Notes on literature.

Microbiology + Chemistry
Genetics!

J. Lederberg
Columbia University.
Yale University

Colard, R. C.R.A.S 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 $(x) = m'$

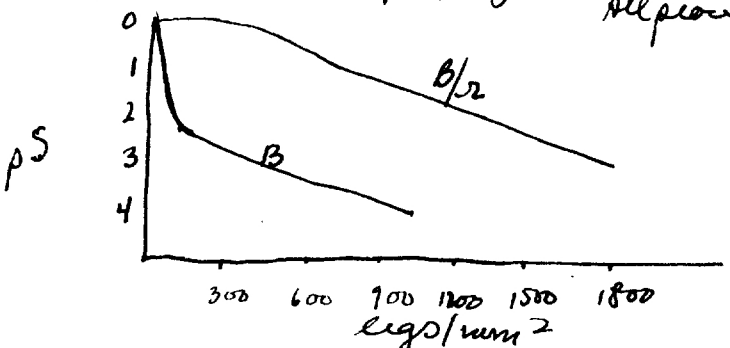
D = const.

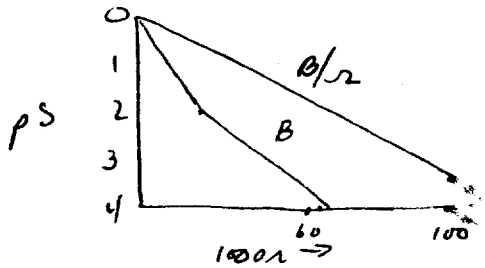
$$\frac{dc}{dt} = D\frac{\partial^2 c}{\partial x^2}$$

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.

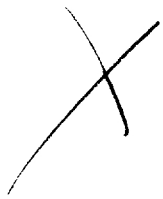
Hershey, AD J Bact 38:563-78 (1939) Factors limiting bacterial growth.
VII Respiration & growth properties of coli receiving sublethal temperatures

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, + albolactis – ATCC
"CC". 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 germinated on the NA but later did not respond to supplement.

E. coli. 18 hour br. culture.

	Untreated (000)	U-V	Δ.
N.A.	57	20	27
" + blood	57	65	102
" + glucose	60	45	105
" yeast	61	25	27
Infusion agar	61	38	189
Tomato juice + 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.