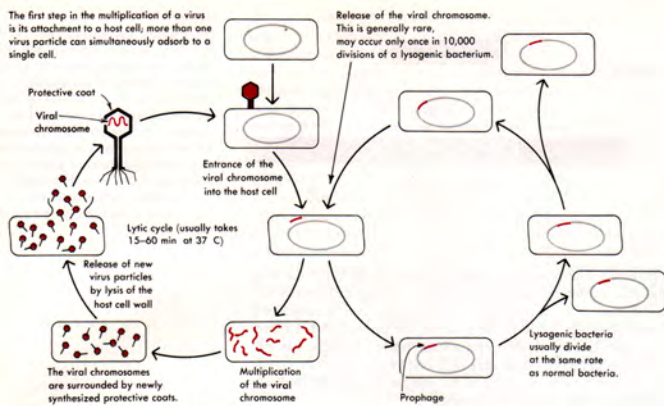
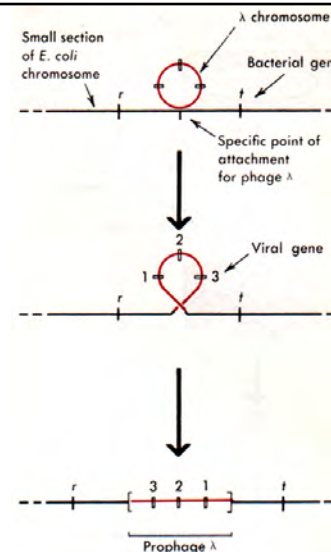


29. The life cycle of a lysogenic bacterial virus

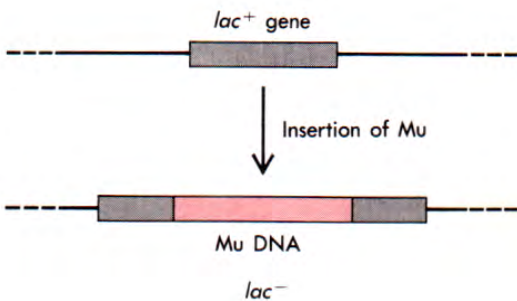


溶原化ファージ⇄入ファージ⇄プロファージ

30. Insertion of the chromosome of phage λ into E. coli chromosome

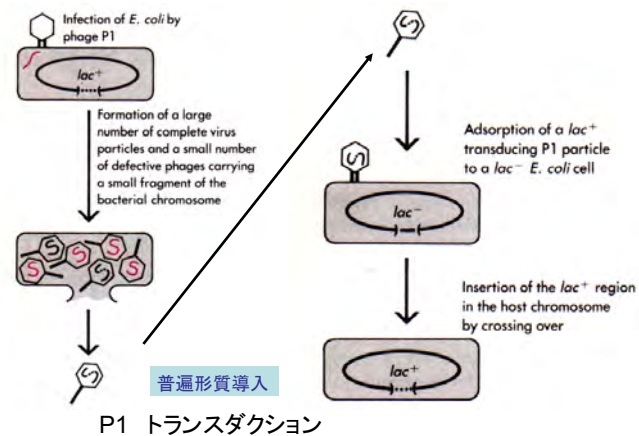


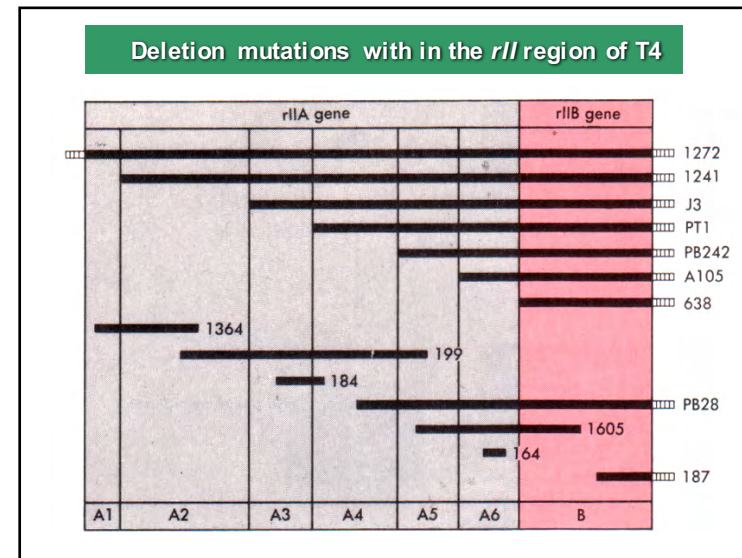
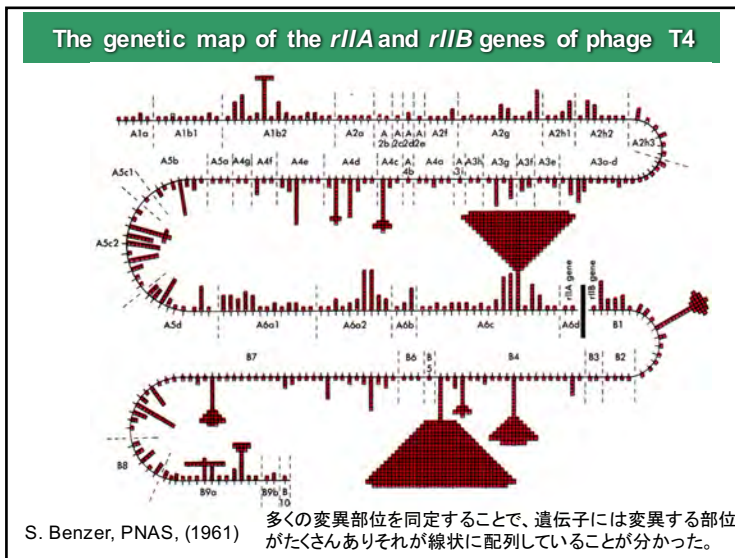
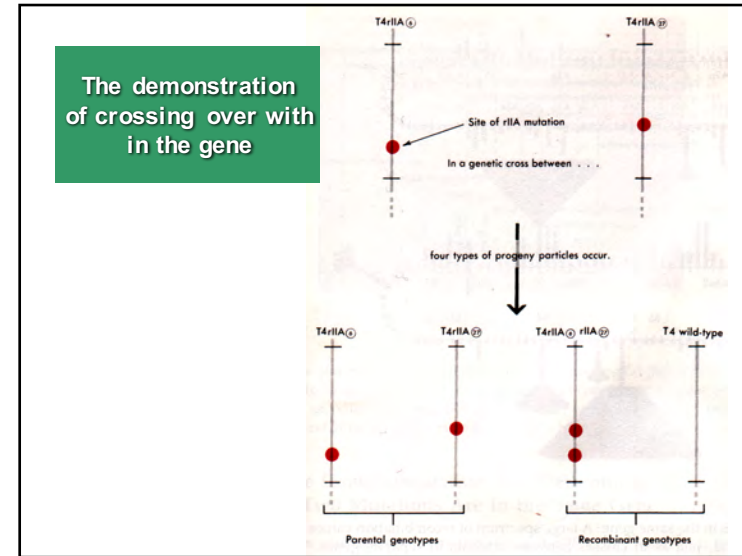
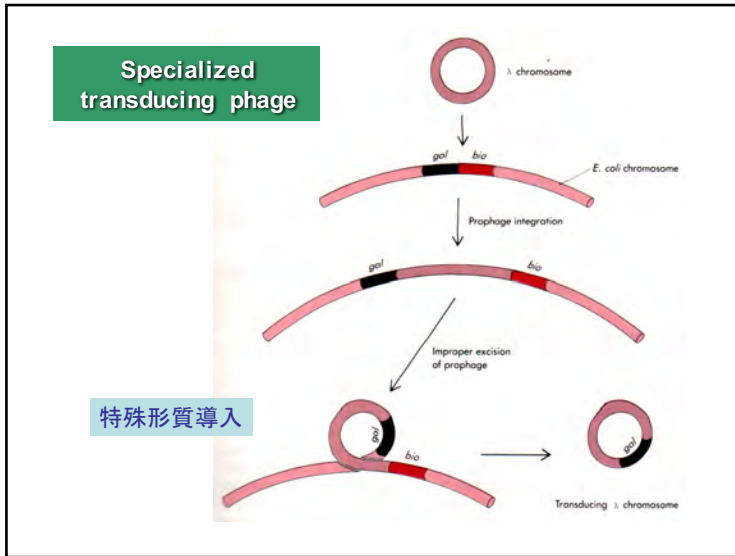
Insertion of Mu DNA



Muは入ファージと異なり、挿入が起こる場所はランダムである

Transduction, the passive transfer of genetic material from one bacterium to another by means of carrier phage particles





The *rII* region consists of two distinct genes that can complement each other during simultaneous infection

相補性検定
シストランス検定
シストロン

Simultaneous infection of *E. coli* K12(λ) with two phage particles each containing a separate *rIIA* mutation. → No phage multiplication

Simultaneous infection of *E. coli* K12(λ) with two phage particles each containing a different *rIIB* mutation. → No phage multiplication

Simultaneous infection of *E. coli* K12(λ) with two phage particles—one an *rIIA*, the other an *rIIB* mutation. → Normal phage multiplication. The progeny consist of a large majority of parental T4rIIA and T4rIIB mutants plus a small fraction of wild- and T4rIIA/rIIB genotypes, which arise by crossing over.

The Genetic Systems Provided by *E. coli*

Molecular Biology of the Gene

1. Fluctuation analysis of bacterial resistance to phage

(1943年)

細菌の変異についての適応説 (ラマルク説)は否定

Five separate *E. coli* B cultures are inoculated onto plates covered with phage T1

Incubation 24 hrs

Colonies resistant to T1

28 35 13 38 107

2. Replica plating

遺伝マーカーの迅速なスクリーン

Handle
Velvet surface (sterilized)
Master plate
Replica plate
Replica plate containing streptomycin
Incubation
All colonies grow
Only Strep^R colonies grow

3. Isolation of mutant *E. coli* cells with a specific growth factor requirement

必須代謝物合成能に影響を与える変異体の分離

栄養要求株 (auxotroph)
原栄養株 (prototroph)

(1944年)

Treatment of *E. coli* cells with a mutagen, such as nitroguanine.

The treated cells are placed on a petri dish filled with a rich nutrient solid agar medium containing the 20 amino acids, the various purines and pyrimidines, all known vitamins, etc. Many of the treated cells fail to multiply because they are killed by the mutagen. The remaining survivors multiply to form distinct colonies on the solid agar surface.

Replica plating and incubation

Rich medium
All survivors grow.

Minimal medium (glucose and inorganic salts)
Most survivors grow, but mutants requiring growth factors do not.

Minimal medium and arginine
Arginine-requiring mutants can grow.

4. Enriching mutants I

direct selection

UV radiation

Plate out and incubate

Amp^r colonies grow

Ampicillin-containing nutrient agar

countersselection

Bacterial culture

Penicillin

Minimal medium

Inoculation and incubation

Minimal agar

Agar supplemented with various growth factors

5. Enriching mutants II

pH-sensitive dyes to detect metabolic mutants

Soft agar

Bacterial culture

Mutant cells

Normal motile cells

physical selection

Brute force isolation

変異剤を使った後、1万個のコロニーを各々スクリーニングする。

8. The use of growth factor requirements to demonstrate sexuality in *E. coli*

thr⁻: threonine-requiring
leu⁻: leucine-requiring
T1^S: sensitive to phage T1
lac⁻: unable to grow on lactose

met⁻: methionine-requiring
bio⁻: biotin-requiring
T1^R: resistant to phage T1
lac⁺: able to grow on lactose

Parent A

Parent B

Mix

No colonies on minimal medium

No colonies on minimal medium

J. Lederberg & Tatum (1946)

異なる変異を持った2つの染色体間で交叉が起こった

有性生殖

A very small fraction of the cells are *met*⁺, *bio*⁺, *thr*⁺, and *leu*⁺. They arise by genetic recombination, as shown by examination of the *lac* and *T1* markers. In addition to the parent *lac*⁻ *T1*^S and *lac*⁺ *T1*^R genotypes, there are found *lac*⁻ *T1*^R and *lac*⁺ *T1*^S cells.

