MICROBIAL GENETICS

7/13/88, 7/26/96, 7/28/97, 14 July 99, 21 July 00, 23 July 01, 19 July 02, 26 July 04, 31July06, 23July07, 25July08, 24July09, 22 July11, 17Oct12, 10/21/15
Alcamo 155..., TFC 7th, 211-242 & 253, 8th: 211-243, Black 6th: 173-229, Bauman 2nd: 197-234, 3rd: 194-235, 4th: 194-233

Much of what we know about molecular genetics was learned by studying the genetics of microorganisms.

CENTRAL DOGMA OF GENETICS: discovered first in bacteria: **DNA → RNA → protein**. (203)

MOLECULES	PROCESS	SIGNIFICANCE
DNA → DNA	replication	genetic material is copied with fidelity for progeny
DNA → RNA	transcription	messenger RNA is polymerized according to DNA template
RNA → protein.	translation	mRNA directs protein synthesis by ribosomes using tRNAs

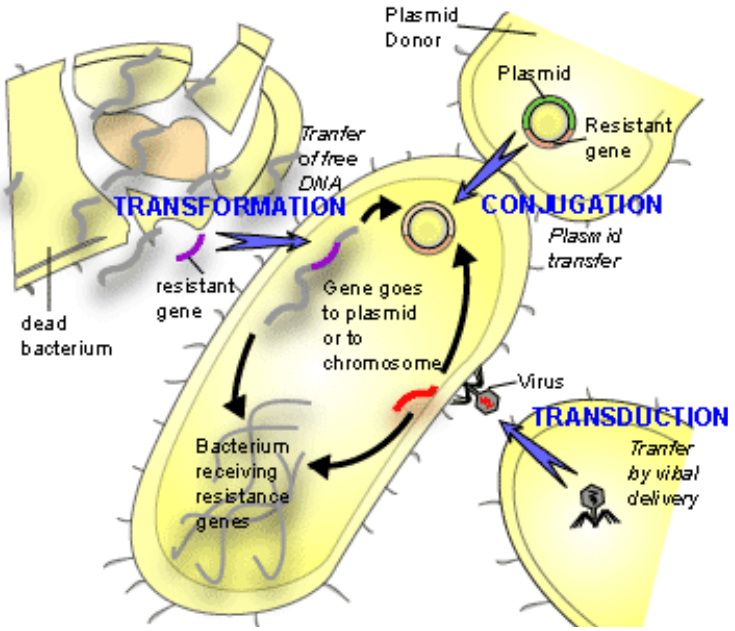
Replication (p. 201, 202) Bacterial chromosome circular, closed loop or rolling circle for plasmids
Transcription (p. 206, 207) DNA acts as a template for the synthesis of complimentary RNA
Translation mRNA directs the synthesis of protein(genetic code: p 208, tRNA: p 210, process: p. 211-212)

In prokaryotes, all these processes occur in same general space, **see p 213 for EM picture**
(eukaryotes perform first two processes in the nucleus. Translation occurs in the cytoplasm)

GENETIC VARIATION in bacteria via either **mutation** or **recombination** (similar to eukaryotes)
Differentiate: **mutagen, mutagenesis, mutation, mutant**

MUTATIONS: (p 219 + 224)
base substitutions transition vs transversion lead to missense or nonsense caused by: UV: 221
base analogs: 5FU, 5 BU, 2 AP, (p 220),
frameshift (P 220) benzpyrene, aflatoxin, acridine dyes
deletions nitrous H+, Xrays, gamma rays, ionizing radiation

Ames test, (p. 224) **auxotropic** bacterium spread on minimal medium, **prototrophic revertants** appear



RECOMBINATION FIRST DEMONSTRATED IN BACTERIA AND BACTERIOPHAGE:

TRANSFORMATION (p. 225) Griffith, 1928: membrane made more permeable: 4°C in $CaCl_2$, heat to 42 with DNA
TRANSDUCTION (p 226) Lederberg and Zinder in 1952 P22 virus of *Salmonella*
CONJUGATION (p. 227-228) Lederberg and Tatum, 1946; Jacob and Woolman in 1950s)
F+ vs F- cells, plasmids, F pili, Hfr, sexduction p 196 RTF:

GENETIC ENGINEERING: (p 240)
endonucleases: Ham Smith first isolated from *Haemophilus influenzae* (P 240)
Recombinant DNA: (p. 241-242) cut two different pieces of DNA with same **restriction enzyme**, recombine, tie together with **ligase**

REGULATION OF GENE EXPRESSION: Operon model
Regulation of lac operon: (Jacob and Monod) (p. 215)

*lac*Z	B-galactosidase	hydrolyzes lactose to monosaccharides
lacY	Permease	Escorts lactose into the cell
*lac*A	transacetylase	Unrelated to lactose!?
*lac*O	operator	binds the repressor
lacI	repressor	Allosteric protein, lactose inactivates

Catabolite repression: Draw growth curve with break in slope.
When glucose is available, other catabolic pathways are shut down (preferentially use glucose, then switch to lactose.)