April 29, 1911.

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<th>Sal</th>
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There are suspensions from fairly old cultures. *v. few plaques.

B

5.0 321. mg glucose

245. ml. lac 5% at 80°C, 1 hour, free.
S.O. 247 on lactose 90% +. Purify ++ - for test as loc.

247 on lactose. All colonies are slow ++. Broad streaks. One (-) colony noted. Purify.

245 on lactose. - good very faint + colonies predominate, with numerous papilae +. S.O. - colony on lactose EMH: all - colored.

Test:

<table>
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<tr>
<th></th>
<th>Enteral</th>
<th>Male</th>
<th>lac</th>
<th>Sua</th>
<th>sal</th>
<th>blue</th>
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</table>
| 108 pm | - | - | +++ | ++ | - | 12/108
| 245bac | - | - | + | ++ | - | - | 18/1-3
| 18/1-3 | 243lac+ | - | + | ± | + | - | th. | W381
| 244lac- | - | - | + | ++ | - | - | W243
| 243lac- | - | + | - | ++ | - | - | th. | W243

Lactate purified W108 on lac.

249 is comparable to W108 and may be lac-3 - . 243bac+ may be a syncom-

gar. Test 243bac- W243 as recovered, and 249bac+ = W381

Reconstitute all these strains.

W185 filtered out. Colonies small +. Soldier;

Glucose. 95% +. Sucrose - melt.

Hemol. All +.

Sorbitol All -.

Fructose All +.

Recover glc. and compare with + on extended series of myc.
May 5 + 1948.

Strainout 177a, W-255/Mal on Mal E11B.
Pick 14 Mel+ colonies to lac and flu. at 37°C.

a) All 14 are lac++ flu-

b) 3 Mel+ colonies lac+ flu-

1 Mel- colony lac- flu- apparent.

So from a and b on maltose to purify. W397 + W398
* 312 & 302 were found filled with water! Source?
So on glucose.
April 18-30, 1944.

58-16 R. 135 plates x >100 scorable colonies

= ca 15,000 total.

15 very colonies pulsed. None mutants.

No mutants from ca 60 other sectors.

Formate mutation Res.

Y10. Spread on Glucose 1%, Formate 0.4% EM18 and incubated as before. 46 plates x 7500/plate = 35,000 colonies.

Due to crowding it is not certain how efficient mutant recovery would be. Test some representative colonies.
May 1, 1948.

Compare \(-\) (glucose EMB+) and \(+\) (-) colonies from formate-glucose EMB on:

(a) Formate - 0.5% Nicotase, 0.01% agar
(b) Formate - phosphate, Nicotase, gaseous tubes.

\[ \begin{array}{c|c|c}
   \text{EMB} & \text{Formate} & \text{Glucose} \\
   1. & 1- & + \\
   2. & 1- & - \\
   3. & 1- & - \\
   4. & 1+ & + \\
   5. & ++ & + \\
   6. & 2- & + \\
   7. & 2+ & + \\
   8. & 3- & + \\
   9. & 3+ & + \\
   10. & 4- & - \\
   11. & 5- & + \\
   12. & 6- & - \\
   13. & 7+ & - \\
   14. & 7- & - \\
   15. & 8- & - \\
   \hline
   \end{array} \]

All cultures produce voluminous gas from formate broth.  
(a) cannot be scored due to diffusion of alkali through agar.

Showout 1, 4, 6, 7, 8, 9 12, 13 \(+\) \(\times\) 1/15 in glucose EMB. Indistinguishable!

Test strain on formate-glucose agar.

Transfer \(\times\) to nutrient agar slant as W-385.
For fumes
Test N-12 on:

1. EM- 2% Na-glycophosphate; 5 pH. Large - colonies.

2. 1% Pectic acid, neutralized NaOH. N. S. Agar very soft.

3. Hydrolyzed casein (HC) agar. Moderate colonies.

4. HC - succinate - Chlorophenol red. Moderate colonies.

Agar was decolorized after autolysis. Shows diffuse coloration around colony groups.

5. HC + succinate Cl. \( ^{7} \) V. slight lightening around colony mass.

6. HC + NaCl. No growth. Spontaneous coloration in agar only in it.

7. HC - Indigo sulfate 0.01% Decolorized on autolysis? Agar.

8. HC - Stain, toluidine.

9. 3, 4, o-dinitrochlorobenzene, (I) 24 hours.

10. Dinitrophenol 1% ++ Not quite same as glucose but unquestionably strong +.

11. Dinitrophenol 0.5% + + + Not inhibited.

12. Salicylic acid 0.5%.
April 30, 1948.

Drew W-145 lightly into T(m) T2B, BM + 0.1%.

1. Glucose
   - 24h. ++
   72h.

2. Glucose
   ++ ++

3. Lactose
   ± ++

4. Maltose
   + ++

58-161 nitro.

1. Na pyrophosphate 5H₂O
   0.2% 24h. 50% ++

2. Lactic acid; nitro. NaOH.
   EMB. 58-161 +
   410 +

P3.

S.O. 1, 3 and 4 on homologous EMB agar.

1. No acid production; colonies very substantial

3. Numerous + colonies. Pick to give EMB

4. Maltose - all -

< 14 colonies all - Purify on lactose EMB.
Glucose mutat. cum.

April 29, 1948.

Vio Ideoz, etc. (Handra bump 5 sec.) on glucose EMB.
Most of 52 plates were heavily contaminated.
Select more likely colonies from 20 best uncontaminated plates; ca 500 scrapable colonies.

3 Glucose - strains across TL. All V5.

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<th>Blue</th>
<th>Bac</th>
<th>H2S</th>
<th>PVP</th>
<th>Sper</th>
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<tbody>
<tr>
<td>1. W - 382</td>
<td>-</td>
<td>*</td>
<td>+++</td>
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<tr>
<td>2. W - 383</td>
<td>-</td>
<td>±</td>
<td>±</td>
<td>-</td>
<td>++</td>
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<tr>
<td>3. W - 384</td>
<td>-</td>
<td>++</td>
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-382. Why paper the only color? This appears to be the desired "Gluco-

specific mutant, for example with 382.

* produces acid strongly when left out at room temperature 2-3 hours.
(compare 340).

Strain/not 382 and 340 on set of two glycer plates. Incubate 37°.

-37°. See 185
Glucose, Sucrose, Sorbitol, Fruuctose, Mannitol, Mannose, Inositol, Mucic Acid, Xyl, NR

1. 1.254  +  ++ ++ ++  ++ ++ ++ ++ ++ ++ ++ ++ ++ ++ ++ ++ ++ ++ ++ +

2. 1.88  +  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++

3. 1.854  ++  +  +  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++

4. 1.855  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++

5. 1.849  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++

6. 1.851  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++

7. 3.56  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++

8. 3.81  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++

9. 10  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++

---

Yeast

* papillae, presumably mucoid.

* Dextrose hemolytic medium, NA
Lac₃ Crosses

May 4, 1948.

Cross the following on EMS-Lac-B₁.

1. W-108 x W-249 (a conc. susp) T-L-B₁-Lac₃ x B-M-Lacₙ

2. W-108 x Y-40 x B-M-V₁r x T-L-B₁-V₁r

3. W-249 x Y-46

P7.

① Yield very poor.

Plate:

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0 38 1

After several days' incubation, some beta's came up. Some other may require more time; do not use these plates.
\[\begin{array}{c}
+ \\
2, 5 \\
6 \\
2 \text{5} \\
2 \\
0 \text{3} \\
\hline
17 \text{25} \\
4 \text{28} \text{1} = 6.7\% \text{ Lac}_3^+.
\end{array}\]

\[\text{T-2-B, } \text{Lac}_3^+ \text{B+M} \left\{ \times \begin{array}{c}
\text{T+L,B, } \text{Lac}_3^+ \text{B-M} \\
\text{Lac}_3 \text{ is fairly closely linked to BM (very weak \text{ Lac}_2^+)}
\end{array} \right\} \]

Phage tests (on glucose plates):
\[\begin{array}{c}
\text{Lac}^+ : \text{6}\text{R} \\
\text{Lac}^- : \begin{cases}
\text{48}\text{R} \\
\text{5}\text{1} \\
9 \text{9} \\
\text{12} \text{1} \\
\text{2} \text{5} \\
\text{1} \text{2} \text{4}.
\end{cases}
\end{array}\]

\[\begin{array}{c}
\text{Lac}^+ : \text{2} \text{R} \\
\text{All ble } + \\
\text{Lac}^- : \begin{cases}
\text{8} \text{1} \\
\text{6} \text{1} \\
\text{0} \text{0} \\
\text{0} \text{0} \\
\text{1} \text{0} \\
\text{1} \text{1} \\
\text{4} \text{3}.
\end{cases}
\end{array}\]

3. Very poor yield and a rather dense background.
May 3, 1948.

100 plates EMB x 250/plate = 25,000.

17 tiny colonies stained whole on glucose
14 thin pearls 5.0 on glucose.

\[ \begin{array}{cccc}
1 & 0 & + & - \\
2 & 0 & + & + \\
3 & 0 & - & - \\
4 & 0 & + & + \\
5 & 0 & + & + \\
6 & 0 & + & + \\
7 & 0 & - & - \\
\end{array} \]

3 - (1-3)

12, 4, 5 and 7 are T1 S5, and probably mutants.
3 is a sulfonamide resistant almost certainly contaminants.
6 a ribose fermenter.

\[ \begin{array}{cccc}
W- & & & \\
1. 386 & - & - & + d & + & ++ \\
2. 387 & + & + & - th & - th & + \\
3. 388 & + & + & +++ & +++ & + \\
5. 389 & + & + & +++ & +++ & +++ \\
7. 390 & + & + & +++ & +++ & +++ \\
\end{array} \]
May 5, 1948.

1. 108 x 58 - 161  on glucose ± B,
2. 219 x 108  on glucose B,
3. 382 x 219  on glucose, lactose
4. 382 x 58 - 161  glucose, lactose.

P71:
1 - B1.

\[
\begin{array}{c|c|c}
+ & & - \\
19 & 177 & 16 \\
35 & 300 & 55 \\
56 & 463 & 519 \\
\end{array}
\]

Tood cell to be properly counted.

Some colonies are discolored. But probably positive.

Handwritten:

2. Yield negligible (ca 1 per plate)

3. (glucose) Yield negligible - all - lactose. All look "+" after prolonged incubation. Some on glucose + 76.

4. Glucose - measurable - no yield lactose - all turned +.
May 7, 1948.

D. Make up varying concentrations of triphenyl tetracycline chloride in nutrient agar and acetone. Streak Y100 plates.

Per ml:

1 mg. Hematin faint pink; all colonies intense deep red.

250 μg. Hematin slight tinged; isolated colonies deep red with hematin magenta.

50 μg. As above, hematin less tinged.

20 μg. As above for isolated colonies; confluent growth colorless.

10 μg. Color more limited in colonies and less intense.

1 μg. Level shows slight initial growth inhibition.
Lac 3 crosses

Lac 3 mapping. May 10, 1948

2. W-2Y9 x Y46

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Lac: 191 0
Glu: 310 0

Both are probably lacY3-.
2. Plates v. unsatisfactory. Overgrown or no cross colonies readable, esp. lacto. + -

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67 12 789

This count unsatisfactory except to indicate more than 2.

0. lac.

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512 105 617 = 17% lac + 83% lac -

Test lac + on EMB, T1:

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52 8 60 = 13% among lac + all scored (-) in glucose, probably due to uncertainty of medium. Test by streaking to fresh gly EMB.
Test loc. segregations of $T$, (Alleles $T$, $t$, $E$, $e$, EMS).

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<tr>
<th>$R$</th>
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<td>$13$</td>
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<td>$10$</td>
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\[ \frac{5}{6} \quad 24 \quad \frac{80}{\text{30\%}} \text{ among } loc. - \]

The distribution is here:

\[
\begin{array}{c|c}
-R & .58 \\
-S & .25 \\
+R & .15 \\
+S & .022 \\
& 1.00 \\
\end{array}
\]

\[ \text{m.d. calculated from } \text{III}. \]

\[ \text{IV: } \frac{\pi}{109} \text{ of 80 as progeny estimates.} \]

This gives a total for the $V$, segregations of $73% R$, or $27%$ crossing over in region $\text{III}$ which agrees very well with preceding data (v. thesis table 6) giving $27%$.

Estimating $x$ from these data:

\[
\begin{align*}
\text{Yield } a &= 0.022 \times 0.15 / 0.58 \times 0.25 = 0.0238 \\
\text{b} &= 0.022 \times 0.58 / 0.15 \times 0.25 = 0.340 \\
\text{c} &= 0.022 \times 0.25 / 0.15 \times 0.58 = 0.064 \\
\end{align*}
\]

\[ \frac{\sqrt{154}}{1.15} \quad \frac{a}{1.16} \]

\[ \frac{0.340}{1.583} \quad \frac{b}{0.67} \]

\[ \frac{0.064}{1.253} \quad \frac{c}{0.26} \]

[10.8]
May 17, 1948.

1. 108 x y40  On Lac- \( \text{and on Gna EMS} \)
2. W-67 X Y46  On Lac
3. W-126 X Y40.  On Lac

\[ 1: \text{gna:} \quad \frac{Y \cdot 7}{10/\text{plate:}} \quad \text{Test on glucose EMS: T1.} \]
\[ -R \quad - \quad +R \quad +S. \]
\[ \begin{array}{cccc}
22 & 8 & 1 & 1 \quad L \quad 32.
\end{array} \]

\[ 1: \text{Lac.} \]
\[ \begin{array}{cccc}
9 & 0 & 0 & 0 \\
2 & 2 & 0 & 0 \\
2 & 1 & 0 & 0 \\
1 & 1 & 0 & 0 \\
3 & 2 & 0 & 0 \\
10 & 2 & 0 & 0 \\
6 & 0 & 0 & 0 \\
1 & 0 & 0 & 0 \\
2 & 0 & 0 & 0 \\
\hline
130 & 7 & 137. & 5.1\% -
\end{array} \]

\[ \text{The distribution is:} \]
\[ \begin{align*}
-R \quad -S \quad +R \quad +S \\
.684 & .275 & .044 & .007
\end{align*} \]

\[ \text{Total U,} \quad \text{R segregation:} \]
\[ .282\% \quad \text{E. S.} \]
On three plates, colonies were much smaller than + possibly distorting nature.
Summary: Lac-3 mapping crosses


p/187: 17⁺ : 254⁻ on lactose, ie 6.7% Lac₃⁺
Among +, 6 V₁⁺ : 2 V₁⁻.
- 99 : 25

\( \chi^2 = 22.2 \)
\( p = < .001 \)

/191: 56⁺ : 463⁻
1.3% Lac₃⁺

/198: 105⁺ : 512⁻
17% Lac⁺
Among +, 52⁺ : 83
13% S.
Among - 56R : 24S
70% R among Lac⁻.

199: 130⁻ : 7 +
5.1% Lac₃⁺
Among +, 6 R : 13
Among - 82 R : 33 S
71% R.

199 (transf. from galactonate E45).
R⁻ 30 : 12 8 = 73% R.
R⁺ 2 : 1 1

All agree on lac = ⊕ lac⁺
lac⁻ = + + lac⁻
on viability for R.
\( \chi^2 = 34.1 \)
Helvorea  +  +  +  +  +
Heterotrofa  +
Helikiera  +
Hemoglobin  +
Cellulose  +  +
Starch  +  +  +
Trehalose  +
Amygdalin  +  +
<table>
<thead>
<tr>
<th>Compound</th>
<th>E. coli</th>
<th>E. coli</th>
<th>E. coli</th>
<th>Aerobic &amp; Salmonella</th>
<th>E. Fyphi</th>
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<tr>
<td>Glycolaldehyde</td>
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<td>+</td>
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<tr>
<td>Dihydroxyacetone</td>
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<td>-</td>
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<tr>
<td>( \text{CH}_3\text{-CH-C\text{H}_2} )</td>
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<tr>
<td>( \text{CH}_3\text{-CHOH-CH}_2\text{OH} )</td>
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<tr>
<td>( \text{H}_2\text{C-C\text{H}}_2 )</td>
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<tr>
<td>( \text{HOH}_2\text{C-C\text{H}}_2\text{OH} )</td>
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E coli  coli  coli  Aerobacter  celarelli  e  typhi

erythritol  -  -  -  -

Adaritol  -  +
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<th>E. coli</th>
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<tr>
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<td>-</td>
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<tr>
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<td>C6 + dextrose</td>
<td>K+ R-12</td>
<td>K+ R-12</td>
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<tr>
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see above.

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</table>
\( \alpha \) D-glucoside

\( \beta \) D-glucoside

\( \alpha \) L-galactoside

\( \beta \) L-galactoside

coli

- 

+ (lactose adap)