

Prokaryotic Genetics:

Domains of Life:

- Three major strains of life are Eubacteria, Eukaryotes and Archaea
- Main focus is Eubacteria

Advantages of Using Bacteria and Viruses for Genetic Studies:

- Rapid reproduction
- Large quantity of progeny
- The haploid genome allows all mutations to be expressed directly
- Asexual reproduction simplifies the isolation of genetically pure strains
- Growth in the laboratory is easy and requires little space
- Genomes are small
- Techniques are available for isolating and manipulating their genes
- They have medical importance
- They can be genetically engineered to produce substances of commercial value

Studying Bacteria:

- Media for culture must contain; a source of carbon, essential elements, vitamins, trace metals and ions, oxygen if aerobic and commonly warmth
- Minimal medium contains inorganic N,P, minerals and a carbon source
 - Another important factor of minimal medium (or synthetic medium) is that it is derived)

E. coli:

- A common gastrointestinal tract bacteria which grows on partially digested yeast/animal product extracts at 37°C

Bacterial Cultures:

- Liquid 'broth' culture -> nutrients allow rapid growth
 - High density, easy and cheap
- Solid media (individual colonies)
 - Use same nutrient broth just solidified with agar (polysaccharide from seaweed that cannot be digested by most bacteria)
 - Individual bacterial cells can be isolated and grown into a colony, making a pure culture of bacteria
 - All cells of a colony are closely related to the original cell with only a small possible amount of genetic variation
 - Allows physical counting of number of bacteria

Bacteria Types:

- Wild type bacteria can grow on media containing simple ingredients (minimal media)
 - Known as prototrophs
 - Can use simple molecules to build more complex ones
 - Sensitive to antibiotics
- Auxotrophs require extra nutrients in the medium as they're unable to make a nutrient themselves
 - Chemoauxotrophs are mutants that can't use some nutrients that prototrophs can as food

Bacterial Mutants:

- Generated in the lab by exposing bacteria to mutagens or through genetic transformation
- Resistance mutants confer resistance to some environmental toxin such as ; drugs, heavy metals, bacteriophage etc
- Amp^r causes bacteria to be resistance to ampicillin

Genotypic Symbols:

bio ⁻	Requires biotin in the minimal medium
arg ⁻	Requires arginine in the minimal medium
met ⁻	Requires methionine in the minimal medium
lac ⁻	Cannot utilise lactose as a carbon source
gal ⁻	Cannot utilise galactose as a carbon source
str ^r	Resistant to streptomycin
str ^s	Sensitive to streptomycin

Replica Plating:

- A common way to identify bacterial mutants is replica plating -> making identical copies of the colonies on a petri dish under different conditions
 - Eg: to find a leu⁻ mutant, one plate would contain leucine and one wouldn't
- Bacteria is first plated on a permissive plate (allows both mutants and wild type)
- After growth, a copy of the plate is made by pressing velvet to the surface and moving it to a fresh plate with the restrictive condition
- The velvet transfer shows identical positions on both plates