

Ratio of types

457.

I 5 K

A. 5 ml Y40; 1 ml Y53. Group by plate (1-4) and colony size (6+5).

	-R	+R	-S	+S.
1L	5	4	2	2
1S	7	2	3	0
2L	7	3	2	0
2S	6	1	2	1
3L	8	1	4	1
3S	3	4	4	1
4L	6	3	1	0
4S	6	4	1	0

L: 26 11 9 3 49

no ev. of selection here!

S: 19 11 10 2 42

O.K.

Σ : 45 22+ 19 5. / 91.

B. 1 ml Y40; 5 ml Y53.

	2	0	1	1
L	2	1	3	0
5	1	0	0	0
S	7	1	0	0
	7	2	0	0
	21	5	2*	0
	22	5	4	1

same plate! ~~check for others~~
no S/plate!

do not use this expt. no too
small any hour

464 x 58 - 161

460

15 min

-R + R -S + S

 B_1^+

7	1	7	5
4	0	6	1
2	0	3	3

 B_1^-

4	0	5	1
<hr/>			
17	1	21	10

TL

Lac-R	Lac+R	Lac-S	Lac+S
2	0	3	2

BTL

2	0	0	1
---	---	---	---

Y80 x Y81.

~~460~~
461

Repeat 451 for lac seg. test + for gly-aggregation:

Plate is T(0), T(B), T(B₁).

1 plate - Y80 in B₁ to check on reversion of M.

B₁⁻ >> B₁⁺

Totals of gly + seg.

Cult
461. 198

451 29

441 70
29.7

++.	31 / 31	Gly +
	27 / 27	
	10 / 10	
	<u>32 / 32</u>	
	100 / 100.	

fun B plates:	42 / 42
	20 / 20
	8 / 8
	<u>28 / 28</u>
	98 / 98

1. Linkage is very tight, perhaps requires a double X against interference
2. Cytoplasmic inheritance
3. Trifug is an reversion.

Y80/G → no colonies

March 20, 1947

Grow Y80 + Y81 in mixed culture, and plate out on EMB medium. Select Lac + colonies and test for Kle reactions to determine possibility of transformation.

plate too crowded. to be rescaled.

Fermentation mutants.

463

March 22, 1947

Mor Y40T (mustard see 440) and Y53T in YB P 22

spread diluted cultures of Y40 on EMB-lactose 1% P 23
of Y53 on EMB glycerol 2%

and incubate at 35°.

Y40-lactose. ca. 13,000 colonies. mucoid.

Read P 24. ↑
1. lac- 1. translucent pigmentation. recover fastest
~~lac-~~ V87. Lac- ✓ V_R ✓
V_S ✓ V_T ✓
Nutrition: as mutants.

Y53-glycerol. ca 20,000 colonies.

mucoid - 1 (2?)

gly - 1? (mucoid?)

gly - probably contaminant.

Test by streaking
on lac, V.

Selectors, etc.

464

March 21, 1947

A. 440 x 453

B. 58-161 x 464.

phage n: 9: lac - unreliable as they were scored
on second transfer to lac-V plate for checking
on phage

	lac-	lac+
T/0) rand.	20	5
	+30	+15
small	23	4
large	18	6

B.	random	27	17	!
	Small	31	8	
	large	39	14	

These data are too
uncertain to
be used.

B. -R +R -S +S.

{ L	0	0	4	5	
{ S	2	0	5	1	

T/0) rand	33	12
to small	15	13
large	22	8

difference A + B $p = .1$

B,	small	16	8
	large	15	7

101 48

269 102 | 371 = 72.5%

Dye resistance as a means of
selecting recombinants. 465

March 22, 1947.

Pick various resistance mutants directly to YB + incubate 48 hours.
Plate as indicated.

Phy / Pro. 100 M.G. 10. turbid. Phy / Sti 100
 20 turbid
 50 turbid
 100 st. turbid - keep. ca. 100 resists.

Phy / Sti 100 B.G. 100 turbid!
 Sm 50 clear - some resists. ca. 10^3

Phy / Pro seems M.G. resistant also, to acutam ext.

Staph / M.G. 5 M.G. 5. lympholytic turbidity. some "resists"
 10 clear plate.
 20 "
 50 "
 100 clear
 B.G. 100 clear

Pen. 1 turbid.
 5 spots clear = resists.
 10 turbid
 50 turbid
 100 turbid.

* Staph / Sm. 5 Sti 10 clear & resist. - to acutam
 20 clear

Sm / Sti 100 Sm 5. clear - small resists.

Sm / Mg 50 B.G. 100 turbid.
 Pen 100 turbid.

520 / Bg 100 Mg 0.5 ureg. turb.
 1 clear - no income.
 5 clear!
 10 clear!

521 / Bg. clear zone in center (not mixed?)

18th 10 Pen 100 turbid.
 Sm 10, 5 turbid 18th - turbid
 Sm 10, turbid.

Chloroacetic acid ceseolame.

466

March 22, 1947.

See Penfold 1911.

Streak Y53 on NA + various conc. Monochloroacetate mut. ± NaOH
conc. expt. as for acid.

1/pen ml

- 50 continuous growth
250 dim growth of streak ± ca 10 papilla of large size per streak.
500 Background growth less. do.
1000 = " " very slight.

Pick papilla of 1 to new 1/2A plate. P24.

Isolated colony to slant: Y88

bros into fermentation tubes P26. (Pathy or Bd.)

Y53 glucose 1% glycerol 1%
A++ ++G A± ±G

12h. Y88 A++ -G A± ±

see 468.

36h. Y53 A++ /+ A+ +G ||

Y88. A++ A+ ±G ||

Segregation of Mucoid Resistance

467

March 26, 1947

b, T(0).

A. Y86 x 58-161 prototyphles rare (2/7 plates!)

B. Y86 x Y40.

A.

8 mm mucoid 7 Lac-
all-resistant. 1 Lac+.

1 Smooth. Lac- VR^S ! ~~Mucoid different from
resistance? J.~~

check.

B. . 28 mm mucoid 8 Lac+
all-resistant. 20 Lac-

1 Smooth Lac- VR

9 Lac+ : 27 Lac-

Smooth 2 Lac- : 0 Lac+.

Prepare Smith fermentation tubes & Nutr. Broth + various supplements as ind.

Formate includes 4/20 phosphate buffer.

12h. control formate 1/2% F+gluc 1% F+men 1% gluc 1% men. 1% malt 1% sucrose 1% glycerol 1%

YS3 - ✓ - ++ + + ++ + + ++ + + ± ± ± ± - ± - ± -

Y88. - ✓ - ++ + + + ± ± ++ + + - ++ ± ± - ± - - ±

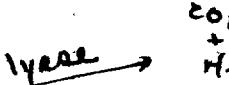
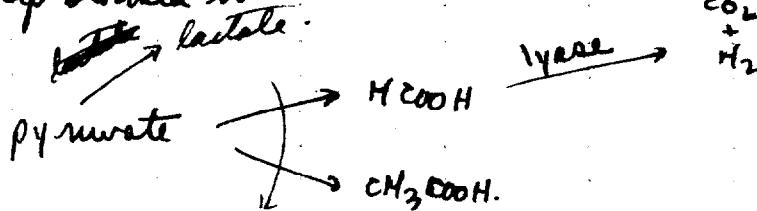
pyruvate 2%, lactate 1%, malate 1%, acetate 1%.

YS3 ++ + + - - - - ✓ second reading 72h.

Y88 ± ± - - - - - -

Formic hydrogenlyase is apparently intact.

∴ step blocked is:



Try: utilization of pyruvate in synthetic medium.

Carbon source utilization ($T(0)$) - asparagine + TLB.

Suppl: 1 - 2 pyr 2% 3 lact 2% 4 gluc 2% 5 malonitol 1% 6 acetate 1% 7 glycerol 1% 8 malate 1% 9 formate 1%

YS3: - + + + ± + + ? + + + + + + -

Y88: - + + + + + + + + + + + -

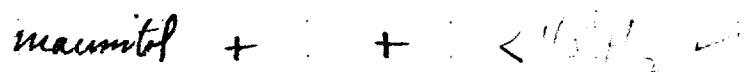
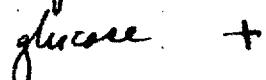
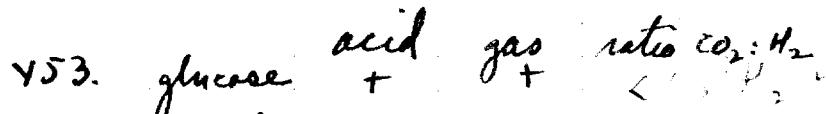
malate } were most eff. carbon sources → major difference.
malonitol }

w.t. mutants

+	++	++ formate
+	++ +	- glucose
+	++ -	- pyruvate } major differentiation
±	± ±	± glycerol
+	++ +	++ malonitol
+	++ ±	± malate
±	± ±	- sucrose
-	- -	- acetate etc.

utilizes AcO? wt. dec

collect gas (if any) in Duthie's tubes & estimate gas ratio).



March 28, 1947

Y77 x Y78. (\therefore Y6 Yx 58-161)not a good expt.

O.	-R	-S	+R	+S.
	8	8	0	3
	3	1	0	0
	4	8	2	0
	<u>15</u>	<u>17</u>	<u>2</u>	<u>3</u>
B.	6	12	0	3

This distribution is
entirely different from standard
~~Y6 x 58-161~~

21. 29 2 6

$$\begin{aligned} R:S &= 23:35 = 40\% (1-60\%) \\ -:+ & 50:8 \\ &= 86\%. \end{aligned}$$

Test for M.G.R.; S₁R:

O:	MG S	R	S ₁ S	R
	-R	16/16.	S ₁ S	4/16.
	+S	lost; mostly R.		
	+R	S; R	S; S.	
	+S.	R; R; R	S; S; S.	

Probably a definite alteration of
frequencies. Too few as lethal
recombinant or for an additional
mut. req.

B.	-R	-S	+R	+S.	S₁; R	all	grn ^x	grn ^x

not certain
as at best only
a dozen colonies
appeared at site
of streak.

- have all MG R
- S are > MG R
- + R variable
- + S variable

Formic Hydrogenlyase.

469
470

March 27, 1947.

Inoc 153 heavily into Nutr. Broth + 2% glucose + 1% formate.

Grow 12 hours. Wash cells once + suspend 100 ml \circ in 5 ml of buffered (6.8 4/10 phosphate) 1% formate, sputically \in Smith tube.

Gas production was marked within $\frac{1}{2}$ hour. NaOH abd. ca $\frac{1}{3}$ of gas.

Repeat \in K-12.

Inoc. 1) glucose-formate-broth + 2) 2% pyruvate broth heavily \in K-12 5 P 28.

Washed cells of 1) gave $^{++}$ gas on formate
2) gave no gas on pyruvate.

Segregation of Cla^R

March 28, 1947.

Y88 x Y40. on T(0).

Test 20 isolates.

	Lac V	Cla^-	Dextro-glucose pyr EMB
1	-R	S	+
2	-R	S	+
3	-R	R	+
4	-R	S	+
5	-R	R	+
6	-R	S	+
7	-S - R	R	+
8	-R	R	-
9	-R	R	-
10	-R	R	+
11	+R	R	-
12	+R	R	-
13	+R	R	+
14	-S (3)	R	-
15	-R	R	-
16	-R	R	-
17	-R	S	+
18	+R	R	(ok)
19	-R	R	-
20.	-R.	R.	-

Many of the large colonies in groups 1 appear to be yellow suggesting possibility of contamination.

Repeat cross.

② #14 seems OK however. Spreads out on NA and Cla^- for use in metabolic studies.

Isolate further, avoid "yellow" colonies.

all 3 sets show same no. of colonies on NA and on Cla^- .

Rich colonies from No. 1 to 20 stand as Y89-1, 2, 3.

reverse losses

472

March 18, 1947.

A. Y40, Y53 B. Y64, S8-161
on minimal.

A. Plate size	-R	+R	-S	+S	small
1.	6	1	2	0	
2.	6	2	1	1	
3.	3	1	4	0	
4.	7	1	3	0	
5.	6	1	8	0	
6.	3	3	3	0	
small.	6	7	2	0	

$$37 \quad 16 \quad 23 \quad 1 \\ 53:24 = 69\% \text{ R/S.}$$

B.	8	1	12	8
<u>total</u>	9	20	31	127

$$9:20 = 31\%$$

B	-R	+R	-S	+S
2	2	4	5	0
3	3	5	0	0
4	0	0	1	0
5	3	1	0	0
6	6	3	0	2
7	3	1	3	0
8	3	1	4	0

$$20 \quad 15 \quad 13 \quad 2 \\ A:S = 35:15 = 70\%$$

Compare A_L & A_S totals.

.11	.53	.23	.04	
37	16	23	1	
20.18	15.75	13	.06	77
2	2	2	50	
57	31	36	3	127
		39		

$$\chi^2_2 = .11 \\ .18 \\ .153 \\ .75 \\ .04 \\ .06 \\ \hline 1.67$$

OK. compare

R/S +/- $\chi^2 = 3.14$ p = .08 & cumul. data -
 K .69 .22 $\chi^2 = 3.14$ p = .08 & fit
 G .70 .35 .07 for fit
 T .31 .31

perfect fit.

April 3, 1947.

16 hours.

Agent.	conc./20 conc. ^{mg/ml}	Y88	
		Y53	Y88
Fluoracetate	.05	++	++
	2.5	++	++

intermediate
conc. do.

Chloroacet. 1.0 ± ++

cb^R hydrazin. 10.0 ++ ++

iodacetate, 1 mg	5r	++	++	showed no resistance
	50r	-	-	resistant colonies appeared profusely
	250r	-	-	in 36 hours (do ^R). Y90.
	500r	-	-	
	1 mg	-	-	a) mutational effect or manifestation
	2.5 mg	-	-	b) liability of double mutant due to metabolic cycle like.

Streak suspensions on surface of
poured NA plates. ++ indicates
heavy confluent growth.



Y90: Ia - resistance.

April 7, 1947.

1. Streak Y53, Y88, Y90 on Ia plates (50, 100, 200 r/ml)
2. ~~Streak out Y90 on 50 r/ml. do.~~

No growth on any plates by any of the cultures.

475

Acetate utilization
exogenes.

April 8, 1947.

Noc. (lightly) T(m) + sugst. = K 12.

24h. 36h. 48h. 72h. 84h.

1. Acetate 1%	-	- -	-	+	++
2. Acetate + gluc + malate .01%	-	- -	-	+	++
3. Malate .01%	-	± +	✓	+	++
4. Glycine 1%	-	- -	✓	-	-
5. Glycine 1% + malate .01%	-	- -	✓	-	-
6. Malate 1%	±	++ ✓	✓	++	++
7. Glycine 1% + malate 1%	-	- -	-	-	- glyc inhib
T(m) + glucose 2% + acetate					
8. Glycine 1% + Acetate 1/2%	-	- -	✓	-	-
9. Pyruvate 1%	-	± +	+++	++	
10. Pyruvate + Malate 1%	-	± +	+++	++	
11. Acetyl-glycine	± +	+	+		

Acetate seems to be inhibitory (cf. 1, 2 + 3). ∴ try K 12 on various acetate, glycine concentrations. Noc PII.

T(m) + A13 P13

Acetate

1	1%	-	-
2	.5%	±	+
3	.1%	+ .. +	± More opt. conc.
4	.01%	±	±

Glycine

5	1%	-	
6	.5%	-	
7	.1%	-	
8	.01%	-	

9 0 -

Nutrition of 679-~~183~~ 662

476

April 10, 1947.

r/10	α -kG	glut	etc. 8102 1810	12h	24h.	36h.
1.	0	—		++	++	++
2.	0	5r		+ ±	++	+
3	0	200r		++	++	++
4	5mg.	—		++	++	++
5	5mg.	200r		++	++	✓
7	2.5mg			++	++	✓
8	2.5mg	Imgalanine		±	++	++
9	2.5mg	Imgalanine + 100r Bc		±	++	++
10.	5mg	5r		+++	++	

adaptation?

Droc. 679-183 into T(0) + threonine + indicated supplements to test nature of block of this glutamicless mutant.

indicates strongly - the utilization of α -keto-glutaric acid by this mutant.

Test 10 single-colony isolates of 679-662.

Values:

	T + 0	T + glut	T + α kG	glut.	24h
1	—	+++	+++	—	✓
2	++	+++	+++	++	✓
3	—	+++	+++	—	✓
4	++	+++	+++	—	✓
5	+	+++	+++	—	✓ ++
6	++	+++	+++	—	✓
7	+++	+++	+++	—	✓
8	—	+++	+++	—	✓ +
9	—	+++	+++	—	✓
10	+	+++	+++	—	✓

no. doubt of utilization of α -keto glutaric

T- OK.

transfer 1 and 2 as

T-G- a & T-GK resp.

Y89; K-12.

477.

April 10, 1947.

1.) $\text{macetate } 1\%$ 12h 24h 48h 72h.

K-12	=	±	++	++
Y89.	-	±	±	±

2) mglucose -
 $K-12$ A 5
 $Y89$ A ng.

Formic H-lyase Activator

478.

July 11, 1947.

per liter.

NH ₄ Cl	5
Na ₂ SO ₄	2
K ₂ MnO ₄	3
KH ₂ PO ₄	1
Malic acid	5 g.
NaOH	3 g.
Trace Elements	
MgSO ₄	.2 g.

= Formic hydroxylase basal. = FH(0).

Use $\bar{\epsilon}$ Durham tubes.

= CO_2 gas.

12 hr. 36 hr. ~~24 hr.~~

K-12 Y89. . . K-12 Y89. . .

-	-	-	+	-	+	-	
±	-	±	-	++	-	++	-
-	-	-	-	±	-	±	-
-	-	-	-	±	-	±	-
+	+	+	+	++	++	++	++
-	-	-	-	±	-	±	-
+	±	X	+	++	+++	++	++
-	-	-	-	±	-	±	-
+	+	-	+	++	+++	++	++
-	-	-	-	++	++	++	-
+	±	-	-	±	-	±	-
-	-	-	-	-	-	-	-

1. FH(0).
2. FH - glucose 2%
3. FH - formate 1/2%
4. FH - glucose 2% + formate 1/2%
5. FH - glucose + formate + γ. ex.
6. FH - glucose + formate + vits.
7. FH - glucose + formate + HC.
8. FH - glucose γ. ex.
9. FH - formate γ. ex.
10. glucose 2% + formate 1/2% + γ. ex.
11. T(0)

γ. ex. 5% + 1/2% HC

Formate is inhibitory, reversed somewhat by something in HC or in γ. ex. perhaps by way of formation of formic dehydrogenase.

Enzyme 5%

Hydrogenlyase everyone.

479

April 13, 1947.

	H-12 12 h.	Y89 12 h.	K-12 24 h.	Y89 36 h.	K-12 36 h.	Y89
1 FH(0) + glucose. ^{growth yes}	-	-	-	+	-	-
2 + formate -	--	--	-	±	-	±
3 + glucose + γ.GK. ++	++	-	++	++	+	-
4 + formate + γ.GK. +	±	±	++	++	++	-
5 + glucose + N2Case ++	±	++	-	++	++	-
6 + formate + N2Case +	±	±	++	++	++	-
7 + glucose + HC	+	±	+	++	++	-
8 + formate + HC	-	-	-	-	-	±
9 + glucose + EAA	±	±	-	+	-	±
10 + formate + EAA	±	-	-	+	-	±
11 + glucose + NAA	±	-	-	++	±	-
12 + formate + NAA.	-	-	-	-	-	±
13 + glucose + EA + NA + vits.	-	+	-	++	±	-
14. glucose + tryptophane.	±	±	-	+	-	-
15 formate	-	-	-	±	-	-

100% growth

Compare poor activities of NA. ± high activity N2Case & intermediate activity of acid-hydrolyzed casein.

NA, tryptophane have slight activity.

try individual NA. & more tryptophane

Oxidation tests.

4/19/2

Drown in acetate 1% broth. Wash & adjust to ca. = densities.
1 ml (\approx 5 ml original) bacteria in 4/10 phosphate + substrate.

Acetate .1%	K-12	y89
Pyruvate .2%	ca 150	ca 150
	ca 10 min	ca 35 m (not complete)
	ca 2 min	ca 3 min.

4:05.

K-12 1 - ClAc.
 2 Ac -
 3 Ac ClAc

cont'd?

④ ~~Pyr~~ ClAc 4:30.

5 Form { 4:20
6 Form ClAc { 4:20

Carbon metabolism of 679-~~1~~ 662

11/10

K-12 679-662

1. T(+) (100r/10ml). - -

24h.

2. T(+) + .1% glutamic acid ++ ++ pellicular growth.

Requantitative response.

T(+) + glut α -ketogl.

0

0

+++

3r

↓

do.

1mg
/10ml

∴ this strain has fully reverted & data on acetate utilization are fallacious.

Reisolate from trypticase & check rigorously. OK

use α , β hydroxybutyrate instead of glutamic acid for growth OK.

Utilization of Acetate

480

24 APR 1947

T(m) + Acetate Glucose		24h. 36h. K-12	48h.	36h. 48h. K-12
Acetate				
.1%	-	+	-	+
.1%	1%	++	++	+++
.2%	-	+	+±	+
.2%	1%	++	++	+++
.5%	-	++	++	-
.5%	1%	±	++	++

? + Mutant is acetate-. Not inhibitory.

~~are acetate + glucose inhibitory when autoclaved together? I. Cf. 475. In pure veget. test was in phosphate buffer.~~

Glycine utilization data are needed

autoclaved together.

T(m) + Acetate Glucose Glycine.

.1%	-	-	.1%
-	-	.1%	.1%
.1%	-	-	.1%
.1%	1%	-	.1%

1	.2%	-	.2%
2	-	-	.2%
3	-	1%	.2%
4	.2%	-	.2%
5	.2%	1%	.2%

6	.5%	-	-
7	-	-	.5%
8	-	1%	.5%
9	.5%	-	.5%
10	.5%	1%	.5%
11	.5%	1%	-

12 - 1% -

IAc Resistance etc.

481.

2. 5/11/67

Prepare plates of NA + IA 50r, 100r/ml. etc. streak thickly.

CLA \perp ^{mg/ml} CLA \geq IA \leq ^{r/ml.} NaN_3 100

Y53 } Y40 } 24h. \pm pap. \pm pap -
Y88 } Y88 } \pm " pap - \pm pap - \pm

Y53 } Y40 } 36h. ✓ ✓ - do. \longrightarrow isolate for $B-M-T, Ia^R$ Y90
Y88 } Y88 } \times - test on 100r/ml
isolate for $B-M-V, C_{at}^R$ Y91
small colony acid, gas, glucose.
on Y40 streaks. (Too conc. NaN_3).
acid, glucose.

Lack of Ia^R from Y88 + Y53 may be due to the more recent origin of these isolates, & a smaller chance of accumulating mutants.

Y53
Y40
Y88 60h.

- pap. small colony
 large colony } some residual growth in
 - } very tiny colonies.

Y92 A_2^R . note: zone of adjacent streak was v. strongly stimulated. pH effect likely.

Y93
 \approx Y53 ~~Ia^R~~

No Ia^R from CLA^R ?? Bro very heavily 124 - confluent growth. see 497.

Segregation of Cla^R .

482

2 APR 4, 1947

V40 x V89.

Held in icebox

Comp. O; B, on lac V sign.

T(0).

	Lac - VR	Lac - VS	Lac + VR	Lac + VS
	24	9	(24)	2

Cla^R	Cla^S	Gas^+	Gas^-
14	6	3	2
5	2	7	0

Scoring is highly uncertain as tests were done on complete medium allowing the contaminants to grow ahead. No. of from sample tested.

T(B₁).

	20	7	9	0
	10	6	4	0

	30	13	13	0
Cla^R	4			
Cla^S	1			
Gas^+				
Gas^-				

Total 4/78 Surr. 2-R
 1-S
 1+R.

Segregation of Cla^R

482

YY0 x YY8.

T(0) Pick from Lac- ν tests to water streaks on Cla (1-2 mg/ml)

1 -	1	Lac- ν	+R	Cla
2	2	-R	R	R
3	3	-S	R	R
4	4	-S	S	R
5	5	+R	R	R
6	6	-S	R	R
7	7	-R	R	R
8	8	-R	R	R
9	9	-S	R	R
10	10	-S	R	R
11	11	-R	R	R
12	12	+S	R	R
13	13	-R	R	R
14	14	+R	R	R
15	15	+R	R	R
16	16	+R	R	R
17	17	+R	R	R
18	18	-R	R	R
19	19	+R	R	R

2 -	1	Lac- ν	+R	R
2	2	-R	R	R
3	3	-R	R	R
4	4	+R	R	R
5	5	-R	R	R
6	6	-S	R	R
7	7	+R	R	R
8	8	-S	R	R
9	9	+R	R	R
10	10	+R	R	R
11	11	+R	R	R
12	12	-R	R	R
13	13	-S	R	R
14	14	+R	R	R
15	15	+R	R	R
16	16	-R	R	R
17	17	+R	R	R
18	18	+R	R	R
19	19	+R	R	R
20	20	-R	R	R
21	21	-R	R	R
22	22	-R (S?)	R	R
23	23	-R	R	R

$$\text{Total: } 56/58 = S$$

$$+ \frac{18/20}{}$$

$$74/78 = S.$$

$$R = 5\%$$

1 -	1	R
2	2	-R
3	3	-R
4	4	+R
5	5	-S
6	6	-R
7	7	+R
8	8	-S
9	9	-R
10	10	+R
11	11	-R
12	12	+R
13	13	-R
14	14	+R
15	15	-R
16	16	+R

Test this group
in B₁-T(0)

1	-R	(S)
2	-R	(S)
3	+R	(S)
4	-R	(S)
5	-R	(S)
6	-R	(S)
7	-R	(S)
8	-R	(S)
9	-R	(S)
10	-R	(S)
11	-R	(S)
12	-R	(S)
13	-S	(S)
14	-R	(S)
15	-R	(S)
16	+R	(S)
17	-R	(S)
18	-S	(S)
19	-R	(S)
20	+R	(S)

+ - S + R + +
B. B M C a L a e V T L ... S
- + + R - S - - R

mostly R. \therefore R near ~~B~~ BM

R's are ~~S~~, +

S's are - S; - R.

R between B, M?

~~Homogeneity of B_1^- : B_1^+~~
 $Y40 \times Y53$; $Y6Y \times 58-161$.

~~483~~
483

April 14, 1947
(22 APR 1947)

Use light mixtures $Y40 \times Y53$. Add B_1^+ .

Hold in cold room after 2da.

ca 1 - 5 colonies / plate.

4/19 Strains out on ETYB Lact

- | | |
|----|----------------|
| 1. | all lac- |
| 2. | " 6/6 |
| 3. | " |
| 4. | " |
| 5. | " |
| 6. | 6/6 const lac- |

Should use B_1^+ on B_1^- plates.

Repeat with $Y40 \times Y88$ ($Y53\text{-O}_2^R$)