available. Too long continued, it may produce decided irritation of the skin.

Chrysarobinum, *U. S.*, *Chrysarobin*. A neutral principle (in its commercial more or less impure form), extracted from Goa powder, a substance found deposited in the *wood* of *Andira araroba* (nat. ord. Leguminosæ). This is a large tree of Brazil. Chrysarobin is an orange-colored, tasteless, odorless, and crystalline powder, insoluble in water, slightly soluble in alcohol, and freely soluble in ether.

Action and therapeutics: Its internal effects are disputed, but gr. v–vij prove emetic and purgative. Applied to the skin, it produces a *yellow* stain, and causes irritation, with at times œdema and a furuncular inflammation. In the treatment of *psoriasis* it is a specific, and it is also employed with success in the other scaly skin diseases. The official (5%) ointment sometimes proves too irritating for the skin, and has to be diluted with one or two parts of some simple ointment. The stain appearing on the skin after its use is almost indelible; this is the reason why the drug is rarely employed.

DEMULCENTS.

Demulcents are substances, consisting chiefly of gum or mucilage, which soften and relax the tissues and diminish the heat, tension, and pain of inflamed areas. As most of them contain sugar and starch, their constitutional effects are chiefly nutritive. They are employed *internally* to relieve severe gastro-intestinal irritation, as after the ingestion of irritant poisons; in acute inflammations; to affect reflexly slight bronchial inflammations, and locally those of the pharynx and larynx; and as light diet for the sick. *Externally*, they are extensively employed to relieve the symptoms of burns, wounds, etc., while in pharmacy they are much used to suspend substances insoluble in water. A very common form for external use is the *poultice* or *cataplasm*, which consists of some mucilaginous or starchy substance made into a soft paste with water and spread upon suitable material. They form a convenient method for the application of heat and moisture, and have already been sufficiently considered.

AQUA, *U. S.* (Water).

Water fulfils important dietetic, medicinal, and pharmaceutical uses. It aids in the solution and digestion of food, the metamorphosis and construction of tissue, and is said to increase the total solids eliminated by the urine. It is the *best of demulcents*, and as such is much used. The ingestion of too large amounts, however, causes disturbances of digestion. For pharmaceutical purposes distilled water (Aqua Destillata, *U. S.*) should alone be employed.

ACACIA, *U. S.* (Acacia; Gum Arabic).

Acacia is a *gummy exudation* from *Acacia Senegal* (nat. ord. Leguminosæ), a small African tree. Several varieties of gum Arabic are known, all of which are somewhat transparent, hard, and pulverizable. They are odorless, and have a somewhat sweetish taste. They are almost wholly made up of *arabin*, or more properly *arabic acid*, which is soluble in water, forming mucilage, from which solution it is *precipitated by alcohol*. It is also precipitated by solution of subacetate

of lead, by ferric salts, and solutions of silicates and borates. Acacia forms the type of a class of compounds known as *gums*, which dissolve in water with the formation of a mucilaginous liquid, from which they are precipitated by alcohol.

Physiological action and therapeutics: Gum arabic is not digestible, and its only effect is that of a demulcent, for which it is used in gastro-intestinal conditions, as diarrhœa, dysentery, acid-poisoning, etc., and as a lubricant in catarrhal affections. It is much used as a vehicle for anodynes and expectorants in cough-mixtures. The following *preparations* are official:

Pulvis Acaciæ,
Mucilago Acaciæ, } used as vehicles; dose ad lib.
Syrupus Acaciæ,

All the preparations of acacia become sour very readily and should be freshly prepared for medicinal use.

TRAGACANTHA, *U. S.* (Tragacanth).

Tragacanth is a *gummy exudation* from *Astragalus gummifer* and from other species of Astragalus (nat. ord. Leguminosæ), small shrubs of Asia Minor. Tragacanth occurs in odorless and nearly tasteless flakes, and when heated with water it swells up and forms a paste without actual solution. Its chief constituents are *arabin* (or a similar substance) and *tragacanthin*. Its chief use is for suspending heavy insoluble powders and to give a proper consistency to lozenges.

Tragacantha and Mucilago Tragacanthæ are official.

CETRARIA, *U. S.* (Cetraria; Iceland Moss).

Cetraria, or Iceland moss, is a lichen, *Cetraria islandica* (class Lichenes), chiefly obtained from Iceland and Norway. It contains a starch, *lichenin*, and a bitter principle, *cetraric acid*. It imparts its bitterness to cold and all its virtues to boiling water. It is a highly nutritious demulcent, and may be used in jelly, the bitter principle having first been removed by maceration with cold water.

Preparation: Decoctum Cetrariæ. In this the bitter prin-

ciple has been removed by previous maceration with cold water. Dose f℥ss–j.

CHONDRUS, *U. S.* (Chondrus; Irish Moss or Carragheen).

Irish moss is *Chondrus crispus*, and *Gigartina mammillosa* (class Algæ), sea-weeds found on the coast of Ireland and the Northern United States. Its active principle, *carragheenin*, is a substance somewhat resembling starch, but not giving the characteristic iodine reaction. Boiled in water, it yields a solution which gelatinizes on cooling. It is best freed from adherent salts by thorough washing with water. It is a nutritious demulcent, and is given as an article of diet to the sick in the form of decoction with suitable flavoring, or with milk as *blanc mange*.

ULMUS, *U. S.* (Elm).

Ulmus, or slippery elm, is the inner *bark* of *Ulmus fulva* (nat. ord. Urticaceæ), an indigenous tree. It contains a large amount of mucilaginous matter and some tannic acid, and has found employment in catarrhs of the intestinal and genito-urinary tracts. It possesses considerable nutritive value as well, and it is used externally in poultices.

Mucilago Ulmi is official, and is used as a demulcent drink.

GLYCYRRHIZA, *U. S.* (Glycyrrhiza; Licorice Root).

Licorice is the *root* of *Glycyrrhiza glabra*, of the variety glandulifera (nat. ord. Leguminosæ). Habitat: Southern Europe. Its long fibrous roots have no odor, but a sweet mucilaginous taste, which they owe to a glucoside, *glycyrrhizin*, soluble in boiling water and alcohol. It is also soluble in ammonia, with the formation of ammoniated glycyrrhizin; from the latter solution it is precipitated by acids, hence preparations of glycyrrhiza should not be prescribed in acid media. Licorice is used as a demulcent and as a flavoring agent to disguise the taste of unpleasant drugs. The cortex of the root is acrid and possesses no demulcent properties. It has many preparations:

Extractum Glycyrrhizæ,
Extractum Glycyrrhizæ Purum,
Extractum Glycyrrhizæ Fluidum,
} used as sweetening agents.

Trochisci Glycyrrhizæ et Opii; each contains opium gr. $\frac{1}{10}$.

Pulvis Glycyrrhizæ Compositus (see *Senna*).

Mistura Glycyrrhizæ Composita (brown mixture), a favorite vehicle for cough-mixtures; contains extr. glyc. purum, acacia, sugar, spir. ætheris nitros. āā 3 parts, paregoric 12 parts, wine of antimony 6 parts, with water to 100 parts.

Glycyrrhizinum Ammoniatum. Ammoniated Glycyrrhizin.

LYCOPODIUM, *U. S.* (Lycopodium).

Lycopodium is the *spores* of *Lycopodium clavatum*, and of other species of Lycopodium (nat. ord. Lycopodiaceæ) (club-moss). Habitat: Europe, Asia, and North America. Lycopodium occurs as a fine yellow powder, which is much used as a dusting-powder, not being moistened by water. It is also used in pharmacy to coat pills so as to prevent them from adhering together. Lycopodium contains 47% of fixed oil and flashes when thrown into a flame.

LINUM, *U. S.* (Linseed; Flaxseed).

Linum is the *seed* of *Linum usitatissimum* (nat. ord. Lineæ). Flaxseed contains large quantities of *mucilage* and *fixed oil* (oleum lini). It is the most common basis for poultices, and is used internally as a demulcent, sometimes in infusion, but preferably in decoction. In the arts it is very valuable because it is a *drying* oil, absorbing oxygen from the air and forms a valuable basis for paints.

AMYLUM, *U. S.* (Starch).

Amylum or starch, is officially the *fecula* of the *seed* of *Zea Mays* (nat. ord. Gramineæ), or corn, but is found as a proximate principle in a large variety of plants throughout the vegetable kingdom. It is a carbohydrate ($C_6H_{10}O_5$), and swells with water at an elevated temperature to the formation of starch paste. By boiling it with dilute sulphuric or hydro-

chloric acid it is converted into an isomeric principle, *dextrin*, and this in turn into *glucose* or grape-sugar.

Physiological action and therapeutics: The starches are an important group of nutrients, the consideration of whose physiological history falls more properly elsewhere. It is used as a dusting-powder, as a constituent of poultices, and is the antidote for iodine.

Other drugs possessing similar qualities are—

Althæa, *U. S.*, Althæa, Marshmallow. The *root* of *Althæa officinalis* (nat. ord. Malvaceæ). Habitat: Europe; naturalized in North America. The official *syrup* affords a pleasant vehicle for the administration of medicines to children. The decoction is a useful demulcent in gastritis.

Cydonium, the *seed* of *Cydonia vulgaris* or quince; the mucilage has been a favorite basis for collyria.

Sassafras Medulla, *U. S.*, Sassafras pith. The official *mucilage* is employed as an eye-wash.

EMOLLIENTS.

Emollients are bland substances, principally of a fatty nature, which are used externally to soften the skin and render it pliable.

ADEPS LANÆ HYDROSUS, *U. S.* (Hydrous Wool Fat; Lanolin).

Lanolin is the purified *fat* of the *wool of the sheep* (*Ovis Aries*, class Mammalia; order Ruminantia), mixed with not more than 30% of water. This purified fat constitutes about 45% of the wool of sheep, and consists of the secretion of the sebaceous follicles. It contains *cholesterin*. When first introduced the property of being quickly absorbed, together with that of impregnating substances, was claimed for it, but recent experiments have apparently disproved this.

GLYCERINUM, *U. S.* (Glycerin).

Glycerin, a liquid obtained by the decomposition of vegetable or animal fats or fixed oils, and containing not less than

95% of absolute glycerin ($C_3H_5(OH)_3$=91.79), is chemically *propenyl alcohol*, and is liberated from its combinations with the fatty acids (stearic, margaric, oleic, etc.) during the process of saponification, when these acids unite with an alkali. In this form, however, it is impure and apt to be an irritant. The purest and blandest forms are derived from this soap-waste by a patented process, but the largest amounts are made by passing superheated steam through fats. Glycerin is a thick, colorless liquid, with a sweet, slightly burning taste. It mixes in all proportions with alcohol, oils, and water, and is itself a solvent for iodine, bromine, tannic and vegetable acids, salicin, and many neutral salts, etc. It is very *hygroscopic* and *does not evaporate.*

The use of glycerin as a nutrient and alterative has now been abandoned, and it is chiefly used *topically.* Either in its own form or in combinations in various *creams* it is employed in chapped skin, excoriations, seborrhœa, and other skin diseases. Even in dilute form it is irritating to some skins. For a similar emollient effect upon the mucous membranes it is used in coryza and laryngitis. Internally, it exerts a *mild laxative* effect; one of its uses is to disguise the taste of unpleasant medicines, as castor oil, turpentine, iron solutions, etc.; also as a substitute for sugar in diabetes, but it possesses no curative properties. It is sometimes added to laxative enemata, but is largely used to abstract water in chronic inflammation of mucous membranes by its local application.

Large doses of glycerin, injected *hypodermically*, produce vomiting, thirst, bloody urine, fall of temperature, depression of heart and respiration, muscular weakness, convulsions, coma, and death.

SACCHARIN (Glusidum, Br. Ph.).

Saccharin is a complex, white, crystalline, *intensely sweet* powder, slightly soluble in water, with which it forms an acid solution, and readily soluble in glycerin, alcohol, and ether. It is a coal-tar derivative. Even in large amounts it produces no marked physiological effects. It is chiefly of

use where sugar is contraindicated for any reason, as in *diabetes* or *obesity*. It acidifies the urine and prevents decomposition, and may be used with advantage in conditions where the urine is ammoniacal, as from cystitis, etc.

PETROLATUM.

Petrolatum is official in three forms: Petrolatum liquidum; Petrolatum molle; Petrolatum spissum. It is a yellowish, translucent, semi-solid mixture of substances chiefly of the marsh-gas series. It is obtained by distilling off the more volatile parts of crude petroleum and purifying the residue when it has the desired melting-point. It is insoluble in water and alcohol, but readily soluble in ether, chloroform, oil of turpentine, and the fixed and volatile oils, and melts at a temperature of 105° to 125° F. It is similar to various proprietary substances, as vaseline, cosmoline, etc., and was introduced as a substitute for them. *Paraffin* is composed of the higher compounds of the marsh-gas series, and may be prepared from petrolatum.

The **advantages** of these hydrocarbon oils and solids consist in their freedom from odor and acridity, their resistance to chemical agencies, and the fact that they do not get rancid.

Physiological action and therapeutics: Petrolatum in any ordinary dose does not produce physiological effects. Its chief use is as a *protective external application* and as a basis for ointments.

Other substances are used for similar purposes.

Adeps, *U. S.* (Lard). The prepared, internal *fat* of the abdomen of *Sus scrofa* (class Mammalia, order Pachydermata), purified by washing with water, melting and straining. This is a mild fat melting at the body temperature and largely used in pharmacy, often as *adeps benzoinatus*, which contains the soluble constituents of 2% of benzoin.

Oleum Theobromatis (Oleum Theobromæ, *U. S.*, 1880) (cacao butter), a fixed oil expressed from the *seed* of *Theobroma Cacao* (nat. ord. Sterculiaceæ). This is a tropical plant of South America. Cacao butter is a bland vegetable fat,

solid at ordinary temperatures, but melting at that of the body, and is much used in suppositories.

Cetaceum, *U. S.* (spermaceti), a peculiar, concrete, fatty substance, obtained from *Physeter macrocephalus* (class Mammalia; order Cetaceæ). Spermaceti is obtained from the head of the sperm whale: used to give consistency to ointments. **Ceratum cetacei**, *U. S.*, contains spermaceti 10, white wax 35, and olive oil 55 parts.

Cera flava, *U. S.*, Yellow Wax. A peculiar, concrete substance, prepared by *Apis mellifica* (class, Insecta; order, Hymenoptera).

Cera alba, *U. S.*, White Wax. Yellow wax, bleached. Yellow and white wax are used to increase the consistency of ointments.

Poultices. Poultices are applied in superficial and also in deep-seated inflammation. They are powerfully sedative when allowed to remain in contact with the skin for a protracted period of time. In deep inflammations they invite the blood to the surface away from the congested areas; for this purpose they are used in *pneumonia*, *pleurisy*, and *peritonitis*, and should be applied hot and frequently renewed. The jacket poultice is a favorite form for the chest. Late in superficial inflammation the poultice facilitates the pointing of an abscess. Flaxseed meal, Indian meal, bread and milk, and slippery elm are used as bases for poultices, though the active medium of all is probably only the water they contain, while the basis retains both the heat and moisture. *Mustard* or yeast will make a poultice stimulating instead of sedative, and may be added in varying proportions.

PROTECTIVES.

The name "**protectives**" is applied to a class of remedies which are used medicinally to exclude the air from and protect inflamed superficial tissues.

PYROXYLINUM, *U. S.* (**Pyroxylin**; **Soluble Gun-Cotton**).

Pyroxylinum, or *soluble gun-cotton*, is made by macerating purified cotton, *Gossypium purificatum*, U. S. (absorbent

cotton), in a mixture of *nitric* and *sulphuric* acids, and afterward washing with water and drying. The official pyroxylin is not so highly nitrated as other varieties of gun-cotton, and is more soluble. It resembles ordinary cotton in appearance, but is harsh to the touch. It is used in medicine only in making collodion.

COLLODIUM, *U. S.* (Collodion).

Collodion is a colorless, syrupy liquid with a strong odor of ether. It consists of pyroxylin 3, stronger ether 75, and alcohol 25 parts. When applied to the dry skin the menstrua quickly evaporate, leaving a thin, flexible, and very contractile film. It may be used as a protective to wounds and bed-sores or for the coaptation of the edges of incised wounds. It is also valuable for the solution of medicinal substances, as cantharides, capsicum, etc., when these are applied locally. When it contains *tannic acid* it is called collodium stypticum.

Collodium flexile, or flexible collodion, contains castor oil 3 and Canada turpentine 5 parts, and shrinks very little on drying—a decided advantage in many cases. The turpentine makes it slightly irritating.

Cantharidal collodion has already been considered under *Epispastics.*

GUTTA-PERCHA.

Gutta-percha is the concrete *exudation* of *Isonandra gutta*, an East Indian tree. A 9% solution in chloroform was formerly official as liquor gutta-perchæ, and when applied to the skin forms a thin adhesive film which constitutes an efficient protective for small cuts, fissures, etc., in domestic practice.

Other protectives: Certain plasters, as **Emplastrum Resinæ, Emplastrum Plumbi, Emplastrum Saponis**, etc., are also used as protectives to denuded surfaces. They should be spread upon very soft kid, and should be fresh enough not to have lost their plasticity.

ANTACIDS.

Antacids are remedies employed to neutralize excessive acidity of the gastric and intestinal contents. This acidity may be due to *hypersecretions* or to fermentation of undigested food. In a wider sense antacids are substances which enter the blood, increasing its alkalinity and that of the secretions. The alkalies and alkaline earths and their carbonates are included in this class. Given before the ingestion of food, alkalies increase the acid secretion; after meals, they help to neutralize this acidity. For the former purpose smaller doses are given than for the latter.

SODIUM.

The arsenate, bromide, nitrate, phosphate, sulphate, and many other sodium salts having peculiar effects due to these constituents have already been mentioned.

The following salts of soda are *antacids:*

Liquor Sodæ, *U. S.*, solution of soda. This is a colorless liquid of unpleasant taste, containing about 5% of sodium hydrate.

Sodii Carbonas, *U. S.*, carbonate of soda ($Na_2CO_3+10H_2O$ =285.45). This salt occurs as colorless crystals, *efflorescing* to a white powder and very soluble in water.

Sodii Carbonas Exsiccatus (dried sodium carbonate), which is formed by heating the carbonate and driving off its water of crystallization.

Sodii Bicarbonas, *U. S.*, sodium bicarbonate ($NaHCO_3$= 83.85). This salt is prepared by saturating solutions of the carbonate with CO_2; it occurs in the form of a white powder, odorless and of a cooling saline taste and slightly alkaline reaction. Soluble in 12 parts of water and insoluble in alcohol.

The carbonate and bicarbonate may be employed as *antacids, antiplastics,* and *diuretics:* they are less irritating and more palatable than the corresponding potassium salts. Of the two, the bicarbonate is the less irritating and more agreeable, and is used in many effervescing mixtures. Locally, it

is a valuable domestic remedy, as ordinary *baking-soda*, in the treatment of burns, scalds, and the bites of insects.

CALX, *U. S.* (Lime).

Unslaked lime is a powerful corrosive, and is used in Vienna paste (potassa cum calce). Slaked lime possesses properties due to its alkalinity and slight astringency.

LIQUOR CALCIS, *U. S.* (Solution of Lime).

Lime-water is a saturated solution of lime containing *0.17% of calcium hydrate*. It is colorless, odorless, and of a somewhat disagreeable alkaline taste. Unless kept tightly corked it absorbs CO_2 from the atmosphere, and calcium carbonate is precipitated.

Physiological action and therapeutics: Lime-water combines antacid and astringent properties. Internally, it is used in cases of *gastric irritability*, small amounts of milk and lime-water in varying proportions being a valuable and frequently used remedy for checking *vomiting*. It is also of value in *diarrhœas* of fermentative origin, and is suitable as an antidote for poisoning by acids, as sulphuric and oxalic. *Externally*, it is used in certain skin diseases—*prurigo, scabies*, and especially *tinea capitis*—and as an injection in *leucorrhœa* and *gleet*. Inhaled or administered by atomization, it will dissolve diphtheritic exudations.

Linimentum Calcis, U. S., or Carron oil, is an invaluable soothing application to relieve the pain of recent burns.

SYRUPUS CALCIS, *U. S.* (Syrup of Lime).

Lime dissolves more readily in **syrup** than in water, and the syrup contains about 5%, forming a saccharate of calcium. It is twenty-four times as strong as lime-water, and is a useful astringent in diarrhœas. It may be used as an antidote in poisoning by carbolic or oxalic acid, but is not the best. Dose f℥ss–ij.

Calcii Carbonas (calcium carbonate or chalk) is a native product of physical properties too well known to require

description. It is insoluble in water, but soluble in dilute hydrochloric acid.

Creta Præparata, *U. S.*, prepared chalk, made from the above by levigation and elutriation, is a white, perfectly smooth powder, generally dispensed in the form of small cones; dose gr. x–xxx.

Calcii Carbonas Præcipitatus, *U. S.*, Precipitated Calcium Carbonate ($CaCO_3 = 99.76$). This is formed by the reaction of calcium chloride and sodium carbonate, and exists as a white, smooth powder; dose gr. x–xxx.

Physiological action and therapeutics: Prepared chalk and the precipitated carbonate possess similar properties and equal efficiency. They act as *antacids* and *slight astringents*, and form very valuable remedies in diarrhœas where an antacid is indicated. They are also used in *dyspepsia*, the *gouty diathesis*, and in *rachitis*. Externally, they are employed as *desiccants* and *protectives* to excoriated surfaces.

Other antacids: The preparations of potassium, the effervescing preparations of magnesium, and the aromatic spirit of ammonia are often used as antacids.

ANTISEPTICS, DISINFECTANTS, GERMICIDES.

Disinfectant and **antiseptic** are terms which for the most part are used interchangeably. Antiseptics are substances which prevent putrefaction or septic decomposition. *Germicides* are remedies which *destroy disease-producing germs* or *their spores*. The same substances may thus be both antiseptics and germicides, depending on their concentration. All germicides are necessarily antiseptics, but not all antiseptics are germicides.

Putrefaction ordinarily, and the septic processes of human pathology as well, require certain conditions for their development: (1) organic substances capable of easy disintegration; (2) certain conditions of heat, air, and moisture; (3) certain ferments, which in most cases are living organisms, generally vegetable. If any of these conditions are wanting, these processes cannot take place. Thus, it is well known that

extreme cold, the exclusion of air (as in the domestic process of canning), and a very dry atmosphere will prevent or delay putrefaction. So, again, the destruction or exclusion of the ferments will produce the same effect; and it is here that the drugs and measures of this class find their field.

Physical disinfectants: The most potent agent of this sort is *fire*, and by it contaminated clothing, etc., may be disposed of. Next in power, and first in importance, are *sunlight*, *air*, and *water*, which act as potent oxidizing agents and are the best natural disinfectants. Free dilution of a poisoned atmosphere with pure air is all-important, and is our main reliance in rendering safe infected rooms and wards.

FERRI SULPHAS, *U. S.* (Ferrous Sulphate).

Copperas, the impure sulphate of iron, is a valuable disinfectant, decomposing noxious gases and destroying many decomposing organic substances, probably by partial conversion into the sesquioxide, which exerts an ozonizing power in oxidizing filth. Sulphate of iron is regarded as devoid of direct germicidal power. It is a cheap commercial product, and may be sprinkled over decomposing substances or thrown into cesspools.

ACIDUM CARBOLICUM, *U. S.* (Carbolic Acid).

The germicidal power of **carbolic acid** is well known. A 1% solution destroys the bacteria of ordinary pus, the tubercle bacillus, and a number of other pathogenic germs. A 5% solution destroys all spores. The more extended use of carbolic acid is prevented by two factors: one, its own poisonous action, though this seldom becomes manifest in the dilute solutions used by surgeons; the other, that it produces sufficient anæsthesia when applied to the skin to interfere materially with delicacy of touch. In general, carbolic acid is an efficient disinfectant, though it coagulates albumin; the crude acid is said to be even more efficacious, as it contains cresylic acid.

CALX (Lime).

Lime is a destructive agent, causing a slow oxidation of organic matter. Oxidation is, as we have seen, a valuable means of disinfection. Lime is much used for disinfection of sewage, etc., but causes the evolution of volatile gases which may carry noxious matter with them. Other uses of lime have been noted.

OZONE.

Ozone (O_3), an allotropic form of oxygen, is a powerful oxidizer. It is present in small proportion in the atmosphere, and undoubtedly is an important factor in Nature's antiseptic processes, but has not yet taken rank as a practical antiseptic. It has been used for the relief of distressing dyspnœa, as in asthma, pneumonia, etc.

AQUA HYDROGENII DIOXIDI, *U. S.* (Solution of Hydrogen Dioxide; Hydrogen Peroxide).

Aqua hydrogenii dioxidi is a slightly acid, aqueous solution of Hydrogen Dioxide ($H_2O_2 = 33.92$) containing, when freshly prepared, about 3%, by weight, of the pure Dioxide, corresponding to about 10 volumes of available oxygen. The compound (dioxide of hydrogen, H_2O_2) gives up its oxygen easily, and is dispensed in a watery solution, slightly acidulated with HCl to give it stability, and yielding from 10 to 15 volumes of oxygen gas. It decomposes at a temperature of 60° F., and must be kept in a cool place. It is a powerful oxidizing agent and germicide, coagulating albumin, but is not very irritant. It has been used to some extent internally, but its chief value is in *suppurating conditions of the ear, mouth, pleural cavity,* etc., and in *inoperable sinuses* generally, in which it acts as a stimulant antiseptic. It is a useful agent in irrigation of pus-cavities in ordinary surgical practice.

POTASSII PERMANGANAS, *U. S.* (Potassium Permanganate), $KMnO_4 = 157.67$.

This drug, already mentioned elsewhere, contains a large amount of readily available O_2, to which it owes its antiseptic

power. It is a powerful antiseptic, but of very short duration, being quickly deprived of its oxygen and rendered inert. As a practical germicide its value is not great, because the organic matter in which the noxious elements are present so quickly deprives it of its oxygen. It is a good *deodorizer*, and is of considerable service, locally, in such offensive surgical conditions as *fœtid ozæna, otorrhœa, leucorrhœa, foul and sloughing ulcers*, cancerous or otherwise. The usual strength is 1 : 500 or 1 : 1000, but much stronger solutions may be used. A dilute solution is used for irrigation of the urethra in *gonorrhœa*.

ACIDUM SULPHUROSUM, *U. S.* (Sulphurous Acid).

Sulphurous acid is a liquid composed of not less than 6.4%, by weight, of Sulphurous Acid Gas (Sulphur Dioxide, SO_2 = 63.9) and not more than 93.6% of water. This is, of all disinfectants, the most commonly employed for the disinfection of rooms. It acts as a *deoxidizing* agent, breaking up organic compounds, and becoming sulphuric acid in the process ; but probably its efficiency is due to a direct but not powerful germicidal effect, and it is said not to affect spores. The usual method of employment is to burn sulphur in a tightly closed room, allowing from 20 to 30 ounces to every 1000 cubic feet of space, with proper precautions against fire.

HYDRARGYRI CHLORIDUM CORROSIVUM, *U. S.* (Corrosive Chloride of Mercury).

This salt, **mercuric bichloride** or *corrosive sublimate*, is so much used in surgical procedures as to warrant detailed notice. As a germicide it is particularly powerful, solutions of 1 : 2000 quickly destroying micrococci and bacilli, while 1 : 500 will destroy the most resistant spores. It is decomposed by ammonia, albumin, and many other chemical substances—facts which lessen its value as an antiseptic—but it still remains one of the best measures for this purpose. It is much used (1 : 1000) for disinfecting bedding, etc., and stronger solutions have been used for destroying the germs

in alvine discharges. It is indispensable as an antiseptic in surgical operations for disinfecting the field of operation, hands, sponges, dressings, etc., but corrodes instruments, which should be kept in solutions of carbolic acid or in sterilized water.

Notice has been already taken of the antiseptic properties of carbolic and salicylic acids, iodoform, iodol, thymol, creolin, etc.

NAPHTHALINUM, *U. S.* (Naphthalin).

Naphthalin is a benzol derivative, obtained by dry distillation of coal-tar, and occurring in white, shining scales, insoluble in water, but soluble in alcohol, ether, chloroform, and oils.

Physiological action and therapeutics: This drug disinfects, or at least deodorizes, the fæces. It or its products are eliminated by the urine, upon which it acts as an antiseptic, retarding decomposition. It is chiefly used in *chronic diarrhœa* (gr. v–x in capsule every four or six hours) and as a disinfectant in *intestinal catarrhs*. It is also highly spoken of in bronchitis and bronchorrhœa and in diseases of the intestinal tract. Locally, in 10% oily solution it is used in *scabies* and *prurigo*. At one time it bade fair to be useful in typhoid fever, and some cases were supposed to be aborted by its use, but it has not sustained its reputation.

ACIDUM BORICUM, *U. S.* (Boric Acid; Boracic Acid), $H_3BO_3 = 61.78$.

Boric (or boracic) **acid** occurs in transparent, white, hexagonal plates, unctuous to the touch, permanent, and soluble with a slightly acid reaction in 25 parts of water, more soluble in glycerin and alcohol. It is a good antiseptic, but possesses only weak germicidal effects. Internally, it acidifies the urine. It forms a very useful antiseptic wash in some conditions of the mucous membranes, as *cystitis*, *conjunctivitis*, *sordes*, etc., producing antiseptic results with very slight irritation. Absorbed or taken in large amounts, it is said to produce gastro-

enteritis, but such effects must be rare. It has occasioned death in several instances; the symptoms are reduction of temperature, depression of the circulation, nausea and vomiting, disturbance of respiration. In most cases the amount ingested seems to have been large.

"**Thiersch's solution**": A combination much used in the surgery of mucous membranes, as the bladder, oral and nasal cavities, etc., is that of Thiersch, or "boro-salicylic," which contains of salicylic acid 2 parts and boric acid 12 parts, in water to 1000 parts.

SODII BORAS, *U. S.* (Sodium Borate; Borax), $Na_2B_4O_7 + 10H_2O = 380.92$.

Borax differs from the acid principally in being efflorescent, and in forming *alkaline* solutions with water, in which it is soluble, 1 : 16. It is insoluble in alcohol and freely soluble in glycerin. Its alkaline reaction gives it antacid properties, and as a combined *antacid* and *antiseptic* it finds its chief value in aphthous, diphtheritic, and other inflammations of the mouth and throat. Claims of utility in *epilepsy* have been made for it.

AQUA CHLORI, *U. S.* (Chlorine-water).

Aqua chlori is an aqueous solution of Chlorine (Cl = 35.37), containing at least 0.4% of the gas. This preparation, in which form alone chlorine is official, is made by the reaction of manganese binoxide and HCl. It is a clear, greenish-yellow liquid, containing 0.4% or more of Cl, and having the unpleasant odor and taste of that element.

Physiological action and therapeutics: Chlorine gas acts as an *indirect* oxidizing agent, uniting with the hydrogen of organic matter and liberating O, which rapidly destroys the organic compound. It is a *powerful germicide*, an hour's exposure to a *moist* atmosphere containing 1% of the gas being sufficient to destroy all spores; but it is a decided respiratory irritant, and somewhat destructive to textile fabrics, especially if colored. Chlorine-water has been used

internally in doses of f℥ss–ij, well diluted, as an intestinal disinfectant, but probably is of no value. In proper dilution it is a good disinfectant and stimulant wash for *foul ulcers*, and as a gargle in *scarlet fever* and *sore throat*. Chlorine gas is generally used in the form of

CALX CHLORATA, *U. S.* (Chlorinated Lime).

Chlorinated lime, or bleaching-powder, is a compound resulting from the action of chlorine upon calcium hydrate, and containing not less than 35% of available chlorine. This chlorine gas can be slowly set free by CO_2, more rapidly by the addition of an acid. Chlorinated lime occurs as a white powder of chlorinous odor and a disagreeable saline taste, gradually becoming moist and decomposing by exposure to the atmosphere.

Physiological action and therapeutics: It acts only locally, and may be used in the same conditions as chlorine-water. For the disinfection of rooms the room should be tightly closed, an acid added to hasten the evolution of the gas, and left for many hours. For the disinfection of rooms it is inferior to sulphur, but for that of excreta and infected filth generally, a saturated solution is the most efficient agent.

"**Labarraque's solution**": Liquor Sodæ Chlorinatæ, *U. S.*, Solution of Chlorinated Soda. This contains 2.6% of available chlorine. Upon this its effects and uses depend, and they correspond to those of calx chlorata. Its advantages lie in its liquid form and its comparative freedom from odor, so that it is a more pleasant form for use. **Eau de Javelle** is the corresponding preparation of *potassium*.

AROMATICS.

Drugs of this class owe their efficacy to oils obtained from them by distillation, and termed *volatile*, *distilled*, or *essential oils*. These oils are volatile, inflammable, soluble in alcohol and ether, and themselves dissolve fixed oils. Locally, they are used as (1) *counter-irritants*, (2) *local anæsthetics*, and (3) *antiseptics*; internally, as (4) *antispasmodics* or *carminatives*

by stimulating the intestine and thus expelling flatus; as (5) *digestive aids*, (6) *diffusible stimulants*, and (7) to disguise the taste of unpleasant drugs. The following is a brief description of some of the most important ones, few of which require detailed notice:

Cinnamomum Cassia, *U. S.*, Cassia Cinnamon. The *bark* of the *shoots* of one or more undetermined species of Cinnamomum grown in China (Chinese cinnamon) (nat. ord. Laurineæ). The bark of any species is "cinnamon," and contains Oleum Cinnamomi (*U. S.*) and *tannic acid*. The oil is much used to disguise the taste of unpleasant medicines. Aqua cinnamomi (.2% of the oil) is also used as a vehicle. For the *aromatic* and *astringent* effects of the drug the *tincture* (f℥j–ij) and spirit (♏x–xxx) may be employed.

Cinnamomum Saigonicum, *U. S.*, Saigon Cinnamon. The *bark* of an undetermined species of Cinnamomum (nat. ord. Laurineæ).

Cinnamomum Zeylanicum, *U. S.*, Ceylon Cinnamon. The *inner bark* of the *shoots* of *Cinnamomum Zeylanicum* (nat. ord. Laurineæ).

Caryophyllus, *U. S.*, Cloves. The *unexpanded flowers* of *Eugenia aromatica* (nat. ord. Myrtaceæ). Habitat: Molucca Islands; cultivated. Oleum Caryophylli, to which it owes its efficiency, is official; dose ♏j–vj. It fulfils the general indications for aromatics mentioned above, and is much employed as a local anæsthetic in toothache. Cloves are an efficient carminative and a popular spice.

Myristica (nutmeg): The *seed* of *Myristica fragrans* (nat. ord. Myristicaceæ), deprived of its testa. Habitat: Molucca Islands; cultivated. It contains a fixed and a volatile oil, the latter official—Oleum Myristicæ. Large doses produce narcotic effects. Although employed chiefly as a condiment, it is an agreeable flavoring agent, and is used to prevent the griping of cathartics and in diarrhœa. Besides the oil, the dose of which is ♏ij–v, Spiritus Myristicæ is official (dose f℥j).

Macis, *U. S.*, Mace. The arrillode of the *seed* of *Myristica fragrans* (nat. ord. Myristicaceæ). It contains the same volatile oil as myristica and fulfils the same indications.

Pimenta, *U. S.*, Pimenta (allspice). The nearly ripe *fruit* of *Pimenta officinalis* (nat. ord. Myrtaceæ). Habitat: Tropical America; cultivated. It contains a volatile oil (Oleum Pimentæ, *U. S.*), the dose of which is gtt. ij–v.

Cardamomum, *U. S.*, Cardamom. The *fruit* of *Elettaria repens* (nat. ord. Scitamineæ). Habitat: Malabar; cultivated. Cardamom contains a *volatile oil, fixed oil,* starch, etc. It is very agreeable to the taste, and much employed as a carminative and to conceal the taste of unpleasant medicines. Tinct. cardamom. comp. is a pleasant vehicle for castor oil and other drugs.

Zingiber, *U. S.*, Ginger. The *rhizome* of *Zingiber officinale* (nat. ord. Scitamineæ). Habitat: India; cultivated in the tropics. Varieties—India, African, Jamaica Ginger. Zingiber in its various preparations, official and proprietary, is a domestic remedy for colic, and is used as a stomachic in dyspepsia, especially when accompanied by flatulence. Its preparations are—

Oleoresina Zingiberis, dose ♏ss–ij.

Extractum Zingiberis Fluidum, dose ♏x–xxx.

Syrupus Zingiberis, dose f℥j–ij.

Tinctura Zingiberis (20% in strong alcohol), dose f℥ss–j.

Trochisci Zingiberis, each contains gr. ij of the tincture.

Piper, *U. S.*, Pepper. The *unripe fruit* of *Piper nigrum* (nat. ord. Piperaceæ). Black pepper contains a *volatile oil,* an *acrid resin,* and an *alkaloid* (*piperine*) which was once supposed to possess antiperiodic properties. Its effects are those of a *carminative stimulant.*

Its preparations are—

Oleoresina Piperis, ♏¼–j (in pill).

Piperina, dose gr. j–v.

Capsicum, *U. S.*, Capsicum, Cayenne Pepper, African Pepper. The *fruit* of *Capsicum fastigiatum* (nat. ord. Solanaceæ). Habitat: Probably tropical America; cultivated. Capsicum already mentioned under *Irritants,* has a distinct value in feeble digestion, and especially that of alcoholism. It is said to be of value locally in acute tonsillitis and scarlatinal sore throat, either in the form of the diluted tincture as a gargle or as the strong tincture applied locally.

Oleum Cajuputi, *U. S.*, Oil of Cajuput. A volatile oil distilled from the *leaves* of *Melaleuca Leucadendron* (nat. ord. Myrtaceæ). Used externally as a counter-irritant; internally as an efficient carminative in *intestinal colic* and *diarrhœa*, and seems to have some action in *rheumatism*. Dose ♏iij–v. It is frequently combined with opium.

Oleum Lavandulæ Florum, *U. S.*, Oil of Lavender Flowers. A volatile oil distilled from the *fresh flowers* of *Lavandula officinalis* (nat. ord. Labiatæ).

Spiritus Lavandulæ, 5% of the oil, dose f℥j.

Tinctura Lavandulæ Composita, 8% of the oil, with Oil of Rosemary, Cloves, Cinnamon, Nutmeg, and Red Saunders; formerly known as the compound spirit. Its use has frequently led to the production of the alcoholic habit. Dose f℥j–ij.

Oleum Rosmarini, *U. S.*, Oil of Rosemary. A volatile oil distilled from the *leaves* of *Rosmarinus officinalis* (nat. ord. Labiatæ). Carminative.

Other frequently employed flavoring vehicles are **Oleum Sassafras, Aurantii Amari Cortex,** and **Aurantii Dulcis Cortex.**

DIETETICS.

Naturally, but a brief résumé of this extensive subject can be attempted in a treatise of this kind. The importance of foods as remedial agents in various forms of disease cannot be overestimated, for on them mainly we rely to repair tissue-waste, while the regulation of the diet in certain diseases, notably acute febrile conditions, gastric disorders, and nephritis, is all-important. The ultimate uses of food, then, are to *repair tissues*, and to *supply energy*, which is manifested in muscular, secretory, and nervous activity, etc.

Classification: The various aliments may be classified under the following groups: I. *Mineral* substances, which enter into the composition of tissue, are incapable of further oxidation, but perform certain necessary functions in the human economy—*i. e.*, water, calcium phosphate, sodium chloride, etc.; II. *Substances capable of further oxidation*, with the production of *heat* and *energy*, or of being stored up as tissue,

which secondarily undergoes oxidation with the same effects. This forms the most important group, and includes *proteids*, *fats*, *carbohydrates* (sugar, starch, etc.); III. *Food adjuncts*, including tea, coffee, alcohol, etc.

A convenient classification of foods for purposes of present consideration is into *animal* and *vegetable foods*.

ANIMAL FOODS.

MILK.

Milk: A perfect food, then, must contain *proteids*, *fats*, *carbohydrates*, *salts*, and *water*. The nearest approach to this we find in milk, a good specimen of which contains all these requisites and is an ideal food. An analysis of milk shows proteids (casein and albumin), fats (cream), carbohydrates (lactose or sugar of milk), salts (chlorides, sulphates, and phosphates), and water.

In **infant feeding**, when for any reason breast-milk is not available, the following substitutes may be employed: (1) *Good fresh cows' milk properly prepared.* Woman's milk differs from that of the cow in containing larger amounts of sugar and of albumin or casein, which coagulates in smaller flocculi. This casein in cows' milk coagulates into a denser mass, it being intended for further mastication by the young ruminant. To make cows' milk as nearly as possible resemble the infant's natural food, it should be diluted with water, lime-water, barley-water, etc. *Lactose* (℥ij to Oj) and *cream* should then be added to make good the deficiency of these ingredients. In this way the casein coagulation is regulated by *dilution*. (2) It may also be made more normal and its digestion assisted by the addition of *peptonized milk powders*. (3) *Condensed milk* is used as a partial and inefficient substitute, especially in large cities, where wholesome cows' milk is well-nigh impossible to procure. This consists generally of a thick, viscid, semisolid mass, obtained by evaporating milk at a gentle heat and adding sugar to preserve it. Its indefinite strength is a disadvantage, rendering its proper dilution rather problematic, and most infants do poorly under its use. (4) *Sterilized milk* is also of great value in bottle-feeding during the summer

months, and is a prophylactic and curative agent in diarrhœal disorders. A very practical formula is that recommended by Dr. Rotch: it consists of 3 ounces of milk, 2 ounces of cream, 10 ounces of water, 1 ounce of lime-water, and 4 teaspoonfuls of milk-sugar to the pint of mixture thus prepared. The whole may be sterilized by keeping it at a temperature of 167° F. for twenty minutes; the temperature is sufficient for practical sterilization, but insufficient to affect the digestibility of milk as boiling will do. Many clinicians strongly advocate *maltose* or *malt-sugar*, instead of milk-sugar, as an addition to milk mixtures.

Unwholesome modifications of milk: Milk obtained from cows during the first two or three weeks of lactation contains more or less *colostrum*, which gives it an unpleasant odor and taste and some purgative properties, and renders it unsuitable for feeding children. Milk from cows during advanced pregnancy, during and for some days after "heat," or when suffering from inflammation of the udder, is unwholesome. Poisonous pasturage may affect milk. Cows suffering from tuberculosis, anthrax, foot-and-mouth disease, etc., should not be utilized for milking purposes: tuberculosis and anthrax have without doubt been thus communicated to man.

Diseases caused or conveyed by milk: *Scarlet fever* and *diphtheria* have been conclusively proven to have been thus transmitted; at least in the case of the former a very similar disease exists in the young animal. *Typhoid fever* has at times been traced to milk. *Tyrotoxicon-poisoning:* As the result of certain putrefactive changes, due here as elsewhere to micro-organisms, a poisonous principle called "tyrotoxicon" is developed; milk or milk-products, as ice cream, cheese, etc., containing this poison give rise to the symptoms of irritant poisoning—viz., *nausea*, *violent vomiting*, *burning pain in the throat*, *œsophagus*, and *stomach*, diarrhœa, and profound depression, lasting for a few hours and generally ending in recovery. While the symptoms are very distressing and severe, the autopsies in fatal cases have been almost negative, the lesions of gastro-enteritis being almost entirely absent. From this it has been inferred that the poison exerts a purely centric effect.

Indications for a milk diet: Full milk diet consists of from 4 to 6 pints of milk daily. Many patients will not be able, however, to consume even the smaller of these amounts, the fats being in greater quantity than they can assimilate. The customary method of administration is to give a glassful (f℥vj–viij) every two hours. Some patients have an idiosyncrasy and really cannot take it. Many more will say they cannot, but after a thorough trial will generally succeed. Lime-water, Vichy, common salt, etc., may make it more palatable and more digestible. Its use is indicated in *pulmonary tuberculosis* and *wasting diseases generally*. The object of its administration in these cases is to promote tissue-formation: the patient's digestion must be good, and no more should be taken than can readily be assimilated. In *febrile conditions* generally it forms an easily digested food. In *chlorosis* and the *severer anæmias* forced feeding with plenty of milk is a valuable adjuvant to drugs. In *albuminuria* an exclusive milk diet will generally greatly ameliorate the symptoms, and may cause the entire disappearance of albumin from the urine. In *gastric ulcer*, *toxic gastritis*, and *typhoid fever* it is the only permissible food, while in *carcinoma of the stomach*, *dyspepsia*, and *severe gastralgia* it may give relief. In diarrhœas, dysentery, and chronic intestinal indigestion it leaves no undigested residue to ferment and irritate, and often proves efficacious.

Unpleasant effects of prolonged milk diet: The continued use of milk is apt to prove repugnant to the patient. It tends to constipate, the cases in which it produces diarrhœa being due to lack of assimilation and consequent fermentation and irritation. A decrease of body-weight often occurs, and the patient may experience disagreeable sensations of emptiness, dizziness, and weakness. In rare cases these symptoms may be so pronounced as to necessitate its discontinuance.

CREAM.

This substance is obtained from milk by allowing it to *rise* or by *centrifugal force*. It is employed in making butter and cream cheeses. It represents most of the fat of the milk, of which constituent it contains from 25 to 33%.

SKIMMED MILK.

Milk minus cream, or skimmed milk, still contains a fair amount of proteids and lactose, and hence has considerable value as food.

BUTTER.

By agitation, or "churning," the fat of the cream is separated, and is known as butter. Butter presents fats in an easily digestible form, and contains of them about 85%. Rancidity of this product is due to a fermentative process, resulting in the separation of the butyric and other acids from their base, glycerin. It is hastened by the presence of too much casein or water from imperfect separation.

Buttermilk, the resultant liquid in butter-making, is a nutritious food; it contains casein, lactin, and salts. It is easily digestible, probably in consequence of the lactic acid it contains, and may be substituted for milk in *albuminuria*, *diabetes*, and *gastric* disease, constituting the so-called buttermilk cure for these disorders.

Cheese is made by coagulating the casein of milk by rennet and subsequent compression. The coagulating casein entangles the fats and some of the lactose and salts in its meshes, so that analyses of cheese show it to be a highly nutritious product. By the "ripening process," which lasts from four to six weeks, volatile odorous constituents are developed, giving it its flavor. Although so highly nutritious, it is, in the main, difficult to digest, and is not suitable for the sick. *Whey*, the liquid portion of the milk expressed during cheese-making, contains very little of nutritive value.

KOUMYSS.

Koumyss is an effervescing alcoholic drink obtained by fermentation of milk. Mares' milk was originally used, and is preferable; but cows' milk is now employed in its manufacture, lactose being added to give more sugar for fermentation, and thus greater alcoholic strength. Besides alcohol,

this milk-product contains carbonic acid and certain ethers. During fermentation the milk separates in layers, the uppermost being koumyss and the lowermost casein. In good koumyss not all the casein should be precipitated, and *no sugar* should be present, as it should all have been changed to alcohol. It contains 1½ to 4% of alcohol, and, roughly speaking, is one-third the strength of champagne. It should be kept tightly corked and in a cool place, and should be frequently shaken.

Although its sour taste is disagreeable to some palates, it is surprisingly well borne by even the most delicate stomachs, and forms a valuable *stimulant* and *food* in cases of malnutrition from any cause, especially when accompanied by gastric disturbance. When first introduced it was claimed to be a specific in tuberculosis, but this claim is no longer made for it.

MATZOON.

Matzoon is milk which has undergone lactic-acid and not alcoholic fermentation, yet differs from sour milk in that the process is checked when a certain degree has been reached. It is said to be well borne by irritable stomachs.

PEPTONIZED MILK.

This artificial milk-product is of such undoubted value, and so indispensable in certain cases, that a somewhat detailed account of its preparation and uses may be given. Milk, as we have seen, is a perfect food. Two of its components, *lactose* and *fats*, are easily digested, but with the albuminoid, *casein*, the case is different, and by its partial or complete conversion into peptone the digestion of milk may be greatly facilitated.

The **steps in peptonizing milk** are as follows: The most convenient form in which to obtain the pancreatic principle is in the various proprietary preparations of "extractum pancreatini," which are dispensed in tubes mixed with varying proportions of sodium bicarbonate. Ordinarily, one of these tubes is sufficient for one pint of milk. To the contents of

one tube add about f℥ij of water and stir thoroughly. Then add a pint of *warm* fresh milk, and keep the mixture at a temperature of 100° F. for thirty minutes, at the expiration of which time it is removed to a cool place—which checks the activity of the ferment—and kept until used. If the process be continued too long, certain products unpleasant to the taste, and perhaps poisonous, may develop. The bitter flavor should not be marked. By first removing the cream, then peptonizing, and then adding the cream again, a preparation more palatable and more milky in appearance is said to be obtained.

If suitable arrangements for regulating the temperature are not available, milk may be peptonized at the ordinary temperature of the sick-room, as follows: To a pint of milk, mixed with ¼ pint of water, add 1½ tubes of the extract; then set aside for from four to five hours, and use *immediately*, or bring to a boiling-point to stop fermentation, and keep in a cool place.

Therapeutic uses of peptonized milk: In *wasting diseases*, especially when more or less *complete anorexia* obtains; in the *persistent and intractable vomiting* of chronic gastritis, uræmia, gastric congestion from cirrhosis or chronic endarteritis; and after *abdominal incision*, it may often furnish relief; in *gastric ulcer* small amounts of this or other artificially digested fluids form the most rational and efficient treatment.

EGGS.

The eggs of the ordinary domestic fowl form a highly nutritious article of diet, containing a *large proportion of nitrogenous matter* (14%) and a comparatively *small amount of non-nitrogenous*. In full diet, then, they should be combined with starchy and fatty food. The fat of eggs is found entirely in the yelk, while the white of the egg is the more highly nitrogenous. In cooking, the albumen should be rendered simply opaque, as hard-boiled eggs are indigestible and cause constipation. To invalids uncooked eggs are given with milk and alcohol.

BEEF.

Roughly speaking, **good beef** contains about 20% of nitrogenous and 20% of fatty matter, with *salts*, *extractives*, etc. The nitrogenous elements are partly in solution (as myosin, the cause of *rigor mortis*) and partly solid. From its composition it is seen that beef contains nutritive principles of prime importance to the sustenance of the body.

During **rigor mortis** the normal alkalinity of the body fluids changes to acidity and the myosin is coagulated. Meat ordinarily should not be eaten until this subsides.

VEAL.

Veal has the reputation of being more slowly digested than beef—an opinion due probably to the fact that it is more difficult to masticate thoroughly. It sometimes exerts a laxative effect, and is seldom used by invalids. It contains, roughly speaking, 17% of nitrogenous and 16% of fatty substances.

MUTTON.

Although possessed of a lower nutritive value than beef, **mutton** is easily digested and forms a valuable article of diet for occasional use. Continued use develops a repugnance to it, and in some an apparent idiosyncrasy exists against its use. It contains a large amount of fat (about 40%) and between 9 and 10% of nitrogenous substances.

PORK.

Of all meats in common use, **pork** is the most difficult to digest, requiring between five and six hours for complete digestion. It is the fattest of meats, containing about 65% of fat and 8% of nitrogenous elements. With two exceptions it is not used for invalids, as it is not well borne by the stomach. *Bacon*, however, is well tolerated by many weak stomachs; and *roast pig* may at times be taken with advantage during convalescence. If tolerated by the stomach, pork is suitable for phthisical patients.

CHICKEN.

The flesh of the ordinary domestic fowl, combining as it does ease of mastication and digestion with an agreeable flavor, is a valuable and much-used article of diet for the sick. Other domestic and wild fowl may often be of value.

Animal viscera: *Sweetbread*, properly the *thymus* of the calf, but more often the *pancreas*, is an agreeable, nutritious, and easily digested food. *Tripe*, the stomach of the ox and other ruminants, combines the same qualities. The *brain* is also easily digested, and contains fats and phosphorus. *Liver*, although nutritious, is too difficult of digestion for the sick. *Kidneys* are objectionable for both sick and well.

Fish suitable for invalids: Certain varieties of fish, as whitefish, bass, trout, etc., are suitable articles of diet for the sick. As a rule, they are easily digestible if boiled, in which way alone they should be served to invalids. Of *shell-fish*, oysters are especially valuable. They are more easily digested when served uncooked, because the brown part of the oyster, the liver, is composed of *glycogen* and a ferment, which aids in digesting the former, if not destroyed by heat.

VEGETABLES.

Wheat and rye: Among the cereals wheat and rye are most important. Wheat bread, properly made, is easily digested, nutritious, and nearly all assimilated, leaving very little residue. This fact accounts for its tendency to produce constipation. Bread made from unbolted flour is more nutritious, less apt to produce constipation, and being less permeable to the digestive fluids, is less easily digested. Fresh bread is difficult to masticate thoroughly, and should not be served to invalids.

Cracked wheat, oatmeal, cornmeal: Cracked wheat, which is boiled until the envelope is burst, is eaten with cream and sugar, forming a pleasant, highly nutritious, and somewhat laxative food. *Oatmeal* and *cornmeal* are staple articles of food, and, prepared in various ways, are acceptable to the

sick. Like the above, they are apt to produce a somewhat laxative effect.

Farinaceous food-stuffs: *Starch*, *sago*, *tapioca*, and *arrow-root* are quickly digested; and are largely used for the sick. They contain *no nitrogen*, and hence are not capable of maintaining life for any considerable time.

Potatoes: Next to wheat, the ordinary potato is the most popular vegetable in general diet. It contains a large amount of starch (about 16%) and small percentages of sugar and nitrogenous matters. Boiled to a dry and mealy condition, it may be used by the sick, but in no other condition is it suitable for this purpose. The *sweet potato* differs chiefly in the larger proportion of sugar it contains, and is probably less easily digested. Other vegetables in common use are seldom used for the sick.

SPECIAL PLANS OF DIET.

Low diet: In *obesity*. For the reducing of superfluous fat it is necessary largely to interdict the saccharine, fatty, and starchy elements of food; of these, sugar is the most fattening, and should be very sparingly used. Various treatments of this sort have received the name of Bantingism.

In *aneurism*. By a combination of perfect rest in the recumbent position and extremely low diet, largely *dry*, a good effect may be produced upon internal aneurism.

Dry diet: A diet in which the amount of fluid ingested is limited may be of signal service in *dropsical conditions*, hydrothorax, ascites, etc. A satisfactory plan is to limit the amount of fluids so that the watery excreta are in excess of those ingested.

Animal diet: The chief indication for a more or less exclusive meat diet is found in *diabetes*. Most vegetables contain sugar or starch (which easily undergoes conversion into sugar), and should be interdicted. Tomatoes, celery, and raw cabbage are about the only vegetables consistent with a strict diabetic diet. Gluten bread relieves to a degree the longing for wheat bread, which is ordinarily the greatest deprivation. Fats generally must be used freely. By a strictly meat diet

nearly or quite all of the glucose may be made to disappear from the urine.

Meat diet also proves of value in *diarrhœa*, whether *acute* or *chronic*, and is indispensable in *cachectic conditions* generally.

Diet in acute febrile conditions: During acute inflammatory and febrile conditions all the organs of the body are subject to a degenerative process, and all the functions are to a greater or less degree impaired. This tissue-destruction is evidenced by a large increase in those excretory elements which represent tissue, especially urea, urates, phosphates, etc. On the other hand, the processes of constructive metamorphosis are incomplete. The digestion shares with others this lessened power. Hence the importance of administering such food as shall be most easily digested. As a general rule, in such conditions *milk diet is indicated*. Beef tea, which once enjoyed popularity for this purpose, is inferior in nutritive properties and more difficult of digestion. Digestibility, to be sure, may be enhanced by peptonizing (by a process similar to that given in detail under *Milk*), but this does not make good the inferior food value.

DIET IN DISEASES.

Diet in acute gastritis: In all conditions our guiding principle should be to give the affected organ as nearly complete physiological rest as possible. Thus in acute gastritis small amounts of milk, milk with lime-water, milk with Vichy or carbonic waters, milk with barley-water, and demulcent drinks should be given frequently. Effervescent drinks, as champagne in small quantities, are generally well borne.

Diet in chronic gastritis: When for any reason there appears to be a deficiency of gastric juice, our aim should be to administer foods largely digested in the small intestine, such as starches, tapioca, arrow-root, rice, and the farinaceous vegetables generally. On the other hand, when *heartburn* (acid fermentation) occurs from fermentation of starchy and fatty foods, these articles should be taken sparingly.

Diet in intestinal indigestion: Again, in cases of *intestinal*

indigestion, summer diarrhœa, and other conditions dependent upon functional or inflammatory disorders of the small intestine, foods entirely or for the most part digestible in the stomach should be given. Starches and fats should be interdicted, and nitrogenous foods, as milk, eggs, meats, should be administered.

Diet in chronic constipation: Here a suitable diet is of prime importance. Materials leaving a large amount of indigestible residue, as fresh vegetables, oatmeal, corn, and brown bread, raisins, almonds, prunes, etc., may materially aid in overcoming this condition.

Diet in cachectic conditions: The objects to be attained are an increase of the muscular and fatty tissues. As fat-forming elements, *fats* (in milk, cream, meats), *sugar* (in its own form or in sweet fruits), and starches in abundance are indicated. Thus, a combination of *nitrogenous* and *carbonaceous* foods is to be given, and freely. In severe anæmic conditions, as pernicious anæmia, Addison's disease, etc., frequent (or "forced") feeding may prove advantageous.

DIGESTIVE FERMENTS.

In this connection we may consider briefly certain physiological ferments which have to do with the digestive process.

PEPSINUM, *U. S.* (Pepsin).

Pepsin is a proteolytic ferment or enzyme obtained from the glandular layer of fresh stomachs from healthy pigs, and capable of digesting not less than three thousand times its own weight of freshly coagulated and disintegrated egg albumen, when tested by the process given in the Pharmacopœia.

Pepsin is the digestive ferment of the gastric juice. It is somewhat soluble in water, and freely so in water slightly acidulated with hydrochloric acid. The purest and most reliable pepsin is obtained by dissolving it in hydrochloric acid, drying, and diluting to a fixed standard, when it is known by its digestive power as 1 : 1000, 1 : 2000, 1 : 3000, etc. As first obtained, pepsin is a viscid fluid; dried upon plates and without artificial dilution, it is known as "scale pepsin."

Alcohol destroys the activity of the ferment, so that preparations made with wine and alcohol are inferior. Glycerin solutions are potent and keep well.

Pepsinum Saccharatum, *U. S.*, Saccharated Pepsin. This contains 10% of Pepsin, *U. S.*, and 90% of Sugar of Milk.

Therapeutics: Naturally, the chief indication for pepsin is weakened digestive power. When hydrochloric acid is wanting or diminished in the gastric secretion, the addition of this element undoubtedly increases its value. Even at the standard strength indicated above, the doses habitually given could be of very little actual benefit unless a stimulant action upon the mucous membrane takes place; and some authorities are skeptical as to its real value. Acting as a ferment, however, its activity may be increased by repeating the dose of hydrochloric acid.

The *diarrhœa of children*, dependent upon imperfect gastric digestion, may be greatly benefited by pepsin. It has been suggested as a solvent for diphtheritic membranes and blood-clot in the bladder.

PANCREATINUM, *U. S.* (Pancreatin).

Pancreatin is a mixture of the enzymes naturally existing in the pancreas of warm-blooded animals, usually obtained from the fresh pancreas of the hog (*Sus scrofa;* class Mammalia; order Pachydermata).

Useful preparations of this important ferment exist both in the liquid and solid forms—liquor pancreaticus and extract of pancreatin. Given by mouth, it is probably rendered more or less inert by the gastric juice before it reaches an alkaline medium in which it can act. Pancreatin may be given in capsule so as to reach the intestine. Its chief and great value is for the partial digestion of food before it is given. This artificial digestion of food has already been considered (see *Peptonized Milk*).

Papayotin (*Papain* or *Papoid*) is a digestive ferment obtained from the *fruit* of *Carica papaya*, a tree cultivated in tropical countries. It is credited with digesting starches and

albuminoids, besides emulsifying fats, and is active in acid or alkaline solution. Dose gr. j–x.

Diastase: This is the peculiar ferment developed in germinating seeds, hence found in malt. It resembles the *ptyalin* of the saliva in so far that it converts *starch* and *dextrin* into *sugar* in slightly alkaline or neutral media. Diastase is useful in cases where starches are digested with difficulty. Usually the liquid preparations of malt are employed; only those contain diastase which have not been heated above 55°–65° C., as the ferment is destroyed at higher temperatures.

TABLE OF DOSES

OF REMEDIES MOST FREQUENTLY ADMINISTERED.

For hypodermatic use the dose should be *half* that used by the mouth.
For use by rectum the dose should be *twice* that used by the mouth.
Doses for Children.—Dr. Young's rule: Add 12 to the age, and divide by the age to give the denominator of a fraction, the numerator of which is 1.

Example: For a child two years old, $\frac{12 + 2}{2} = \frac{1}{7}$; the dose should be $\frac{1}{7}$th that for an adult. In giving powerful medicines and opium still smaller doses must be used for children.

Remedies.	Grains or Minims.	Grams or Cubic Centimeters.
Abstracta. (*See Extracta. Take half the dose.*)		
Acetanilid (antifebrin)	2—15	0.1 — 1.
Acid. arsenos.	$\frac{1}{60}$ — $\frac{1}{20}$	0.001 — 0.003
benzoic.	5—15	0.3 — 1.
boric.	5—10	0.3 — 0.65
carbolic.	$\frac{1}{2}$ — 1½	0.03 — 0.1
gallic.	3—15	0.15 — 1.
hydrobrom. dil.	10—60	0.65 — 4.
hydrocyan. dil.	2— 6	0.1 — 0.35
hydrochlor. dil.	5—20	0.3 — 1.3
nitric. dil.	5—20	0.3 — 1.3
nitro-hydrochlor. dil.	5—20	0.3 — 1.3
phosphoric. dil.	5—30	0.3 — 2.
salicylic.	5—20	0.3 — 1.3
sulphuric. dil.	5—30	0.3 — 2.
sulphuric. arom.	5—15	0.3 — 1.
sulphuros.	30—60	2. — 4.
tannic.	2—10	0.1 — 0.65
Aconitina (white crystals)	$\frac{1}{300}$ — $\frac{1}{200}$	0.0002— 0.0003
Adonidin	$\frac{1}{10}$ — $\frac{1}{3}$	0.006 — 0.02
Agaricin	$\frac{1}{8}$ — $\frac{1}{4}$	0.008 — 0.015
Aloe	2— 5	0.13 — 0.3
Aloinum	$\frac{1}{4}$ — 1	0.008 — 0.18
Ammonii benzoas	10—20	0.65 — 1.3
bromid.	5—30	0.3 — 2.
carb.	3—10	0.2 — 0.65
chlorid.	10—30	0.65 — 2.
iodid., valer.,	2—15	0.1 — 1.
Amyl nitris (inhaled or internally)	2— 5	0.1 — 0.35
Amylene hydrate (hypnotic)	10—60	0.6 — 4.
Antimon. et pot. tart.; diaph. or expectorant	$\frac{1}{20}$ — $\frac{1}{10}$	0.003 — 0.006
et pot. tart.; emetic	$\frac{1}{2}$ — 1	0.03 — 0.06
Antipyrin	2—15	0.1 — 1.
Apiol	5—10	0.3 — 0.65
Apomorph. hydrochlor.	$\frac{1}{30}$ — $\frac{1}{10}$	0.003 — 0.006
Arbutin	5—15	0.3 — 1.

Remedies.	Grains or Minims.	Grams or Cubic Centimeters.
Argenti nitras	$\frac{1}{6}$— $\frac{1}{2}$	0.01 — 0.03
Arsenii iodidum	$\frac{1}{64}$— $\frac{1}{10}$	0.001 — 0.006
bromid.	$\frac{1}{64}$— $\frac{1}{16}$	0.001 — 0.004
Atropinæ sulphas	$\frac{1}{128}$— $\frac{1}{64}$	0.0005— 0.002
Auri et sodii chlorid	$\frac{1}{32}$— $\frac{1}{8}$	0.002 — 0.008
Bismuthi subnitras	5— 60	0.3 — 4.
Caffeina	1— 5	0.06 — 0.3
Calcii lacto-phosphas	5— 10	0.3 — 0.65
Calx sulphurata	$\frac{1}{10}$— 1	0.006 — 0.06
Camphora	3— 10	0.2 — 0.65
Camph. monobrom.	2— 5	0.1 — 0.3
Capsicum	1— 5	0.06 — 0.3
Cerii oxalas	1— 10	0.06 — 0.6
Chinoidinum	3— 30	0.2 — 2.
Chloral	3— 20	0.2 — 1.3
Chloroformum	1— 15	0.06 — 2.
Chrysarobinum	$\frac{1}{2}$— 3	0.01 — 0.2
Cinchonidina, and its salts	5— 30	0.3 — 2.
Cocaina (locally, 1 to 4 % sol.), internally	$\frac{1}{10}$— $\frac{1}{2}$	0.004 — 0.03
Codeina	$\frac{1}{10}$— 2	0.004 — 0.13
Colchicin	$\frac{1}{100}$— $\frac{1}{50}$	0.0006— 0.0013
Confectio sennæ	60—120	4. — 8.
Coniina, and its salts	$\frac{1}{100}$— $\frac{1}{6}$	0.0006— 0.01
Copaiba	15— 60	1. — 4.
Creasotum	$\frac{1}{2}$— 5	0.03 — 0.3
Creolin (locally, $\frac{1}{2}$ to 2 % sol.), internally	$\frac{1}{2}$— 5	0.03 — 0.3
Croton chloral	1— 5	0.06 — 0.3
Cubeba	2— 60	0.12 — 4.
Cupri acetas	$\frac{1}{6}$— $\frac{1}{2}$	0.008 — 0.03
sulphas	$\frac{1}{10}$— $\frac{1}{4}$	0.004 — 0.015
Curare	$\frac{1}{32}$— $\frac{1}{10}$	0.002 — 0.006
Digitalinum	$\frac{1}{64}$— $\frac{1}{32}$	0.001 — 0.002
Digitalis	$\frac{1}{8}$— 2	0.008 — 0.13
Elaterinum;	$\frac{1}{50}$— $\frac{1}{12}$	0.001 — 0.005
Ergota	15— 60	1. — 4.
Ergotinum	2— 8	0.13 — 0.5
Eserina, and its salts	$\frac{1}{64}$— $\frac{1}{48}$	0.001 — 0.003
Extractum aconiti [rad.]; U. S. P. 1880	$\frac{1}{12}$— $\frac{1}{4}$	0.005 — 0.015
aconiti [rad.], fluid.; U. S. P. 1880	$\frac{1}{2}$— 1	0.03 — 0.06
aloes aquos.	$\frac{1}{2}$— 10	0.03 — 0.65
bellad. alcohol.	$\frac{1}{6}$— $\frac{1}{2}$	0.01 — 0.03
bellad. fl.	1— 3	0.06 — 0.02
buchu fl.	30— 60	2. — 4.
calumbæ fl.	15— 30	1. — 2.
cannab. ind. (with caution)	$\frac{1}{10}$— $\frac{1}{2}$	0.004 — 0.03
cannab. ind. fl. (with caution)	$\frac{1}{2}$— 1	0.03 — 0.06
cascaræ sagrad. fl.	5— 30	0.6 — 2.
cimicifugæ fl.	5— 30	0.3 — 2.
colchici rad. fl.,		
colchici sem. fl.,	2— 8	0.12 — 0.5
colocynthidis comp.	5— 15	0.3 — 1.
conii fl.	1— 10	0.06 — 0.6
convallariæ rad. fl.	5— 30	0.3 — 2.
digitalis	$\frac{1}{6}$— 1	0.008 — 0.06
digitalis fl.	1— 6	0.06 — 0.4
ergotæ	$\frac{1}{2}$— 15	0.03 — 1.
ergotæ fl.	15— 60	1. — 4.
erythroxyli fl. (coca)	15—120	1. — 8.
eucalypti fl.	5— 30	0.03 — 2.
gelsemii fl.	2— 5	0.13 — 0.3
gossypii fl.	15— 60	1. — 4.
grindeliæ rob. fl.	10— 60	0.6 — 4.
guaranæ fl.	30—120	2. — 4.

Remedies.	Grains or Minims.	Grams or Cubic Centimeters.
Extractum hæmatoxyli	10— 30	0.6 — 2.
hydrastis fl.	10—120	0.6 — 2.
hyoscyami alcohol.	½— 2	0.03 — 0.13
hyoscyami fl.	2— 8	0.1 — 0.5
ignatiæ	½— ½	0.008 — 0.03
iridis fl.	5— 10	0.3 — 0.65
leptandræ fl.	20— 30	1.3 — 2.
lobeliæ fl.	1— 5	0.06 — 0.3
matico fl.	30— 60	2. — 4.
nucis vomicæ	⅛— ½	0.008 — 0.03
nucis vomicæ fl.	1— 5	0.06 — 0.3
opii	⅛— 1	0.008 — 0.06
physostigmatis	1/16— ⅛	0.004 — 0.01
pilocarpi fl.	5— 30	0.3 — 2.
podophylli	½— 3	0.03 — 0.2
prun. virg. fl.	30— 60	2. — 4.
pulsatillæ fl.	2— 5	0.1 — 0.3
quebracho fl. (aspidosperma)	20— 60	1.3 — 4.
rhei fl.	5— 30	0.3 — 2.
scillæ fl.	2— 3	0.1 — 0.2
scoparii fl.	15— 60	1. — 4.
scutellariæ fl.	15— 60	1. — 4.
senegæ fl.	1— 5	0.06 — 0.3
sennæ fl.	60—240	4. —16.
serpent. fl.	20— 30	1.3 — 2.
spigeliæ fl.	10— 60	0.6 — 1.
stillingiæ fl.	15— 45	1. — 3.
stramonii	¼— ½	0.015 — 0.03
taraxaci	5— 60	0.3 — 4.
ustilag. fl.	15— 60	1. — 4.
uvæ ursi fl.	30— 60	2. — 4.
valer. fl.	30— 60	2. — 4.
veratr. vir. fl.	2— 8	0.1 — 0.5
viburni	15— 60	1. — 4.
xanthoxyli fl.	15— 60	1. — 4.
Fel bovis purif.	5— 10	0.3 — 0.65
Ferri arsen.	1/20— ⅛	0.003 — 0.01
bromid.	1— 5	0.06 — 0.3
carb. sacch.	2— 15	0.1 — 1.
et ammon. citr.	5— 10	0.3 — 0.65
et ammon. tartr.	5— 15	0.3 — 1.
et pot. tart.	10— 30	0.6 — 2.
et strychn. citr.	1— 5	0.06 — 3.
hypophosphis	5— 10	0.3 — 0.65
iodidum sacch.	2— 5	0.13 — 0.33
lactas	1— 3	0.06 — 0.2
oxid. hydrat. cum. magnes. (antidote to arsenic),	ʒ ½ –ʒ 1 (frequently)	16. —32.
pyrophosphas	1— 5	0.06 — 0.3
subcarb.	5— 30	0.3 — 2.
sulphas	1— 3	0.06 — 0.2
sulphas exsiccat.	½— 2½	0.03 — 0.15
valer.	1— 3	0.06 — 0.2
Ferrum dialys.	1— 15	0.06 — 1.
reduct.	1— 5	0.06 — 0.3
Gaultheria, oil of	3— 15	0.2 — 0.65
Guarana	8— 30	0.5 — 2.
Homatropinæ hydrobrom. (mydriatic, locally, 0.2 % to 4 %), internally,	1/80— 1/20	0.001 — 0.003
Hydrarg. chlor. corros.	1/64— 1/10	0.001 — 0.006
chlor. mite	1/10— 10	0.004 — 0.65
iodid. rubr.	1/50— 1/10	0.0013— 0.006
iodid. vir.	⅙— 1	0.01 — 0.06

Remedies.	Grains or Minims.	Grams or Cubic Centimeters.
Hydrarg. subsulphas flav.	¼— ½	0.015 — 0.03
as emetic	½— 5	0.12 — 0.3
c. creta	3— 8	0.2 — 0.5
Hydrastin	3— 5	0.2 — 0.3
Hydrogenii peroxid. (10 vol. sol.), locally (25 to 100 %), pus destroyer; tonic-stimulant and antiseptic, *per os,*	30—120	2. — 8.
Hyoscinæ hydrobrom.	2$\frac{1}{0}$— $\frac{1}{60}$	0.0003— 0.001
Hyoscyaminæ sulph.	2$\frac{1}{0}$— $\frac{1}{60}$	0.0003— 0.001
Hypnone	5— 10	0.3 — 0.65
Ichthyol (locally, 10 to 50 %), internally	3— 5	0.2 — 0.3
Infusum digitalis	f℥ 1—f℥ 4	4. —16.
Iodoformum	1— 5	0.06 — 0.3
Iodol	$\frac{1}{6}$— ½	0.01 — 0.03
Iodum	$\frac{1}{10}$— ¼	0.006 — 0.015
Ipecacuanha { expect.	½— 1	0.01 — 0.06
Ipecacuanha { emet.	15— 30	1. — 2.
Jalapa	15— 30	1. — 2.
Liq. ammon. acet.	f℥ 2—f℥ 8	8. —32.
acidi arsenosi, arsenii bromidi, arsen. et hydr. iod., potassii arsenit., sodii arsenatis, } *Commencing doses to be increased cautiously.*	1— 5	0.06 — 1.
ferri chloridi	2— 10	0.15 — 0.65
ferri dialys.	10— 30	0.65 — 2.
potassii citrat.	f℥ 2—f℥ 4	8. —16.
Lithii benzoas	5— 20	0.3 — 1.3
bromid.	5— 20	0.3 — 1.3
carb.	2— 10	0.13 — 0.65
citras	5— 20	0.3 — 1.3
salicylas	5— 30	0.3 — 1.3
Lupulinum	5— 30	0.3 — 2.
Magnesii carb.	15— 60	1. — 4.
citr. gran.	℥ 2—℥ 8	8. —32.
sulphis	10— 30	0.6 — 2.
Mangani oxid. nigr.	1— 5	0.06 — 0.3
Massa copaibæ	5— 30	0.3 — 2.
ferri carb.	5— 15	0.3 — 1.
hydrarg.	1— 15	10.06 — 1.
Mist. asafœtidæ	f℥ 4—f℥ 8	6. —32.
chloroformi	f℥ 1—f℥ 8	4. —32.
ferri et amm. acet.	f℥ 1—f℥ 4	4. —32.
glycyrrhizæ comp.	f℥ 1—f℥ 4	4. —32.
magnes. et asafœt.	f℥ 1—f℥ 4	4. —32.
potassii citr.	f℥ ½—f℥ 2	16. —64.
rhei et sodæ	f℥ ½—f℥ 1	16. —32.
Morphina, and its salts	$\frac{1}{60}$— ½	0.004 — 0.03
Morrhuol (derivative of cod-liver oil)	3— 60	0.15 — 4.
Moschus	2— 15	0.1 — 1.
Naphthol	2— 5	0.15 — 0.3
Narceina	½— ½	0.01 — 0.3
Nitro-glycerinum (1 % sol.)	{ gtt. 1 increased. }	0.03 increased.
Oleoresina aspidii (filix mas)	15— 60	1.0 — 4.0
capsici	½— ½	0.01 — 0.03
cubebæ	5— 20	0.3 — 1.3
lupulini	2— 5	0.13 — 0.3
Oleum copaibæ	8— 15	0.5 — 1.
erigerontis	5— 15	0.3 — 1.
eucalypti	5— 10	0.3 — 0.6
phosphoratum	1— 3	0.06 — 0.2
terebinthinæ	2— 30	0.12 — 2.

Remedies.	Grains or Minims.	Grams or Cubic Centimeters.
Oleum tiglii	gtt. $\frac{1}{2}$— 2	0.01 — 0.06
Opium (14 % morphine)	$\frac{1}{2}$— 2	0.008 — 0.12
Paraldehyde	20— 60	1.3 — 4.
Pelletierine (Tanret's)	f3 $\frac{1}{2}$—f3 1	15. —32.
Phenacetin	2— 10	0.1 — 0.4
Phosphorus	$\frac{1}{128}$— $\frac{1}{50}$	0.0005— 0.0013
Physostigminæ sulphas	$\frac{1}{128}$— $\frac{1}{60}$	0.0005— 0.0011
Picrotoxinum	$\frac{1}{120}$— $\frac{1}{60}$	0.0005— 0.0011
Pilocarpina, and salts	$\frac{1}{64}$— $\frac{1}{2}$	0.001 — 0.03
Plumbi acetas	$\frac{1}{2}$— 3	0.03 — 0.2
Potassii acetas	15— 60	1. — 4.
bicarbonas	8— 60	0.5 — 4.
bitartras	1— 2	0.06 — 0.13
bromidum	8— 60	0.5 — 4.
chloras	8— 30	0.5 — 2.
cyanidum	$\frac{1}{20}$— $\frac{1}{8}$	0.003 — 0.008
iodidum	2— 30	0.13 — 2.
nitras	2— 15	0.13 — 1.
tartras	3 1—3 8	4. —32.
Pulv. antimonialis	1— 3	0.06 — 2.
Pulv. glycyrrhizæ comp.	30— 60	2. — 4.
ipecac. et opii	5— 15	0.3 — 1.
jalapæ comp.	10— 60	0.6 — 4.
morphinæ comp.	5— 15	0.3 — 1.
rhei comp.	5— 60	0.3 — 4.
Resina copaibæ	2— 10	0.13 — 0.65
euonymi	2— 5	0.13 — 0.3
guaiaci	5— 20	0.3 — 1.3
jalapæ	2— 5	0.13 — 0.3
podophylli	$\frac{1}{12}$— $\frac{1}{2}$	0.005 — 0.03
scammonii	2— 10	0.13 — 0.65
Resorcin	2— 5	0.1 — 0.3
Rheum	2— 30	0.13 — 2.
Saccharin (substitute for sugar)	$\frac{1}{2}$— 5	0.03 — 0.3
Salicinum	5— 30	0.3 — 2.
Salol	2— 10	0.15 — 0.65
Santonica	8— 60	0.5 — 4.
Santoninum	$\frac{1}{4}$— 5	0.015 — 0.3
Senna	8—180	0.05 —12.
Sodii arsenas	$\frac{1}{64}$— $\frac{1}{10}$	0.001 — 0.006
benzoas	5— 15	0.3 — 1.
boras (in epilepsy)	5— 30	0.3 — 2.
bromidum	5— 30	0.3 — 2.
chloras	2— 5	0.13 — 0.3
hyposulphis	5— 20	0.3 — 1.3
iodidum	2— 30	0.13 — 2.
phosphas	2—120	0.13 — 8.
salicylas	5— 30	0.3 — 2.
sulphas	60—120	4. — 8.
Sparteinæ sulph. (cardiant and diuretic)	$\frac{1}{10}$— $\frac{1}{2}$	0.004 — 0.25
Spiritus ætheris nitrosi	15—120	1. — 8.
æther. comp.	15—120	1. — 8.
ammoniæ arom.	15— 60	1. — 4.
camphoræ	5— 30	0.3 — 2.
Spiritus chloroformi	15— 60	1. — 4.
Strychnina, and salts	$\frac{1}{64}$— $\frac{1}{32}$	0.001 — 0.005
Sulphonal (best in hot milk)	5— 20	0.3 — 1.3
Sulphur	3 $\frac{1}{2}$—3 4	2. —16.
Syr. ferri bromidi	5— 60	0.03 — 4.
ferri iodidi	5— 30	0.03 — 2.
scillæ	30— 60	2. — 4.
scillæ comp.	5— 30	0.03 — 2.
senegæ	f3 1—f3 2	4. — 8.

Remedies.	Grains or Minims.	Grams or Cubic Centimeters.
Syr. sennæ	f℥ 1—f℥ 8	4. —32.
Terebene	5— 15	0.3 — 1.
Terpin hydrate (tonic expectorant)	2— 5	0.13 — 0.3
Thymol	1— 5	0.06 — 0.3
Tinct. aconiti	½— 5	0.03 — 0.3
aloes	15— 60	1. — 4.
arnicæ rad.	5— 15	0.3 — 1.
asafœtidæ	30— 60	2. — 4.
belladonnæ	2— 15	0.1 — 1.
cannabis ind.	5— 20	0.3 — 1.3
capsici	8— 15	0.5 — 1.
cimicifugæ	30— 60	2. — 4.
cinchonæ comp.	15—120	1. — 8.
colchici [sem.]	5— 20	0.3 — 1.3
conii	5— 30	0.3 — 2.
digitalis	3— 15	0.2 — 1.
ferri chloridi	10— 30	0.6 — 2.
gelsemii	2— 15	0.1 — 1.
guaiaci ammon.	30— 60	2. — 4.
hydrastis	30—120	2. — 8.
hyoscyami	5— 30	0.3 — 2.
ignatiæ	5— 30	0.3 — 2.
iodi comp.	7— 15	0.06 — 1.
kino	15—120	0.1 — 8.
lobeliæ	5— 30	0.3 — 2.
moschi	15— 60	1. — 4.
nucis vomicæ	5— 15	0.3 — 1.
opii	2— 15	0.1 — 1.
opii camph.	5—240	0.3 —16.
physostigmatis	5— 15	0.3 — 1.
stramon.	5— 15	0.3 — 1.
strophanthi (cardiant and diuretic)	2— 10	0.1 — 0.65
valer. ammon.	10—120	0.6 — 8.
veratr. vir.	3— 10	0.2 — 0.6
Trituratio elaterini (10 %)	¼— 1	0.008 — 0.06
Urethane (hypnotic)	5— 30	0.3 — 2.
Vin. antim. { expect. et alt.	1— 8	0.06 — 0.5
Vin. antim. { emet.	30— 75	2. — 5.
colch. rad. (40 %)	5— 15	0.3 — 1.
colch. sem. (15 %)	5— 30	0.3 — 2.
ergotæ	f℥ 1—f℥ 3	4. —12.
ferri amar.	30— 60	2. — 4.
ipecac. { expect.	5— 15	0.3 — 1.
ipecac. { emet.	f℥ 2—f℥ 6	8. —24.
opii	5— 15	0.3 — 1.
Zinci acet.	½— 2	0.03 — 0.13
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iodid.	½— 3	0.03 — 0.2
oxid.	1— 5	0.06 — 0.3
phosphid.	1/10— ¼	0.006 — 0.01
sulphas (emet.)	15— 30	1. — 2.
valerianas	½— 5	0.03 — 0.3

IMPORTANT POISONS AND THEIR ANTIDOTES.

ACIDS, HYDROCHLORIC, NITRIC, SULPHURIC. See *Mineral Acids.*

ACID, CARBOLIC. Evacuation of stomach; *soluble sulphates*, as the sulphates of magnesium, sodium, or dilute sulphuric acid.

ACID, HYDROCYANIC. *Ammonia* by inhalation and subcutaneously; alcohol and atropine hypodermically; artificial respiration.

ACID, OXALIC. *Lime salts* (whitewash, chalk, etc.); calcii carbonas præcipitatus; syrupus calcis.

ACONITE. Evacuation of stomach; recumbent position and perfect quiet; diffusible stimulants (*ammonia, alcohol*); artificial respiration if necessary.

ÆTHER. *Artificial respiration;* faradization of respiratory muscles; *atropine* and strychnine subcutaneously.

ALCOHOL. Evacuation of stomach; *aqua ammoniæ;* heat.

ALKALIES, CAUSTIC POTASSA, AND SODA. Weak acids, as *acetic* (vinegar), *citric* (lemon-juice); later demulcent drinks.

ALKALOIDS. *Tannic acid; iodide of potassium.*

AMMONIA. Weak acids; demulcents.

ANTIMONII ET POTASSII TARTRAS. Tannic acid; morphine; free stimulation.

ARSENIC. Thorough evacuation of stomach; *ferri oxidum hydratum*, freshly prepared and frequently administered; *ferri oxidum hydratum* cum *magnesia; ferrum dialysatum;* stimulants.

ATROPINE. Evacuation of stomach; respiratory and circulatory stimulants; *morphine;* physostigma.

BELLADONNA. See *Atropine.*

CANTHARIDES. Opiates; demulcents in large quantities (water, flaxseed tea, etc.); *Avoid oils;* alkaline diuretics.

CHLORAL. As for *Opium*, q. v., but avoiding forced exertion; cardiac stimulants; heat.

CHLOROFORM. *Inversion of patient*, head downward; cardiac stimulants, *alcohol, ammonia*, and strophanthus hypodermically; amyl nitrite; artificial respiration.

COLCHICUM. *Opium;* stimulants; demulcent drinks in later stages.

CONIUM. Cardiac and respiratory stimulants; artificial respiration; external warmth and measures against shock in general.

COPPER SULPHATE. Albumin; sodii bicarb.

CORROSIVE SUBLIMATE. Albumin; milk; emetics.

CROTON OIL. *Opium;* astringents; demulcents.

DIGITALIS. Quiet in recumbent position; diffusible stimulants, as *ammonia* and *alcohol.*

GELSEMIUM. Alcohol; ammonia.

GAS, COAL OR ILLUMINATING. Oxygen inhalations; stimulants.

HYOSCYAMUS. See *Atropine.*

IGNATIA. See *Strychnine.*

IODINE. *Starch;* demulcents.

IODOFORM. Stimulants as indicated.

LOBELIA. *Tannic acid;* stimulants; opiates.

MINERAL ACIDS. Calcium and magnesium salts (chalk, aqua calcis, magnesia); alkaline carbonates (soap); water and demulcent drinks.

MUSCARIN (POISON MUSHROOMS). *Atropine;* emetics if necessary.

NUX VOMICA. See *Strychnine.*

NITRATE OF SILVER. Common salt (sodium chloride).

OPIUM AND ITS ALKALOIDS. *Evacuation of stomach* by stomach-pump or emetics—by the latter preferably *mustard, cupri sulphas,* or *zinci sulphas;* tannic acid; strychnine; *atropine* tentatively, guided by respiratory effects; *caffeine; black coffee;* various methods of respiratory stimulation; oxygen inhalations; cardiac stimulants.

OLEUM AMYGDALÆ AMARÆ. See *Hydrocyanic Acid.*

PHYSOSTIGMA. Atropine; heat; artificial respiration.

PHOSPHORUS. *Sulphate of copper* as emetic and antidote; *old French oil of turpentine.*

POTASSII CHLORAS AND POTASSII NITRAS. Emetics; cathartics; opium; demulcents.

POTASSA, CAUSTIC. See *Alkalies.*

PRUSSIC ACID. See *Hydrocyanic Acid.*

POTASSII CYANIDUM. See *Hydrocyanic Acid.*

STRAMONIUM. See *Atropine.*

STRYCHNINE. *Chloroform* or *ether,* if necessary to check convulsions; *chloral; bromides.*

SODA, CAUSTIC. See *Alkalies.*

TARTAR EMETIC. See *Antimonii et Potassii Tartras.*

VERATRUM VIRIDE. Emetics if drug have not been self-emetic; recumbent posture and enforced quiet; heat; diffusible stimulants subcutaneously and per rectum.

ZINC, CHLORIDE OR SULPHATE. Albumin; sodium bicarbonate.

INCOMPATIBILITIES.

DRUGS may be *physically, physiologically,* or *chemically* incompatible with each other. Physiological incompatibility will be understood only by a thorough knowledge of their physiological effects, chemical incompatibility by strict attention to chemical principles, and physical incompatibility by a knowledge of their physical properties.

Chemical incompatibility occurs when substances precipitate each other in solution (this may be intentional), form explosive compounds or volatile ingredients, and when chemical decomposition takes place from any cause. The most commonly occurring instances are the combination of liquid preparations of vegetable substances with solutions of iron (inky tannate of iron formed); alkaloids with tannic acid, alkalies, or alkaline salts, mineral acids with weaker acids (carbonic).

Physical incompatibility results when precipitates are formed without chemical action. Usually this takes place in liquids which differ in their menstrua; alcoholic tinctures, fluid extracts, and spirits do not mix without precipitation with the aqueous preparations, like infusions, decoctions, waters, and solutions. The precipitate may be active or inert.

Therapeutic incompatibility takes place when substances of opposite physiological action are combined in the same formula.

When possible make use of the greatest simplicity in prescribing, avoiding multiplicity of drugs in the same prescription. Scientific interest will thus be subserved, a clearer insight into the effects of individual drugs will be possible, and at the same time all likelihood of the ingredients neutralizing each other or forming unpleasant or dangerous compounds avoided.

Remember the chemical principle that soluble salts brought together in the same solution generally, if possible, exchange radicals, with a resultant insoluble compound or precipitate. Hence such combinations are to be avoided; also, that the stronger mineral acids decompose salts of the weaker mineral and vegetable acids, and form ethers with alcoholic preparations. These general statements simply serve to illustrate the bearing of chemistry on the subject of incompatibles. A complete list of incompatible combinations would be inappropriate in a work of this kind. The following are a few general statements, involving the most important ones:

Alkalies are incompatible with acid solutions, alkaloids, and the soluble non-alkaline metallic salts.

Alkaloids in general with tannic acid, alkalies, and alkaline salts.

Stronger mineral acids with alkalies and salts of relatively weak acids (carbonic, hydrobromic, hydriodic, acetic, citric, etc.).

Arsenic with tannic acid, salts of iron (especially hydrate), and lime and magnesia. In fact, as a matter of course, *all drugs* with their *antidotes*.

Carbonates with stronger acids and acid salts.

Chlorides with salts of silver and lead, and with alkalies.

Corrosive Sublimate with almost everything: it is best given alone in *simple* syrup, even the compound syrup of sarsaparilla being said to slightly decompose it; it is, however, often administered in combination with potassium iodide, which it decomposes, with the formation of an efficient double salt.

Digitalis with iron and preparations containing tannic acid.

Glucosides with *free acids* and substances containing *emulsin*.

Iodine and *Iodides* with alkaloids and the ordinary soluble metallic salts. Iodine and potassium iodide are compatible, as in Lugol's solution.

Iron salts with tannic acid (tinctures, infusions, fluid extracts, etc.) and astringents.

Mucilages with acids, iron salts, and alcohol.

Syrup of Squill contains acetic acid, and is incompatible with the carbonate of ammonium, but not with the chloride.

Sweet Spirit of Nitre with sulphate of iron, tincture of guaiac, and carbonates.

Tannic and *Gallic acids* and the vegetable astringents with alkaloids and salts of iron and lead. Vegetable infusions in general with metallic salts. Tannic acid precipitates albumin and gelatin.

Nitrate of Silver and the *acetate* and *subacetate of lead* are best prescribed alone. The first may be administered with opium and extract of hyoscyamus. The lead salts are much used with opium in "lead-and-opium wash," the insoluble precipitate resulting being therapeutically efficient.

Water with tinctures and other alcoholic preparations containing *resin:* the resin is precipitated. When such combinations are necessary, add acacia or other emulsifying agent.

Powerful oxidizing agents with *easily oxidizable* substances: combustion, and even explosion, may occur. Among the oxidizing agents in general medicinal use may be mentioned potassium chlorate, potassium permanganate, chromic, nitric, and nitro-hydrochloric acids. Especially combustible are glycerin, sugar, alcohol, fats, sulphur, and phosphorus.

CLASSIFICATION OF DRUGS

ACCORDING TO THEIR ACTION.

ANTISPASMODICS. Camphor, spiritus ætheris compositus, valerian, asafœtida, moschus, oleum succini, humulus.

ANÆSTHETICS. Æther, chloroform, nitrogen monoxide, ethylene bichloride, ethyl bromide.

LOCAL ANÆSTHETICS. Cocaine, eucaine, tropacocaine.

HYPNOTICS OR SOMNIFACIENTS. Opium, cannabis Indica, cannabis Americana, chloral, chloralamid, sulphonal, amylene hydrate, paraldehyde, urethane.

BELLADONNA GROUP. Belladonna, stramonium, hyoscyamus, duboisia, coca.

SPINANTS.—*Excito-motors.* Nux vomica, ignatia, cocculus indicus [ergot, digitalis].—*Depresso-motors.* Physostigma, the bromides, the nitrite group—amyl nitrite, nitroglycerin, potassium nitrite, sodium nitrite—curare, conium, gelsemium, lobelia, tabacum.

AFFECTING CIRCULATORY SYSTEM.—*Cardiants.* Ammonia, alcohol, digitalis, strophanthus, convallaria, sparteine, adonidine, caffeine.—*Cardiac Depressants.* Antimony, veratrum viride, veratrine, aconite, pulsatilla, arnica, staphisagria, hydrocyanic acid, potassium cyanide, oil of bitter almonds, vegetable acids—acetic, citric, tartaric.

ASTRINGENTS.—*Vegetable Astringents.* Tannic acid, gallic acid, galls, krameria, catechu, kino, hæmatoxylon, hamamelis, quercus alba, rosa gallica, rubus, castanea, rhus glabra, etc.—*Mineral Astringents.* Silver, copper, zinc, lead, alum.

TONICS.—Iron and its salts, manganese, sulphuric acid, hydrochloric acid, nitric acid, nitro-muriatic acid, lactic acid, phosphorus.

ALTERATIVES. Arsenous acid, mercury, iodine and the iodides, iodoform, iodol, cod-liver oil, phosphoric acid, hypophosphites, sarsaparilla, guaiac, mezereum, sassafras, taraxacum, ichthyol, colchicum, the animal alteratives.

ANTIPERIODICS. Cinchona and its alkaloids, eucalyptus, Warburg's tincture.

ANTIPYRETICS. Salicylic acid and the salicylates, salicin, oil of gaultheria, salol, betol, carbolic acid, creosote, kreolin, thymol, resorcin, benzoin and benzoic acid, antipyrin, antifebrin, phenacetin, thallin, kairin, naphthaline.

STOMACHIC BITTERS.—*Simple.* Quassia, gentian, calumba, chirata, hydrastis.—*Aromatics.* Serpentaria, cascarilla, anthemis, eupatorium, cimicifuga, absinthe.—*Astringents.* Cornus, prunus Virginiana.

DIURETICS. Squill, scoparius, apocynum, triticum, vascular diuretics (see *Cardiants*), potassium compounds.

BLENNORRHETICS. Buchu, pareira, matico, uva ursi, juniper, chimaphila, oil of erigeron, oil of turpentine, copaiba, cubeb.

CATHARTICS.—*Laxatives.* Tamarind, manna, cassia fistula, castor oil, olive oil, magnesia.—*Salines.* Magnesium sulphate, solution of magnesium citrate, Rochelle salt, phosphate of soda, sulphate of potassa, bitartrate of potassium.—*Purgatives.* Rhubarb, senna, aloe, cascara sagrada, frangula, juglans, leptandra.—*Drastics.* Jalap, podophyllum, chelidonium, iris, euonymus, scammony, colocynth, camboge, elaterium, croton oil.—*Mercurials.* Calomel, massa hydrargyri.

ANTHELMINTICS. Santonica, spigelia, chenopodium, azedarach, aspidium, granatum, kamala, brayera, pumpkin, oil of turpentine, ailanthus.

EMETICS.—*A.* Local: *Mineral.* Copper sulphate, zinc sulphate, alum, turpeth mineral. —*Vegetable.* Mustard.—*B.* Systemic: Ipecac, apomorphine, sanguinaria, tartar emetic.

DIAPHORETICS. Pilocarpus, liquor ammonii acetatis, sweet spirit of nitre, antimony, ipecac, refrigerant diaphoretics.

EXPECTORANTS. Lobelia, antimony, ipecac, grindelia, pulsatilla, senega, ammonium chloride, garlic, balsam of Peru, balsam of Tolu, pix liquida, terebene, terpin hydrate.

EMMENAGOGUES.—*Tonic Emmenagogues.* Iron, manganese.—*Purgative Emmenagogues.* Aloe.—*Stimulating Emmenagogues.* Savine, rue, parsley, tansy, water-pepper.

OXYTOCICS. Ergot, cotton-root bark, ustilago, cimicifuga.

IRRITANTS.—(1) *Rubefacients.* Mustard, capsicum, Burgundy pitch, Canada pitch, oil of turpentine.—(2) *Vesicants.* Cantharides, stronger ammonia.—(3) *Escharotics.* Nitrate of silver, caustic potassa, caustic soda, arsenous acid, zinc chloride, bromine, chromic acid, solution of nitrate of mercury, nitric acid.—(4) *Suppurants.* Croton oil, ointment of antimony.—(5) *Mild Irritants.* Green soap, chrysarobin.

DEMULCENTS. Water, acacia, tragacanth, cetraria, chondrus, ulmus, licorice, lycopodium, starch, althæa, cydonium, sassafras medulla.

EMOLLIENTS. Lanolin, glycerin, petrolatum, lard, oil of theobroma, cetaceum, white and yellow wax.

PROTECTIVES. Pyroxylum, collodion, gutta percha, etc.

ANTACIDS. Sodium and its salts, lime and lime salts.

ANTISEPTICS. Lime, ozone, peroxide of hydrogen, permanganate of potassium, sulphurous acid, corrosive sublimate, boric acid, borax, chlorine-water, chlorinated lime, solution of chlorinated lime.

AROMATICS. Cinnamon, cloves, nutmeg, allspice, cardamom, ginger, pepper, capsicum.

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