

White (J. B.)

Value of the Subcutaneous Administration of Gold and Manganese in the Treatment of Tuberculosis.¹

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THE history of experimental pathology in relation to tubercle dates far back to the time of Laennec. The subsequent diligent researches of Cruveilhier and Erdt and Lombard added vastly to the stock of knowledge respecting the development of tubercle, but it was due to Klenke, and later to Lebert, of Breslau, and Villemin to first demonstrate the possibility of cultivating tubercle artificially by inoculation with opaque and transparent tubercular virus. I do not, however, propose to recapitulate the profoundly interesting advances made by that laborious galaxy of histologists who have successively added to our store of knowledge in relation to tuberculosis, until almost the culminating point of investigation appears to have been attained. It is enough at present to state that by far the most important doctrines in relation to tubercle and scrofula have been established by the experimental researches of the last twenty years.

The discoveries of Koch, within the last decade, have,

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indeed, opened up a new era in therapeutics. The future practice of medicine it would seem, must henceforth, in a great measure, be conducted by the hypodermic administration of remedies through that long-neglected avenue to the system, the absorbents. The special absorptive powers of the lymphatic system have been too clearly established, first by the illustrious Alexander Munro, in the beginning of the eighteenth century, and subsequently by John Hunter, to admit of any hesitancy on our part to trust at the present, its ready and beneficent co-operation.

Virchow has taught that the primary lesion in scrofulosis is simple hyperplasia within the glandular tissue. Shüppel has also proved that a scrofulous gland is indeed a tuberculous gland, and Friedländer has authoritatively asserted that the microscopic characters of lupus are identical with those of tubercle. In view, therefore, of such declarations from acknowledged men of science, taken together with the generally accepted opinion that the lymphatic system is especially prone to tubercular degeneration, I submit the inevitable conclusion, that the only true and direct route by which we may expect to antagonize such maladies must be through the skin and thus immediately into the avenues of the absorbent system.

When we desire to secure active and speedy effect of a remedy we must have recourse to the hypodermic method. We cannot fail to admit that remedies introduced by the mouth to antagonize diseases originating in the glandular system are subjected to too great dilution and chemical change in their course before they reach the seat of lesion to expect the advantage that surely would accrue if introduced more directly into the circulation by the subcutaneous route.

Taught by recent experiences, the wise physician of the present day must recognize the fact that the numerous elements of our materia medica known to possess power of antagonizing disease have heretofore failed, owing rather to error in their mode of administration than to deficiency of virtue or potency in the drug itself.

The powers of an ill stomach may well be spared the incongruous task forced upon it of distributing drugs to distant morbid conditions and assimilating nourishment for the support of the body.

Even though the intimate composition of the lymph of Professor Koch be destined to remain a secret from the profession he so greatly adorns, medical men throughout the world must ever be profoundly grateful for the new direction his genius has opened in the practice of medicine.

Functional incapacity of the organs of digestion and assimilation is the first evidence presented to us of tubercular invasion, which is manifested by absorption of the adipose tissue and by muscular atrophy—depending upon faulty nutrition. Such condition, as we are all aware, is followed by listlessness and low vitality, which lessens respiratory vigor, favoring the accumulation of mucus in the air-cells and bronchi that in turn excites inflammation, and so becomes the nidus of inimical bacilli. Dr. Sibson very aptly and truly says, that not only life depends on respiration, but vital energy is in a great measure governed by the freedom and capacity of the respiratory organs. It is not a difficult matter to appreciate this when we contemplate how dependent is the condition of the blood upon the aeration afforded through the medium of the lungs, and that whatever impedes or interferes with thorough oxygenation of this vital fluid must favor physical decay, for the prime condition of phthisis is impurity of the vitalizing current.

It will be therefore seen how important a matter lung exercise becomes, not only to those subject to pulmonary disease but also to the healthy and strong. The less these organs are used and expanded the more useless they become, as has been so forcibly dwelt upon by our own distinguished authority, Dr. James R. Leaming, and present a ready recipient of micro-organisms, while the more their full capacity is encouraged the more is their vitality established.

The apices of the lungs are the first tracts to break

down, because, as is generally supposed, there is less expansion of this portion in the ordinary respiratory act, and this passive state especially favors tubercular inception and degeneration.

The early detection of lesion is not an easy matter, but requires frequent critical observations extending over long intervals of time to be discerned, for morbid processes in the lungs are very insidious, creeping along almost imperceptibly, until, in the language of Aitken, "day by day, and grain by grain the mortal part wastes and dies away." Aitken declares that one of the best indications of advancing tuberculosis is gradual but continuous loss in weight, or, more properly speaking, a deficiency in the ratio of weight to age, height, and respiratory and other functions. There is no doubt of this in my own mind, the difficulty being in fixing this ratio, which, however, is quite practicable. It has been my practice to estimate in all cases the respiratory capacity and to base my prognosis, in many instances, largely upon the data thus obtained. If I find the respiratory capacity progressively lessened while a patient remains under observation, I have been led to regard the prospects of advancing tuberculosis very probable, especially if associated with this condition is found progressive failure of nutrition.

There is an undoubted period preceding the deposit of tubercle in which the blood becomes impoverished through faulty digestion and assimilation. This is the stage described by some authors (E. Smith and others) as the pre-tubercular; and as it precedes the deposition of tuberculous matter we cannot afford to wait for the actual detection of the tubercle bacilli before a diagnosis is made and a proper line of treatment determined upon.

The observations of Dr. Bennett, of Edinburgh, confirmed by many others, tend to prove that treatment simply aimed to correct malassimilation of food not infrequently arrests the tubercular process and causes the complete disappearance of all general symptoms, as well as physical signs of tubercular degeneration.

The dictum uttered by Cullen is sound to-day, that

"beyond a certain degree of emaciation and debility no man recovers." The first and most important indication in the treatment of tuberculosis should be to attempt to re-establish functional activity of the organs most directly concerned in the nutrition, since under the tuberculous influence the vital forces perniciously wane.

Dr. R. C. M. Page¹ declares that true tubercle does not always contain the bacillus, but that true tuberculous virus free from Koch's bacilli is capable, by inoculation, of reproducing itself; which is in accord with other observers, and explains the absence of the bacillus in true tubercle when sought for by its non-liberation, the germ only existing.

Here we have suggested the relation of the bacilli to tuberculosis, which the majority of physicians to-day regard as settled by the deservedly renowned Teuton. As it has been well established by equally high authority that we do have a fixed tubercular state prior to deposition of tubercle, with no bacilli discoverable in the sputum, and as the establishment of tubercular tissue, according to Koch himself, is a necessary condition to enable the micro-organisms to flourish, we are yet unable to reconcile our minds to a full acceptance of the doctrine that the tubercle bacilli are the direct causes of tuberculosis.

We have always considered that they were potent factors in the continuation of the process, after finding a suitable nidus in which to propagate, but not until such condition has been established will a search for the microbe be successful. The discussion of this subject, however, is not a part of this paper, but has been merely alluded to thus far for the purpose of approaching, rationally, the line of treatment to be hereinafter detailed.

For years past pulmonary tuberculosis has been successfully treated by judicious administration of medicines and the institution of hygienic measures in the incipient stages. Cases have also been recorded of well-advanced tubercular processes which have yielded to simple methods of treatment.

¹ MEDICAL RECORD, October 13, 1888.

To produce a physical condition not favorable to the deposition of tubercular tissue, and therefore inimical to the intrusion and germination of microbic life, has been the ordinary course of treatment long before the bacilli were discovered by Koch. The same line of treatment is even now advised by the distinguished bacteriologist himself, who states that his famous lymph has not the power to destroy the microbe, but that it has selective action in its direction to the tubercular tissue, causing it to be thrown off and leave a condition of tissue vitality which proves an effectual barrier to bacterial invasion and multiplication. This must not only be due to selective action of the lymph itself but to some somatic change effected through the agency of some of its elements, which results in a restoration of functional activity followed by an improvement in general nutrition.

We have in the *materia medica* remedies that have long been known to possess this particular power, but none in so direct and potent a degree as the preparations of gold, which, from no fault of their own, have long since fallen into desuetude. The precise action of the preparations of gold upon the system is not yet fully determined, but there is ample reason for the belief that they exert a remarkable influence upon the general nutrition. I therefore especially refrain from making, with regard to my own fluid, the mysterious assertion that it might be used in the diagnosis of disease. I think I can venture, however, to assert, and enforce the assertion with reason, that the remedy acts upon diseased conditions with such natural promptitude, being introduced in a pure chemical state directly into the circulation through the absorbents, that in its mode of action it presents all the appearance of an alert detective upon the track of an offender.

The precise mode of action of no element of the *materia medica* is distinctly understood. That certain medicines do manifest their peculiar virtues upon particular organs of the body has long been an undisputed fact. Why and how Ipecac expends its first effect upon

the stomach, Strychnia upon the spine, and Digitalis upon the heart are questions that have never yet been answered. But that any drug is endowed with the faculty to discover and pursue a lesion within the body at large is a new doctrine which, in the present state of our knowledge, we are unprepared to admit. Let us, then, not pretend to claim that this or any other remedy is endowed with the occult and extraordinary faculty to first discover, then pursue existing lesions not yet discerned and located by our own acumen.

I will now proceed to detail candidly the views entertained by high authorities respecting this remedy, being convinced that most of these opinions are true in some particulars, and that the absolute truth will be found in a comprehension of all opinions. From this aggregated testimony the conclusion must certainly be arrived at that the various preparations of gold possess rare and active therapeutic qualities, and in the hands of only the unskilled are likely to occasion other than benefit. The administration of gold in phthisis dates back even to Paracelsus, and up to the times of Horst and Poterius gold in combination with bichloride of mercury was depended on in the treatment of the various cachexias resulting from phthisis, scrofulosis, syphilis, etc.

The violent effects of the remedy in the hands of bold experimenters, however, soon brought discredit upon it, and it is not improbable also that many adulterated preparations were used, which accounted for the subsequent loss of confidence in this remarkable remedy.

The preparations of gold had long been neglected when Christien,¹ in 1810, again brought them into notice and caused their eminent therapeutic value to be fully recognized. He esteemed the chloride to be by far the most active and reliable in its effects, and extolled its efficacy chiefly in the treatment of lymphatic degenerations and the cachexias resulting from phthisis, syphilis, and scrofula.

Hoffmann claimed that he obtained from its use entire

¹ Recherches et observations sur les effets des préparations d'or.

success in the treatment of cancer of the pylorus and cancer of the uterus. A marked value has been claimed for this particular salt by Hufeland, Herrmann, Riecke, Meisner, Grotzner, Gozzi,¹ Krimer, and Delafield, in drops dependent on organic disease of some important viscus. According to Carron du Villards the catamenia is influenced as to frequency of recurrence and quantity by moderate doses of the chloride of gold. Though recommending to favor all preparations of gold M. Pourché² rather relied upon the cyanide, which he considered milder in its action than the double chloride and yet quite adequate to fulfil all the specific effects required in the treatment of disease. Pitcairn and Neligan³ both assert that the chloride of gold, while indetical in its effects with mercury, appeared to exert a more decided influence on chronic syphilis.

The potent efficacy of the gold preparations in syphilis, scrofula, phthisis, tumors of the bones, scirrhus indurations, especially of the tongue, and glandular enlargements have been emphatically dwelt upon by such undoubted authorities as Neil, Cullerier,⁴ Mitchill,⁵ Biett, Lallemand,⁶ Wendt,⁷ Le Grand,⁸ Eberle, and Kopp.

Magendie⁹ declared his belief that the cyanuret of gold promotes coagulation of the blood. When, therefore, a decided modification in this fluid is desired in hemorrhages or in chronic affections, its administration may prove of great value.

M. Chavannes¹⁰ has found the chloride of gold to be a remedy of rare virtue when applied externally as a caustic in lupus, syphilitic tubercles, and ulcers.

¹ Sopra l'uso di alcuni remedia aurifici nelle malattie venere.

² Journal de Pharmacie, xx., 599 and 649.

³ Medicines, Their Uses and Mode of Administration.

⁴ Dict. des Sciences medicales.

⁵ Dyckman's Dispensatory.

⁶ Journal universel des Sciences medicales.

⁷ Rust's Magazine.

⁸ Gazette Medicale de Paris, 1837.

⁹ Leçons sur le Sang.

¹⁰ Revue Médicale, 1848; British and Foreign Medico-chirurg. Rev., 1849.

Orfila¹ affirms that the chloride of gold is more active than corrosive sublimate, and that when administered in doses of $\frac{1}{20}$ to $\frac{1}{10}$ of a grain it will give rise to more or less inflammation of the gastro-intestinal mucous membrane. Experiments instituted by him upon dogs go to prove that even when a very small amount of this preparation of gold in solution is injected into the jugular vein death will speedily ensue by vomiting and suffocation, preceded by a short paroxysmal cough.

In his experiments upon mammals with the chloride of gold, T. Lauder Brunton² found that small doses encouraged the appetite, while large doses started symptoms of irritation of the stomach and intestinal canal together with a pseudo-catarrhal condition of the respiratory passages resulting in death by asphyxia. When large doses were injected into the veins œdema of the lungs occurred and death rapidly followed, with convulsions and asphyxia.

No authority, perhaps, ever devoted more careful research into the physiological action of the gold preparations than the justly renowned Aronowitsch. Conducting his experiments with a dilute solution of the double chloride of gold and sodium and also another solution of a triple salt composed of gold, sodium, and sulphur, he found that in cold-blooded animals both preparations caused central paralysis, the respiratory function being affected before that of the heart or brain. In warm-blooded animals even long-continued small doses produced no very marked effect, the animals maintaining a good physical condition and even gaining in weight. When the dose was increased, the appetite failed, followed by progressive emaciation, acceleration of the pulse, excitation of the respiration, and decrease in animal heat. When 0.3 to 0.5 gm. of the chloride of gold was introduced under the skin there was great unrest, the pulse became quickened and an exhausting diarrhoea

¹ Orfila on Poisons.

² Pharmacology, Therapeutics, and Materia Medica, first edition, 1885.

commenced. No more being administered spontaneous recovery advanced in less than three or four hours. After the administration of 1.0 gm. to a fresh subject the same symptoms manifested themselves but with overpowering intensity, destroying the animal in less than an hour after causing decline of temperature with convulsions and arrest of respiration. The post-mortem examination revealed most prominently pulmonary œdema.

Bartholow,¹ while greatly extolling the efficacy of the gold preparations in cancer, scrofula, constitutional syphilis, and in chronic Bright's disease, advances the important observation that they are singularly apt to undergo decomposition in the alimentary canal, a part only being absorbed as an oxide in combination with albumen. This fact would explain, in many instances, the inefficacy of the remedy when used internally, and is the strongest plea that could be advanced for the more direct or hypodermic method of obtaining its effects in the system.

All these authorities, however, concur in stating that the remedy, so potent for ill when pushed to toxic effect, exhibits rare eutrophic virtues when administered in strictly therapeutic doses.

Under prolonged use of the preparations of gold an auric ptialism may occur, but the salivation thus produced never assumes the same profuse and debilitating character as that superinduced by mercury or iodine.

I have met with one individual in my experience who manifested a peculiar idiosyncrasy against tolerance of chloride of gold. Her pulse and temperature fell below normal four hours after the administration, hypodermically, of a minimum dose, and, without presenting any other symptom worthy of note, these phenomena continued for two or three days. But mark the sequel; after the pulse and the temperature had returned to their natural grade I subjected her to treatment with Koch's lymph and to my astonishment I found her again presenting the identical symptoms above described, which endured about the same length of time. Five minims of a one per cent. so-

¹ U. S. Dispensatory, 1884.

lution of carbolic acid was injected also by House Surgeon Dr. Newman without causing the same phenomena.

I believe that the value of gold as a therapeutic agent, especially in phthisis, is enhanced by the addition of the iodide of manganese. This latter ingredient is itself an influential tonic and anti-anæmic, and has long and justly been regarded as on a par with, if not superior to, the preparations of iron. It is an element ever present in the blood as well as in the other fluids and solids of the body, and is certainly better tolerated than iron when administered to remedy the persistent anæmia of tuberculosis.

Under the influence of these combined salts in the manner advised the very action which Garrod hoped to achieve by the salts of potash seems singularly secured, viz.: "a ready metamorphosis of the less vital tissues, less vital deposits, less vital plasma, and of course of the deposition forming the glandular and other swellings of scrofula."

Mr. Hannon tried the carbonate of manganese upon himself. After taking it for several days he observed that his appetite had increased, that a decided tone had been given to his circulation and that the functions generally had been aroused to a more healthy action. He further experimented with it in cases of syphilitic cachexy, phthisis, scrofula, and cancer, and noticed that in every instance the quality of the blood had undergone very marked improvement.

The effects obtained in my own experience with the particular combination I am in the habit of using, hypodermically, have been first exhilarant, followed by an increase in animal heat and vital activity. The pulse becomes more full and active, the temperature rises and a decided period of reaction is established. During this period a constriction about the chest is sometimes complained of, amounting in certain cases to absolute dyspnoea. This sooner or later is followed by depression more or less expressed, which never lasts long. These are commonly succeeded by the more permanent tonic and alterative effects manifested by remarkable increase

in appetite and weight, with marked amelioration of the various morbid symptoms.

In a few cases presenting idiosyncrasy there resulted, after an ordinary dose, chill and subnormal temperature with headache. In such cases it is unnecessary to advise caution in repeating the dose, as the propriety of refraining must be at once apparent.

The initial dose of the fluid should not exceed one drop for adults, but may be increased to three drops provided no intense reaction has been produced by the tentative doses. When three drops were administered as an initial dose certain cases manifested dyspnoea, increased cough with bloody sputum. These, however, disappeared entirely within twelve hours, followed by the usual exhilarant effect, with amelioration of cough and expectoration.

I have found these salts combined administered hypodermically very efficacious also in the chronic glandular enlargements and sinuous abscesses due to scrofula, chronic obstinate skin affections, especially of a leprous character, persistent anæmias, chronic Bright's disease and the cachexias due to syphilis and scrofula.

For using the fluid, the following directions are to be regarded: Take from five to ten minims of a one per cent. solution of carbolic acid and boil it in a test-tube. (This step is unnecessary if a one per cent. solution of carbolic acid is prepared with distilled water.) When thoroughly cooled, add one or two drops of the fluid (the dose intended for injection), and when well mixed charge the syringe for use. The patient's temperature should be carefully recorded every three or four hours, and no dose should be repeated until the reactionary effects of the previous dose have subsided. It is suggested that the patient's temperature be noted every four hours for several days before treatment is commenced. The remedies introduced hypodermically sometimes produce powerful effects in individual instances, therefore great caution and judgment are to be exercised in their administration. For this reason the initial dose should never exceed one drop for an adult.

In combining the chloride of gold and sodium with the iodide of manganese, unless some special skill is exercised, a precipitate always results which it is very necessary to avoid, because it will be found to depreciate the value of the liquid and may even render it useless.

When correctly compounded it should have no precipitate, and present a rich, transparent, garnet color, as the specimens herewith exhibited.

Thus far it has been prepared in accordance with my directions by Messrs. C. F. Lord, 482 Seventh Avenue, and W. E. Cramer, corner of Park Avenue and Seventy-third Street.

Without taking up more of your time, or fatiguing you with the details of the various cases which have been subjected to the treatment, I will only record a few which have shown characteristic temperature reactions, and otherwise exhibited symptoms of interest, with decided evidences, in individual instances, of benefit from the treatment.

In all but one of the cases reported, the diagnosis has been corroborated by the determination of the presence of tubercle bacilli in the sputum, and all manifested physical signs of more or less advanced phthisis. The cases were not selected, but taken as they presented and expressed readiness to receive the treatment.

I desire to express my appreciation of the aid afforded me by my associate, Dr. Charles Lewis Allen, in the observation and care of my private patients, as well as the assistance rendered me in the hospital by my able staff, Drs. J. H. Coughlin, C. J. Proben, and H. S. Goodall.

CASE I.—Mr. J. F.—, private patient, aged twenty-three, single; collector. Father and brother died of pulmonary tuberculosis. Up to two years ago was perfectly well. At this time took cold and began to cough and expectorate, and with loss of appetite lost flesh rapidly. Indications of tubercular invasion were manifest in both lungs, but the right apex was especially affected. On auscultation loud mucous râles were heard, anteriorly in infra-clavicular region, with few moist fine râles extending

down to base of chest, and pleuritic friction-sound subaxillary and posterior aspects of right chest. Under appropriate treatment—inhalations, tonics, etc.—an improvement resulted, but more or less cough with slight expectoration continued.

February 1, 1891: The cough becoming more aggravated, the resulting increase of expectoration and losing appetite and flesh induced him to consult me again. He has been coughing and expectorating a muco-purulent sputa for past six months. Sputum was examined by Dr. Charles Lewis Allen and found to contain bacilli of tuberculosis, which he kindly demonstrated to me.

Physical Examination.—Right lung: Diminished expansion, dulness on percussion anteriorly and posteriorly, extending down to middle lobe. Modified percussion note over lower lobe anteriorly, but dull posteriorly. Moist râles discerned anteriorly, upper portion of lung louder, mucous râles extending down to base with increased fremitus. Posteriorly fremitus increased all over the right lung, and some moist and dry râles discerned. Left lung: Percussion sound modified slightly; broncho-respiratory murmur feeble anteriorly and posteriorly. Some loose râles heard over middle portion of chest. Has some irritation in throat and a feeling of tightness across chest. Body weight, 135 pounds.

First injection, February 1, 1891. Temperature, 98.5° F., 6.30 P.M.; injected 1 drop. I was not able to follow the temperature curve in this case, as he lives some distance from me, but the patient informed me that he felt feverish after the injection.

February 5th. 6.30 P.M.: Temperature, 98.5° F.; injected 2 drops.

February 10th. 7 P.M.: Temperature, 98.5° F.; injected 2 drops. Cough and expectoration diminished and appetite much improved.

February 13th. 7 P.M.: Temperature, 98.5° F.; injected 2 drops.

February 16th. 6.45 P.M.: Temperature, 98.5° F.; injected 2 drops.

February 19th. 6.45 P.M. : Temperature, 98.5° F. ; injected 2 drops. All cough and expectoration ceased, no irritation in throat.

February 24th. 6.45 P.M. : Temperature, 98.5° F. ; injected 2 drops.

February 26th. 6.45 P.M. : Temperature, 98.5° F. ; injected 2 drops. Feels quite well and strong and has no cough or expectoration. Body weight, 135½ pounds.

This patient while under the above treatment received no other medication. His general physical condition markedly improved, cough and expectoration checked. Leading a very active life it is not remarkable that the body-weight showed no greater difference than at the beginning of treatment. The evidences of general amelioration, however, are especially worthy of note. I have desired sputum for microscopic examination, but have been assured that none can be obtained.

CASE II.—Miss S——, private patient, aged twenty-one ; native of the United States. Began treatment January 11, 1891. Father, brother, and sister died of pulmonary tuberculosis. A year ago began to cough and expectorate a frothy mucoid sputa ; throat felt sore and voice was hoarse. Upon examination found percussion-note modified over upper portion of right lung anteriorly, and auscultation revealed harsh bronchial breathing, with few coarse moist râles. For the past year has been much annoyed with irritation and tickling in the pharynx and larynx. Laryngeal examination showed slight œdema of vocal cords and mucous surfaces about the glottis. Body weight, 120 pounds

January 11th : Temperature, 99° F. ; injected 1 drop.

January 15th. 3 P.M. : She said she felt feverish during the evening after last injection. Had slight headache. Cough increased, with a little bloody expectoration. Irritation in throat lessened and had better appetite. Temperature, 99.4° F. ; pulse, 94 ; injected 1 drop.

January 18th. 3 P.M. : Twenty-four hours after last injection, increased cough with bloody expectoration. Cough this day much less. Appetite much increased.

Much less throat irritation. Temperature, 98.5° F.; pulse, 86; injected 1 drop.

January 20th. P.M.: No more bloody sputa. General improvement reached. Temperature, 100° F.; pulse, 84; 3 P.M., injected 1 drop. Weight, 121½ pounds.

January 23d. 6 P.M.: After last injection, January 22d, had a little bloody expectoration and felt somewhat feverish during the afternoon. Temperature, 99.6° F.; pulse, 84; injected 2 drops.

January 25th. P.M.: Cough less. Temperature, 98.5° F.; pulse, 80; injected 2 drops.

January 29th. P.M.: Cough decidedly diminished and little expectoration. Catamenia recurred at this time, and the flow was increased. Temperature, 98.8° F.; pulse, 94; injected 2 drops.

February 1st. P.M.: Feels much stronger, and in every respect is better. Temperature, 99.4° F.; pulse, 100; injected 2 drops.

February 5th. P.M.: Temperature, 98.5° F.; pulse, 84; injected 2 drops.

February 8th. P.M.: Temperature, 98.5° F.; pulse, 84; injected 2 drops.

February 12th. P.M.: Temperature, 98.5° F.; pulse, 80; injected 2 drops.

February 15th. P.M.: Temperature, 98.5° F.; pulse, 72; injected 2 drops. Weight, 122 pounds.

February 17th. P.M.: Temperature, 89.2° F.; pulse, 82; injected 2 drops. Cough and expectoration nil, and throat relieved.

February 22d. P.M.: Temperature, 98.5° F.; pulse, 88; injected 2 drops.

February 27th. P.M.: Temperature, 98.5° F.; pulse, 80; injected 1 drop.

March 2d. P.M.: Temperature, 98.5° F.; pulse, 78; injected 1 drop. Weight, 122½ pounds.

No other medication received. Though no bacilli were discoverable in the sputum, I am quite satisfied that the case was one of undoubted pulmonary tuberculosis in its early stage.

CASE III. *Phthisis Pulmonalis*; *Albuminuria*. — J. E—, male, aged twenty-five; United States, single; wood planer. Admitted to hospital November 18, 1890. Father died of consumption; also a sister, niece, and nephew. For the last twelve years has had more or less cough following an attack of pneumonia. Cough is particularly severe in the morning. Expecto- rates a large amount of muco-purulent sputa, which on microscopic examination was found to contain tubercle bacilli. At times the cough is so paroxysmal in character that it often gives rise to emesis. Has frequent attacks of diarrhoea, sweating at night, no appetite, and has gradually been losing flesh and strength. Since he began to cough has had hæmoptysis two or three times. In the afternoon and evening has fever and complains of pain over both lungs, extending through to the back, pain increased on full inspiration. Physical examination: Expansion of chest on both sides diminished, with retraction of chest in the infra-clavicular and supra-clavicular regions of both sides, more marked, however, on the right. Vocal fremitus increased on the right side. Left chest anteriorly: Dulness on percussion marked posteriorly. Modified percussion sound over middle or subscapular region. Auscultation revealed loud moist râles in the infra-clavicular region of both lungs, with feeble bronchial respiration. Posteriorly, upper portion of left lung, moist râles with feeble broncho-respiratory murmur. Over lower lobe the respiratory murmur clearer, but a few coarse and fine moist râles were discerned. On the right side, posteriorly, feeble respiration with some mucous râles, especially heard at the base. Evidences of pleuritic adhesions discerned posteriorly in subscapular region along spinal aspect of both chest-walls.

The local disease has not proceeded to a very advanced stage, though softening of the tubercular exudation at the apex of the left lung was clearly discerned. This patient gave evidence of debility, some emaciation, with distressing cough, night-sweats, profuse expectoration, anorexia, and albuminuria, with granular and hyaline casts. Quan-

tity of urine passed in twenty-four hours was 135 ounces. First injection of 1 drop of the gold and manganese fluid was administered December 24, 1890, about 4 P.M. Body weight, 116 pounds. Temperature, 99.2° F.; pulse, 108; respiration, 28. About 6.30 P.M. he complained of a sense of constriction about the chest with some dyspnoea, which soon spontaneously disappeared. The temperature rose to 100.4° F., and afterward gradually declined to normal, not exceeding 99° F., the following day.

On December 27th the quantity of urine passed was 125 ounces in twenty-four hours. At 5 P.M. 2 drops of the fluid was administered, the patient's temperature being 98.4° F.; pulse, 76, and respiration, 28. No record was kept of the temperature after this until the next day, but the curve did not extend above 99.2° F.

December 29th, P.M.: Two drops were again administered, the temperature subsequently rising to 101.2° F.; pulse, 120; respiration, 36; and the excretion of urine again increased to 135 ounces per day.

December 30th: The temperature did not exceed 99.4° F.

December 31st: The highest temperature curve, being 99.4° F., and not exceeding this until 4 P.M. January 4th, 1891, when it reached 100° F. An injection was administered January 2d, but no reaction followed.

January 5th: Another injection was given of 2 drops, the temperature rising to 99.8° F., receding to 98.5° F., and rising the following day to 100.7° F., after which, it gradually declined to normal. Body weight, 119 pounds.

January 7th: Injected 2 drops of the fluid, the temperature again rising to 100° F. Excretion of urine, 104 ounces a day.

January 9th: Injected 2 drops 10 A.M., reactionary fever not over 99.5° F. Cough and expectoration diminished.

January 11th: Injected 2 drops, followed by slight reaction. Temperature, 99.8° F.; pulse, 92; respiration, 32.

January 14th: Body weight increased to 120 pounds, and urine excreted not more than 86 ounces.

January 18th : An injection of 2 drops was followed by no fever ; pulse rate, 78 to 84, and respiration, 32.

January 23d. Two drops were injected, causing a temperature of 100.7° F., and on the morning of the 24th the curve reached 102° F., gradually declining. The quantity of urine excreted about this time was 66 ounces per day. From this time on to February 12th the injection of 1½ drop was administered every other day, causing no elevation of temperature above 99.5° F. ; the excretion of urine not exceeding 60 ounces, and body weight reached 124 pounds. The patient's general physical condition is markedly better. Has little cough and expectoration. Appetite excellent, and manifests every evidence of amelioration of his disease. Latest body weight, 125½ pounds, being a gain in weight of 9½ pounds to February 20th. Urine examined February 27th by Drs. R. H. Pomeroy, P. Meierowitz, and A. Rosenthal, of the house staff. Barely a trace of albumin, and no casts found under the microscope. The prompt amelioration of the nephritic symptoms in this case is no less remarkable than the benefit which the patient experienced from the injections in respect to his pulmonary and general physical condition.

CASE IV. *Phthisis Pulmonalis ; Albuminuria.*—W. D—, aged thirty ; Ireland ; single ; stableman ; admitted to hospital November 26, 1890. Family history negative. Twelve months ago was quite ill and had a severe cough with hæmoptysis resulting from a thorough wetting and going to sleep in his wet clothes. Cough always more severe at night and in the morning, when he expectorates a large amount of muco-purulent matter. Has lost much flesh, and strength much reduced. Sputum shows the presence of bacilli. Albumin, with casts, in the urine.

Physical Examination.—Emaciation. Expansion lessened on both sides, with marked infra-clavicular depression. Fremitus increased over both apices. Percussion dull over left apical portion anteriorly. Modified percussion-sound in subaxillary portion and in subscapular

region. Right side : Exaggerated resonance in infra-clavicular region as far down as third rib, posteriorly, and in subaxillary space marked dulness on percussion. Auscultation : Broncho-cavernous respiration right apex and infra-clavicular portion of lung, with loud gurgling crepitation as far down as third intercostal space. Coarse moist râles also heard anteriorly and posteriorly over light lower lobe. Left side, anteriorly loud moist râles and bronchial respiration extending down to base and a similar condition heard posteriorly, with some subcrepitant chonchi. First injection of 1 drop gold and manganese liquid was administered December 26, 1890. Body weight, 113 pounds. Urine excreted per diem, about 55 ounces. The temperature at the time of the injection was normal; there was only a slight reaction to 99.2° F.

December 29th : Two drops were injected, followed by a reaction to 100° F., which subsequently decreased to normal. The amount of urine excreted was increased after the two injections to 65 ounces.

An injection of 2 drops was administered January 2, 1891, followed by reaction to 99.8° F., and on January 4th, temperature, 99.2° F., after the injection; the quantity of urine excreted about these dates amounting to 82 ounces in twenty-four hours. Injections of 2 drops gold and manganese liquid were given January 6th, followed by rise of temperature to 100.2° F.; January 8th, with temperature curve 100.6° ; January 9th, with a reaction of 100.4° ; January 11th, 99° . All of these injections were administered when the temperature was about normal, or not exceeding 99° F. The body weight January 5th was 111 pounds, and on January 14th 112 pounds. The urine excreted at this time did not exceed 44 ounces a day.

Injections of $1\frac{1}{2}$ drop were given January 13th, 15th, 18th, and 21st. No reaction of any note resulted till after the last injection, when the temperature became elevated to 101.8° F. On this date the body weight had increased to 114 pounds, and the patient declared his cough and expectoration was lessened and his appetite much improved. The excretory function of the kidneys was stim-

ulated again so that about 64 ounces of urine were passed in twenty-four hours.

January 23d : One and a half drop was again injected, the patient's temperature being normal at the time, and a reaction to 100° F. followed, subsequently declining to normal and again rising to 99.4° F. after injections of same dose January 25th and 27th. On the 29th the temperature was 99° F. at the time of an injection of 1½ drop, and four hours after there was a reaction to 100° F. Excretion of urine on this date was 32 ounces per day. Body weight, 115 pounds.

February 1st : Injection of 1½ drop. Temperature rose from 98.8° F. to 101.6° F.

February 3d, 5th, and 7th the injections were continued, followed by no marked reaction. Body weight increased to 119 pounds, with pulse, 84; respiration, 28; and evidences of general amelioration of his condition quite manifest. Cough and expectoration much reduced.

February 11th : Body weight increased to 121 pounds. Urine now free from albumin and casts, and amount excreted in twenty-four hours averaging 55 ounces. The gain in weight of this patient was from 113 to 123 pounds in ten weeks' treatment.

CASE V. — A. S. —, female, native of England, aged twenty-five; married; domestic. Admitted to hospital September 24th, 1890. Family history negative. Personal history: Has had measles, chicken-pox, scarlatina, and pneumonia. Since an attack of La Grippe about a year ago has had a cough, growing progressively more severe; has had three hemorrhages; sweats at night, and has lost flesh and strength. Expectoration muco-purulent, containing tubercle bacilli. Sleeps poorly and has no appetite. Physical examination showed signs of consolidation at the left apex.

Treatment begun on December 31st, 1890. Injected 2 drops gold and manganese solution at 5.30 P.M. At 7.30 P.M., temperature, 101.8° F.; pulse, 99; respiration, 30.

January 1st, 1891: Highest temperature, 99° F. at 1.30 P.M.; urine, 12 ounces; sputum, 2½ ounces.

January 2d. 5 P.M. : Injected 2 drops. Temperature, 100.4° F.; pulse, 88; respiration, 40. 7 P.M. : Temperature, 102° F. (highest); urine, 22 ounces; sputum, 14 ounces.

January 3d. 7 P.M. : Temperature, 101° F. (highest).

January 4th : Urine, 16 ounces; sputum, 3½ ounces. Highest temperature, 101.8° F. at 11 P.M.

January 5th. 3 P.M. : Temperature, 99.2° F.; pulse, 88; respiration, 32. Injected 2 drops at 7 P.M. Temperature, 101.1° F.

January 6th. 9 A.M. : Temperature, 97.8° F.; at 7 P.M., 102.2° F.; urine, 38 ounces; sputum, 8½ ounces.

January 7th. 9 A.M. : Temperature, 97.4° F.; 5 P.M., 99.4° F.; injected 2 drops. 11 P.M. : Temperature, 101.2° F.; urine, 57 ounces; sputum, 4½ ounces. Body weight, 107 pounds.

January 8th. 9 A.M. : Temperature, 97.2° F.; 9 P.M., 100.4° F.

January 9th. 9 A.M. : Temperature, 97.2° F. Injected 2 drops at 10 A.M. 7 P.M. : Temperature, 100.6° F.; urine, 40 ounces; sputum, 2 ounces. Marked decrease of sputum, with lessening of cough. For the next week the temperature ran from 97° to 99° F. A.M., and from 99° to 102° F. P.M.

Injections of 2 drops were made on January 11th and January 13th. After this date a new solution, twice as strong as the first, was used—*e.g.*, 1 drop of No. 2 equals 2 drops of No. 1.

January 12th : Amount of urine, 70 ounces; sputum, 1 ounce.

January 13th : Urine 31 ounces. From this time until January 20th the treatment was carried on in a similar manner, 1 drop of the stronger solution being used. The temperature ran about the same.

On January 20th, injected 1 drop; January 21st, 1½ drop; January 22d, 1½ drop; January 23d, 1½ drop. The temperature rose on the evening of January 22d to 102.4° F., and remained high all the next day, 100.4° F. at 9 A.M., and reaching 104° F. at 9 P.M. January 23d. Sputum, 4 ounces; urine, 45 ounces.

On January 24th no injection was made ; but the temperature remained high all day, reaching 103.2° F. at 7 P.M.

On the morning of January 25th temperature had fallen to 99° F. ; so an injection of $1\frac{1}{2}$ drop was given. Temperature rose P.M. until at 9 P.M. it was 104.4° F. ; pulse, 110 ; respiration, 40.

On January 26th and 27th temperature had fallen to normal in the morning, but ran high in the evening ; 103° F., January 26th, and 102.4° January 27th.

January 28th : Injected $1\frac{1}{2}$ drop ; but none given again until February 1st, as the temperature ran high, reaching 102° F. in the evening.

February 1st. 11 A.M. : Injected $1\frac{1}{2}$ drop. Temperature reached 101.4° F. at 3 P.M., and then declined.

February 3d. 2 P.M. : Injected 2 drops (strong solution), with little or no reaction. Temperature, 100° F. at 6 P.M.

February 5th and 7th : Injections of 2 drops, with no appreciable reaction ; evening temperature varying between 100.4° F. and 101.4° F.

February 8th. 5 P.M. : Injected 2 drops. 9 P.M. : temperature, 102.6° F. ; urine, 80 ounces ; sputum, 1 ounce.

February 9th. 3 P.M. : Temperature, 101° F. (highest).

February 10th : Injected 2 drops. At 6 P.M., temperature, 101.4° F.

February 11th : Highest temperature, 101.2° F. at 6 P.M. Body weight, 106 pounds. Sputum reduced in quantity from 14 ounces to 2 ounces to-day, and cough not so severe. Appetite better, rests better, and sweats have disappeared. Is able to get about now, which formerly could not do. Body weight, February 20th, 110 pounds, being a gain of 4 pounds from February 3d, before which time she lost in weight one pound (between January 7th and February 3d).

Concluding Remarks.—The cases treated at the hospital were not selected, but subjected to treatment as they presented and expressed a desire to receive the injections. All were very much reduced physically, and manifested extensive pulmonary lesions. The nutrition uniformly im-

proved—in some of the cases the expectoration was remarkably decreased—especially reduced in Case V., A. S.—, where the amount was lessened from fourteen ounces to one ounce in twenty four hours, though at first it was slightly increased. The rapid gain in body weight in several instances was remarkable, following improvement in the appetite and the functions of digestion and assimilation.

The improvement in the respiration does not appear so readily as the other indications of benefit, though cough and expectoration are soon lessened, fewer râles and less pronounced dulness over affected areas are evidences of amelioration which are not long to supervene.

In some of the cases a very pronounced reaction followed the injections, but it is desirable to avoid such effects as far as possible by moderate doses, for I believe the best therapeutic effects are assured when little or no very decided reaction is manifested.

The two private cases reported, both incipient cases of pulmonary tuberculosis, were not confined to the house during treatment, but attended to their daily avocations without any inconvenience. The general amelioration was prompt. Cough, expectoration, and throat irritation were entirely relieved after six injections in one and eight in the other case. Both immediately began to experience better appetites, and rapidly gained in body weight. This is the class of cases in which the most decided beneficial effects from the treatment may be expected.

Before these patients were subjected to this method of treatment, inhalations, sprays, etc., were tried for some time without effecting such relief of the throat irritation and cough, which, in so short a time, yielded to the hypodermic injections. I have many private patients under treatment progressing equally as well as those above cited.

In conclusion, I may now say that in my practice of over five hundred injections, there has neither resulted an abscess, nor even a trace of inflammation of the skin about the seat of the punctures, which I attribute largely to my antiseptic hypodermic syringe, described in the *MEDICAL RECORD*, January 31, 1891.