Notes on literature.

Microbiology + Chemistry
Genetics!

J. Lederberg
Columbia University.
Yale University

Colard, R. CRAS 216:616 1943 Action des rayons X sur la fréquence d'une mutation bactérienne.

S⁻ to S⁺

Spont. 5×10^{-8}

$\bar{c}$ 5 min (~~90%~~ $\rho S = 1$) (75 000 r!!!) 60×10^{-8}

Cooper KE + D Woodman, JPB 58:75-84 (1946) The diffusion of antiseptics through agar gels...

Dept Pure Med
Univ. Bristol

$m' = m_0 e^{\left(-\frac{x^2}{4Dt}\right)}$

x = distance

conc $(x) = m'$

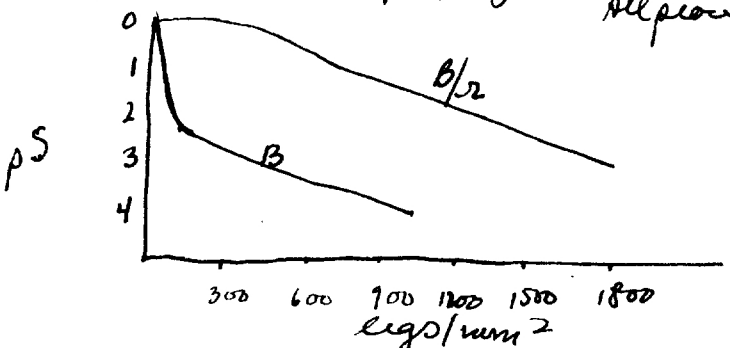
D = const.

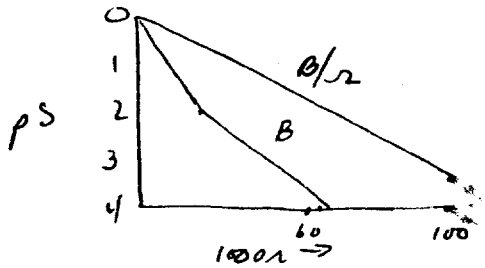
$$\frac{dc}{dt} = D\frac{\partial^2 c}{\partial x^2}$$

Witkin, E.M., PNAS 32(3): 59-68 (1946) Inherited differences ~~in~~ in sensitivity to radiation in Escherichia coli.

U.V. - 3E Hg lamps 2537Å. Irradiated on petri plates. Colony counts at ~4 hours.

B, 5×10^4, irradiated ~ 1000 ergs/mm². At 24h. (nutrient agar) 4 colonies developed. One was propagated as B/r and proved to have a different resistance. All proved to be more resistant.





No other levels of resistance were found.

B/r is also X-ray resistant

At pS = 2, there are breaks in the killing curves of B and partially repl. by B/r.

lag B/r in broth is less; m.g.t. 19 mins. At 50 ergs, pS of B is 1; of B/r is 0. However, after 3 hours, the cells of B are elongated and undivided, of B/r → 100 cells.

A second irradiation of 700 ergs will reduce each B/r microcolony leaving a representative but kill each undivided long cell of B. The effectiveness of the technique in mixtures of B and B/r indicate that the long cells behave like individual bacteria in terms to radiation. With lagg samples, surviving colonies are tested for resistance by a test dose + elongation phenomenon. Delbrück analyses. Induced mutations are not detected. B → B/r 10^{-5}/generation.

The UV curve for B/r is a multiplehit curve.

Sonneborn, EC, PNAS, 32: 68-70 (1946) A new gene theory and an explanation of the phenomenon of dominance to ~~mutation~~ Mendelian segregation of the cytogene

chromogene = place of attachment for cytogene.

contaminated recessive = chromogene$^-$ cytogene$^+$

absorption of cytogenes on certain recessive loci.

$$F \times f \rightarrow \begin{matrix} F \\ f \\ f^{cont.} \end{matrix}$$

$f \times f^{cont} \rightarrow$ 1:1 in most cases.

Hooey!

Ferguson, T.B. + S.O. Thorne, jr., J Pharm 86: 208-63 (1946) The effect of some bacteria compounds on the growth + respiration of E coli.
Oulse.

ATCC 6522 SG.

Acidines:

1. 3-amino
1a 5-amino, 1,2,3,4 tetrahydro
2 2 dimethyl -7 amino
3. 5-amino
4 2,7-diamino
5 2,8, diamino.

Riboflavin had no effect.

Effect on oxidation of various substrates (glycose, pyr, lact, aspar, olic).
is in diffuent order (1,4,2,5,3) from growth (1...5)
% inhibition increases ↑ pH.

Cope, S. + G. Cameron, JCCP 27:43-52 (1946) Effect of a lipid-tyrosinase system + creatine upon the growth of cells in vitro

diaphorase (~~DPN~~) (FAD)

At 10^{-6} ~~dede~~ elicited response in tissue culture

do. creatine 50 mg%. only when supplemented.

together, synergy.

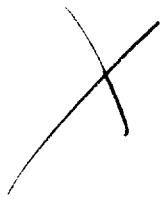
Hershey, AD J Bact 38:563-78 (1939) Factors limiting bacterial growth.
VII Respiration & growth properties of coli receiving sublethal temperatures

Waddell, Agnes H., Edinburgh Math. Notes, #35 Dec. 1945 Curves formed by colonies of microorganisms growing on a plane surface.

Mathematical analysis of outlines of conjoined colonies & of sectors.

Wmilow & E-A, G.R.B. 9:259-74 (1934)

Falk I: The role of certain cations in bacterial physiology. Amer. Jour. Bact. 7: 33, 87, 133 (1923).



distilled water as good as NaCl for E coli.

Winslow + OA Brook. J Bact 13: 235-43 (1927) The viability of various spp. of bacteria in aqueous suspensions.

Short growth suspended in H2O & incubated 18-20 hours at 37°.

E coli highly resistant even when carefully washed. (high zone ca 10⁹

10^{-3} broth protects B. cereus from ~~heat~~ death in saline.

N. rapid effects (1-24).

• 0145 M NaCl best menstruum for viability.

7.725 is toxic. Only 5-10% killed in H2O in 9 h.

20-40 × 10^6 cells.

.85% = 8.5 g/l = ca. .2 N.

Sherman, J. M. + H. B. Naylor, Aging & reproduction and the viability of young bacterial cells at low temperatures. J. Bact 43:749 (1942)

Effects of certain mild agents (cold, low saline etc. are) greater on "young cells. During lag, bacteria become sensitive just before active reproduction.

A 4-hour E coli culture at 37° grad. cooled to 1° C. (15 min.) Samples were warmed gradually & suddenly chilled. / As a control, a 24 hr. culture over a period of 3 hours. in 1% peptone was simi. treated.

The "young" cultures were held at 1° for periods up to 36 days & responded to cold shock by being killed & lag in restoring growth at 37°. Old cells did age.

When held at 1° "young cells" die more rapidly.

Days held.	Y. Viable cells/ml. $\times 10^6$	Mature.
0	8.6	
2	1.47	650
4	.49	460
7	.125	440
14	.004	192
24	400	95
36	72	43
42	—	39
51	—	16
62	-	10

Nelson, F.E. J Bact 48:473-7 (1944) Factors which influence the growth of heat treated ~~cat~~ bacteria.

Basal - NH_4, KPO_4 glucose agar + peptone - tryptone used most.

Heat E coli 55° 8 min.

Medium.	Counts (tupl.) $\times 10^3$	
Minimal	.46	.32
.01% tryptone	.74	.39
.04%	1.0	.89
.2%	3.0	4.6
.5%	6.5	16.0
.01% thioglyc.	14.0	25.0
+.01% tryptone. bitter		

Unheated organisms were essentially same in all plates.

I.
45:395-403 (1943)

Iowa State College
Ames, Iowa.

Temperature

Curran, H.R. + F.R. Evans, J Bact 34: 179- 1937

The importance of enrichments in the cultivation of bacterial spores previously exposed to lethal agents.

B. subtilis, cohaerens, + alboluctis – A TCC
"TC". E coli

"Nutrient agar" gave much lower plate counts when treated cultures were tested than were obtained is supplemented variously, e.g.
" 1 drop of st. defibrinated cow's blood per plate"
.3cc 10% glucose.

These supplements had no effects on untreated cultures.

Temp – 98° How long?
$HgCl_2$ .05%
Details not stated
Y. Ex. deleterious, if anything.

Spores generated on the NA but later did not respond to supplement.

E. coli. 18 hour broth culture.

	Untreated 3000	U-V	Δ.
N.A.	57	20	27
" + blood	57	65	102
" + glucose	60	45	105
" yeast	61	25	27
Musein agar	61	38	189
Tarozzi + milk pdr.	54	69	237.

This can be investigated.

Hansen, P.A. Arch. f. Mikrobiol. 5:99-122 (1933) The growth of thermophilic bacteria.

Temperature – tolerance

Williams, F. T. J Bact 32: 589-97 (1936)

Attempts to increase the heat resistance of bacterial speres.

Various strains. Peptone – beef extract – sugar

Temperature – tolerance by bact.

Edwards, OF + LF Rettger, J. Bact 34: 489 – 1937

The relation of certain respiratory enzymes to the maximum growth temperatures of bacteria.

M.G.T. measured by observation in liquid + solid tubes in a variety of organisms. Solid or liquid had no effect.

A statistical correlation was found, among different strains, between temperature of destruction of enzyme activity (cytochrome oxidase, catalase and succinic dehydrogenase).

E.g.: °C.

	M.G.T.	Cytochrome Oxidase	Catalase	Succ. dehy.
B. mycoides	40	41	41	40
"Thermophiles"	76	65	67	59
	1	2	3	4

A correlation of .8466 = $R_{1,234}$ was found for these items.

"Indophenol" oxidase activity gave best correlation.

r_{12} = .8431 r_{13} = .8451 r_{14} .7737

Qualitative tests: on intact cells

(2) – CN sensitive, ~~indophenol~~ p-phenylenediamine oxidation

(3) H_2O_2

(4) Thunberg. Me Blue.

Endospores guarded.

Dunn, M.S., et al., JBC 156: 703 - 713 (1944)

XVIII. The amino acid requirements of Leuconostoc mesenteroides.

Standard curves formed for asp, cyst, glut, hist, isol, leuc, lys, meth, ΦA, prol, trypt, tyr + val.

Glycine, Hoprol, norl, & norv, were non-essential as chain.

In medium "C", ΦAl. was required, 150 γ/tube giving max. rec. prod.

XIX The determination of lysine in protein hydrolysates by a microbiological method.

U Cal, L.A. Chem Lab

Waksman, S., H.S. Dunn + L. B. Rubin, JBC 151:511- (1943)

The microbiological analyses of 7 amino acids in L. casei.

72-hour cc. titrations.

DL-A. required: 30γ/tube for ½ max. growth.

Medium of Hutchings + Peterson PSEBM 52: 70 1943.

50 mg m

HISTIDINE; ASSAY

Rumm, M.S., et al. JBC 159: 653

Histidine by Leuconostoc

TRYPTOPHANE

Substrate utilization and synthesis.

L. arabinosus

Wright, L.P. and Skeggs, H.R. JBC 159: 611- 1945

Tryptophane utilization and synthesis by strains of L. arabinosus

PYRIDOXINE + CO_2

Amino Acid Assay.

Feyman, C.M. et al JBC 162:173-4 (1946) On the function of pyridoxine in lactic ac. bacteria. Letter.

Amino ac. requirements modified by CO_2.

CO_2 + pyridoxine (1 Gr) removes requirement for ΦA, Tyr, Arg in L. acidophilus and Aspartic in S. faecalis

Texas.

THREONINE assay
S. FECALIS amino acid analysis

Greenbut, I. T., BS Schweigert & CA Elvehjem,
JBC 162: 69 – 76

The amino acid requirements of S. faecalis and the use of this organism for the determination of thr in natural products.

Leuc, thr, gl, asp, lys, val, isol, meth, arg, hist, ser, trypt, and cyst required

alan, tyr, OA, glyc stimulatory.

Differ ± Snell and Strong who did not require meth, val, hist and isol., and that alan was

Purines, biotin, pant, B_2, B_6, nic, + folic
Glucose, citrate, Mg, Fe, Na, Mn

Response to dl is not linear. Unnatural isomer (~~d~~ l(+)) inactive

2 - 5 hour hydrolysis ± 2N HCl, autocl. gave satisf. recovery

ATC 8043

Wisc.

Atkins, P & J L Ward, BJEP, 26:120 - 1945 The antibacterial
effects of analogues of vitamin K.

Nobley, DCW PSEBM 60: 225 - 1945 Observations on the antimicrobial action of 7,3 dichloro-1-4 naphthoquinone & its reversal by vitamin K.

Shive, W. + J. Macow, JBC 162:451-462 (1946.)
Biochemical transformations...
I Aspartic Ac.

dl hydroxyaspartic ac. is inh. to E coli, reversed by glutamic ac. or by aspartic ac. (c.) pantothenic ac. raises antibacterial index.

An E coli strain initially non-prototrophic was adapted by serial transfer for use in these expts (!!). (Reisolated?).

COOH
CHOH
$CHNH_2$
COOH . I
dl.
also
COOH
$CHNH_2$
$CHNH_2$
COOH (II)
meso.

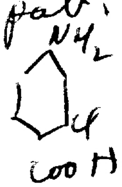
Antibact index ca 10-15. molar. in E coli. In Leuconostoc 60-100.

II tried on coli. similar, but index 100-200.

At low levels of I, 1γ pant ≐ 10γ aspart in reversal. do. β-alanine. Asparagine less effective. Pant. increased antibact index from 3-20. e.g. Other q.t. had no effect.

At higher (I) glut. decreases in activity. Oxalac, malic, succ, + fumaric ineffective. Isoserine had no effect at 1mg/cc!

Interprets eff. of pant as indicating shift of limiting reactions from β-alanine synthesis to another one. Interprets glut. effect as precursor of aspart by transamin.

II ~~SA~~ pab. 463.
also 

II reversed completely by methionine.

Series of antib. indices in addition of different substrates. 1. Methionine 2. adenine 3. . ?

II.

SA:pab

3000 no meth.
10000 meth.
30000 purines.

Presumably II is effective only at a certain locus of pab action.

Madinaveitia, J. Biochem. J. 39:85-91 (1945). Antibacterial substances related to pantothenic ac.

"pantamides". Reference vit.. PT.: P-$NHCH_2CH_2SO_3H$.

L. casei ε used.

pant-hydrazide was active, but not highly so: P-$NHNH_2$. No other act.

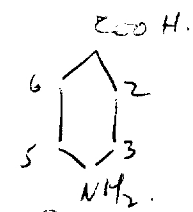
Also, pantoyl-N-2aminoethyl-(p-aminophenyl)-1 sulfone.

P-$NHCH_2CH_2SO_2\Phi NH_2$. Not reversed by pab; " by pantothen.

Sl. therapeutic activity in rats ε S pyogenes.

Martin, AR + FL Rose, 39:91- 1945. Antibacterial substances related to pab.

(overlap Wyss et al; Seun, Johnson + Pauli).



	2.	3.	5.	6.
1.		Cl		
2.	Cl			
3.		I		
4.		Me		
5	Me			
6		HO		
7		MeO		
8	MeO			
9		EtO		
10		NH_2		
11		COOH		
12		MeS		
13		EtS		
14		$MeSO_2$		
		$EtSO_2$		
		Cl	Cl	
		Cl		Cl

	2.	3.	5.	6.
15		SO_2Et		~~NH_2~~
16		Cl	Cl	~~Cl~~
17		Cl		Cl
18		Cl		NH_2
19		Cl		NHAc
20		Br	Br	
21		Me		Me
22		MeO		MeO
23	MeO		Me	
24.		MeO		Me.

" S. pyogenes; Wright's broth + blood.

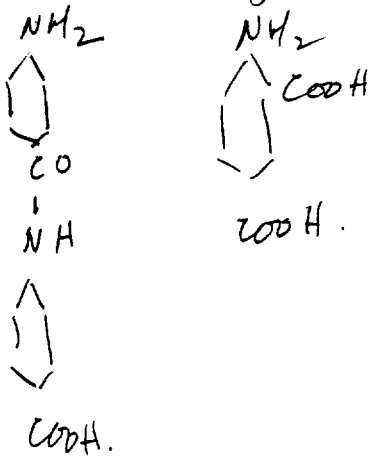
I: ½ eff. as SA. | 2 + 4 anti SA.

5. Inact.

4-amino isophthalic

4-(4'-amino benzamido) benzoic ac. } Sl. anti SA activity

& Et. 4-aminobenzoate



McIlwain H. Biochem. J. 39: 329-33 (1945) Biochemical characterization of actions of chemotherapeutic agents. 5. Lack of gross displacement of pante thenate and pabate from microorganisms by pantoyltaurine & sulphanilamide.

Strep. haemolyticus. Limiting pantothenate medium → pantothenate poor cells. Pant all exc pant in heavy pant medium growth removed by rinse washing.

Suspensions contg 15-60 mg (dry) of cells in 2-3 ml $M/18\ PO_4^-$ pant determined by digesting + Proteus growth.

Wet cells (1g. batches) exposed to SA. No release of anti-SA occurred on exposure to buffer, saline or SA.

Pant. content of bugs grown in initially 2×10^{-6} M was 30 mμ mol/g (dry) Growth for shorter periods = more pant, the centrifuged cells being important. The cells inactivate pant.

Cells c up to 700 mμ mol/g were obtained

No pant was liberated on exposure to pant-taurine of the poor pant cells. Nor did washing. placing with pant inactivators.

In pant rich cells, pant stable at R.T. was released into saline at 37°. The quantity remaining being ca that of pant poor. Large exc pantaurine had no effect on quantity removed.

The amt of SA-antagonists present is not altered by large amts of SA.

"It is suggested that although pab + pant function in resting bacteria these activities, when the resp. substances are incorporated are not influenced by SA + PT but the reactions involved are the assimilation of the substrates. These are stably bound. Therefore expect a lag in action for dilution of ~~cells~~ substrate.

McIlwain, H + DE Hughes, Biochem J. 39:133-139 (1945). 3. Relationships between metabolic and growth inhibitions by pantothenate analogues: their structural and spp. specificity.

Assay = Proteus.

Several analogues tested for (1) effects on growth, reversed by Pthen

Some comps. inh. growth but not pthen inactivation: bis nor desoxy pantothenate. These were not reversed by pantothenate!

All analogues which competed = pthen, inhibited the reactivation of pant.

order of activity of different analogues

+ of pant T. in different species is the same for growth + pant metabolism.

McIlwain, H., Biochem. J. 39:279- (1945) 4. Time-relationships between metabolic and growth inhibitions by pantoylataurine.

1. pnt + streptococci ⇒ slow inactivation of pnt at uniform rate.
2. Protection at 0°.
3. Inhibited by pantoylataurine immediately.
4. Growth inhibition has lag ca. 1 hour.; recovery also lags.
5. Reversible on washing & removal of pnt. occurs very quickly.

∴ assumes action of ~~pnt~~ PT is to inh. the synthesis of a pnt derivative essential for growth, which can be produced in excess.

Field, J.B., EG Jansen, J Spero, and KP Link, JBC 156:725-737(1944)

Studies on the ~~hemorrhagic~~ hemorrhagic sweet clover disease.

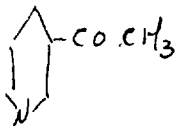
XL Hypoprothrombinemia induced by methyl xanthines and its effect on the action of 3-3' methylene bis (4-hydroxycoumarin).

Caffeine theobromine + theophylline stimulate liver to production of prothrombin + fibrinogen; reversing dicoumarol.

NICOTINIC AC. analogues (Acetylpyridine)

Woolley, D. W. JBC 162:179-80 (1946) Reversal by tryptophane of the biological effects of 3-acetylpyridine.

Tryptophane was as effective as nic in reversing effect of 3-AP on mice (pellagra).



Rockefeller.

RIBOFLAVIN, analogues
L. casei

Lareth, H.P. JBC 162:87–97 (1946) The effect of riboflavin analogues upon the ~~use~~ utilization of riboflavin and FADD by L. casei

Review: isoriboflavin has < .5% activity of B_6 for L. casei
inhibits rat growth at low B_6

Shows: in presence of suboptimal B_6 or FAD, stimulates ac. prod.

Diaminophenazine competitively inhibits utilization of B_6.

Lumiflavin competes ≈ low B_6, stimulates ≈ high.
inhibits FAD utilization at lower conc.

L. casei in alkali-treated peptone, or Casamino (Sandy + Dielon)
main effects on B_6 enzymes, and not on B_6 → FAD reaction

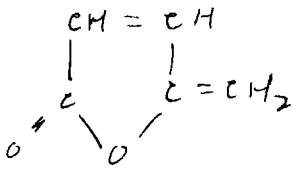
Tulane, New Orleans

ANTIBIOTIC: Buttercup juice

Baer, Harold, M. Holden and BC Seegal, JBC 162(1):65-68 1946

The nature of the antibacterial agent from Anemone pulsatilla.

~~Anemonin~~ ANEMONIN obtained, a polymer of proto-A.



proto-anemonin.

Activity measured against E coli, Staph and Candida albicans.

Acetylacrylic ac., not vinylacrylic had no antibacterial effect.

Kimball, R.F., Genetics 24:49-58 (1939). A delayed change of phenotype following a change of genotype in Paramecium aurelia.

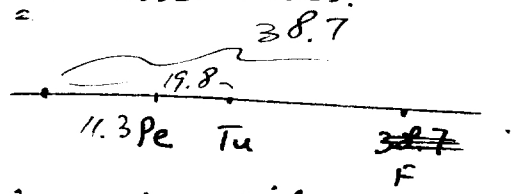
Following endomixis there is a delay in the expression of change of mating type that may occur.

Lindegren, C.C. + G., Genetics 24:1-7 (1939) Non-random crossing over in the 2d chromosome of Neurospora crassa.

See L. '36. Genetics 32: 243-56.

9 chromosomes.

knot-tow, peach, tuft + fluffy.



1. Excess of 2-strand exchanges. Deficiency of multiple exchanges.

Severens + Tanner, J Bact 49:383- 1945.

The inheritance of environmentally induced characters in bacteria.

Graded conc.

(Selection favoring wild type in mixed cultures in absence adaptive agent.)

Inoculate mass populations into Agar.

Changes of critical conc.

NaCl - from 3 to 8%
$CuSO_4$ - 1:4000 to 1:800
$HgCl_2$ 1:300,000 to 1:50,000

∴ use 6% salt agar

Horowitz, N JBC 162:413 1946.

The isolation + identification of a natural precursor of choline.

$CH_3-NH-CH_2CH_2OH$ isolated from Y7704, culture as 34486

Appears only after 7 days. More rapid in mold than in medium;

Y7704 must synthesize type choline. methylation of $diMeEtOHNH_2$ also effected.

$NH_2EtOH \longrightarrow MeNHEtOH \rightarrow Me_2NEtOH \rightarrow Me_3N^+EtOH.$

↑ 34486. ↑ Y7704

Fries, Nils. Svensk Botanisk Tidskrift, 39:270-8 (1945)
Two X-Ray induced auxo-heterotrophies.

Ophiostana (Ceratostomella) multiannulatum.

wild type requires: B_1 + B_6. Mutants for Biotin (225) and pab (617) obtained by X-Ray. Isolated by special selection technique.

Ark. för Botanick, 32:1-9 (1945) Über Röntgen-induzierte physiologische Mutationen bei Ophiostoma multiannulatum.

50kv. 2-3ma. 100m. Plated irradiated spore suspension onto minimal "Fries agar" + B_1+B_6. Mutants "durch sichtlich schlechteres Wachstum abweichen wurden." Von den auswachsenden Ansporungen wurden deshalb nur solche isoliert, die sich in dieser Beziehung von - des Meisten - normalen Typpflein unterscheiden.

1. Temporary radiation effects (back mutations?)
2. Morphologicals.
3. Mutants.

627 isolated. 30 mutants - 6 biochemicals.
None from unirradiated material.

\# 225 Biotin
358. Reduced S. (parathiotogh - cystine etc. or Y valent S. ($SO_3^=$)
446 Parathiotogh - can not use tetravalent S.
460 - ~~yet~~ Uracil
513 Adenine ? Low activity
617 pab.
848 Guanine.

Naturw. 30:44/5 - 1942. Adenin als Wachstumsfaktor für Ophiostoma ulmi (Buisman) Nannf.

Requires only B_6.

Nature, No. 3947 : 757 (June 23 1945) X-ray induced mutations in the physiology of Ophiostoma.

O. multiannulatum. strains mentioned above.

Parathiotrophs ii crosses lost ability to reduce tetravalent S. (#358). Other features inherited as 1 gene ii crosses.

Needed large quantities of adenine.

Uracil-less used cytidine or cytidylic ac. but not cytosine (blue 1298).

Nature #3847 : 105 July 24, 1943. Vitamin B_1, Vitamin B_6 + Biotin as growth substances for some ascomycetes.

Ophiostoma:

	Needed	Stimulated
O. piceae	Pyr	
ulmi	Pyr	Biotin
coeruleum	Pyr	B_6 "
quercus	Pyr	" "
piini	Pyr · Biotin	B_1
ulmi	B_6	Pyr
fagi	B_6	Biotin
pilliferum	B_6	Biotin
multiannulatum	$B_1 + B_6$	—

"Artificial symbiosis" tested + worked. (Heterocaryon?)

Nitrate needs biotin & NH_4 for N; desperable & NO_3 + acid!

Hollaender, A. Effect of long uv & short visible radiation on E coli
J. Bact 46: 531-41 1943.

Saline = NaCl 3g KCl .2g $CaCl_2$ .2g/100 ml H_2O. Protected by beef broth somewhat.

1. Growth delaying effect before appr. lethality (plate counts)
2. Survival in saline: (incubation).
   controls survival quite well 10 hours. (98%).
   irradiated died much more rapidly

Longer wavelengths much less efficient (10^5 energy req.).

Wickerham '45

8 ascospores/ascus. after copulation. Relatively anaerobic. Bottom fermentation 3 pellicle.

Under slide conditions, hyphae are formed. (rel. anaerobic). Nucleus visible in terminal hyphae, ca. 8-10μ, particularly anaerobically.

glucose, maltose & sucrose rapidly fermented. Also melibiose.
Not galactose & lactose

Sporulation did not occur from hyphae, or was diminished temporarily.

Trypan blue in agar leads to dark pigm. in aggl. phase (obt. from normal). Growth rapid 30-37°. Colonies develop slowly - 4-6 days. Copulation occurs readily at 20-33°. Asci ruptures before completing development.

Wickerham, L.J., & Enrique Duprat.
J. Bact 50: 597- 1945.
A remarkable fission yeast, Schizosaccharomyces versatilis, n.s.,

Lwoff, A. + A. Audureau, Ann. Inst Pasteur — ? 1941.

Sur une mutation de Moraxella lwoffi apte a se développer dans les milieux à l'acide succinique.

pp 1-2 missing

Typical strain will not utilize succinate. Rarely mutations appear, influenced by succ. from S− to S+. In presence of EtOH S+ outgrows S+. S+ → S− not found. Rate S− to S+ ca 10^{-8}.

~~Retest mutation~~

——— 70:51- 1944. Recherches expérimentales sur les mutations bactériennes.

Succinoxidase is present in both strains. Oxaloacetic ac. is decarbox. spontaneously but not rapidly enough for growth.

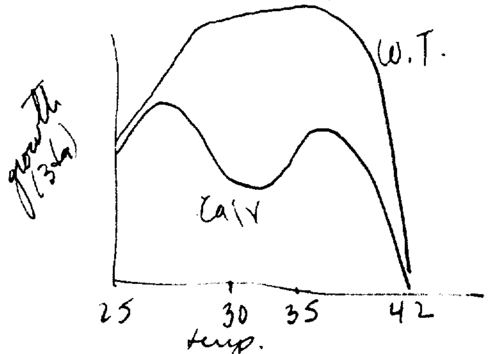
Hydroxy fumaric acid studied (enolic form of $\begin{matrix} COOH \\ | \\ C{=}O \\ | \\ CH_2 \\ | \\ COOH \end{matrix}$). (almost as rapid) as ~~by CO2~~. S+, but slows down to spont. rate

Prove there is an enzyme present? in S−. which is not present in S+?

Mitchell, HK and MB Houlahan ABB 33:31- 1946.

Neurospora IV. A temperature sensitive Neurospora mutant.

51602. At 31° or above, requires riboflavin absolutely.
S-shaped response curve .1 - 2.5 μg. At high B_2, growth curves like wild, at lower levels, bimodal temperature response.



Grows on 20 ml

At higher temperatures, c̄ a small B_2 supplement, (ca .3 γ) full wt. can eventually be obtained (200 hours = 8 days.) containing full B_2 content by L. casei.

For B_2 detm., autoclave cultures in medium & analyze filtrate. F. wt. ca 6 - 9 γ/100 mg. Mutant grows intermittently, using up & syn- thesizing vitamin. Not tested in Neurospora.

Inhibited by lumichrome; reversed by B_2. R_{50} = 1.2 - 2.5.

Some inhibitors in tissue extracts.

Neurospora may contain a doubly functioning set of genes for different temperatures.

Abb 4A x 21a.

Tatum, E.L. + T.T. Bell. A.J.B. 33(1): 15-21 (1946)

Neurospora III. Biosynthesis of thiamin.

			Distance from centromere
1090	(sitophila).	45 asci	23
9185		24 "	8.3
18558		8 "	0
17084.		33 "	35

No interspecific heterocaryosis.

3 day growth, 20 ml/125 ml flask.

18558 requires thiazole
9185 intact thiamine

When grown on limiting thiamin, accumulation of pyrimidine was established by 18558 (tested on 17084, + Phycomyces)
Analogues of thiazole had activity very similar to Phycomyces, except that 5th ethyl may have ca. .1% activity of B_1. for 18558.

2-methyl deriv. was also app. active

Factor S did not influence 9185 response.

17084, 1090 (and 56501) require both pyr and thz. Mixture had same activity as thiamin. Filtrates have a 9185 active compound, which loses activity on sulfite treatment. It is also active for 18558 and Phycomyces. Not active for 17084.

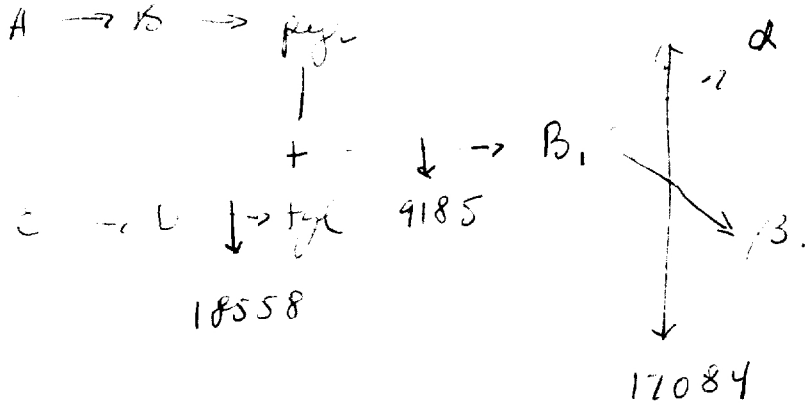
299 as low B_6 responds only to B_1 or pyr + thz.

Wooley's conclusions on pyrithiamine not confirmed. 17084 and 1090 can use pyrithiamine for pyrimidine.

A thiamin metabolism enzyme exist in 1090 + 1084.

These strains have a high requirement.

i.e.



Carrel, A. Pr. Am Phil Soc 68: 129-32 (1929) The nutritional properties of malignant cells.

Numerology

Kellogg, W.N., et al S 103:49. 1946. Spinal conditioning in dogs.

RADIATION: Cathode

Wycoff, RWG + T.M. Rivers, ~~JE~~ JEM 51: 921- 1930.

The effect of cathode rays upon certain bacteria.

The absorption of a single election will kill a cell. 1.5×10^5 volts

Concluded that only .008 of the incident elections are absorbed from phantom expts.

"Only 85% of the single hits were effective, but when death occurred, a single hit sufficed ..

(data from dose response curve, and calculated absorption by the bacteria.)

[How can this be compared to the production of x rays by radioactive P, etc?]

RADIATION: u-v

Hollaender, A + RM Duggar, J. Bact 36:17 1938

The effects of sublethal doses of monochromatic u-v radiation on the growth properties of bacteria

2650 Å

Giles, N.H., Genetics 28: 398- 1943. Comparative studies of the cytogenetical effects of neutrons and X-Rays.

Hollander, W.F. Gen. 28:76- 1943 Abst. A possible case of deleted mutation in the pigeon.

♂♀ ♀ sex linked Almond a^{br} → mosaics of brown and a^{bl}.

Al · a^+ → mosaics ♀ black but never brown.

do. Al · — (hemizygous ♂♂).

Evidence that Al → a^+, etc. If so, mutation is deleted by the other allele. (rather than somatic loss or crossing over).

Sonneborn, T.M. do.: 90 Development and inheritance of serological characters in variety 1 of P. aurelia.

Stock P has antigen; 60 lacks it. Single dominant gene.

P × 60 → some homozygotes which retain antigen 4-8 fissions (cytoplasmic lag).

Aa × aa → slowly developing antigen detectable only after several fissions + increasing to standard level.

~~Anti-A kills most~~ of

Anti-60 kills most individuals, but some resistants arise. Lost within a few fissions unless continued exposure to serum. Some lines retain their resistance (275 gener.); others lose it more rapidly. Lost at endomixis or fertilization in 9 fissions! (Dauermodification!)

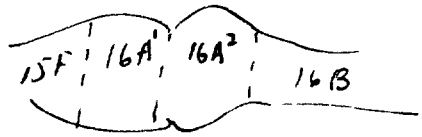
Note: Bar is dominant.

Sutton, E. Genetics 28: 97- 1943 Bar eye in D. melanogaster: a cytological analysis of some mutations and reverse mutations.

Summ: Hemizygous ♂, and Bar deficiency have no phenotypic effect.

The Bar effect is produced by interaction with other loci which may mutate..." The Bar effect may be destroyed by mutation of one of the two interacting loci, as well as by separation of these loci through chromosomal rearrangement.

Reversals:



a) deficiency of a duplication incl. 15F — 16A.

b) inv. $16A_1^1$ — 17A.
c) undetect. change
d) def. $16A^1A_2^2$
e def 16A.
f. inv - long from 4A to $16A_2^2$
g. " - $16A_7^1$ to C.

Similar effects in DoubleBar.

Oeshoor, J.L., Acta Path, Microbiol Scand, 22:523 (1945) Investigations of the permiability of yeast cells.

White
Woolley
Hutner

C+F.

Grob, D., J.G.P 29: 219 (1946) Proteolytic Enzymes I.

P.4.

Strong, L.C. XII. Yale JBM 18: 145-155 (1946)

The effects of selection toward resistance.

1. Meth induces ag. tumors in homozygotes; diverse in heterozyg; particularly in strains selected for resistance to local tumor formation. [illegible]

An increased mutation rate is also postulated.

Mice have strongly selected for resistance.

1. In one subline, no change [biotype - pure line?]

2. In 4 lines, a decrease, but accomp. by an incr mutation rate to susceptibility.

Owen, FV, J Agr Res 71:423 1945 Cytoplasmically inherited male sterility in sugar beets.

Ostergren G. Hereditas 30: 213-16 (1944) An efficient chemical for the induction of stickiness in chromosomes.

Allium roots 3da. 1 molar.

Turbidimetry

Hayes, W. JPB 57: 457-466 (1945) The effect of agar depth in the plate method for the assay of penicillin.

200 000/ml opt. For penicillin, agar depths less than 5-6 mm. give sharply increasing zone sizes of inhibition, varying ± concentration.

The assay value increases at agar depths considerably greater than the apparent radius of diffusion.

8.8 cm plates require 50 ml for 8 mm. agar, which is required for uniform results.

Lehmann, F E + H Weber, Verh. Schweiz. Naturf. Ges., 120: 181-2 1940.

Verschwinden embryonaler Zellkerne v. Tenifex nach Colchicinbehandlung.

6.20.74(1910) Method of counting

Smith, Sister MC, A.J. Med Tech
bacteria....

Beijerinck, M.W. Archives Néerlandaises des Sciences, 23: 367-72 (1889)

L'Antanographie ou la méthode de l'hydrodiffusion dans la gélatine appliquée aux recherches microbiologiques.

Add required supplement to the surface of an agar or gelatin pour plate culture requirements. e.g. yeast + phosphate (yeast is more resistant than most bugs to killing under such conditions). Also, double diffusion zones for recognizing giving "une teinte lenticulaire opaque du contour jaunâtre." Glucose + asparagin, etc. as C & N source. Inhibitors also easily demonstrable. Also suggests drying the plate.

Points out that bacterial cons. do not have to be known. Used large plates for multiple effects.

Furth, J. + M. L. Boon, AAAS Research Conference on Cancer, 1945, 129-138.

The time and site of origin of the leukemic cell.

Malignant cell determined by bioassay - intravenous adm. to recip.

1 cell needed for transmission.

1. Young leukemic mice do not harbor neoplastic lymphocytes.

2. Some neoplastic can be found before clinical leukemia.

3. Thymectomy reduces incidence leukemia. (ca 60 to 10%). Do. underfeeding. Splenectomy = effect. Does not influence transmissibility. May have a genetic effect in inhibiting tumor growth.

4. Underfeeding reduced incidence from 65 to 10%. Also interfere transmission. May have leukemic cells by bioassay = evidence of leukemia Rarely in bone marrow; probably not typical site.

5. Method leukemogenesis. a. X-Radiation mice recipients.
b. Lead + hybrids which do not develop spont.
Develop in 70-100 days. contain neoplastic a short time before leukemia develops.

Earle, WR, AAAS Cancer 1944.139.
A summary of certain data on the production
of malignancy in vitro

Dedal, ZJ HRK Busch. J Bact 51: 791-2 (1946) The biotin requirements of Neisseria sicca

only biotin required opt. .0001 µ/ml

Reyes-Teodoro, R. + M.N. Nicholson, J Bact 51:389s (1946)

Recovery of biotin from cultures of acetone, butyl alc. bacteria. Synth. medium.

75-80 % recovery. 15-20% in medium.

acid hydrolysis or papain-diastase are best methods.

Klieneberger Nobel J Hyg 44:99 1945

gbl Bakt I 135: 239 1940 (mixcultures)

JID 54:313.

~~Holdemeister~~ Z. ~~Bakt~~ ~~[illegible]~~ symbiosis

J Bact 30:301

Green, FE + FU Mylan JID 4/2:525-36 (1958).
4/2:545-

Tulsteen, HC + ML Snyder, J Bact 42: 653-64 (1941) The inhibition of the spreading growth of Proteus and other bacteria to permit the isolation of associated streptococci.

a) Fry's technique of pouring layered plate
1. Prevent spreading with a top layer

6% NaCl inhibits spreading but not growth markedly.
(probably cuts diffusion of water - as mid. by dyes)
(probably not a good idea

Hyde inhibits spreading at 10^{-4} but growth as well.

alcohol 5% inh. spreading but not growth.

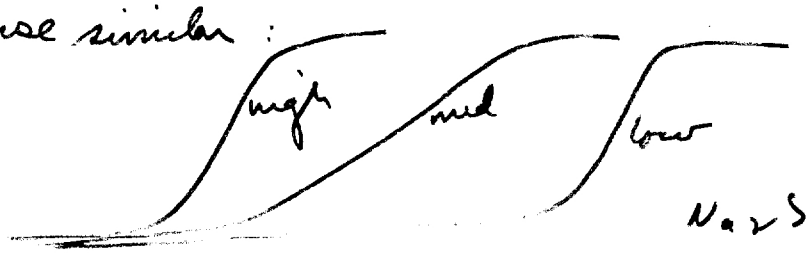
[Dettling has proteus phages.]

Fry - BJEP 15: 456-7 (1932)

Burrows, W. J.I.D. 54:135- 1939 The nutritive requirements of the Salmonellas.

Many strains require tryptophane. Casein treated. Tryptophane conc. does not affect rate, or final growth, but only lag. Replaceable by lysine in one strain. Tryptophane assay increased after growth.

Na_2S response similar:



N variations affected both rate + amount. Glucose was also none.
not lag.

NH_4SO_4
$NaCl$
KH_2PO_4.
glucose

Resp. rates ~~lower~~ higher ∴ low tryptophane. (selection?)

Demerec, M. CSH 9:145 (1941) Unstable genes in Drosophila.

see Demerec 1935.

Plough, HH. CSH. 9:127 (1941) Spontaneous mutability in Drosophila

Goldschmidt, R. Biol Zentr. 49: 437-48 (1929) Experimentelle Mutation und Problem der Entw. Parallelmodifikation. Vers. an Drosophila

By heat-treatment of larvae, phenotypic sooty which bred sooty were found. "simultaneous somatic + germinal mutation", "favored." !

Bluhm, A. Biol Zbl. 48: 641-8 (1928) Einige fragende Worte zum Mutationsbegriff. (Hanson has it)

see Bauer. —

Delbrück, M. Biol Rev. 21:30 - 1946. (Bacterial viruses or bacteriophages

Winge, O. CR Carlsberg 24:79-95 (1944) On segregation and mutation in yeast.

S. cerevisiae - only ½ spores survive. (lethal?)

S. unisporus - (single spore form) probably varying segregants

Ditlevsen, E. CR Carlsberg 24: 31-37 (1944) A case of simple segregation in Saccharomyces italicus.

1:1 segregation of a morphological gene (L.) long dom. short cell type.

Spore lines are of two types & when they sporulate, they bud true (particularly ll). LL sporulate only rarely. Hybridization attempted L × l & yielded substantially the F_1, again segregating 1:1. L × L race; l × l fug.

Twombly, G.H., & D. Meesel, Cancer Research 6: 82-(1946) The growth of mammalian tumors in futile eggs. Dso a filtrable virus produced?

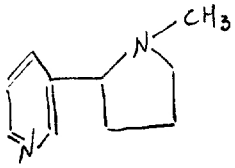
Rebsamana R39, Bagg mouse ca 755 + the RC mouse ca. were grown in futile hen's eggs.

Tumor producing activity could not certainly be dissociated from viable cells.

Dawson, R. Alkaloid formation in plants. Zoology Colloquium 3/6/46.

Tobacco alkaloids:

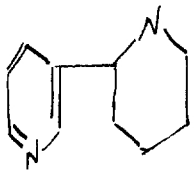
nicotine



nicotine

Nor-nicotine is demethylated nicotine.

nic + normic = fairly constant in various plants



Anabasine.

Also N-methyl anabasine

Nicotyrine is a 1'-2" ene - nicotine.

Pyridyl common; side group varies. A similar series in cinchona, cactus alkaloids.

Accumulation of nicotine in leaves is not modified by most procedures on leaves.

Grafting tomato top to tobacco roots ⇒ nicotine containing leaves + fruit.

Tobacco / tomato ⟶ no alkaloid

Solmssen, U.V. Chem. Rev. 37:481- 1946. Synthetic Estrogens & the relation between their structure and their activity.

Res. Labs
Hoffman La-Roche Inc
Nutley 10, N.J.

Mangenot, G. Rev. Cytol et Cytophysiol. Vég. 5:169-264 (1941)

Substances mitoclasiques et cellules végétales

Shemin, D. JBC 162:297-307 (1946) The biological conversion of l-serine to glycine.

Benzoic ac. and labelled comps. injected into rats, guinea pigs. N^{15} in hippuric ac. determined + comp'd ∴ that in the labelled injectum. The dilution factor was lowest for glycine (2.8, 2.4 resp.) and v. high for dl-glutamic (1500, 450...) NH_3 → 400, 20 resp. in the two spp. d-serine was rel. sufficient. l-serine was 5.5, 3.9. l-glutamic is 45, 10.

CH_2OH / CHN^* / C^*OOH prepared. CH_2OH / CHN^*H_2 / C^*OOH

Ratio of $\frac{N^*}{C^*}$ in hipp glycine demonstrates the direct conversion and eliminates ethanolamine. Pcr is $COOH$ / $CHNH_2$ / $COOH$ the intermediate, unless reversible deamination. N-benzoylserine ⇄ hippuric. Probably no reversible deamination to glycine...

Luria, SE, Genetics 30:84- 1945. Mutations of bacterial viruses affecting their host range.

Coli B. Viruses α, r.

B/α, B/r ~~readily~~ obtained. Also B/αr. Also B/α, etc. morphovariants.

B/r more difficult.

r + B/r → 10^{-5} to 10^{-7} clear plaques. A new virus, active on B/r can be isolated. r'. r' can be obtained from single plaque isolates.

No virus active on B/α_1 found. But α → α' active on B/α_2, not active on B/α_1.

r' → a smaller plaque count on Br than B (.2 to .6) After absorption by Br the plating efficiency does not vary. This is not due to r' → r. It is likely that r' is less readily absorbed by Br than by B. r' interferes ≈ r. (Self-interference also likely).

α' is identical ≈ α on B. Plating efficiency .3 - .7 on $B\alpha_2$. Absorption is known

Delbrück analysis, ≈ complication of bacterial mutation to resistance e.g. multiplicates. Fluctuations → conclusion of mutation. Some cultures had a mutant population < smallest burst size indicating mutation in cell.

Serologic identity of α α α'; r + r' is established. Back-resistance independent: Bαr susc. to r'.

$B\alpha_1$ → $B\alpha_1 r'$ but was susc. to α

a mutant can be obtained from $B\alpha_1 r'$ → $B\alpha_1 r'\alpha$ resist. to α, r, r'

McDowell, -

Genetic factors - High incidence in C58. Incidence related to "amt. of inheritance" of leukemic strain. Genes vs. cytoplasmic elements.

F_1 heterozygotes: differences in reciprocal hybrids. Maternal infl?!

Variability in F_1 - isolates. $F_1 \times P_1(r)$. Low incidence (to 1/4.) Still problem of segregation due to imperfect penetrance + masking of phenotype. Breeding tests essential. (Test of genotype)

Stoli = Little-Stocks. "S"

Why backcross rather than inbred?? (resistant)

RR × rr
↓
Rr. — 1:1 ratios in progeny expected for monogenic units. (Ask for experiments) C58. (7 generations = isog??) (Selection??)

RR × rr
↓
Rr × rr
↓
Rr, rr test by × rr!!

S × C
↓
X SC × S♀

↓ Test progeny by mating to S♀. Variability in backcross.

F1s practically uniform, c̄ reduced incidence. ∴ non-genetic determ.
All crosses to high strains c̄ ♂♂. Nursing c̄ S ♀♀ inhibits leukemogenesis.
Planned as high, uniformity as possible.

Each ♂ × 10 ♀♀

N used on Ballinos.

Heterogeneity between families.

Effect on +/s or homozygotes.

age or litter no?

P1 RR × rr

↓

F1 Rr × rr

↓

F2 Rr, rr. Test. the progeny of these.

× rr. Some lines should have no leuk.
Some up to 50% leuk.

Variability found between ♂♂. in F-2

(Test # of genes??)

C - S differ in 3 genes on pigment. 2 correlated c leuk.
transmission of a longevity factor from ♂♂. non sp. leuk

but had as much influence as leukemia...

Nurse effect greatest on ♂♂. Also ♂♂ — fighting; cystitis; Nurse improved competition + improved cystitis.

— Age of mother at parturition. (Stole) Young → higher incidence.
50 families are not adequate for multivariate analysis.

Effect of nursing greater on hybrids. (Sex-linked factors)

Young removed as born.... Divided between 3 strains of nurses.

No mice got 1st milk) Everything fostered. 4/6 ♀s.

1. Reciprocal hybrids still vary. ♂-nursing produces in both crosses except in final % leukemia.

∴ B nurse, the cytoplasmic effect is much greater, and affects final rate.

Frejer, HC + JW Gowen, Genetics, 27:212 – (1942) Analyses of data on X-ray induced visible mutations in D. melanogaster.

Timoféef-Ressovsky's data indicate no significant direction of mutation, or mutability of any allele in the w series.

Hauffmann, BP, Genetics 27: 537- 1942. Reversion from roughest to wild type in D. melan.

Sex-linked recessive. Accentuated at low temps. rst^3 flies are a mosaic of smooth + rough facets, roughest. in ♂♂. Associated ♀ along inversion from rst to the right of bobbed. left break is in 3C2 - 3C4 region. rst^2 is allelic (see Gruneberg 1938).

Rst ♂♂ × $In(1) rst^3, rst^3 carbb$ ♀ 4000r x-rays and × YY females → revertants, which were sterile (~~heterozygous~~ hemizygotes for inversion).

Then radiated ♂♂ × $In rst^3$ ♀♀. 21,104 F, ♀♀ examined.

171 were Rst phenotypically. 72 analyzed. 25 sterile + lost 23 rst ♀ poor expression; 17 reversions. (ca. 4%).

16 had breaks in proximal heterochromatin of the $In rst^3$ x chrom. 4 were inversions; 2 also translocs. 7 recipr. transl. 2 could be maintained as ~~balanced~~ homozygotes + were ♂ fertile. After two years some rst flies appeared again (♀ cytological modification).

There exist some data that new arrangements have weak "spots."

Other genes tested. No reversions of forked or peach found.

Grunberg, H. J Genetics 34:169-89 1937 The position effect proved by a spontaneous reversion of the X-chromosome in D. melan.

Griffen, AB + WS Stone 1939. Reverse Mutation & the position effect. Gen 24: 73

The w^{m5} and its dev. Q. Jrl. 4032: 190-200

Sinclair, et al., Gen. 24:88- 1939 Reversal of lethal factors.

Oliver, CP., PNAS 26:452-4 (1940) A recessive to wild type associ. & crossing over in D. melan.

Glossy (l_2^g) and Spectacle (l_2^s) are sex linked, recessive, alleles of l_2; are in the dl-49 inversion.

l_2^g Bx / l_2^s f ♀♀ × l_2 ♂ Bx ♂♂, 11/5584 ♀♀ 26 ♂♂ 9 ♀♀ were wild type & dominant to l_2^g or l_2^s. The inversion was not bx.

Ten of the offspring were Bx. ∴ the crossing over occurs in the inversion, and has been shown to be between v and l_2.

The complementary type was not picked up. The only compound which counts is l_2^g / l_2^s

Robbins, Richard O., ChemRev. 38(2): 255 - 377 (1946).

Metabolite Antagonists. ✓

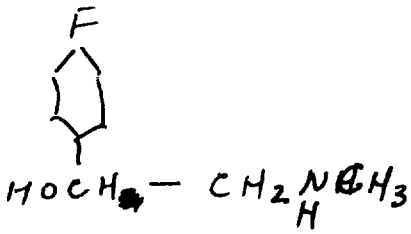
Chemotherapy, American Cyanamid Co., Stamford Res. Labs., Ct.

Fosdeik, L.S., et.al., JACS 68:840- 1946 Presence Ammonia comp.

nuclear Cl and F.

mol. Syntheses.

p F-styrene



Lwoff, A. JACS 68:835- 1946. The microbiological synthesis of riboflavin - a theory concerning its inhibition.

decomposition of B_2 increased by addition of Fe (.18-.36 mM/ℓ)
do. decreased production by C. acetobutylicum. Traces of catalase + $Na_2S_2O_4$ incr. yield. H_2O_2 mechanism.

Tatarjet, R. Rev. Can. Biol, 5:9-47 (1946) L'effet biologique primaire des radiations et la structure des microorganismes.

K ✓

Wahl, R., Ann Inst Pasteur 72:73-80 (1946) Influence de la composition des milieux sur la bactériophagie.

B, , Ca needed by some strains. Elaris multiplication is lysis.

Ramyer, M + R. Latarjet, Ann Inst Pasteur 72:89 - 1946. Augmentation du nombre de bactériophages en présence de bactéries sensibles par irradiation.

S. paradysenteriae Y6R; phage C16. X-Rays 33kv 30cm H.

8 - 16000 r/min. 10^9 cells irradiated + given doses of 150 000 - 400 000 r (ρ³ = 12, 32 resp!!) Tested for ability to take colonies + for titre of added phage.

Non-irradiated incl. from ~~5 x 10⁶~~ 11×10^3 to 146×10^6 in 6h. Irradiated ~~from~~ to 800×10^3. There was no increase in killed bacteria. After 4h. in icebox, radiated bacteria did not support phage. 1 single c.d. / 200 bacteria would allow phage multipl. found. Increase in phage about same at 400 000 as 16 000 r.

Expl. on basis of growth giving giant forms.

Woolley, DW. JBC 163: 481- 1946. Reversal of the action of phenyl pantothenate by certain amino acids.

Spp. requiring ~~pant~~ Øpant are inh. reversibly by Øpnt. Sp. synth. pnt are not protected by it term Øpn H.C. reversed Øpnt. 4 amino acids which are active were histidine, glut, pro, glyc + asp.

S. cerevisiae. Similar results L. casei

Kirkwood, S + PH Phillips. JBC 163: 251 (1946). (Quantitative effect of γ-hexachlorocyclohexane.

S. cerevisiae.

bioactivated.

Carlson, J G. Biol Bull 90:109- 1946. Polyploidy viscosity changes in different organs of the grasshopper ~~[illegible]~~ by heat during metabolism.

Whitelaw, W.L. PSEBM 61:420 - 1946 Portal vein ligation and the Eck fistula in the rat.

Univ Mich Ann Arbor

Demerec, M PNAS 32:36- 1946.

B/1. (called B in this paper). Ca. 5×10^8 phage / plate.

U.V. — GE lamp at 92 cm. = 4.2 ergs/sec. Exposed on plate

X-Ray / 80kv 25ma 2050 r/m.

24 hr bacteria concentrated to give 10^9/cc.

(term dropped from "phaging"???). Irradiated 0 – 4 min.
to lysis?

(Distinct increase in 4 hours from 0 to 295 of mutations is unirrad. cntl.)
somewhat greater ē U-V.

After 2 hours, increase of 10x in controls

1 min irr.	4.4
2 min	2.2
4 min	1.6.

mutation rate increases until 1-2 div., falls to normal by the 13th div
(6 hours). Killing not known.

Rubor, RJ + BD Davis JEM 83: 409 - 1946. Factors influencing the growth of the bacilli in liquid media.

Oleic esters (water sol) facilitating diffuse growth.
Serum albumins

Ammonium - citrate - yes.

~~21658~~

Menkin, V.
C.R. 1:548 1941.

21913
4637

McDowan Clin MJ 48: 305 '41. Mutation Theory Cancer

G, BC Science + Culture 7: 299. 1141. Regarding wound hormones.

1. hemodegrades to Lofbourow
2. Irradiated tumor cells - M. Ichelf

Pelczar, M.J. + J.R. Porter, Arch. Biochem. 2: 323-329 43.

The Nutrition of Proteus morganii Amino Acid + Growth Factor Req.

T/O) essentially pH 7.2 - 7.4 ± NaOH.

Cystine M/10^4
Prot 1 γ/ml
Nic 1 γ/ml (intact)
nicotinic ac. or amide eq. effective.

~~Inf~~ Infusion medium eq. 2 x as dense as synthetic. (± amino ac.)

cystine or methionine is only essential amino ac. cystine better. Others a.a. have little effect.

~~of~~ Aqueous extr. animal materials have a stimulating effect.
Norvaline, norleucine + allothreonine are inhibitory but reversed by other amino acids.

Purines + pyrimidines had no effect.

Nor Bs. : B_1, B_2, B_6, choline, biotin, folic, pab, inos, purines, glutamine...
all tried ± effect.

Try Vitamin C, fat-solubles, K, etc.

Bact. Med. State U. Iowa, Iowa City.

Meyers, FP + J.R. Porter, J Bact 50: 323-31 (1945) The nutrition of Proteus morganii: sulphur requirements.

Basal:

NH_4Cl	1.	Glucose	5 g
$NH_{4_2}SO_4$	1	Cystine	24 mg
NaCl	1	Pht	1 mg
KH_2PO_4	1	N/C	1 mg.
K_2HPO_4	1		
$MgSO_4$	1		
~~Na_2S~~			
H_2O	1 l.		

Other S- compounds (cystine 4+).

lanthionine	3+	
Methionine	2+	(variable)
Na_2S	2+	
Cysteine	variable !!	
homocystine	2+ var.	

Porter + Meyers. Arch Biochem 8: 169-176 (1945) Amino acid interrelationships in the nutrition of P. morganii.

~~allotho~~ allothreonine reversed by 20 am ac.
norvaline by leucine, meth valine.
norleucine (l, d, dl) methionine. (leucine M/750)

Stokes, JL + H Gunness, J Bact 51:570 1946.

The aa composition of microorganisms

absth.

Finley, H.E. Morehouse College, Atlanta Ga. Biol. Bull. 6(108): 31-) 1946.

Patterns of sexual reproductive cycles in ciliates.

Johnson E A + L F Rettger, J Bact 45: 127 - 1943

Yale

S. typhosa — no vits., tryptoph
S pullorum — 2/45 nic. through — leuc, asp / asp, arg / asp
S. gallinarum — B1. \ - histidine — leuc, asp, glut
——— 0.

Kligler - Salmonella para A.

nic required in presence of glucose.

Doede, D.R. — Yale JBM 1945 — Eff. pH on nutr. req. Shigella, Lactobacillus ... See Dept Bact.

typhosa — IX, a., ...
gallinarum
pullorum

Wyss, O. PSEBM. 48:122- 1941. The Nature of SA inhibition

See Elvejhem.

$E + S \rightleftarrows ES \rightarrow E + P.$ $\quad K_s$

$E + I \rightleftarrows EI.$ $\quad K_i$

$$\frac{1}{v_i} = \frac{1}{V_o}\left(K_s + \frac{K_s}{K_i}(I)\right)\frac{1}{(S)} + \frac{1}{V_o}$$

then $\frac{1}{v_i}$ oc $\frac{1}{S}$

$$\frac{K_s}{V_o} = k_s$$

$$\frac{1}{v_i} = k_s\left(1 + \frac{(I)}{K_i}\right)\cdot\frac{1}{(S)} + g.$$

$$g = \frac{1}{V_o}$$

$$k_s = \frac{K_s}{V_o}$$

$$\frac{k_s}{g} = K_s.$$

Genetics of Path. Organ.

Lewis
Diener
(Knaysi)
Dubos
Mellon
Bowen
Sherman + Wing.
Lindegren

JID 71:

Jennison, M.W. + C.P. Wadsworth J. Bact. 39: 389-97 (1940) Evaluation of the errors involved in estimating bacterial numbers by the plating method.

Reprint at Standards. Bull. Sci. Pharmacol

(do.)

Perry, CA + Epstein. AJCP-T.S. 3:70-1 (1931) Problem the use of double-pointed ~~plates~~ Rod plates in the examination of throat smears cultures for Hemolytic streptococci. .

Belehav, J. Beih Bot Zbl Pflanzen 26: 221 - 49 1939.

Alternation of generations in Chl. spp.

C. variabilis
paradoxa

Braarud, T. + Bigelthe, F., — BA 7: 1826

C. sp
1 cell = 2.98×10^{-12} g. N; $.98 \times 10^{-12}$ P

Rahn, O. JGP 14: 315 - 37 1931.

* Harvey Ann Bot 23 181 1909

* Strelow, Z Bot 21: 625-92 1929 C. paradoxa x bolleyes

Kaiser-Wilhelm Inst; Berlin

Moewus, F. Biol Zentrbl. 60:597-626 (1940). Uber Mutationen der Sexual Gene bei Chlamydomonas.

~~70~~ 75°C. 15 m. → rate of mutation of .3%
6000r → .002%.

60: 143-166 1940. Hormones.

60: 225-38 (1940). Uber Zoosporen-Kopulation bei Monostroma.

M. wittrockia Copulation of gametes → zygote. In 2-3 weeks → sporophyte → 32 haploid zoospores
<u>Oocyte</u>!

60: 484-498 (1940) Botrydium granulatum

~~Whitford~~ Whitford, L.A. Freshwater algae of No Carolina. (Ohio St U.) ~~Abst~~ Dost Dissert. C. fenestrata found: new form

Pätau, K. Zeit f Abstr Vereb. <u>Stat.</u> <u>Moewus</u> would prob 10⁻¹⁰
79: 317-19 (1941).

<u>Cornman, I.</u> Bot Gaz. 104: 50-62 (1942). Colchicine

Chlamydomonas pseudococcus - resistant to .015%

*# Moewus, Zeit f Abst Vereb 78: 418 1940 Selbstfertile. Zeroin

Krapp's Zygote germination by soil extract. 10-14 da / generation.

Lelois, L.F. + Muñoz, J.M. (1938) Ethyl Alcohol metabolism in animal tissues. Brit J. 32: 294-307.

"The action of kidney was especially marked in a rat which had previously received alcohol orally for a month".

fasting 24h. diminishes Q_{EtOH} in liver.

Alcohol tolerant animals have livers with $Q_{EtOH} = 8$, at upper range of normal variation.

pyruvic acid stimulated alcohol disappearance, especially in fasted animals (undoubtedly a H acceptor).

Alcohol disappears more rapidly in intact tolerant animal, site of difference might be kidney?

Abderhalden, E. et al. (1914). J. Physiol. Ch. (90: 369-387.

+ Bassani, E. Studien über das Verhalten des Blutserums gegenüber Dextrose, Lävulose u. Galaktose vor und nach erfolgter parenteraler Zufuhr dieser Zuckerarten.

Usually, no optical changes noted in any serum tested. Do. with serum after or amino acids + or pepsin.

+ Waldenmaier, F. Weitere Untersuchungen über das Verhalten des Blutserums gegenüber Kohlenhydraten vor u. nach erfolgter parenteraler Zufuhr dieses Disaccharids. Versuche ~~mit~~ an Kaninchen. 23/24 rabbits responded
388 - 418.

Theadapted rabbits showed no polarimetric activity on lactose or galactose. "Ein vorläufiger Versuch, durch Verfütterung von Milch eine Änderung des erwähnten Resultates herbeizuführen, war bis jetzt ohne Erfolg. Es wurden noch Versuche mit parenterale Zufuhr von Milchzucker in Angriff genommen, um festzustellen ob hier ganz ~~specific~~ spezifische Reaktionen vorliegen."

Used 10cc 10% sugar. Activity found within 2 4h.

(1cc serum (α_D = -.28° → +.25° initially → +.16 at 23h.)

L. Pregnescu

Versuche an Hunden. sunder effects with sano animals.

P. 3.
Present.

It is has come to be assumed that LA-22 is actually genetically a stable single mutant a single genetic although it was isolated on two strips, does not revert, and has a complex mutation.

Röhmann, F. (1917) Biochem. Z. 84:382 – Über die durch parenterale Rohrzuckerinjektionen "hervorgebrachten" Fermente des Blutserums von nüchternen Kaninchen.

In repeating earlier work, found adaptive serum sucrase to be quite irregular. Studied gravid animals to determine relation with lactogenesis. Regularly found sucrase in 7-10 days & sucrose disappearance in urine.

v. 57:380 (1913) 61:464 (1914); 72:26 (1915).

Plimmer, R.H.A., (1906-7) On the presence of lactase in the intestines of animals and on the adaptation of the intestine to lactose. J. Physiol 35: 20-31.

[illegible] lactose metabolism:

JBC 81: 541- (1929)

80: 33-36.

see also JGP 19: 879 lactose synthesis in mammary gland.

J Phys. 71: 342

Corley. Disposal of intravenous lactose in rabbit

1 gm. adm. Unfermentable sugars returned [illegible] in 3 h.

> 75% accounted for in the urine as unfermented. red. sugars

Insulin had no effect. Anemia resulted in only slightly delayed removal. No blood lactose found.

Walters [illegible] [illegible] Lactosuria [illegible] during confinement

Plummer did not find adaptation to lactose
young animals contain lactase which is lost in later life

does not accept Weinland's conclusions on presence of enzyme in
adapted four (intestine

Potter, VR + Klug, H.L. (1947) Dietary alteration of enzyme activity in rat liver. Arch Biochem 12: 241-248.

High fat diet did not increase citric acid oxidative activity of liver or ~~not any part of~~ fat fed livers showed marked decreases in octanoic oxidase when lysed. Succinoxidase < in high fat + high carbohydrate animals.

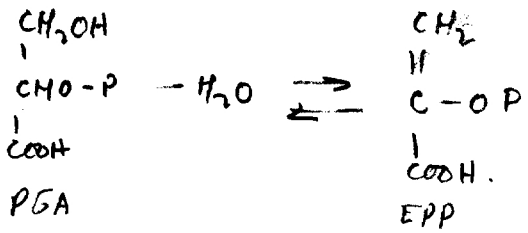
what is DBC in prev.

Lightbody HD + Klemmar A (1939) Variations produced by food differences in the concentration of arginase in the livers of white rats. JBC 129:71-78.

High protein diets caused a) increase in urea
b) increase in relative arginase conc.

Gelatin augmentation caused b) & a).

Warburg, O. & Christian, W. (1942) Isolierung u Kristallisation des Gärungsfermente Enolase. Biochem Z. 310: 384–421.



Determinated spectrophotometrically a 240mμ in .5cm cell,
c 3ml M/300 also combines c Zn.
Half saturated c $MgSO_4$ in phosphate buffer at 2.8×10^{-3} pH 6.74
HCO_3 6.1×10^{-4} 7.34.

3 hypotheses for F inhibition:
1. binds Mg. 2. displaces substrate from enzyme Mg
3. a MgF compound displaces Mg. 3 – affirmed.
When the product: $Mg)(PO_4)(F^2)$ has same value, inhibition is same. c Mg > M/100, ∴ inhibition was noted.

for 50% inhibition, $3.2 \times 10^{-R}\ (M/L)^4$.

Arsenate replaces phosphate. Pyrophosphate cannot, but is itself inhibitory.
Carboxylase is inhibited by fluoride at higher conc; Pb, Ba had no effect.

Wilson, W.J. (1910) Variation among bacteria. Brit Med Jl. (2), 1909-11

Understood selection vs. slow fermentation.

See Adami "Principles of Pathology" 1908. I: 104. and J Exp Med 4: 349 (1899)

n intermediate coli-typhi isolated:

Prompt (< 2da) fermentation of lactose at 22°. Negligible) >7 mo
+ 37. Seeded J.P.B. 14: 1 (1909) re detection. Showed
no agglutinins associated with the lactose. lactose diffusi

+ 37, Mtl, Mal and Glu fermented ± gas.

I. The utilization of lactose by Escherichia coli-mutabile. Deere, C.J., Dulaney, Anna D., and Michelson, I.D. J. Bact. 31: 625-633 (1936).

White form of Ecm uses very little lactose (determined as reducing sugar with Cu) before the red forms appear. NH_3 production indicates that amino acids are used as C source if lactose is unavailable

II. The lactase activity of Escherichia coli-mutabile. ib. 37: 355-363 (1939).

Used Shaffer-Somogyi (JBC 100:695-713 '33) method, with Reagent # 50 and 15 minutes heating. Thymol used to sterilize heavy cell suspensions (req. 1 hr.) Dry cells prepared after Morrison & Hisey (JBC 117: 693-706). Substrate was 50 ml ½% lactose in 1% acacia an M/10 P buffer 7.0-7.2.

Dried cells suspended in 25 ml 2% acacia in .2M P buffer, 10-20 mg thymol added and incub. 37 1-1½ h. 25 cc. 1% lactose added, and samples taken for analysis. .01% Cu used to stop enzyme action. Activity expressed as u = 2.5 mg lactose split / 12 h/ mg.

Lac+ grown on lactose had activity ca 2.8 if grown on lactose; 0.2 on plain agar, 0.1 on glucose. Lac- had activity of 1.0 on lactose, etc. on others. No difference whether dried or not. These values characterize the Lac- itself, as no Lac+ were seen at this interval, on Endo's agar.

III On the activation of the lactase of Escherichia coli-mutabile. Deere, C.J. J. Bact. 37:473-483.

"Earlier experiments led us to believe that the antiseptics employed "activated" the lactase which was present, but inactive, in living growing cultures of the non-lactose-fermening (white) form." Later found that drying would also activate lactase while only partially inhibiting glycolysis, so that Q_{O_2} might increase

Garrett white: /plain agar:	Wet:	Lac 11.7	Dry: 30.7	
		Glu 139	91.7	
/Lac	Wet:	Lac 19	72.6	
		Glu 136	132	
		-- 9		
Red: /plain		Lac 19.2	42.3	
		Glu 117	88.9	
Red:/Lac		Lac 128	1.8	This prep. was obviously overdried.
		Glu --	1.9	but may have been too acid.
		-- 7		

Ex tracts of dried cells contained demonstrable lactase.

No valid test was made of the possibility of lactase activation in Lac+, but he concluded that adaptation was based upon increased permeability rather than increased enzyme.

Papacostas G + J. Daté - Les associations microbiennes : leurs applications thérapeutiques.

Revue mix culture phénomena

W. T.

Williams, Anna Mae 1951 Degeneration and regeneration of antibiotic-producing strains of Streptomyces griseus (Krainsky) Waksman & Henrici. M.S. Thesis U of W.

Yeast glucose agar Y. Ex. 10 Glu 5 K_2HPO_4 1 Agar 15
tapwater

Maltose (or starch) Spor. Agar (pH 6.8-7)

Maltose	10
Tryptone	5
K_2HPO_4	.5
NaCl	.5
$FeSO_4$	.1
Agar	20
~~H_2O~~	

more stable. Sporogenesis restored on this medium.

S. griseus cultures + media.

		B21	B13
	Glucose g.	10	20 ~~B22~~
	$(NH_4)_2HPO_4$	4	
	$CaCl_2$	.4	
	K_2HPO_4	2	2
	$MgSO_4 \cdot 7$	1	1
	NaCl	5	
	$FeSO_4 \cdot 7$ mg	20	10
	$ZnSO_4 \cdot 7$	10	10
	add alkali to		Cu 5
	pH 7		Mn 5
	Sod Lact	8	
	NH_4NO_3	2.5	
	$CaCO_3$	1	

See Delaney et al. Mycologia 1949
Savage) Bact 57:429
Carvajal Mycologia 1949
Kelner) Bact 56:157
57:73

Walksman: Streptomyces

Spore suspensions:

Aerial potato dextrose agar 7-10 days 30°. 5 ml H_2O, gently shaken. suspensions shaken with 10g. "glow beads". (480 r.p.m. 2 min) diluted with Aerosol OT to give 1:1000. Filter aseptically through cotton.

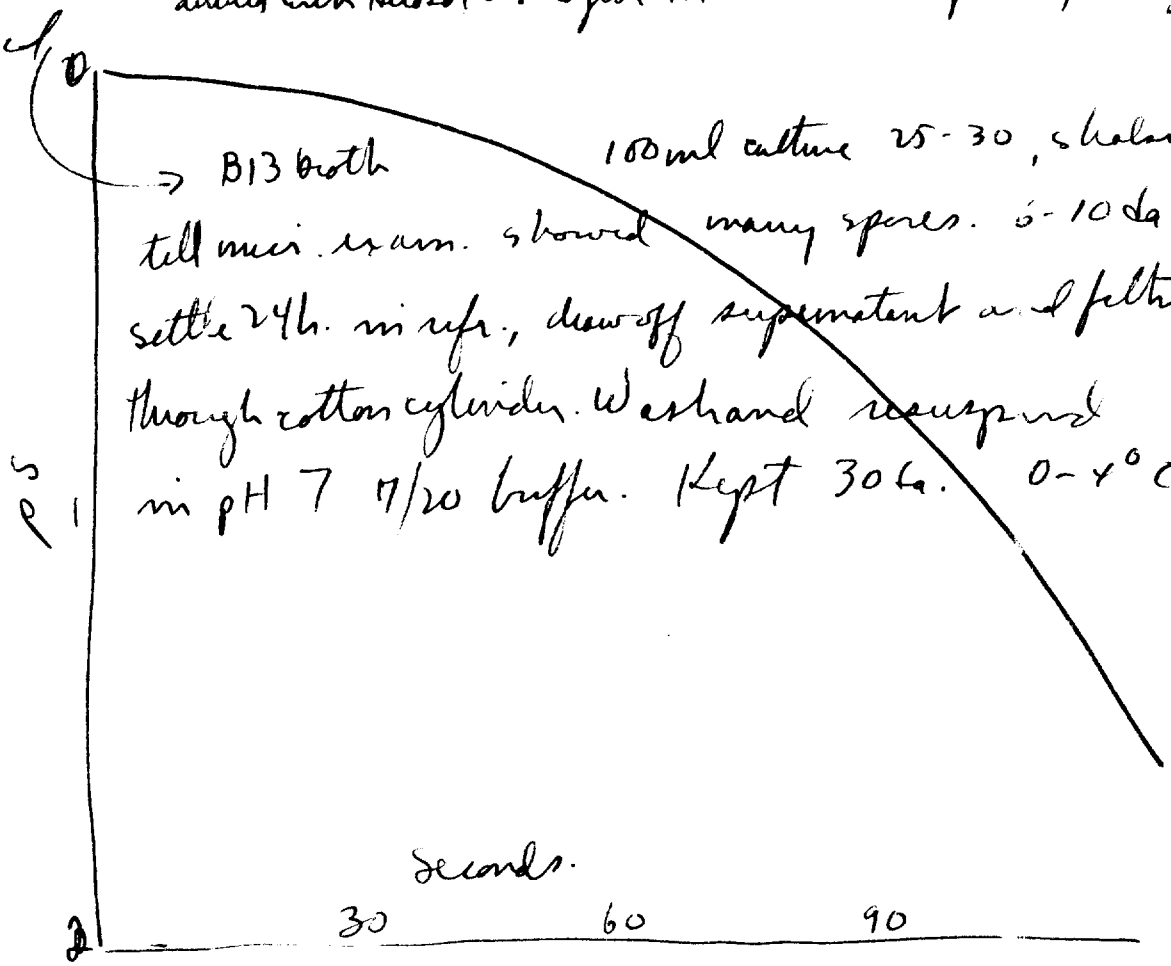
Submerged

→ B13 broth 100 ml culture 25-30, shaken till micr. exam. showed many spores. 5-10 da. settle 24h. in refr., drew off supernatant and filter through cotton cylinder. Washed resuspend in pH 7 M/20 buffer. Kept 30 da. 0-4° C.

UV - p.s.

45 cm

Shielding



Williams Smith, H., (1948) Investigations on the typing of staphylococci by means of bacteriophage I. The origin and nature of lysogenic strains. J. Hyg. 46. 74-81.

A number of coagulase +, φ42D^{S}, strains were studied. Many were mutually lysogenic. 7/23 were lysogenic for the other 16., and sometimes mutually. None of these 42D^{S} types were λ for other strains. Presence of λ did not necessarily confer mercury-resistance. Very few resistants were non-lysogenic.

Williams Smith, H. (1948) II. The significance of lysogenic strains in staphylococcal type designation. J. Hyg. 46: 82-89.

a) Mixture of a(λ$_1$) + b(λ$_2$) led to the production of new phage types, c a(λ$_1$ λ$_2$). A genetic classification was attempted with limited success. Much of the resistance pattern depends on the λ carried.

IL

Cowles, P.B. (1931) J. Bact 22: 119-123. The recovery of bacteriophage from filtrates devoid from heated spore suspensions.

1. B. anthracis. Induced λ. Filtrates from cultures heated to 90° 10 mins were λ; 95° survivors were not, at least from isolated colonies

2. B megatherium 899 (de Jong) Spores survived 90°, and "all colonies .... showed ... bacteriophage"

3. B subtilis (d'Herelle) survived 90° 10m. or 100° 5 mins. Some, but not all, of the spores carried λ.

75° 10 mins. inactivated all the five phages used.

Regards as evidence against spont. generation of φ.

S.A. 20:15-23; 21:161

Flu,P.C., (1938). Etude sur la bacteriophage du Bacterium megatherium. Ann inst Past 60, 610-632.

From summary: Used de Jong's 899 as lysogenic; 338 as indicator.

a) found less phage than bacteria, in contrast to Wollmans

b) very young cultures carry phage alsp, but saline destroys the phage and prevents its filtrability.

Wollman,E. and Wollman,E., (1938) Recherches sur le phenomene de Twort-d'Herelle. V. (Bacteriophagie ou autolyse heredo-contangieuse). Ann inst Past 60, 13-57.

lysogen negens. have sol. low titre

phage ca = bacteria argue that phage particles exist as such in bacteria

phage sensitive at division

not compatible i parasite L'existence de "phases" de la bacteriolyse lysogène et la production de novo des particules corpusculeuses bactériophages paraissant démontrer l'origine endogène de ceux-ci

Phage. Summary.

Burnet,F.M. & McKie,M. (1929). Observations on a permanently lysogenic strain of B. enteritidis Gaertner. AJMS 6:276-284.

Lysogenicity determined by growing test strain with indicator, heating to 56 for 30 mins to kill bacteria and plating on indicator for plaques. Titers of 10^7 - 10^8 often obtained in most isolates; others showed 10^3-10^4.

Repeated washing continued to liberate phage. After almost exhaustive washing with saline, distilled water liberated additional large quantities of phage. Lysis by other phages diminished the yield.

Lysogenicity was found to be permanent ' "The permanence of the lysogenic character makes it necessary to assume the presence of bacteriophage or its anlage in every cell of the culture,i.e., it is part of the hereditary constitution of the strain.
Rough enteritids produces the phage although it will lyse inly smooth cultures of other organisms.

A mucoid resistant variant of the enteritidis to phage 13 was found to be lysogenic of 13 as well as for gallinarum. The mucoid strain was unstable and gave off rough and smooth colonies.

ib. Type differences amongst staphylococcal bacteriophages. 6:21-31. 4 phages found for a white coccus "SF". Some resistant variants were aureus pigmented, but nonpathogenic. (Among the phages was C-C'- see induced lysogenicity.)
/B is C-resistant.

Burnet 1932 JPB 35:851.
ABCD & phage types from BD (groups B and D)

A: halo at margin, filled center
serol. uniform.

B: smaller, sharper, uniform.
serol. heterogeneous

About 50% para B → A type only.

see Burnet 1930a JPB 33:647

enteritidis → B most usually

typhimurium → A, D, N.

A + B are specific for smooth.!
C is SR
D, N are SR or R.

gallinarum

rough strains may often produce S phages.

BTM strain (enteritidis?) → phage S1 (A phage) This is specific for smooth BD. (evidently no action on para A).

A phage from para A did not attack any but sanguinarum and 1 enteritidis. (is sanguinarum, rather?) role of I?

supports common origin of enteritidis, and para B with later divergence of somatic antigen (does not refer to common XII component).

Argues ecol. advantage of symbiosis

(over)

para C
highly path
for mouse!

suipestifer - hirschfeldi VI - VII

"European" suipestifer 5/8 lysogenic for smooth or rough sang.

others rarely lysogenic for suip., but did act on typhi suis.

typhi suis (F 12) best indicator.

para C → only FT2

most others (e.g. Thompson) also → second R phage

2 serological and resistance types: H (hirschfeldi) + suipestifer (S)

Range of action not clear e.g. virulence not tested

Burnet + Fresh (1936.) 14:27-38.

	x-resistance						Absorption by heat-killed cells	
Culture	A	B	C	c'	D	Au1	C	c'
SF	+	+	+	+	+	+	+++	++
SF/C	+	+	−	−	+	+	−	−
SF/c'	+	−	−	−	+	+	−	−

SF and SF/C are serologically identical, SF/c' distinct.

If SF is spread fairly heavily on excess C, no loss of colonies, but SF/C found.

SF + stated C., then excess C'.

Explosive production of C grown on SF cultures, infected with a few particles Do. single bursts, 80-150 per burst, in 10-90 mins.

C' appeared in older cultures of SF/C, reaching a peak of 50%.

SF/C/Au1 remained lysogenic; SF/C could not be disinfected by anti C serum. SF/C colonies were noted in the centre of C' plaques

SF/C/B did not liberate C' mutants.

Estimates 10-20% contents ~~to~~ became lysogenic.

See). d'Herelle, F + Rakieten, TL. (1934) JID 54, 313.

Bruce White, P. (1937) Lysogenic strains of V. cholerae and the influence of lysozyme on cholera phage activity. J. Path. Bact. 44:275-278.

Phage LL φ acts weakly on certain strains. Addition of lysozyme (egg white 1:25) enhances action to give more active filtrates.

LL-resistant strains of agglutinable V. cholerae (Indian) are invariably λ infected with it. Most existing lysates are simple probably contain related with it.

~~Most~~ Chinese strains were sensitive, could be made lysogenic. El Tor and other vibrios ~~do~~ were emitted λ^+ or λ^s.

Once again, no lysis was seen with LL φ on Rough vibrio, but the phage multiplied and became lysogenic. "blockade immunity" interpretation:

J. Doerr

Fraser, L.B. (1945) A bacteriophage for Pseudomonas pyocyanea.
J Bact 50: 301-303.

Evans, A. C. (1940) The potency of nascent streptococcus bacteriophage B. J Bact 39: 597-604.

phage as released from lysing bacteria more active. Lysis?

... (1942) Technique for the determination of the sensitivity of a strain of streptococcus to bacteriophage of type A, B, C, & D. J Bact 44: 207-209.

Phage structures

CRSB.

Lomonossoff 125:846 ~~126:~~ 127:962 128:379
129:151, 269 130:602, 144

$\phi \cdot X \cdot 174$ 138: 497

See also JPB 58:259

J Mol Bio 54:313

Proc Soc 48:359 (poxvirus ϕ)

Feldmeister, E. (1941) Z. Balet. (I), 147: 417- E

~~Robertson~~ d'Heuelle, F. & Robertson, T.L. (1934) J. I. D. 54: 313

Gratia, A. (1948) Lyse bactérienne par un filtrat bactériophagique sans multiplication des corpuscles. Ann IP 75: 472 - 484

C16 - lysis & plaque formation on pseudysenteriae Y6R

on coli 36, however, conc. phage causes a sterile area, but when spread, no plaques are formed, only a granular growth.

ϕ is not regenerated from coli 36 (Burnet). Do readily absorbed. (shown by heating mixtures to eliminate absorbed phage. Cells are lysed by microscopic examination in liquid medium.

Titre of C16 does not increase on coli 36, but does on dys.

Considers possibility of "lysin". Shows same behavior when grown on other hosts. ~~Host~~ bacteria do not lyse ~~co~~ coli 36. Phage antiserum inhibits lysis. Lytic agent is removed by absorption with sensitive Y6R. bacteria

Does not show numerical relationships of ϕ adsorbed to bacteria killed.

Gildemeister, E., & Ahlfeld, I. (1941) Beitrag zum Bakteriophagenproblem

Z. Bakt. (I) Orig., 147: 417-437.

Most intestinal contents carry phages (77% on dys., 7% on para B; 5% on S. typhi.) The latter are more often found in Salm. convalescents

---

Refers to earlier work Z B. 91:12 (1923)

" dass in den lysoresistenten Kulturen immer einige wenige lysosensible Keime vorhanden sind, welche zur Entwickelung von Phagen Anlass geben. Experimentelle Beweise für diese Annahme sind jedoch bisher nicht erbracht worden." Many migs colonies of coli 88 tested.

Believes in growth without bacterial destruction. Disagrees.
Tested λ by filtration of suspensions.
32/50 (64%) of a variety of Salmonella strains tested were λ+ usually best for homologous types. (E typhi, Para B, Breslau, para A, Gärtner)

11/30 (34%) of dys. tested were λ+ (9E, 1Y, 1 Boyd, 1 Flexner, usually for homologous type.

5/16 cholera λ+, specific for vibrio.

Coli λ usually active in dysentery.

Believes in activation of latent λ - rather than infection & extrinsic λ. Appears varies thereon.
Clonic cultures can be temporarily λ-.

d'Herelle, F., + Malcolm, T.L. (1934) J.I.D. 54:313-344.
Mutations as governing bacterial characters and serologic reactions.
also book.
Reduced lysogenicity. [See Malone, K.H., and Sakuri, M., Studies on Asiatic Cholera. Indian Medical Research Memoirs #14, Calcutta 1930: Theobald Spirilla S.

S. enteritidis, ATCC Danysz 404. stated to be λ⁻. Lysogenicity was induced by addition of a lytic φ. Activity of λ became attenuated by daily transfer over several months. Some cultures became partially resistant, especially after 150 transfers. [i.e. not isolated?].

With λ₁+, λ₂ could be added

Some of the symbiotic "mutant" are available.

Nicolle, P., Grabar, L., + Gilbert, P. (1946) AIP 72: 814-88.

Fréquence de la lysogénécité et moindre fréquence apparente de la lysosensibilité parmi les bacilles paratyphiques B.

31 tested for λ on ~~3 + human dysentery indicators~~ strain 12, and to 1 + 9.

~~26~~ were λ+ (11%) With one exception, λ+ were resistant to λ_I, λ- were sensitive. The exception was marked very rough culture.

↓

2 exceptions. λ from strain 1 and strain 9 shown to be diffuent, serologically & in host range.

Bordet, J. + Bordet, P. (1946) Bactériophagie et variabilité microbienne. AIP 72: 161-173; 321-334.

S(λ-) → R(λ+), especially in ~~presence~~ absence of Ca.

"excès de calcium entrave l'apparition du type R producteur de principe".

Complete Ca deficiency (oxalate 20 drops 2.5%/5 ml). does prevents the change.

Tests for the λ involve heat heating culture. [They have been described].

See Hadley 1924 J.I.D. Pyocyanea λ]

Lisbonne's bact. at 37° has a metallic sheen, "glaieuse" at 10-12.
cells encapsulated & metachromatic material (toluidine blue).

Change does not require Ca. Cold bacteria have not produced

λ, reappears in 24 h. at 37.

Lisbonne ✓ indexes Shiga lysogenic. antiserum does not remove λ although pre λ is inhibited. ✓ lysis by λ is inhibited by oxalate, but cells are not decontaminated.

Write for strains].

Fish, Roy T. (1942) Studies on staphylococci. I. Occurrence of bacteriophage carriers among strains of Staphylococcus aureus. J. Inf. Dis. 71: 152-160.

Took a 4mm loopful over an area of 1 x 6 cm. Spotted loopful lysin used in both directions; not always seen reciprocally. Incubated 5h. at 31°, then at room temperature. Used zephiran 1:50,000 - 1:100,000 to sterilize lysates. [I used milk agar for chromogenesis: 30cc skim milk + 70cc 1.5 g agar, mixed after autoclaving.]

With 45² combinations, 43 ~~phages~~ lysis was found.

No lysogenic combinations were found in coagulase-negative, albus strains. Ultimately found that 19/43 = 44% of coagulase positive strains carry λ. Considerable specificity found.
Reciprocal lysogenesis was not observed here. But sequences such as: 64 → 47 → 44 → 68 → 49
77

24 groups of λ noted. None active on albus.

5 frankly lytic cultures were found.

II. Identification of Staphylococcus aureus strains by means of bacteriophage. 71: 161-165.

showed that staph. from related sera gave same responses to a series of 27 & isolated as λ.

See Amer. J. Hyg. 40, 232-238 (1944) for III.

See Topley + Wilson 1936 p. 239

Thomas, R.C. (1948) Ohio J. Sci. 48(3):102-106. A method for recovering transmissible lysins from secondary cultures of bacteria. (Ohio Agl Exp Sta - Wooster).

Exposure of lytic cells to nucleic acid from various sources gave colonies reacting with original lysins. Grew lysogenic (?) bacteria with 2/9 % NA in H_2O. R. temp 1-12 h. Poured plates and tested colonies.

Science 88:56-57 (1938). Transmissible lysins in water extracts of seeds.

Phytopath. 30: 602-611 (1940) Additional facts regarding bacteriophage lytic to Aplanobacter stewartii.

SB599 P5

Phage from resistant corn. Typical plages of resistant. "Transmissible in series".

N K

McKie, M. (1934) The lysogenicity of coliform bacilli. A.J.E.B.M.S. 12: 169-175.

82 coliforms and 9 atypicals tested for lysogenicity by testing filtrates.

>31% gave phages in the primary filtrate, and in several cases there were two or more phages. (52 ϕ from 37 ϕ+). Rough Flexner VR dysentery was most susceptible (38 ϕ active). 13 were active on rough 398R gallinarum.

15/52 were weak and lost on passage
28 on Flexner VR
3 as coli KR, weak on Flx VR
3 on 398R, — on VR
3 specific S'ϕ on 398S; Shiga S and YS.

Complex cross-resistance

Dunbar, James M. (1948) Bacteriophage typing of untypable Salmonella typhi organisms. Nature 162:851. (Nov. 27)

Many cultures are contaminated with an "anti O" phage, rather [illegible].

When [illegible] reduced, "agglutinations" are characteristic and ... [illegible] to I and IV & ... with [illegible] specific Type [illegible] phage. Growth inhibiting serum was used to type these previously untypable strains.

These contaminated bacteria are "interfering with" by specific phages.

"Central Pathological Laboratory
M.E.L.F."

Taylor, H.E., (1949) Additive effects of certain transforming agents from some variants of pneumococcus. J. Exp. Med. 89:399-424.

Small scale (1500 ml) preparations of TP described. Bovine Serum Albumin as accessory factor.

Strains: A66 (SIII)
R36A (R) from D39 SII. Never reverts and readily transformed.
ER Extremely rough from R36A. Grows in aggregates.
SIII-1 ← SIII ←(A66 / TP) R36A.

SIII-2 " " .

ER can revert to R, especially in liquid medium. Stable in agarose shallow layer.
When SIII TP is added, R is regularly formed. BSA needed for regular effect.

RTP activity only from SIII and R36A bacteria. ER DNA and other NA's inactive.
Known of parallel c S transformations, the ER → R effect is regarded as an induced change, not selection

anti R prevents ER → R. Thus it can be shown that ER ↛ S with SIII. "Like other morphological mutants obtained from R36A, ER is 'incompetent' to undergo direct transformation into the SIII condition.

ER → R → S was obtained in one tube by adding ~~3/4~~ anti R after 3/4 h. and using SIII TP. ~~OR TP gene~~ R36A TP gradually R.

type-specific antiserum inhibit transformation of R36A → STIV
but is essential for STIV - 1

SIII-N (normal) - 1 and - 2 differ in amount of III substance.

anti III enzyme makes -1 and -2 cultures rough. ~~Does~~ Is less effective on III N.

III-1 requires very little antibody for agglutination. Is also agglutinated by R. No quelling. Not mucoid.

III-2 mucoid, quelling but less III than III-N. Not virulent.

TP from III-1 and III-2 transform R36A to comparable S type. and ER to R.

Rough obtained from III-1 and III-2 are transformable to III-N.

When mixtures of SIII-1 and SIII-2 are applied together, III-N bacteria were found as well as the -1 and -2 types.

$R \xrightarrow{1} III\text{-}1 \xrightarrow{N} III\text{-}N.$ Does not believe this goes through R as mediate.

$R \rightarrow III\text{-}2 \not\rightarrow III\text{-}N.$

$R \rightarrow III\text{-}N \not\rightarrow III\text{-}1$
$\not\rightarrow III\text{-}2$

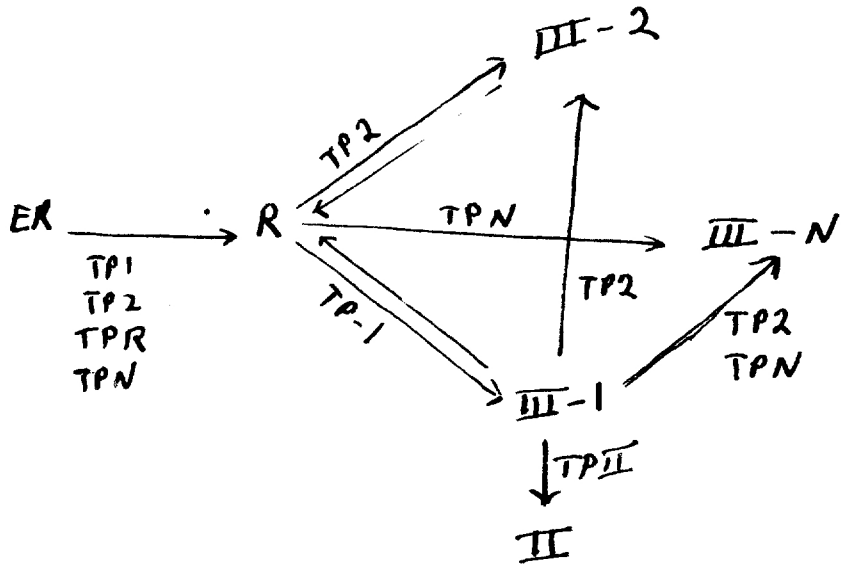
TP from SIII-N ($\leftarrow$ -1 $\leftarrow$ R) shows no signs of inducing SIII-1 from R. They show no signs of the intermediate stage.

$R \rightarrow III\text{-}1 \xrightarrow{2} III\text{-}2.$
$\xrightarrow{TP\ III} III\text{-}N$

Summation may or may not take place

No statement whether the III-N type prepared by summation is "heterozygous".

TP1
TP2
TPN
TPR



does not III-N from summation contain both transforming principles? [Evidence that intertransformations do not go through R?]

Austrian, R., and MacLeod, C.M. (1949) J. Exp. Med. 89:451-460

Acquisition of M protein by pneumococci through transformation reactions.

I - SVI
III - A66 } used. { I -
III - 3M

The "Dawson Rough" seems to correspond to Taylor's ER.

When II - R36NC (or - 36A) (II; 2'M) was transformed with
III - A66 TP , III 2'M was obtained.

do, ∈ TPI transformatrado.

Dawson (=ER) Roughs were obtained from R36NC.

Some of these were transformed to III 3M.
from cells which (altho) still had some 2'M to III 2'M. (These may arise
(sucrogically detectable)

This transformation does not take place so regularly. Griffith Roughs not treated for TP.

In vivo: ER + vaccine I 2/10
+ vaccine III 2/10

Concomitant acquisition of M3 protein noted in one case each.

↓
R
↓
II.

Bryatt, Pamela H., Jann, D. J. & Salle, A. J. (1948) Variations in pigment production in Staphylococcus aureus.

Extracts of chromogenic S. aureus (strain??) ~~did~~ transformed avirulent strain to colored. transformed strain retained lac- character.

Burnet, FM + McKie, M. (1929) Type differences amongst staphylococcal bacteriophages. Austr. J. EBMS. 6: 21-21.

SF: MR- Lac+ gel-.

Phage B gave three kinds of SF/B: opaque white; colorless + translucent; frank aureus. /B was also resistant to C.

SF/B was non-lysogenic, but after being kept on agar for some weeks gave rise to papillae some of which were of the chalky white type, others frankly aureus. Either in this way, or directly ... SF/B ... the aureus type of SF/B could be obtained.

Goldstein, Adrian (1944) The mechanism of enzyme-inhibitor substrate reactions. J Gen Physiol. 27:529-580

Non-competitive.

E = total enzyme
+ = free

$E + I \rightleftarrows EI$. $\quad a = \text{fractional activity} = \frac{E_f}{E}$.

(1) $K_I = \frac{(E_f)(I_f)}{(EI)} = \frac{(E_f)(I - EI)}{(EI)}$ $\quad E = E_f + EI$

$= aE + EI$

(2) $I = K_I \frac{(1-a)}{a} + (1-a)E$. $\quad$ Let $I' \equiv \frac{I}{K_I}$; $E_I' = \frac{E}{K_I}$

= "specific concentrations"

(3) $I' = \frac{1-a}{a} + (1-a)E_I'$ (2me B).

(free) (combined) $\quad$ 2me A = $I' = \frac{1-a}{a}$ $\quad (E < \frac{K_S}{10}$ i.e. $I' \simeq I_f')$

2me B: $I' \neq I_f' \neq EI$.

2me C: $I' = (1-a)E_I'$ $\quad (I' \simeq EI)$

$E + S \rightleftarrows ES \rightarrow E + P$. $\quad a = \frac{v}{V_{max}}$ $\quad v = k_0(ES)$ $\quad V_{max} = k_0(E)$

(3B) (4A) and $S' = \frac{a}{1-a} + aE_S'$

Most enzyme systems operate in zone A., i.e. $S' = \frac{a}{1-a}$ (MM equation)

They prefer to plot $\frac{v}{V_{max}}$ / $\log_{10} S$. $\quad$ Considers 1.1×10^{-3}; 1.25×10^{-3}; 1.7×10^{-3} as good fits for K_S.

The zone B equation is fitted as follows:

$\frac{S}{a} = K_S \frac{1}{1-a} + E$ $\quad$ and $\quad \frac{I}{1-a} = K_I \frac{1}{a} + E$.

S.A. 26:559.

$$\frac{V_{max}}{v} = 1 + \left[K_s + \frac{I}{K_I} \right] \frac{1}{s}.$$

For $I = 0$, $\frac{V_{max}}{v} = 2$ when $\frac{K_s}{s} = 1$. ✓

otherwise, for a given, constant activity:

$$\frac{K_s}{s} + \frac{I}{s K_I} = C.$$

$$C = \frac{1}{s} K_s + \frac{I}{s} \cdot \frac{1}{K_I}$$

$$sC = K_s + \frac{I}{K_I}$$

$$sa = 1 + \frac{I}{K_s K_I}.$$

$$aS - bI = 1.$$

Competitive equilibrium.

$$\frac{E_f I_f}{(EI)} = K_I \qquad \frac{E_f S_f}{(ES)} = K_S$$

$$\frac{(ES)}{E} = a. \quad ES = aE. \qquad E = ES + EI + E_f.$$

$$\frac{EI + E_f}{E} = 1 - a \qquad EI = (1-a)E - E_f$$

$$= (1-a)E - K_S aE$$

$$S - aE$$

$$I' = \underbrace{\left[(S' - aE_S')\left(\frac{1-a}{a}\right) - 1\right]}_{\text{Free}} + \underbrace{\left[1 - a\left(1 + \frac{1}{S' - aE_S'}\right)\right]}_{\text{Enclosed } (= (EI)')} E_I'$$

If $I_f \simeq I$ $\qquad I' = (S' - aE_S')\left(\frac{1-a}{a}\right) - 1$ $\qquad$ GA$_I$B$_S$

or if $EI \simeq I$ $\qquad I' = \left[1 - a\left(1 + \frac{1}{S' - aE_S'}\right)\right]E_I'$

Hefrids $\frac{I'}{S'} = \frac{1-a}{a}$ i.e. for $a = 1/2$, $\frac{I}{S} = \frac{K_I}{K_S}$.

$$\frac{1-a}{I'} = \frac{a}{S'}$$

$$\frac{\frac{EI}{E}}{I'} = \frac{\frac{ES}{E}}{S'} \quad \text{and} \quad \frac{\frac{EI}{I}}{\frac{ES}{S}} = \frac{K_S}{K_I}.$$

Hoder, F. + Akano, R., Z. Immunf. 85:423- (1935)

Foley, G.E. and Schwachman, H. (1950) J Bact. Rev. Mic 2
4: 141-149 Some observations on streptomycin-dependent strains of Staphylococcus aureus. RR RR

Bawden, F.C., Kassanis, B., and Nixon, H.L. (1950) The mechanical transmission and some properties of Rothamsted potato paracrinkle virus. J GM 4: 210-219.

Fleming, A., Voureka, A., Kramer, IRH, + Hughes, V.H. (1950) The morphology and motility of Proteus vulgaris and other organisms cultured in the presence of penicillin. JGM 4: 257-269.

RR

Eriksen, K.R. (1949) Studies on the mode of origin of penicillin resistant staphylococci. Acta path 26: 269-279. From Univ Inst General Path. Copenhagen.

Broth & various P inoculated with varying amounts (10^{-1} to 10^{-6}) of a 24 hr. broth culture. Later plated loopful (ca. .002 ml) on ~~ag~~ agar. With large inocula, secondary growth is found up to 1/4 OU/ml; with initial bacteria of 10^{-3}, no sec. gr, but eventually comes up. "Demerec is not correct and that the resistant bacteria appear only after contact with penicillin for some ~~time~~ length of time." Reasoning ?? Noted that with ca 1/8 OU/ml and perhaps 10^{-5} ml, any secondary growth was delayed 24-48 hours. In 6 ~~cups~~ tubes, it appeared only after 6 days. "In these cases where the secondary growth appears at such a late juncture, presently it can be taken ~~that~~ for granted that the growth does not originate from resistant bacteria present in the original culture."
(Some confusion about isolation of pure resistant cultures in testing for stability.)
Found variance in mutant numbers only in 3 ml cultures, ~~not~~ in 15 ml cultures.

Treatment of recombination in texts since 1948

1950 Clifton Introduction to the bacteria pp 73-75

"Possibilities of recombination of genes by other than sexual mechanisms may exist, and our original definition of bacteria as "apparently sexless" organisms is still valid." Fair statement of expts. T+L 1947

1949 Burrows et al. p. 184 passing reference
extensive ~~treatment~~ discussion of genetical analysis of bacteria T+L 1947.

Stocker, B.A.D. (1949) Measurements of rate of mutation of flagellar antigenic phase in Salmonella typhimurium. J. Hyg. 47: 398-413.

[Dept. Bacteriology + [illegible], Institute of [illegible] + [illegible]]

[illegible] + [illegible], [illegible] to [illegible].
Occasional [illegible]. Some non-motile [illegible] (< 2%) were found. Some populations at mutational equilibrium were noted.
Rate of 3.5×10^{-4}/generation found by [illegible] + D. Noted [illegible] phenomenon.

p. 415

KR

Klieneberger-Nobel, E. (1947) [illegible] of the [illegible]. J. Hyg. 11. [illegible].

[illegible] filtrable, [illegible], filtrability of [illegible] [illegible] is [illegible] possible.

Stern, C. 1936 Somatic crossing over and segregation in Drosophila melanogaster
Genetics 21: 625-730.

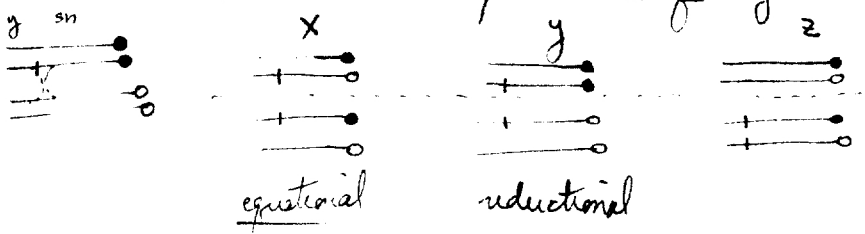
Minute flies (M/m) show m spots. Originally interpreted as elimination of M carrying (deficient chromosome). By use of ⊙ translocation, it was shown that the M phenotype (not merely deficiency, covered by duplication) was necessary for spotting. Bobbed (bb) spots not found: interpreted as partial elimination.

Autosomal M also cause X-mosaics (sn^3 (singed)
However, the Bld ~~=~~ Minute causes X-spots, but not III-spots!!!!
Effect of autosomal Mw on Notch^8 ♂. was studied:

N^8/y ♀ X sn^3; Mw/+ ♂ Among females:

N^8/sn^3 9/280 y/sn^3 15/381 No difference.
↓ sn sette (elim? N^8) ↓ 2 y sn^3 spots
2 sn^3
11 twin spots (y)(sn) suggesting segregation of X-chromosome.
No ysn spots. ∴ 2-strand and no reduction.

ysn/++ flies → 110 y sn 43 y sn spots. y and sn imply somatic crossing-over as well as segregation. But no y-sn twin spots were found, ruling out two-strand crossing over. Complete reduction is ruled out by absence of ysn-sn-y-(+) triple spots.



Segregation patterns.

Region of crossing-over varies with spot size (developmental stage). Crossing-over to the right of sn in ysn spots supported by expts. with ⊙ translocation.
Segregation is probably nearly always equational.

bb fails to show segregation in +/bb flies. Assumption of phenotypic masking seemed unlikely. ∴ Crossing-over to the right of bb considered very rare.

Determined X-ploidy of spots by color of 5-6th abd. segments. Most spots in females were XX by color.

Autosomal mosaics

Under influence of autosomal M.

Notes on genetics of epilepsy 3/3/55

Secondary Sources:

1. Sorsby "Clinical Genetics"; pp/ 337-40;313-15
2. Kallmann and Sander 1947. in Hoch & Knight, "Epilepsy". Chap. 3
3. Neel 1947 Medicine 26:115. at 123-125

Acc. 3: 25-30% of propositi have family history (5-6x as frequent in parents sibs and children of propositi). monozygotic twin correlation 70%. Quotes Lennox extensively on cerebral dysrhythmia. In 24% of families both parents showed dysr. Obvious complexity.

2: Examples in animals; also audiogenic seizures. From Conrad: (incidence figures) %

gen. pop.	childr.	sibs	neph&nieces	dizyg. notwins	monozyg cotwins
.3	6.3	4	1.2	3.1	66.6

concordance in twins:

	diz	monoz
idipath.	4.3	86.3
symptoma.	0	12.5

Thus even sympt. epilepsy has a genetic component. Index twins were restricted to severe hospital cases.

also found consanguinity correlations with mental deficiency, but not with schizophrenia.

From Lennox:

	dysrhythmia
general pop	.10
epileptics	.9
par and sibs	.6

in twins, 85% whow concordance of encephalo. if monozyg; 5% if dizyg.

1. Similar to 2, but emphasizes consanguinity correl. with psychopathy.

Conclusions: inheritance not simple (probably several different mechanisms). Certainly a very large genetic component in severe cases, from Condrad's twin studies. Most frequent suggestion is dominant with low penetrance, but high incidence of dysrhythmia in both patents of propositi (Lennox) suggests recessive factors also.

(Lennox '47 is Res Pub Ass Res nerv ment dis 26:11)

CC: Dr. Javid

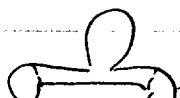
1957

1/21/54

Conjugation in yeast.

Fowell 1951 emphasizes dicaryon: mating of cells 1 & 2 gives  from which either haploid or diploid or dicaryotic (i.e. → + and − haploid) buds may be generated. Tools care to remove prefusion buds. Paired 250+/− cells; 30 zygotes formed. 50% zyg. → only haploid. Often zygotes → only 2s. "An investigation of spore fusion revealed that nuclear fusion apparently always occurs in zyg formed by this proc." Renaud 1946 also suggest dic. Also discussed by Däumann 16; (Burlhemond 25. Bot Rev 1940 6:1.) Comp. Morph. of Fungi 1928.

Wingé & Roberts 1948. Unsuccessful crossing: spores may give haploid cells "before fusing"

W & L figure  spores. But W'35 also shows substantially complete copulation and diploid buds. ∴ some variation.

But note analogy of Fowell's dic. & oogen formation.

Kawada, H. Zbl. Bakt. I 118: 304-16 (1930)

S. para B + G+ soil bact → frequent antigenic variations in Salmonella → enteritidis; breslau.

JPB 35:851

19 Burnet 1932 Lysogen. Delaurten 69 J Bact 34:285

[Andrewes 7. Pr. Roy Soc Med 33 Dec 39]

5 Krueger Physiol Rev 16:129

18 Burnet Abst J Exp BM 6:277

Delbruck JGP 23:443 Adsorption rate. Ext. lysis -> loss of virus.

22,365 — temperature ~~same~~ as for cell division

Receptors: 63 - Levine + Frisch JEM 59:213 ✓

See Burnet 9. AJEBM 15:227

J Immun 46: 281.

(leave out glucose in virus media)

Tryptose 2% glucose .1% NaCl 1% pH 7 [.6% agar media.]

AD Hershey. 1/8

.5 ml phage

2 ml 12-24 h. bact. 10^8/ml

3 mins later, .5 ml mixture + 3.5 ml .7% agar

pour on plate: [illegible]

Frendzel, J. + Z. Szymanowski, CRSB 117:543–546 (1934)

Recherches sur la Paragglutination: Différenciation des antigènes H et O.

They had shown that P. exhibits a different serological specificity from the "agglutination commune de Schütze". But the R strains do contain an antigen related to the parent strains. ~~His~~ paragglutinable strains are homogeneous + repeated resolution indicates that the modification is heritable. Only some E. coli are capable of paragg.

coli-typhoid paragglutination:

The P. coli absorb H-agglutinins for anti-typhoid serum. The original coli does not. anti-H was removed by absorption on Stanley. There was little further agglutinin absorption. However, there was still considerable aggl. of coli. ∴ Paragl. coli has all H antigens, and a fraction of the O of typhi. anti-P coli serum has a low titer on heated typhi. Typhi phages do not lyse (P) coli.

2. Balat (I, 121:448–451 (1931) Paragglutination des Bact. Bang mit Typhusserum. —

Zironi - ctd.

Using para A and ~~they~~ typhi, (P) is also obtained with cross-reactivity, but very little c̄ para B.

Could not transform staph. Relates paragglutination to the pn. transformation

Smith WE, J Bact 47:417-418 (1944)

Wahlen + Almeden JID 65:147-55 (1975)

Appleby, J. C. J Bact 38:641-51 (1939) Cytology and methods of reproduction of two cocci and the possible relation of these organisms to a spore forming rod.

Cocci appeared in a culture of the bacillus.

Agr Bact Dept, Univ Reading England

Sex in Bacteria. Literature:

J. Bact 50

Nuclei - El. M. cr. (R)

Baylor, M.B., M.O. Appleman, O.H. Sears + G.L. Clark, J. Bact 50: 249-56 (1945)
Chem. + Agronomy Illinois
Some morphological characteristics of module bact as shown by the electron microscope II. [See Soil Sci Soc Am. Pr. 7: 269-71 (1942)

4-5 granules/cell untreated + ē .02% $NaHCO_3$ 2¼ hrs. Attempts at staining e.g. M saline left mottled cells. (corneal transparencies; corresponding to nuclei? After $NaHCO_3$ saline did not remove granules. 15 min.
acetone removed granules. also HNO_3, HCl

Knaysi, G. J Bact 49: 473- 1945. A study of ... factors.. in production of Polysaccharides.

low p 11 n.g.

Spores are not formed until ingest of hydrolytic products + also the nitrogenous comp.

"healthy cells, facing starvation, endoconidia with ..."

See: Reed HC J Bact 35: 261

Kruysse, G. + S. Mudd. J. Bact. 45: 341-57 (1943)

The internal structure of certain bacteria.

Apparent DR nucleic acid material in granular form in S. flexneri and E. coli.

Most dividing cells contain 2 granules each.

R.R. Mellon, J. Bact. 10:481-501 (1925) Studies in Microbic Heredity I Observations on a primitive form of sexuality (zygospore formation) in the colon-typhoid group.

B. coli (Nx) In patient being given urotropin appeared as filamentous form & "many very large coccus like forms were encountered developing from the filaments."

In vitro, peptone-veal-5% NaCl broth + 1% Na_2 glycerophosphate at pH 6.8 autoclaved; ~~ppt redissolved~~ ~~filtered~~ + reautoclaved. ppt redissolved in serum. Single cell isolate inoculated into broth 37° 72h. Then at R.T. streaked out on Endo. (with broth-glyc base pH 8) & incubated at 37° 18-24 hours, periphery of colonies rich fungoid & zygospore formation.

"no attempt has been made to study the fate of these spore like bodies".

Similar forms are found in small cells.

No convincing evidence of origin from > 1 cell.

Mystic on sexuality + variability. Does not understand basis of relationship.

Assumes that cell-fusion has taken place. Criticizes Hinguist.

"makes it necessary .. to rule out the purely symbiotic influence of the accompanying strain."

10:579-88 (1925)

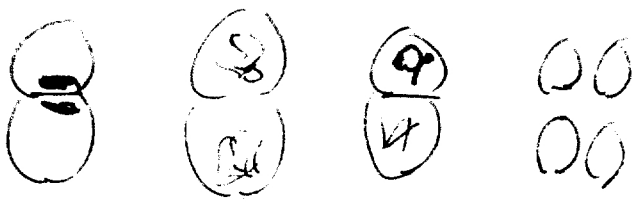
Lindquist, CC + Ralph R Mellon, Nuclear Phenomena suggesting a sexual mechanism in the tubercle bacillus.
Proc Soc 30:110 - 1932.

Mellon et al Proc Soc 30:80 1932

AFB → filterable gonidia → non AF diplococci →
tetrad diplococcus → diphtheroids → ectast gonidia → R tbc
→ S tbc

Aceto Carmine purpus.

Thionomonas



Maublanc, J.G. Contribution à l'étude de la variation en microbiologie. Th. doc. sc. nat., Nancy 307 p. 1932.
: from Année Biologique ✓

temporary variations in pigment in prodigiosus:

La aut. Mg. in pigm. prod.

Brown, F.M. + H M Heffron, Science 49:198 – 200 (1929). Mendelism among bacteria?

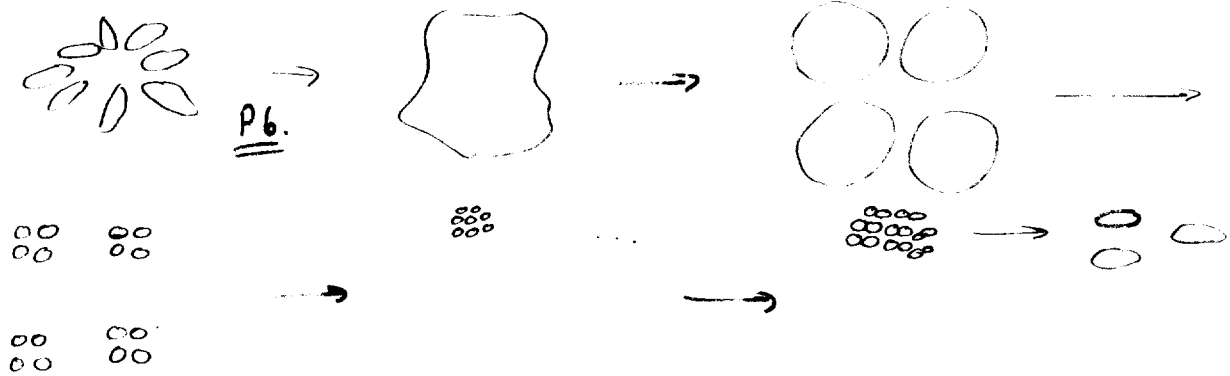
yellow "bacillus" — B. luteus (Brown) G+ young cultures — "sph. refractile bodies" in old cult

a) yeast like organism associated "both, while annoying at the time have been
b) loss of color. found to be merely phases in the life history..."

a) filament formation in old cultures

b) sudden torsion: e.g. Pb. : 8 rods fuse into a mass, staining intensely ē fuchsin "symplasm."

Mass does divides into 4 sph. non-staining bodies. Each of these → tetrad → 16 "cocci" On transfer to new medium, cocci divide and → rod forms.



In white strains, old cultures, or symplasm formation → both yellow + white colonies. Each bend tube is daily transfer. Single cell isolations of each made q 2 wks. After 11 transfers, "substrains that showed no change of color from the 1st. single cell isolation were taken and considered to be pure strains of that color". Serologically identical.

Both cultures were mixed. On transfer, almost entirely white.

(Fountain Valley School, Colorado Springs, Colo);

isolated sympatrics from mixed cultures on Pb-nutrient agar slant grown in broth and plated out. → 362:138 w:y. (8:3)

→ w + y w > y.

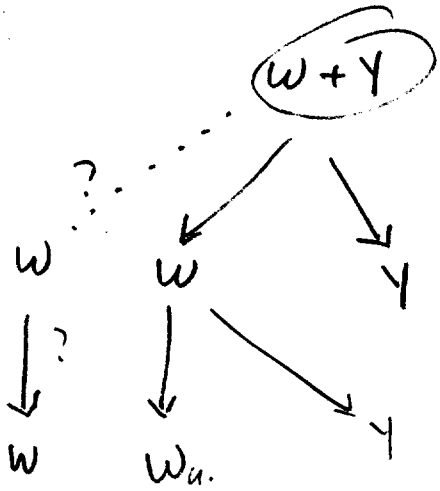
In one instance → all white.

V. imp: single cell isolation after mixed culture???

1. Pure strains stable
2. Mixed cultures → unstable white colonies.

Assume that there is a diploid segregation in F_1 & dominance.

1) Should have studied the progeny for variance.



Gowen + Lincoln J Bact 44:551- (1942) A test for sexual fusion in bacteria

1. yellow + wh. strains of Phytomonas stewarti.

a) Looks for heterozygous colonies, replating colonies from mixture. Also worked by R.S. No recombinations found.

4/2072 mixed colonies found. Stable on replating

(This is not unexpected in view of a small % of sticking together.

2. Recombinations of characters (haploid)

509 - large, smooth, mucoid, wh. 400 sm, rough, non-m, yellow.

Mutations observed in parentals, as frequently as in mix culture.

↓

app. recombinations.

LSMW

509

$L^+S^+M^+Y^-$

$L^-S^+M^+Y^-$

$L^-S^-M^-Y^+$

$L^-S^-M^-Y^-$

no multiple changes.

Data not analysed.

>200 000 colonies examined.

no literature.

See J Bact 33.

Eagles, L + O. Hesselbrock, J Bact 49: 233 - . 1945. Some observations on the filtrability of B. tularense.

Forms ca 300-350 mμ demonstrated by infectivity + adsorption.

Imieneckii A J Bact 49:1-5 (1945) On the structure of anaerobic bac—

Hollande, Arch Protistenk. 83:465-608 (1934) Contr. à l'étude cytologique des microbes (Coccus...)

Dienes, L. J Bact 50: 441-458. Morphology + Nature of the Pleuropneumonia group of organisms.

(R)

Altura - Weber, E., et al J Bact 50: 241-5 (1945) The effect of incompletely neutr. conc. of penicillin on E coli. Dept Labs; Jewish Hosp. Brooklyn, N.Y.

Nutrient broth:
75 units/ml Gram → "bipolar" diphtheroids

Rds. at 300/ml

at 100, mycelium

150 "zygospores"
200 early small cells.

Arle, P.A. J Bact 51(6): 699-701 (1946) "Mutation in certain phytopathogenic bacteria induced by acenaphthene."

PL Path
UC Berkeley

Phytomonas michiganensis + Erwinia carotovora

acenaphthene saturated nutrient broth. 2 cultures 28°.

by P. mich "a sudden + complete mutation:" → only a wh. shiny smooth type of colony. Neither intermediate nor typical forms were found after a certain time.

E. carot → several types - pink. grayish compact flat colony

Ramchandani, I. C. Ann. Bot. 44: 975-987 (1930) Saltation in Bacteria. III B. violaceus

colonial variations.

Zeitb. 40: 2, 43: 579.

→ sch. mutans + numerous.

Hook. EC PRS B89:468 (1917). Morph St. in the Life History of bacteria.

Breeding? (Centenicidey.)

Stewart FH J Hyg 27:379-95 (1928) The life cycle of bacteria: alternate sexual and autogamous phases.

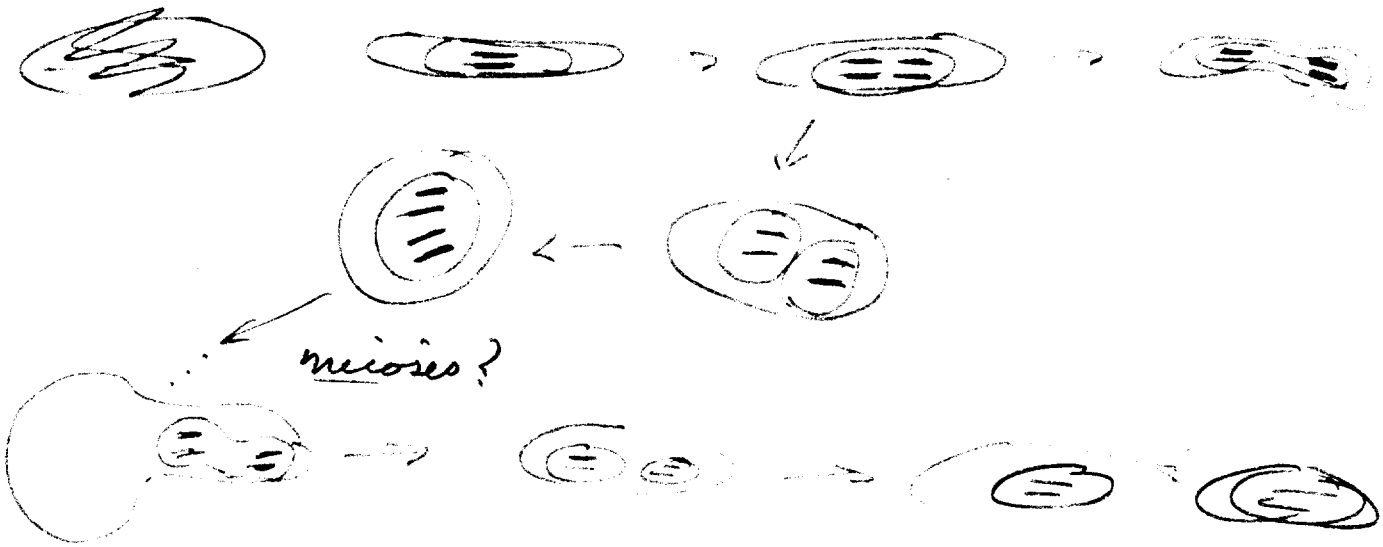
Rosen HR Mycologia 20: 251-75 (1928) Variations in cultures of a bacterial sp - I Morphologic Variations Acta.

"Gurney-Dixon, S. "The transmutation of bacteria" 1919.

"B. mesentericus ?" Tiny particles attached to flagellae were seen.
interpreted as gonidia.
No direct evidence of vitality. Filtrates did show culture.
∴
not relevant.

Beebe, J.M. J Bact 42: 193-223 (1941) The morphology and cytology of Myxococcus xanthus. M.S.
Univ. Ariz. Tucson.

Describes nuclei ± 2 chromosomes and autogamous fusions before sporulation. Meiosis not observed.



(Seems OK.) But a myxobacterium!!

Nyberg, C. Acta Soc Med Fennicae 12: 1-18 (1930) Zur Biologie des Bacillus mycoides.

Broadhurst, J. & J Bact 27: 48 (1934) SAB.
Zygotophores in bacteria.

[Frid "Tonnel" 1926; Wygodtschikoff + Manuilowa 1930
Rony + Terain 1890.

Classification of Literature.

1. Growth
   - a general
   - b growth factors
   - c " " - analogues
   - d antibiotics
   - e regeneration - see sp. organs
   - f genetics.

2. Genetics
   - a transmission
   - b gene acting as gene; induced mutation.
   - c action
   - d biochemical, in microorganisms
   - e other, "
   - f adaptive enzymes.

JPB
JCP
JLCM
JEM
J Col Res
J.O.Ch.
J.Ph.Ch.
Faraday Soc.
J. Imm.
J. Hyg.
J. Chem Soc.
J. Exp Pht Th.

Enzymologia
Advances

Biol Rev
Fact Rev.
Q.R. Biol

"Flux" in "specific" proteins not established.

Is order specific???

"Specificity" – + substrate: enzymatic
immunologic
[genetic].
how else.

Is order maintained in denat.??

Are sp. proteins made by enzymes??

Spont. renaturation.

Brooks J 39(5):) 1945.

$B \xrightarrow{m} B/r$

$r \xrightarrow{m} r'$ $\quad r' \propto B, B/r$

$Br \xrightarrow{m} Br\alpha.$ $\quad \alpha \not\propto Br\alpha$
$r' \propto Br\alpha.$

$\therefore$ this mutational resistance is specific.

$B\alpha_1 \xrightarrow{m} B\alpha_1 r'.$ $\quad r', r \not\propto B\alpha_1 r'$
$\alpha_1 \propto B\alpha_1 r'$ (!!!)

$B\alpha_1 r' \xrightarrow{m} B\alpha_1 r'\alpha$ $\quad$ resistant to α, r, r'.

The mutant viruses are all active in original host!

$B \xrightarrow{m} B\alpha_1.$

$B \xrightarrow{m} B\alpha_2.$ small colony mutant on nutrient agar!

T1 = α
T2 = r

Bacteriology 231
April 17, 1952

M. R. De Carlo

Some Aspects of the Nitrogen Metabolism of a Lysogenic Strain of Bacillus megaterium

The total nitrogen of the infected and uninfected cells was determined by the semi-micro Kjeldahl technique. The uninfected cells were found to contain a larger amount of total nitrogen than the infected cells. It was found that the desoxyribonucleic acid (DNA) content of the infected cells was slightly higher than that of uninfected cells. The presence of the virus in lysogenic cells in the immature form is believed to be the explanation for the slightly larger amount of DNA in the infected cells.

The technique of Feldman and Gunsalus was used to study the activity of the transaminases of B. megaterium. Pyridoxal-PO_4 was required as a coenzyme and a number of amino acids could serve as amino donors.

The effect of sodium azide, sodium fluoride and iodoacetate on growth and virus production was studied. NaF had little or no effect in the concentrations used. Sodium azide and iodoacetate depressed growth and virus formation. The inclusion of ATP in the medium, along with the inhibitor, produced inconclusive results.

Studies with N^{15}-ammonium carbonate showed that after a 30 min. exposure the amount of N^{15} taken up by both strains was the same. A study of N^{15} distribution in amino acids, purines and pyrimidines was done also.

A complex amino acid medium was developed; it supported better growth of the lysogenic strain than nutrient agar, the amount of virus produced was significantly less. The addition of asparagine or adenine to the amino acid medium increased virus formation.

The two strains of B. megaterium were grown on synthetic media containing purines, pyrimidines and nucleotides as the sole sources of nitrogen. The uninfected cells showed good growth on these media, but the growth of the lysogenic strain was only fair. The lag phase could be shortened appreciably with larger inocula, i. e., direct transfer. Little or no ammonia was liberated, and there was little change in pH over a 48 hour growth period. Attempts to isolate and identify intermediate products of metabolism by chemical methods, paper chromatography and UV irradiation were unsuccessful.

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4/52

Rhoades ijap.
"Unités .... 1950"

(1) Ij ij shows no effect. (2) Gives ij ij segregants which are striped. (3) Striped segregants × Ij → striped Ij ij F_2. (4) Striped F_2 × Ij ij → striped Ij Ij. (genetic marker.

1. ∴ Plastid abnormality is inherited at least two generations in presence of Ij. Further selfing of Ij Ij ??.

(Q) Virus is brought in from ij Ij stock. This virus has no effect in presence of Ij but can be propagated in presence of ~~Ij~~ ij.

See Jenkins MT J Her. 15: 467-472.

Notes that green Ij ij plants show "conditioning"

In summer-grown plants, F_1 plants are pure green. In out-of-season plants (e.g. 4 mos for maturity) white-striping is seen: intracellular competition.
lecture modifies ijap plastids in same sense as others.
Other genes do not behave in the same way. (1948)

Dojap. y/y are stuped.

$y\,♂ \times I_j \rightarrow$ normal F_1. $y\,♀ \times I_j \rightarrow$ white and stupid as well as green F_1.

$F_1 \rightarrow F_2$ 3:1 $I_j : y$

y plastids are smaller as well as chlorotic. "Both types of plastids were found in certain green cells".

Stupid F_1 $(y\,♀ \times I_j\,♂) \times$ unrelated I_j. → plants ½ should be $I_j\,I_j$.

Occasionally all progeny of a backcross ear (white sector) were wholesome, though ½ were $I_j I_j$. Concludes that mutant plastids retain their individuality.

(Persistence of striping in $I_j I_j$ stupid plants?)

Later, glossy-1 was used to mark I_j to prove homozygous condition. Normal stupid plastids were paler in cells adjacent to white tissue. Also proportion of white offspring less than expected from proportion of mutant white tissue. Direct effect of y on cytoplasm suggested: indecisive whether the permanent changes are in cytoplasm or plastid: plastid or plasmagene mutation?

Segregation as ear of Rennie's case is best evidence for cytoplasmic factor

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~~Test H213 for partial segregation; hemizygosity of lac.~~

Cowie, D.B.; Roberts, R.B; Roberts I.Z. (1949). JCCP 34:243-257. potassium metabolism in Escherichia coli. I. Permeability to sodium and potassium ions.

Na^+ reaches equilibrium rapidly between water space of cells and environment. K^+ concentrated: 2-15 mg/ml K bound inelegant; also diffusible K in equilibrium. "After initial equilibration there is a further slow uptake of K even in resting cells suspended in a medium with no energy source. This appears to be due to the residual metabolism of the cells."

When glucose is added, K is taken up at a minimum rate of 1 mg K/min/ml cells. Bound K (low K medium for growth) is not readily lost. Free K is lost upon washing. By metabolism, cells exchange K rapidly (5%/min.) Cell membrane must be highly permeable.

2.3 ± 0.3 atoms K taken up per mole glucose.

Iodoacetate inhibited K-exchange but not P-loss. DNP prevented K turnover. Azide inhibited P uptake. Excess PO_4 partially

Attempts to isolate K compounds failed. K was released by suspending cells a) in NaCl pH 9 2) Et_2O; water 3) freezing + thawing, 4) extn. 50% EtOH. Implied that K-compounds are extremely unstable + destroyed when extracted. Uptake with D-1-P accelerated.

See Lebowitz & Kepermitz.

Potassium metabolism in Escherichia coli II Metabolism in the presence of carbohydrates & their metabolic derivatives JCP 34: 259 - 291.
Roberts, Cobb 1.2, + ...

Rb behaved like K and could be used as a tracer.
K-uptake inaffected by UV or by penicillin.

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+ : aerobacter, coli, para B, typhi, enteritidis

− : typhi, paratyphi, cholera-suis, dysenteriae.

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Hershey + Bronfenbrenner.

① Chenia-Blue – Rosolic Acid Indicator medium.

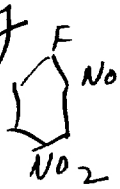
Toluene supposedly inhibits oxidation but not hydrolysis. after Kaserian.
No activity in autolysates.

Deere et. al 1936. – lactose is not removed from broth by bac–.
Measured lactase by increase in total reducing power caused by toluene or thymol-treated cells. Thymol stimulates in 1 hour.

Substrate: .5% lactose in 1% acacia + .1M Phosphate at 7.0-7.2.
Samples dried by vacuum desiccation. Dried cells (20-30 mg.), suspended in 25 cc 2% acacia, 10-20 mg thymol & incubated. After 1 hr, 25 cc 1% lac added. Dil. c .01% $CuSO_4$ to stop enzyme action.
Activities: small activity noted in unadapted cells! .1–.2% hydr/mg cells.
This increased to about 4.5%

No specific statements on no-cell controls in lactose-acacia system.
Acacia might be hydrolyzed! 12 hour incubation period. No statement on contamination! [10mg thymol/50 cc.] Dried + Non dried cells had similar activity.

Porter, RR. (1948) Acta Chem. Scand. 2(2): 105–112. The unreactive amino groups of proteins.

Only 19 of the 32 ϵNH_2 (lysine) of β-lactoglobulin react with  (FDNB) unless denatured. All can be acetylated.

W 327. ~~Mal S_M+ T-L-B_1-~~ ×

$M_1 + M_3 - S_M +$ T-L-B_1- × S_M- M_1- B-M- H.

$S_M - M_1 - M_3 +$ B M T L B_1 ....

S_M+ S_M+ M_3- ——— —

S_M	M_1	M_3	Glu	Mal
−	−	+	+	−
−	−	−	−	−
+	−	+	+	?
+	−	−	−	?
+	+	−	−	+
+	+	+	+	+
−	+	−	−	−
−	+	+	+	+

If suppressor affects M_1 −

$S_M + M_1 - M_3 +$ and $S_M + M_1 - M_3 -$ have to be identified from ++ and − + (wild types). Need progeny tests of Mal+ Mal+

(1) Measure "K_m" of adaptation and compare ~~c~~ K_m for the enzyme.

(2) Determine u.v. absorption spectrum of [illegible] + [illegible] (unadapted) for spectrophotometric evidence of complex formation. Do. enzyme + OMPG in presence of inhibitor - $Mg \cdot F \cdot PO_4$ (?)

If $S_M \rightarrow Mal_1-$ in $S_M + M_1 - M_3 +$.

$S_M \pm M_1$

Wild types vs. $S_M + M_1 - M_3 +$. Cross segregants $\overline{\text{Glu+ Mal+}}$ to wild type and look for Mal- recombinants.

If $S_M \rightarrow Mal_1-$ in $S_M + M_1 - M_3 - [\text{Glu} - \text{Mal}+]$, must be distinguished from $S_M \pm M_1 + M_3 -$. Take M_3+ papillae and cross $\bar{c}$ wild type ....

Glu-Mal+ is index of $S_M + M_3 -$.

Cross W108 – Mal+ – Glu+ : $S_M + Mal_3 + Mal_1 +$ x $S_M - Mal_3 + Mal_1 -$

and look for Mal segregation. Diploid, Mal+ Type.

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Relazioni tenute al convegno su GLI AGENTI MUTAGENI 27-31 maggio 1949

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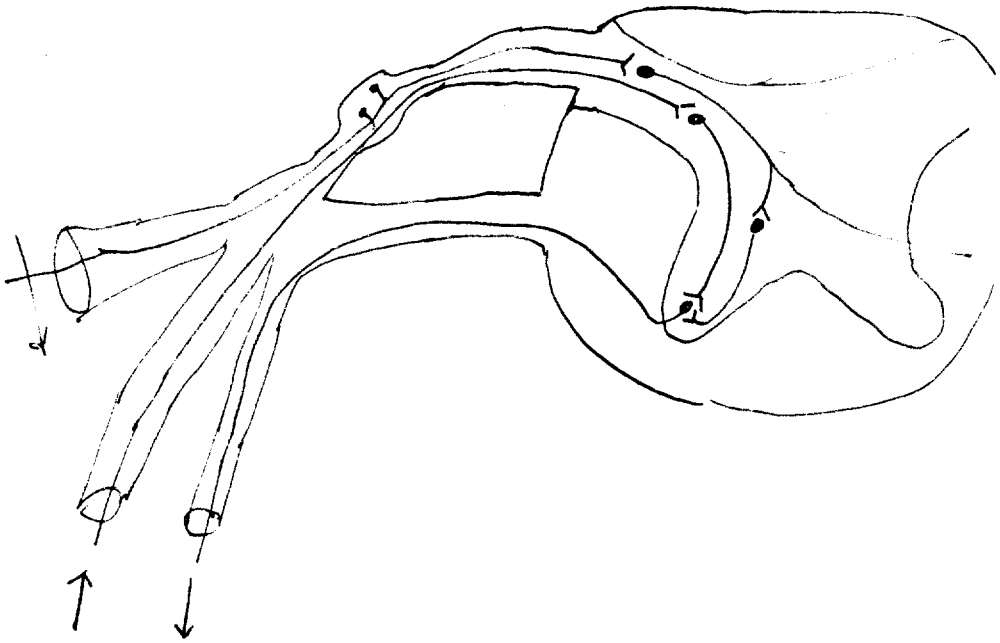
Porter and Taylor

J. Neurophys. 8 (1945)

Intermuscular disturbances + pain.

post tibial nerve stim, measure tib. ant. response Spinal cat. Stim n. at each respiration. (artificial). Pain produced by acid in stim muscle fields. Response increased. No response to conc. reflex stimuli.



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$\phi N(CH_3)_2$ (DMA) 47 ml + CS_2 50 ml are mixed in a 500 ml suction flask and in ice bath in hood. Add 9.1 ml. $ClSO_3H$ dropwise. Add 13.9 g p-nitrophenol rapidly. Stir one hour & let stand overnight.

Add 100 ml .4 M. KOH → yellow crystals. Stir thoroly. Evaporate CS_2 at 80° in vacuo. Recrystallize crude product 3-4 x in 80% EtOH. [Method from J. Ch. S. 1:684 (1926)].

Formed activity measurable in 10 hours. opt. at pH 6.12 in acetate N/2. $K_m = 7 \times 10^{-5}$ M. from talse diastase.

Dept Surgery, U Chicago.

BA - for serum adaptive enzymes.
Indexes

Enzymes
Lactase + Lactose
Adaptation
Serum (~~water~~)

18

8838 "protective" R. Abderhalden. Munch. Med. Wschr. 88: 726
5415 localization of lactase in yeast cell See
Hjärbäck + Vasseur Z. physiol. ch.
277: 171-180 (1943). T. cremoris
fermented but did not hydrolyse !?

Über die Isolierung und die Identifizierung der Enzyme in der Hefezelle

17 13310 arginase. See JBC 147: 99-108 (1943).
481 } Conyell + Christman JBC 150: 143-154 (1943).
~~16447~~ } Utilization of lactose by the testing rat.

16 ~~632~~ 15
~~4676~~

Caputto, R., Leloir, L.F., and Trucco, R.E. (1948) Lactase and lactose fermentation in Saccharomyces fragilis. Enzymologia, 12: 350-355.

Extracted adapted yeast cake by adding ½ vol toluene and .2 vol M/2 $NaHCO_3$ and mixing 20 mins. Washed with one vol. water, solid then left 2-3 days with 2 vols .6M KCl.[3] Residue removed. Add .4 vols cold acetone, discard ppt, and ppt active fraction with additional .3 vols. Redissolve in 20 cc .6 MKCl. "When suspended in pure water the enzyme loses about half its activity in 2-3 hrs. AS fractionation gave high losses, but separation from invertase was achieved.

Modified Steinhoff method used for estimation:

I. 7% $CuSO_4$ added to 50g NaAc to vol 100 ml. II AsMo Rx according to Nelson, + 1 vol (1.5N H_2SO_4) JBC, 153,575 '44

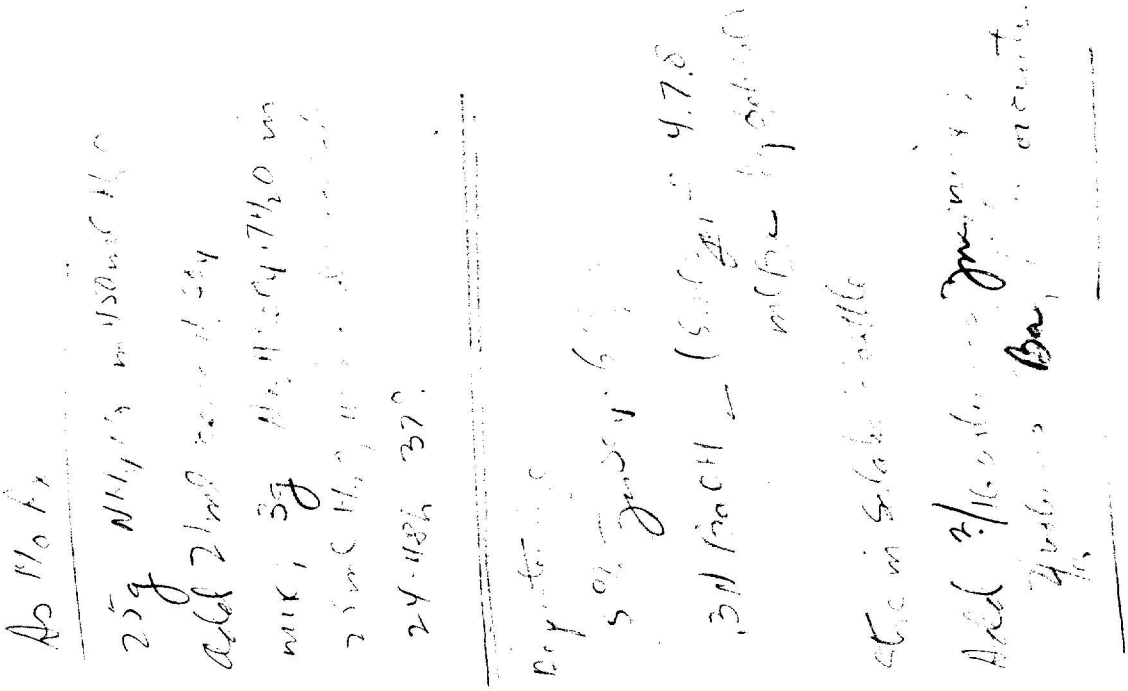
III 5N Sulf ac

2 ml sample, 2 ml I and .4 ml BuOH mixed in tt grad to 10ml. Cover tube with marble and heat at 80 20mins. After cooling, add 2 ml II, 1.5 ml III and water to 10 ml. Mix and read with #52 filter. Found reduction by glu, gal and lac in ratio: 1, 1.2, .016. M/25 Phosphate buffer caused ca 44% inhib., but accounted for with blank and with glucose control.

Lactase: pH opt. 6.7-6.9. Deprot. usually unnecessary. Rather poor linearity illustrated. Apparent phosphate activation noted, but explained as K, and removal of Zn, etc. K, Mn and Mg activated the enzyme considerably. (ca. 10x M/100) Hexokinase studied: fastest with glucose; lactose only after induction (hydrolysis?) Amount of lactase more

than adequate for rate of fermentation, but faster fermentation of lactose than the hexoses not explained.

"In cell-free extracts, toluene treated, or acetone dried cells, glucose fermentation becomes the fastest so that either the enzymes necessary for the direct fermentation are more labile, or the different rates are due to some structural factor such as a differential permeability to lactose."



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9.

Colonie #	from	3A	3B	3C	5 1
1335		++	CL	CL	++
"	(211)	−	CL	++	−
"	(145)	−	+	−	(+)
"	(1339)	−	CL	CL	−
211		−	CL	++	−
145		−	+	−	CL
1339		−	(+)	CL	−
1394		CL	CL	CL	++
"	(145)	−	+	−	(++)
"	(211)	−	CL	++	−
284		CL	++	−	+
"	(145)	−	+	−	+
145		−	+	−	CL
"	(1394)	−	+	−	+
1371		CL	CL	CL	++

similar results in other groups.

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I.	enteritidis	(I), IX, XII.
(2) ~~II~~	typhi	IX, XII, Vi
(3) ~~III~~	pullorum	IX XII
(4)	derby	I, IV, XII
(5)	para B	IV, XII
(6)	stanley	IV, I, XII
(7)	reading	IV, XII
(8).	typhimurium	(I) IV (V) XII

1, + 12

Phages ~~1, 11, 13 + 18~~ attack typical smooths only of (1), (2) + (3).

Phages 11, 13 + 18 regularly attacked only typical roughs of (1) (2) + (3).

Special "r" strains were attacked only by phage 8, which attacked all but a few variants, of (2).

~~18~~ 1R/13 was "smooth", and lysed by 12; it carried 1 lysogenically. 1S/12 were "rough" and sensitive to 11, 13 + 18.

φ8 attached* S forms of ~~1, 6~~, ①, ②, ③, ⑤, but not ⑥, ④, * para A, superstitfer., R forms of 1, 2, 3, ⑤, ⑧, ⑦, para A.

φ1 + φ12 attached typical S forms only of ① + ② + ③ + ④. no R.

φ11 " most R forms regardless of type. do. 13 + 18.

φ20 " R + S forms of ①, ②, ③ para A

φ21 R + S ① ② ③ + daughy S.

Conclusion: Sphagna probably are correlated with the factor now recognized as IX. K are cosmopolitan, as are the ecological behavior.

Burnet 1929b. Further obs. - Rypmst.

φ 8 eq. active on R + S of gallinarum. No serological difference detectable between S + S/8, or R + R/8. R/8 did not absorb φ8.

R + S sera showed little cross-reaction. R was obtained with φ1.

1929a. Classified phages:

A	B	C	D
1, 12, 33	8, 18, 28, 31, 34, 38	20, 26, 32, 35	11, 13

Testing as variants obtained S phage.

A are Sφ.

18, 35, 11 + 13 are R only.

8, 34 are indifferent to R/S. other φ are more active on R than S.

32 + 38. : 32 gallinarum R or S, 38 R only.

gallinarum S/12 are variably "rough" if really resistant, but fog readily reacted with both R + S sera. Various colonial types noted.

The mucoids which were found were hypogonic → smooth variants.

resisting to R φ.

All /H were rough. S/3 → smooth; correlated with resistance to φ.

Smooth resistants could be recovered from rough strains. Reversibility may be associated with a slight O-agglutinogen content. (titre ca 80)

R - S - G - > ... could take place.

Burnet 1930) Bacteriophage activity and the antigenic structure of bacteria. J.P.B. 33:647-664.

Table 4. S. gallinarum:

A B C D D'

Discussion of resistance patterns in terms of "change" planes

For some phages, susceptibility & specificity are uniform in R + S phases.

It is possible that different directions of modification of the O-substance are responsible. In Staph, sensitivity is more closely correlated w serology:

	Prager				
Antigens	1	2	3	4	
ABC	S	S	S	S	SF
BC	R	S	S	S	SF/1
~~AB~~AC	S	R	R	S	SF/2
ABC.	S	S	R	S	SF/3

Table 4. D. gallinarum.

	A	B		C			D	D'	Rough Test
Cells.	12	39	40	8	18	38	25	35	13	
398S	S	S	S	S	±	R	S	S	R	S
398S/8	S	S	S	R	R	R	S	S	R	S
398S/25	S	S	S	S	R/S	±	R	R	R	S
398S/39	S	R	R	S	±	R	S	S	R	S
398R=S/12	R	R	R	S					→	R
398R/8	R	R	R	R	R	R	S	S	S	R
398R/35	R	R	R	S	S	S	R	R	R	R
398R/13	R	R	R	S	S	S	R	R	R	R

Note: R are R to A, B., S to C + D /8 is $C_R D_S$ /13 or 35 is $C_S D_R$

Burnet, + McKie, (1930) Bacteriophage reactions of flexner dysentery strains. JPB 33:637-646.

4 groups of phages. E - smooth only.
others - most roughs, some smooths.
antigenic types characteristically different.

Groups C + D are homologous with the salmonella phages active on rough gallinarum.

Burnet + McKie JPB. 36: 299-306; 307-318 (1933).

I + II.

The classification of dysentery-coli bacteriophages. resistance patterns + serology. Some phages may act equally on dysentery S, coli + Salmonella.

pKa (25°)

Acetate	4.76
Barbituric	3.98
Benzoic	4.20
Citric	3.06 4.74 5.40
Formic	3.75
Lactic	3.86
Malic	3.40 5.05
Malonic	3.4
Oxalic	1.19 4.21
Phosphoric	2.12 7.21 12.32
Phthalic	2.89 5.41
Succinic	4.19 5.61
Sulfurous	1.76 7.20
Tartaric	3.02 4.54

Phosphoric ($HPO_4^{=} \rightarrow H^+ + PO_4^{\equiv}$)

or Succinic $H_2Suc \rightarrow H^+ + HSuc^-$

Sulfurous.

Oxalate

Absorption of p20 by W3718 and W811. 532.

4/20/49

Assays on E. coli B to avoid confusion with λ action

Temperature sensitive resume

W:			
	31	1	108
	35	20	110
	40	3	124
	42	36	125
	43	58	138
	44	60	137
	45	71	178
	47	78	179
	48	88	200
	65	87	242
	67	83	259
	72	42	305
	74		
	76		

tested for T.S. by E.L.

W305 maybe fertile at 37 then at 40.
W110 - at 31 ++ at 40. W42 maybe similar.

Lactulose   ca 1:12 of p. 467-468 NBS "Sugars".

100g lactose in 500ml (ca. 75g) H_2O sat'd $Ca(OH)_2$ at 35° kept several days. Concentrate in vacuo to wt of 125g. Dilute residue with 125ml MeOH and cool or crystallization overnight. Remove cryst. lactose, ca 75g by filtration + wash with [illegible] MeOH. Concentrate filtrate in vacuo. Dilute with 50 ml H_2O + [illegible] to remove [illegible]. Dilute to 200ml and titrate with iodine.

5 ml sample. in 200 ml Erlenmeyer. Add 5 ml .1N iodine from burette. Add 7.5 ml .1N NaOH ~~[illegible]~~ dropwise. Repeat for 6 times. (30 ml I_2) Acidify with 10 ml N HCl + backtitrate with N/10 $Na_2S_2O_3$. [illegible]. For 2.5 l., Br_2 = 1/20 iodine titration of 5 ml sample. Add [illegible] equivalent. Add 15 g $CaCO_3$ [illegible]. Add bromine dropwise with mechanical stirring. Remove bromide with Ag_2CO_3 [illegible] per equivalent Br. H_2S to filtrate to remove excess Ag. Evaporate filtrate to 125 ml to remove H_2S.

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$\sim p \cdot \sim q$

$p \vee q = \sim(\sim p \cdot \sim q)$

$\sim(p \vee q) = \sim p \cdot \sim q$

$\sim(p \cdot q) = \sim p \vee \sim q$

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