June 29, 1952.

Resume Hp studies. Plaut of W1895 showed a yellow coagulase. Extracts on EM10 bac. Colony #1 was extreme rough (cont nuclei Hp) lyzes W2041.

H. pylori a "smooth" culture as W1895. Both cultures tested highly Hp.

Attempt to accentuate hybrid cultures.

- 777 strain mostly invisible.
- W1051.8k HPy, Bacillus bcr-Mbl. Preserve as H-311.
- White bac.

H245 = L. J. first attempt gave all bac.

<table>
<thead>
<tr>
<th>6/25</th>
<th>W1678 x 1607</th>
<th>2 trials</th>
<th>No lact + SR colonies</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>W1918 x 1959</td>
<td>2 trials</td>
<td>No lact + SR</td>
</tr>
<tr>
<td>P</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Papilla ninth culture trials: A, B, C, D

See 955

<table>
<thead>
<tr>
<th>6/26</th>
<th>W1590 x W1940</th>
<th>EM13 lac. No + colonies noted. 1?</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>H27P papilla. 1? See 952.</td>
<td></td>
</tr>
</tbody>
</table>

F: H270 x W1895

G: H311 (Hpf lac = Huf x) x W1922. See 955

H267/5H. 7 bac: all pyrophilus. 1236 to Mal-4, 5, Mal + 7 Mal

See 953. Save + 2: H311
June 27, 1952.

W1940 x W1590. Not vi necessary ca. 4 hours, streak out, EMB lac.

Whereas: agar all lac-, some colonies have dense center.
A. 0 streaked out, gives a few lac+, apparently not var, but with var.
appearance on EMRTal. 0 lac+ is pure lac-.

6/29
48 hours: ca 1% lac- colonies, and typically lac+ at colony intersections.
B. Pick and streak EMB lac. (8)

6/30. lac+ appear pure. Hold for further development. 3 colonies in EMB lac.

1. lac-?
2. lac-?
3. lac+

 Restricle / 2. Test mutation. Both. 
1. (BY): - (T18) +
2. (BY): - (T18) ++

Use #1 for further tests. Both are mostly rather weak lac+.
June 27, 1952.

H312 isolated by selection from H767 as Mal- lac proto. W1845 x H312 on EMS Mal for Mal+ proto.

1/30 4 hours, plate on EMS Mal. (in H312 parent, ca 10%)

Mal+ my as papilla.

H318 ocercut, plate on EMS Mal.

after 3 days, numerous papilla noted.

7/6 8 studied out directly, 1 clearly Mal+.

Rectuale on EMS Mal → Mal+, Mal- colonies.

Rectuale, 4 of these to EMS, EMS Mal. also lac+ →

7/9 40 tests 2 Mal+. Rectuale EMS Mal, EMS Mal.

#1 #2 Rectuale on EMS Mal col.

Malt + Lac -.

H319 on EMS Mal gives almost exclusively Mal- and Mal+ colonies.

The better rectualied do the same. An EMS lac-, mostly weak lac+ and lac-, occasional lac+.

Triploid? or mut of Malt, lacs, auxogants?
July 16, 1952.

H318 = w1875 x H312 (H267/mal-3).  
8 segregants: 4 Mal+ 114+  all lac-

<table>
<thead>
<tr>
<th></th>
<th>S</th>
<th>B(0)</th>
<th>(87)</th>
<th>(77)</th>
<th>(79)</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>+</td>
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<td>+</td>
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<td>+</td>
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<tr>
<td>4</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

\[ \text{Mal+ are T2B, - Mal- are prot. (also see E175/Mal see 953)} \]

Note crossover Mal+/mut.

H310 = zm-disposed (W1016 x W177) T4B - 
5º M + lac- Xyl- 8 + Prototrophic plated from EMS lac. (padd lac+ and Malt+).
Houtagman lac - Spot on EMS lac, studie EMS M, HFL violett.
11 from EMS M.

8 lac: all pure lac+ 4 Mal: 3 pure, 1 Malv! H313
check EMS M lac+ / sm.

Preliminary EMS M.
8 lac. on EMS M.

Pick 8 Malv from H313 to screen Malt, Malv.

40 Malt = no clearcut Malt. Reactivate 4 EMS Malt lac- check os sm.
act I'm neither

E) I sound to be Malv S/Mal- Sº
reacts: apparent

vs SM: single colony and mass.
lacks single colonized No Malt lift.
July 5, 1952.

7 pm:

Hal - Xgal - ML. Completely blocked. All auxotrophs, lact +

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
</tr>
</tbody>
</table>

These types were therefore seen:

\[ \text{Lac}^{+} \]

MXY - S' (TLB) -

MXY - S' (TLB) -

MXY + S' M -

MXY + S' (TLB) -

MXY + S' (HTL)

B5 would appear to be \( W1895 \). Experiments:

\[ \text{Hfr} = W1895 \]

Also test types 1, 2, 4, 5 for Hfr.

Also mix \( W1607 + 13, 4 \) together. Select EMM, Lac/SN. (Precomb.)

7/8.

Also mix \( W1607 + 13, 4 \) together. Select EMM, Lac/SN.
July 13, 1952

H310 (mass culture) x m010

7/16.
59-161 ++
W1607 +++
59-161 x 1895 ++
1607 x 1958 =
1802 x 1968 =

(Cfr. 9/30).

H310 is presumably Hfr.

and W1895 x H310 is not especially significant.

7/16. Test lac-, lac- from H310, \& hybrid W1895 x W1936.
1 E8L 7/10/52 Single cell + 34 strains. lac 5R #7 T 134 W1607
2
3
4
5. H310 lac+ (FL+)
6. " lac- (FL-)

What does this mean?

All gave 2 prototrophs x W1607! #2 x 1956
Repeat H310, lac+ and lac- x W1607; #2 x W1956.
(F+) F - probably F - dominant.

Repeat H310 and lac-

H310 x 1607 +++
H310 lac- x 1607 --
59-161 +

At least two progeny of H310 are not Hfr.
H310 itself appears to be.

Try crossing X F-! streakout H310 x W1607 on EMB, EMS, Mal

969
7/21/52

a. 8 lac+sr from W1895 x W1958. 5 were also associated with lac-sr. Check mutation: 2 lac+ were B; -1 remain unclassified.

Test these 6 lac+ and 5 lac- for F status:

\[1 - 8 = \text{lac}^+ \times 11 - 18 \text{lac}^- \times W1607.\]

\[
\begin{array}{cccccc}
1 & 2 & 3 & 4 & 5 & 6 \\
\times 1607 & 12 & 13 & 14 & 15 & 16 \\
\end{array}
\]

(3) 2

All appear to be compatible F. Possibly some types of colonies in lac - B, C lac + were in mixed and restated #8. The others appear to be F -.

b. Isolate lac- + segregants from individual H310.

Usually after cultivating purity.

\[
\begin{array}{cccc}
21 & 22 & 23 & 24 \\
25 & 26 & 27 & 28 \\
29 & 30 & 31 & 32 \\
33 & 34 & 35 & 36 \\
\end{array}
\]

All were incompatible x W1607.

955 F8A = M+ - but M+ papillae and one +. Colony noted!

Restated. Test M+ and M- W2688.

M- papillae after several days. Y. W1958 itself?
June 26, 1952


Pick: mostly lac- Proc. coli fact. (Maybe remnants of H-311?)

8 picked: all are Hfr- S.M Hfr (lac- +1, +8 MH-). Restructure these
as EMS lac. (pick not diploid) (Should select for Malt prototrophs)

you see 2 are lac+ Malt- MM- not diploid.

? Are the lac- reversions of H-311 or recombinants with W1895?

Restructure from EMS lac (e.g. lac-) to EMS lac. (+Malt)

This strain is ca 20% lac+ but very few if any Malt or EMS.

(1) Mut EMS Malt.

Almost all Malt- 2?? Malt prototroph. Rat to exp 30/40

4/5 show a + Malt EMS Malt. Possibly Malt + lac-? Restructure on
lac+ Malt: All ? are lac+ Malt+, as suspected.

These must be results of H-311 x W1922, and presumably
hemizygous for Malt. Het diploids may not bypass elimination!!

2. Test additional

Test #2A for Malt hemizygosity: 8 Malt EMS progeny ->
Malt+ EMS. Restruct on EMS lac: All were lac-
Malt- lac+ prototroph. All were Malt- See 952A.

D. 40 lac- tested: 23 were clearly lac-.

Spot on EMS lac, EMS Malt: all 23 are Malt-. Do not Kan-
7/15/52 Segregate A 2. Y Lac, Y lac- (all MR - in fruit test) (Hfr x Hfr- Hfr x Hfr-)

<table>
<thead>
<tr>
<th>lac</th>
<th>0 (10)</th>
<th>0 (374)</th>
<th>0 (123)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>3</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>5</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>6</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>7-8</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
</tbody>
</table>

- Types: 1, 5, 8. 
- lac- 

All should be S S lac-.

Test for Hfr by lac S cross. (Ans. #5 and 8 are lac-) I

H320: Select for recombinants in EM5 lac. Plate #48 possible to EMS lac.

1 was still lac v → lac v Hfr+

H320 is

heterozygous lac-.
July 1, 1952

Spot plate of:

\[ \lambda \quad \text{WB27B} \quad W1485 \]

\[ \text{K12} \quad \text{1485} \quad \text{1827abc} \quad \text{B} \quad 518 \]

\text{selective medium}

\text{plaqueing}

Cross-studies on EMB Base

\[ \begin{array}{c|c|c|c|c}
1827 & B & \lambda & 1485 \\
\hline
1827^c & 2 & + & + & - \\
1827^c & 2 & + & + & - \\
\end{array} \]

\text{? plaque}

No evidence that 1827 is lysogenic vs. 1485 or B.

\text{Include A} / \lambda \quad \text{B is} \lambda^k

\[ \begin{array}{c|c}
1827 & 1485 \quad 518 \\
\end{array} \]

EML now reports that W1485 was responsible for the modification.
July 2, 1952

2/3. 40 Mal+ colonies streaked E77B Mal. Mostly Mal+ on
  Barely Mal. Prentice E77B lar, Mal; E77B Mal.

2 3 6 7 8 are Mal+?  1 2 6 7 8 are Mal+ prob. lar.

1, 6, 7 certain flux  6 certain MalV


1-5 are MalV, lacV  6 MalV lac+

At first glance #2 appears lac+  1, 3, 4, 5 lac +/−

Revertify lac+/.  H321
June 26ff. 1952.

Plate H295 from D( lac) to EM13 Gal. Replace to lac. Pick apparent Gal+ lac- and test for a

1 Gal- lac- secondary isolated. It is apparently still up'1/4'.

Interpreted to be only still, although with slower expression of

Gal+.

Difference between H295 - H317 obscure. May be primarily a shift from segregation ratio + to - to +.

Lipid colonies (Gal) are very prominent.

June 9, 1952. Plate mix from D( lac) to EM13 lac, replace to lac, M6, Gal.

2 plates each. > 95% lac+ (1). CA 150/plate

Possible lac+ Mal-

1. H326
2. H325
3. H324

H324-325

4. Gal+ lac-

H324
5. Mal+ Gal lac-

H324

All 1056
July 4, 1952.

EMS Mal.

V. High yield. ca. 20% Mal+. Pick smallest colonies, rest make EMB Mal.

16 tests: 7 3 likely Mal+. Hold to pool with further test.

40 tests: S. No Mal noted!

Some possibly Mal+ but no Mal-segregants seen in rest.

+
7/7/52.
A) 1 plateful W1895; W1678 ml 15 ml H2O. 
Subjected to Raytheon machine at full power, 15 min.
Then filter (14 1/2 Hanks).

4:30 Box 1 ml filtrate (+ 1 ml W1807) to 5 ml assay.

9A8: Control clear. Mix exp. with W1177 or 0.6 or EMS lac.

\[ A = 1607 + 1895 \times 1/5 \]
\[ B = 1607 + 1678 \times 1/5 \]
\[ C = 1607 \]
\[ D = 1607 + 10^4 \lambda (K:124x) \]
\[ E = 58-151 \times 1952 + 10^2 \]

1. Ultraviolet kills both F+ and Cal+ transduction activity

Retrieve papillae from E, D1 to confirm Cal vacuogeny; test possibility of F transfer coincidently.

"D1" was a very dark papilla. C papillae don't show such darkening generally.

1. Are areas between papillae for control use \( \times \) F+ transduction?

In addition to strain-out, cross-breed freshly picked papillae \( \times \) EMS Cal; spot on D(0) all spots.

Send samples to assay to prepare F+ test.

C1-8 D11-20
D 9-10

BC: all appear to give pure +

12 D: at least 9 show Cal, possibly all.

Repurify from purple (selected) colonies.

Point Cal (C,D) and Cal- (E) remain F- (x 1956)
7/14/52

Recti single colonies.

C (spot v.) 8: all pure Cal+.

D. (should be 9/20 re-levered). 12 tests:

\[ \begin{array}{ccc}
1 & + & - \\
2 & + & - \\
3 & + & - \\
4 & + & - \\
7 & + & - \\
8 & + & - \\
9 & + & - \\
10 & + & - \\
11 & + & - \\
12 & + & - \\
\end{array} \]

8/1 3.5
6.6 3 5.9

is comparison. No serious doubt of effect.

For further study, rectrate single colonies of #1 for acquired stability, and 8, 9, 10 for present stability.

7/15

in rectrases, #8 showed 1 Cal-? (produce\?). 9, 10 were entirely +.


but rectrase single colonies \( \rightarrow \) all Cal+

A (buhredrughespos-?)

7/15

#1 showed 3 +, -

"pure +". Rectrase

7/16

All colonies were +. Rectrase + and v \( \rightarrow \) all +, -, v colonies.

Resume: \( W1607 + \lambda (K-12) \)

\[ \begin{array}{ccc}
& Cal+ & Cal+v \\
9 & + & + \\
10 & + & + \\
11 & + & - \\
12 & + & + \\
\end{array} \]

purification: \( \cdots \)

7/15

\( \cdots \)

7/16

\( \cdots \)

7/17

\( \cdots \)

7/18

\( \cdots \)

7/19

\( \cdots \)

8 spot, survivors from Cal- from #1

Chart all stable + for 2 transfers.
July 18, 1952.

5 plates DNA lac harvested to ca 20 ml. Ultrasonic (10,680 cps) 2 minutes.

K12, W1895 H)

A) Survival ratio (measured 7/21/52). Plate 1 ml. 10^-5 initial counts unfiltered, estimate density at ca 5% (by glb. est.). 2) ca. 10^8/ml filtered cells ca. 10^8/ml

Filter through 14"* Handels: Highly opalescent filtrates

1: K12 2: 1895 test stability 1 ml samples add 1956.

Stability offered in 4 day incubation.

Renovolte samples to fresh broth for F tests.

Test x W1607: Both F-

, some mating with F
A 1945 5 ml heme assay + 0.1, 0.2, 0.4, 1, 1.0 ml of 0.1% BT
B 1956 " blue coloration by BT, but inhibition of heme breakdown
ca 7/16. ERL picked a single long cell from 1945 x 1956. This
divided to 3 cells -> microtubers.
Only parental combinations were recorded, however.
Invisible crossovers or planomogy. Save
Lysate # EML 269-9
A 1 ml in 5 ml Penassay
B 0.5 " " + W1952
C 0.2 " "
D 0.1 " "
E B 1/5 " "
F D 1/5 " "
G 0 " "

1st testing: at 6 hours
2'd " at 20 24:

Lysate may have a 'dominant' contaminator: Strain # 40, Cal, NA.

(1) Malt + Cal+ (very likely the W1952 (cal+ used to prepare lysate)

Experiment above is confounded. Do not pursue.

Test 3 day suspensions of heated W1952 showed none Malt or
EHR161: 949 and #10.
(750+) (929)

Tentative conclusion: F transduction is due to 'dominant contaminator.'

HP20: have 1 ml lysate #10 in 5 ml broth

p 10.121: clear

Repeat i # 10:
1. 1 ml 1/5 Student yeast
2. 1 ml + W1952 F transduction test
3. Do 2 test of HP20 + W1952

2 and 3 were both F- (x 1607).

#1: F-
July 21/1952.

**Le 955**: EMP EMB Mal.

Repeat cross EMP**<sup>lac</sup>** 7/29

8/1 24 Lac → EMP**<sup>lac</sup>**

8/3 Repurify 6 possible LacV. Mal**<sup>lac</sup>** EMP**<sup>lac</sup>**

<table>
<thead>
<tr>
<th></th>
<th>Mal +</th>
<th>Mal -</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>v</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>+?</td>
<td>+</td>
</tr>
<tr>
<td>3</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>v</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>v</td>
<td>?</td>
</tr>
<tr>
<td>6</td>
<td>+?</td>
<td>-</td>
</tr>
</tbody>
</table>

Save for homogeninity tests on Mal**<sup>-lac</sup>**

Mal+ Homoginity tests on Mal**<sup>-lac</sup>**

Mal- H<sub>3</sub>2<sub>2</sub>

H<sub>3</sub>10 Renarrien! EMP Mal.

Mal+ Lac - no tests.

6 addmal Mal+ Lac - " "

see 1057
T3 stock is undoubtedly mature on K-12.

It showed a limited e.o.g. on W1485.

full active on W1118 (7/10... acc'y 89%)

T3K was relatively non-viable (in K12?).

9/15... T3, T3K isolated in E. coli B, 1918.

Reprinted and tested:

<table>
<thead>
<tr>
<th></th>
<th>T3/B</th>
<th>T3/1918</th>
<th>T3K/B</th>
<th>T3K/1918</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>++++</td>
<td>++++</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td>K</td>
<td>-</td>
<td>±</td>
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<td>++</td>
</tr>
<tr>
<td>1918</td>
<td>++++</td>
<td>++++</td>
<td>++</td>
<td>+++</td>
</tr>
</tbody>
</table>

Question: If possible host modifications should be studied more explicitly. T3K originally gave +++ in K as well as B.

For testing DG series, use T3K initially; then T3B for T3K strains.
9/22/52.

(8) Strain "PLT22/LT2" 10^10 3/52 found quite muddy.

(9) 10AM. In 100 ml assay jar: Incubate at 37°C

\[
\frac{1}{2} \text{ ml LT2} + 1 \text{ ml stock PLT22}
\]

\[
\frac{1}{2} \text{ ml } 10^1 \text{ ml SWY35 (LT22)}
\]

2PM. Heat shock #2, #4 60° 1 hour. Sediment. Treat supernatant i CHCl₃.

Test 1 ml "4" / SWY35 EMASCal

(10) Cal+ transduction;

9/23 SWY35 1 papilla

SWY35+ FA ca 30 cal+ papillae

FA strain 0

(11) Assay FA #2 on SWY35/Cal:

<table>
<thead>
<tr>
<th>D(0)</th>
<th>papilla</th>
<th>colonies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>6</td>
</tr>
</tbody>
</table>

(12) 1 ml each SW603 (pale B) ca 10^10/ml: 9/66-4

\[
\text{PLT22, rough, small turbid}
\]

No turbid: 1/20
No swarms: 1/20

(13) Assay 4: 80x10^8 phage/LT2;

\[
\frac{61/1 \text{ ml}}{\text{ SWY35 cal+ papillae/ml}}\]

\[
\text{ phage/FA = ca } 10^8\]

---

Note: SW552 "Comp Rough", not hemolysed by PLT22/2.
966 C  16 tests of SW 435 transinduced all stable
0 7/29/52 Second run: SW 435 + 1 ml 966 B Y. (see C)
Picle & papilla (smallest or apparently
mottled)
↓
↓
all stable as of 7/23.

24 tests total
9/27/52


Supernatant, 20 seconds gave a swarm. Repeat on a larger scale.

\[ b^- = F1 \]

9/27 2 plates 5w603 / 10 ml. (F2)

Mediate 5 ml digest 25 seconds.

5 ml - 0

Concentrate to ca. 0.5 ml plate 0.2 ml / plate

9/27 UV-0. 5 plates: 3 show swarms (late d'empge; one clear)

Two to her. 5 purifying = F2, 3, 4. = all b^-

UV-25 sec. 5 plates 0 swarms 0 traces.
Recap.

1. W65678 found to grow poorly on D10
2. Red+C-positive, citrate-positive (presumably slow)
3. Citrate test (+770-3+ = A1395)
   a. C +
   b. C +
5. Not dehydrogenase


A. Repeat SRP (minimum growth)  Mal  Lac

9/24

<table>
<thead>
<tr>
<th></th>
<th>N-12 x 2058</th>
<th>5</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>w6 x 2068</td>
<td>all+</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>w6</td>
<td>all+</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>w6 x 1926</td>
<td>all+</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>w6 x 1970</td>
<td>all+</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>w6 x 1817</td>
<td>all+</td>
<td></td>
</tr>
</tbody>
</table>

no suggestion of growth!

B. Penicillin

<table>
<thead>
<tr>
<th></th>
<th>succ</th>
<th>penic.</th>
<th>Ca: 3x10^8/mcl.</th>
<th>3:15 - 920</th>
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</thead>
<tbody>
<tr>
<td>1</td>
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<td>-</td>
<td>+++</td>
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<td>+</td>
<td>+</td>
<td>+++</td>
<td>3:15 - 920</td>
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<td>+</td>
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<td>+++</td>
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<td>3:15 - 920</td>
</tr>
<tr>
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<td>+</td>
<td>-</td>
<td>+++</td>
<td>3:15 - 920</td>
</tr>
</tbody>
</table>

Plate: ca. 300/10^2 mcl

But poor growth when replicated to D10 + pen succinate

1? mutant
SRP test does not support fertility of yg 6.

Similarly, yg 7 never gave a clean response.

On 9/26 Try vscs:

\[
\begin{align*}
W & 1987 \times 1817 \\
1978 & \times 1987 \\
1978 & \\
1987 & \\
1978 & \times 1976 \\
1978 & \times 2058 \\
1978 & \times 1817 \\
1987 & \times 2058 \\
1987 & \times 1976
\end{align*}
\]

\[\text{on D16) all barren}\]
Observations on recombination Hfr × Tc Nearpato.

9/27/52.

Tc Nearpato 23 lac− in EMB lac. All tested also had lac +3 R.

Accept colony, all appear to give pure +, - (no undetermines).

9/26 Restricts + to both possible resistant lac+ (like H3 10) all pure lac+

9/28 VIII TEN. Pick lac+ colonies from EMB lac various times to

<table>
<thead>
<tr>
<th>EMB Mock</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1895 + 1956</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Penassay</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45 min</td>
<td>3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>90&quot;</td>
<td>19</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>120&quot;</td>
<td>19</td>
<td>1*</td>
<td></td>
</tr>
<tr>
<td>180</td>
<td>14</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>240</td>
<td>7</td>
<td>1*</td>
<td></td>
</tr>
</tbody>
</table>

Replicate to EMB lac + to verify. Restricts * to verify whether they are actual crosses or false conjugations.

These two are probably second sector colonies.
### 1. Test sensitivity of various strains by cross-brush of broth cultures of E. coli.

<table>
<thead>
<tr>
<th>Strain</th>
<th>LT2 72</th>
<th>PLT22/7</th>
<th>PLT22/12</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EA</strong></td>
<td>R</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td><strong>FA</strong></td>
<td>L</td>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td><strong>SW603</strong></td>
<td>R</td>
<td>L</td>
<td>R</td>
</tr>
<tr>
<td><strong>SW605</strong></td>
<td>S</td>
<td>R</td>
<td>R</td>
</tr>
</tbody>
</table>

**Note:** Host specificity of PLT22/2 or PLT22 as previously recorded. PLT22 remains the phage of choice. Growth in broth and on plates on

- **Stanley**
- **SW603 (Dublin)**
- **attenuated**
- **H901**
- **B d 1,20**
- **D gp**

### 2. Activities

- **Drug**
- **Blox**
- **Blox**

### 3. Although H901 is readily lyed by PLT22, no noted 4-ply agar have been obtained in detailed cultures. Adapted phage should be needed. Work for Stanley:

- **Glyc**
- **Dubc**
- **Paco**
- **Pac**
- **Pac**

### 4. Data from PLT22/603, 607

- **PLT22/12:** SW603 and SW605 are evidently nonvirulent to PLT22/12
Phage - lysogamy test

H-901

Fiebroni

LT10 mixed, (LT1, LT3) probably mixed lysos.

PLT22 very slight

Typhico

Boyd 1104

Lysosomal

Beta C D

Lagging test in

Lysogamy: did not work too well seem to overgrow.

Phages:

1 2 3 4 5

A Stanley, standard study control

B LT1

C LT6

D PLT22+ + + +
1. STANLEY, Tipton...
Repeated efforts to grow P.722 on Stanley, Tipton H701 or 60 have failed, despite plating on agar.

2. Tipton H901

3. Heidelberg SA LT-7 SB LT-22 n.q. Report: OK. See 971 D5...

7. Tipton H9101

7. Tipton H9102

8. Buenos Aires Coli 1-3

9. London dual motuloids
SW694 — resistant to PLT22, PLT7

no FA against SW66C.
9/29/52.

A 6w603 / motility age
B 6w551 1 + typhimurium cemnm 1:100 (indrajal) 1:10
C s typhi 11901 d antiurum 1:500 (indrajal), 1:200

A ++s
B ++
C ++

1. "FA 970-1A, 1B" motile crosstrain (FA: no phage)
2. FA 970-2A, 1B numerous trails and swarms. Streak out and
   keep on slant 971A-1 2 ++s + trails +
   971A-3 test single colonies: Select 2A, 2A' < 2A: 1 b++
   later shown
   Chide between available sera: b, i, d, c, 1:5; 17, 1:2
   Inescapable

3. 7. Scram and trails. 2 plates. Test b, e.
   6 16 isolates all b. = 971A-4 +
   = 971A-5

4. 2/30 8. shrampo trails. 2 plates.
   a 7 isolates all b.
   b 8 were b. = 5, 8.
   (± 5, 8) 971: A6, 971: sandiego + +
   possibly 971 env. - ?
   possibly 971 env. - ?
   parac. + +
   Correct e oxyn labo.
   smell of: 971, 971, very faint env
   1:10 mod. is # 1. e.x. (example.) e swarm?
   + +

5. few trails; scarm

6. " "

Notes: 6w603, A1, A2 are st (yhl) 6w551 is u. weak ±.
\[ 97A := 5w603 + \]

1. 47a-2 (dublin, 0) sw 66 \[ \text{antigen} \]
2. " sw 66 2 " gp ?
3. " gp ?
4. 4720-7 any
5. " "
6. 4720-8 sandiego b b
7. " " b
8. " " 66 1 env?
A. SW063 [span 1/6]

   1. FA 970-1

B. II ?

   1. FA 970-1

   2. SW063 [span 1/6]

   a. SW 160 [span 1/6]

   b. SW 063 [span 1/6]

   c. SW 971 [span 1/6]

   d. SW 063 [span 1/6]

   e. SW 063 [span 1/6]

   f. SW 063 [span 1/6]

   g. SW 063 [span 1/6]

   h. SW 063 [span 1/6]

   i. SW 063 [span 1/6]

   j. SW 063 [span 1/6]

   k. SW 063 [span 1/6]

   l. SW 063 [span 1/6]

   m. SW 063 [span 1/6]

   n. SW 063 [span 1/6]

   o. SW 063 [span 1/6]

   p. SW 063 [span 1/6]

   q. SW 063 [span 1/6]

   r. SW 063 [span 1/6]

   s. SW 063 [span 1/6]

   t. SW 063 [span 1/6]

   u. SW 063 [span 1/6]

   v. SW 063 [span 1/6]

   w. SW 063 [span 1/6]

   x. SW 063 [span 1/6]

   y. SW 063 [span 1/6]

   z. SW 063 [span 1/6]
7. 1st test: 2 plates many tufs (tall as swarms). 16 colonies all b.

parent culture in large phial 2 phases (anti B serum would be valuable).

2d plating 10/2/52 4 plates. 0/8 single colonies: b.

incubate 41 (story b) + 7 (week b) and move into b agar. Also allow to rotate one.

10/4. Both 1 and 7 were moved to b agar, gave 2-3 swarms


swarms not b, 12, 0m ...

T.O. all of these cultures

8. 2 plates many tufs.

7/7 all b. 6/8 b 2/8 react. 

Tubes react only B at 1:10. Rx not very strong but confirmed microscopically. Some 2 b

as 971A-6, 7. I presume that "c" as 971A8 =

SW 66 y

( ch: - )
Sept 29 - 1952

B 2 9/30 2 plates works 10/3 2 buds replant to 11/2
D gp
#1 did not grow out well
#2 mag: i 0.12 Presumably gp.

not Salen MEMB

(Cal- ) SW 674

B 7 9/30 4 plates works PM 1 cream. Very poorly probably contaminant
2 buds, pale to broth 1: b 2: Magg: 0.12, amp, i

Identified as SW 672. Plant on b contain (not Salen).

B 8 9/30 4 plates works

Update: Need d’growth contain? 20/3 no buds on swarma

San Diego
B els en 45

B - 0 Immobilization OK
m: 1: 200 1: 400 1: 800 H 1: 200, antibiotic
in 1: 500, para 13 grew well. However, buds are growing not very poorly!
Sept 29, 1952

C - 0 9/30 14901 not completely suppressed; dense spreading growth may obscure some swarms.

C - 2 9/30 1 plate, robust, PM 1 bud, smear, no migration, b, d, i. Isolate as SW-667.

c - 7 9/30 7 plates, 5 buds 1-5
b - buni
all 5 are b (abnormal parent ped. thin phase)
Isolate as SW-670.

C - 8 9/30 7 plates, robust, PM 2 buds? Need smears.
Both strains both react with rest (a?) Purify and isolate as SW 669-9.
C - 15 (abnormal) 0 10/25 v. faint turbidity away from mo. Plate and kid.

C - PL722 1 plate 2 buds (or 3?) Meats. 678 smears/late.
3 isolates: all 3 are i-, not b, d, 12.

Samuel 97/122

No taides associated with the buds. More buds to fresh plates, broth


CS (anti-Dendritic) but no hoodoo swarm
Transduction to paratyphoid B

10/1/52

D7: many mutants pooled: all cold sensitive, s/5 b

D8: Several kinds. Role in test (D7B:1-)

9/18, plant individual colonies from original pool to b again. (two kinds of diploids?)
D7B gives weak reactions after transduction and some D7B1 mutants.

D7B2 gave weak reactions after transduction and some D7B1 mutants.

D7A1 = b
D7A2 = b
D7A1 and 130 give weak b SW671

B1 maggi? (2nd phase?)

D3 10/2 From survivors transplanted to b again. No rec. 17?

From survivors transplanted to b again. No rec. 17?

D3: From survivors transplanted to b again. No rec. 17?

D5 10/3 PA n.g. 10? 3 buds ± stuck and lost single colonies. See 8/16/53

D15 10/24 Numerous single survivors. Role in test: see 9/7/54

D18 (L-2R) 1/8/53 FA18 x 666. 51:52b. Note concordance

with 22 x 666 see 9/86

D6 10/7 3 survivors. 2 nan. B 1 b. Save var. b as SW 669

FA39 (sendai) 12/4/52. 306: 2a (22? i rejected) Survivors may have some mixed.

SW

2/3 weak and "cling" b have not been carefully studied. May represent

feature of? Throw out
\[ \begin{align*} &\text{+3} \\
&533 \rightarrow 534 \rightarrow 588 \\
p_{23} &\quad 0 \quad sp^+ (1, 2) \end{align*} \] 

Note: 588 still

sure, like

6^{-3},

5436^+ are rest}
FA58 (SW960) appear inactive re FLa. (SW66; SW467)
FA55 and FA57 x SW616 give 6 only
\[ \text{unusually short} \]

\( 57 \times 967 \text{ scores unusually short} \)

3 trials each FA57 x main or (d, a, 123 remain) to secure \( \frac{x}{17} \)
7, 3, 2 resp. FA57 is designated as 26
but should be renewed.
Compare X 942-1 and virion on sw592

No improvement.

sw543, 4.5i3 seems resistant.

Typhi derivatives:

<table>
<thead>
<tr>
<th></th>
<th>942-1</th>
<th>X/592</th>
</tr>
</thead>
<tbody>
<tr>
<td>703</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>588</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>633</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>537</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

(labeled) 976:54
A SW541 schr3 4m3 3 xyl 2 cec uv (OK).

1 earl??  Cal8.1  Xy1  rosbuck. SW665
excellent mutant: no transduction, papilla are clear in 48 hours.

Appearance rather high yield compared to SW435. Should be compared closely
Plate + PLT2/2. Pick papilla + streak to test stability

12 papilla. Streak to give large but poorly fermenting colonies!

Compare SW, 665 and papilla! (possible a xyl, wire, clone, in this background).
In various tests, nicotiamine, scoring. Best result: incubate
at 37, thermostymp. No sign of segregation - not many tests

SW603 5 gal 1 xyl
↓
1 second col.
↓
good col. SW666

excellent mutant factor. Pick papilla + streak to test stability
+ PLT2

plaque-former (e.g. p. x 10^-4)

8 papilla. I appear only 973 81 1 destain several
colonies.

All others appear stable.

10/1 Picked 16. (all large papilla only). All+ apparaeable not at all stable.

Product: no - auxin, cot + 2c. Showsambi mutability. Revert this
as 973 102: repeatl - and - mutted (phase?). Revert once again.

Appears to throw stable, mosaic types. Repile B1A to look for new stable,
"stable" 1 colony is stable.

Sheets of B1A mosaic daily - ?, +. Check + revert -

This unstable transduction segregates pure + and -

(pen) hysteresis pure and -
973D PLT22 + sw665
973D 0.5ws541 + sw665 xfl.
973E PLT22 sw435 cal. - 20: all pure +!

D) sw541, transduction of sw665 behave very peculiarly on xylose.
    Sharp, Xyl+ colonies give - reaction; sw541 strain gives
    inconsistent response as EMRS xylose, but not to cause a false
    negative reaction. Only one reaction gave a typical +
    reaction. 24 hours 22 - 1+ 1++1++ !

These colonies gave typical + reactions on original plating.
Possibility: interaction with sw655? Try mixture.
Save 1 plate which carries 1++, 1+, 2-.

1 2 3 4
Efficiency of transduction and effect of serum.

FA in PLT22 966-H.
Mix fluid to 10^10 cells/ml with 5 ml FA (cold, acid).
Let stand 5-10 minutes, plate 1 ml.
1 = SW665 or EMB Xyl
   Note self-plug.
2 = SW666 EMB Cal
3 = SW Y35 EMB Cal

<table>
<thead>
<tr>
<th>papillae/ml FA</th>
<th>0.05</th>
<th>0.025</th>
<th>0.01</th>
<th>0.005</th>
<th>112 sec 10 mm</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>SW665/Xyl</td>
<td>477</td>
<td>218</td>
<td>40</td>
<td>31</td>
<td>1</td>
<td>self plug</td>
</tr>
<tr>
<td>SW666/Cal</td>
<td>15</td>
<td>6</td>
<td>5</td>
<td>40</td>
<td>0</td>
<td>self plug</td>
</tr>
<tr>
<td>SW Y35/Cal</td>
<td>53</td>
<td>50</td>
<td>31</td>
<td></td>
<td></td>
<td>why non-lumic?</td>
</tr>
</tbody>
</table>

JAN 2 6 1955 This calculation at only 10^6 papillae per phase of 100D95 strain of
Repeat 12.

10/5 4 swarms from 2 adult plates
to i,12. no swarm.

10/7 4 adult plates: one broke. 6 to i,12
2 showed slight movement (moisture?): both are b
others remained stationary.

10/8 18 adult swarms from 2 large plates (including pool swarm)
all stationary on i,12 again.

Total 30 swarms: all i. ?
Note: 974 DDS B

1. Seems to show purity of individual strains but control may be inadequate.

2. In these cases tested, failed to isolate O forms from initial flora. 
   Traces themselves not tested. Established growth 
   appears to be inhibitory to approximatives. May need further methods: su 680.
<table>
<thead>
<tr>
<th>FA</th>
<th>SW</th>
<th>plate in</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12</td>
<td>609 A&lt;sup&gt;i&lt;/sup&gt;→H&lt;sup&gt;+&lt;/sup&gt;A&lt;sub&gt;y&lt;/sub&gt; ?</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td>618 A&lt;sup&gt;i&lt;/sup&gt;→H&lt;sup&gt;+&lt;/sup&gt;A&lt;sub&gt;y&lt;/sub&gt;</td>
</tr>
<tr>
<td>3</td>
<td>22</td>
<td>618 A&lt;sup&gt;i&lt;/sup&gt;→H&lt;sup&gt;+&lt;/sup&gt;A&lt;sub&gt;y&lt;/sub&gt;</td>
</tr>
<tr>
<td>4</td>
<td>11</td>
<td>435 A&lt;sup&gt;y&lt;/sup&gt;→H&lt;sup&gt;+&lt;/sup&gt;A&lt;sub&gt;i&lt;/sub&gt;</td>
</tr>
<tr>
<td>5</td>
<td>11</td>
<td>623 A&lt;sup&gt;y&lt;/sup&gt;→H&lt;sup&gt;+&lt;/sup&gt;A&lt;sub&gt;i&lt;/sub&gt;</td>
</tr>
</tbody>
</table>

Repeat

6 12 609 b → i SW 685
7 22 609 b no buds i.e. "swarms" is still i

C5. 10 buds 9/10 b 1/10 still i admixed.

974/03 repeat 11/1/52. Use relatively light bacterized medium. This seems to work much better. Numerous swarms (not well separated when finally seen). Includes 2-3 phases. Pick those as possibly synchronously regenerative of b.

C3 3 phases (fudan from contam. by bloated b not eaten.) How in essence, pick quite early and select on i again: act i

C3 3 distinct swarms for any i: 16 - all i, 10<sup>s</sup> resub FA.

(#10, #15 maybe 10<sup>s</sup> or 10<sup>s</sup> FA. See 993.

4/5 Molecular: 1/5 — b. (Possibility of contamination). In further experiments use added X cells as a contamination inhibitor (e.g. 666 K).

After pub. ket have #1, #4 ex SW9
1. FA76 (sw642) + sw666. only 2 swarms - both i

2. PA (sw685) " plant m i, began

3. " (c86) no Tor S! "

4. PT22 " many swarms. pool and stick out

5. FA 12 (b23 = iand i) " individual swarms pulled out

1 Repeat. mixed swarms - no motility as i - again.
   Test pool growth: a) no agglut! b) c+ as usual.
   b) reacted b, (c + ?) c

2. " as above (c)
   i and b1!

5

4

12
b

This experiment was recalled to be confused, and these results blown out!
From previous experience, 4 should give a mixture of b and i, 5 i only.

REPEAT 10/17.

4 b+i? post was destroyed. Test colonies: 14/14 b

7/7 b

7/7 b

7/7 b, not c. 

Missed on b again.
D1 separate T+S

D2 1 plate T+S pool t both react o i++ Colony het from strain 4i:2b

D3 No T or S need new PA

D5 both individual strains b i agar agar b swarmed i swarmed

b and i Total

8 19

personal difficulty not reproduced

D2 affects F-2 progeny test of limited transduction
10/21: Isolate SW623 single colony (b) and prepare FA (FA9 + …) 
FA(SW623) + SW666 = many T+ S- (very well defined on large agar plates)

5A. Preliminary results: retest
10: i 1: b (may be similar?) retest

5B. FA12B + SW666 = motility agar, well separated swarm and trails.
Count: 14 lateral swarmers (mostly T+ facilitators) 46 trails. In many cases, 
the trails fuse out into swarmers. Pick well-isolated swarmers for facilitation test.
Plate these out to reisolate presumable T+ competent.

At least 2-3 mm Halo from SW666 (2 batches) No T+ S- (check compatibility)

FA12B controls No T+ S-

Spot on i (0.6) agar, incubate 5/15 i immobilized.
Call, Katsapilid, keybad agar, but incubate also single b dropped around 
and retest all are immobilized. Real swarmers were pure.

Spot i on b plate and v. (16 swarmers 8/16 grown poorly) 

6. FA18 (PLT22/LTA PHASE 1, 2) + SW666.

\[
\frac{16}{16} b
\]

Total 18/18 all b
No 1/2 ???

Spot in b agar: no swarmers. Typical abnormal growth, some
mutual inhibition.

\[
\text{Conclude these are monofac}. \quad b \text{ identical with SW618.}
\]

(over)
57B: 3 flakes streaked out.
15 colonies tested from each: all x NO O Torres.
(45 tests !)

Perhaps the flakes are not actually 0 microcolonies.

12 isolated buds tested: 11 → i
       1 → b (≠ 12)

Spot on NSA, transfer to homologous screenagar.
all mini-tyeps: i, each screen
is pure

The agrees with 15/15 individual tests each of 3 screens.

Note 11/8. 00688 (tong/tough) gives very coarse flakes
on motility agar, prior to late "smooth" success. Dissolate
and compare morphology, success i original undissolved.
This maybe the basis of flakes. See 978.
FA21 → sw666 1st test: age too stagnant? 2d test activity?
Repeat prep: FA9, LT7.
New FA9 prep. apparently hydrous but activity still poor.

New LT7 prep. expected to be few radicals 2nd summer, but might be summer?

Test other hybrid's for reciprocal to LT22, cf. 697 which is pyramidal.
E.g. 974/D5S6: 1-11 and sw697. Allow no hydrous plate with FA9 except #6 = sw904. However in both 697 does seem to be inhibited by FA9!

FA21A (704) × sw666
27 survivors: 25 i × 2:1

Note: in 974/D5S6: 111 i 10 a = LP22

2 FA20 × activity? / a number of survivors delayed later. Hinder development: quenches an ups

Extract: 1 survivor → 4 i

New prep (FA9) → + survivors fairly reproducible

22 → all 6 (not i) 23 total

Test on FA9: 15 21 R of 486
October 4, 1952.

Many fewer swarms occur in antigen substitution experiments (e.g., R typhi x R typhimurium) than in "transinduction" (e.g., SW 93 x R typhimurium). It appears likely that this is due to a lower frequency of occurrence. The SW 93 transinduction follows a suppression of the substituted.

10/3. Plant D2 (SW 666 + PA 2722/3) on motility agar ± 6, 2/12.

Not swarmer. Many trails and swarms (ca. 60 trails, diff. swarms)

a. 1 kind
   a1: Transplant
      b. 1 kind, 0 trails.

Could this effect be due to O-antibodies? Normal sera should be used.

Also, cf. 97/10.

D3: 19 'swarmer' swarmer

D3/6: Not kind, swarm, or trails.

Repeat D4, D3/6, /6, /6 (test specificity of effect)

D5: D3/6: swarmer, ca. 15 trails

D5/1: Ca 12 trails.

D5/6: Not kind, swarmer.

D5/6: 1 + 5 as above.

In this case, it is specific. Cf. 97/9


Note. Magglutinable phases might come either from PA or alternate phases in SW 603. Occasional kinds appear in each plate of SW 666/6, e.g., SW 073. - Magglutinable by 6, 1, 2, env... Furthermore they may be magglutinable (accessory capacity) = env. show very weak reaction with our one serum.