





























- 1  **Chapter 8**
Bacterial & Viral Genetic Systems
- 2  **Bacterial Genetics**
 - ▶ Prototrophic
 - ▶ Minimal medium
 - ▶ Auxotrophs
 - ▶ Complete medium
 - ▶ Colony
 - ▶ Replica plating
- 3  **Bacterial Genome**
 - ▶ Circular chromosome
 - ▶ Plasmids
 - ▶ Episomes
 - ▶ F factor (*E. coli*)
- 4  **Gene Transfer**
 - ▶ Conjugation
 - ▶ Donor → recipient
 - ▶ Transformation
 - ▶ Media → recipient
 - ▶ Transduction
 - ▶ Bacteriophage → recipient
- 5  **Conjugation**
 - ▶ Joshua Lederberg & Edward Tatum's experiment
 - ▶ Auxotrophic → prototrophic
 - ▶ HOW?
 - ▶
- 6 
 - ▶ Bernard Davis
 - ▶
- 7 
 - ▶ F factor
 - ▶ Sex pilus
 - ▶ three types of conjugation
 - ▶ F⁺ & F⁻
 - ▶ Hfr & F⁻
 - ▶ F' & F⁻
 - ▶
- 8 
 - ▶ F⁺ & F⁻
 - ▶ Directional
 - ▶ oriT site first
 - ▶ Entire plasmid transfer
- 9 
 - ▶ Hfr & F⁻
 - ▶ High frequency strains
 - ▶ Bacterial chromosome integration
 - ▶ Chromosomal genes follow during F transfer
 - ▶ Crossover integrates part of transfer
 - ▶ Rarely becomes F⁺
 - ▶
- 10 

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- ▶ F' & F-
 - ▶ In a Hfr cell the F factor excises from chromosome along with nearby genes
 - ▶ F' lac
 - ▶ Sexduction
 - ▶ Partial diploids
 - ▶
 - ▶
- 11  ▶ summary
- 12  **Mapping with Conjugation**
 - ▶ Hfr cells
 - ▶ Full transfer ~100min
 - ▶ Directional transfer (oriT site)
 - ▶ Chromosomal genes transferred in order
 - ▶ Maps using interrupted conjugation
 - ▶ Unit of distance = 1 minute
- 13  ▶ Mapping example
 - ▶ Media
 - ▶ Streptomycin
 - ▶ No leucine
 - ▶ No threonine
 - ▶ What is the order of genes
- 14  ▶ Directional transfer
 - ▶ Hfr integrated at different sites and orientations
- 15  ▶ Align sequences from different strains to map chromosome.
- 16  ▶ Worksheet
- 17  ▶ R plasmids
 - ▶ Related & unrelated
 - ▶
 - ▶ R100
 - ▶ Sulfonamides, streptomycin, spectinomycin, fusidic acid, chloramphenicol, tetracycline & mercury
 - ▶ Enteric bacteria
 - Escherichia, Klebsiella, Proteus, Salmonella & Shigella
- 18  ▶ Transformation
 - ▶ Competent cells
 - ▶
 - ▶
- 19  ▶ Bacterial genomes
 - ▶ 580,000-7million bp
 - ▶ Gene loss vs. gene acquisition
 - ▶ Horizontal gene transfer
 - ▶ Other species (including eukaryotic)
 - ▶
- 20 

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- ▶ E. coli -model organism
 - ▶ Easy to culture
 - ▶ Small
 - ▶ Fast reproduction
 - ▶ Small haploid genome
 - ▶ Useful in experimental systems
- 21  **Viral Genetics**
 - ▶ Plants, animals, fungi, bacteria
 - ▶ Nucleic acid & protein coat
 - ▶ DNA or RNA
 - ▶
 - ▶ Bacteriophages
- 22 
 - ▶ Lytic
 - ▶ Virulent
 - ▶ Always kill host
 - ▶ Lysogenic
 - ▶ Temperate
 - ▶ prophage
- 23 
 - ▶ Study of Bacteriophages
 - ▶ plaque
- 24  **transduction**
 - ▶ Generalized
 - ▶ Lytic
 - ▶ Transducing phages
 - ▶
 - ▶
- 25  **transduction**
 - ▶ 1952
 - ▶ Joshua Lederberg
 - ▶ & Norton Zinder
- 26 
 - ▶ Specialized
 - ▶ lysogenic
 - ▶ Lambda
 - ▶ Attachment site
 - ▶ Single crossover – unstable
 - ▶ Double crossover - stable
- 27  **RNA Viruses**
 - ▶ Influenza, polio, AIDS, plants
 - ▶ Retroviruses
 - ▶ Reverse transcriptase
 - ▶ Provirus
 - ▶ Envelopes
 - ▶ oncogenes
- 28 
 - ▶ 65 million infected 25 million have died
 - ▶ HIV-1
 - ▶ Global (most cases)
 - ▶ HIV-2
 - ▶ Primarily western Africa

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