Lecture 1

Classification

- Binomial naming system: *genus species*
- When classifying organisms it is standard practice to a hierarchal system which includes: domain, kingdom, phylum, class, order, family, genus and species. (Katie Pokes Charlie On Fridays).

The basis for naming includes:

- Similarities of morphological traits,
- Molecular similarities (DNA, RNA, proteins and other secondary metabolites).

Traits:

- Homologous: present in the ancestor.
- Analogous: between organisms that may not be closely related.

Lecture 2 - Viruses

Viruses are:

- **Obligate parasites** – they require a host to reproduce.
- **Acellular**; consisting of a **capsid** made from capsomeres, a genome of **single or double stranded RNA or DNA**, and sometimes enzymes or a lipid membrane.

Genome:

- New strains of viruses become apparent quickly due to the highly mutable nature of the viral genome.
- The genome encodes at least four proteins:
    - 1 x Capsid
    - 2 x Replication
    - 1 x Intercellular Movement

Life Cycle - General:

- The viruses searches for a particular **receptor on the host cell**.
- The capsid and host receptor bind causing **invagination.**
- The **virion enters** the cell and **releases its genome**.
- The genome enters the nucleus of the host where it will make copies of itself.
- It may be necessary for the virus to undergo reverse transcription.
- Viral **RNA will act as mRNA.**
- The virus than uses the **host ribosomes to synthesize** its own proteins and enzymes.
- The viral genome and protein will than come together during **self-assembly.**

Terminology:

- **Virion:** the complete, infective form of a virus outside a host cell, with a core of RNA or DNA and a capsid.
- **Viroid:** an infectious entity affecting plants, smaller than a virus and consisting only of nucleic acid without a protein coat.
- **Retrovirus:** any of a group of RNA viruses that insert a DNA copy of their genome into the host cell in order to replicate, e.g., HIV.
- **Prions: Proteinaceous Infectious Particles,** are infectious proteins that convert host proteins into versions of themselves.

Lecture 3

Feature	Bacteria	Archaea
Nucleus	No, Nucleoid	No, Nucleoid
Membrane bound organelles	None	None
Peptidoglycan	Yes	No
Ribosomes	70S	70S
Membrane	Ester link	Ether link- Isoprene Chain
Plasmids	Yes	Yes
Sensitive to antibiotics	Yes	No
Ribosomes sensitive to diphtheria toxin	No	Yes
Methanogens	No	Yes
Autotrophs/Heterotrophs	Both	Both

Bacterial genetic diversity is achieved through:

- **Transduction:** virus takes up genes from a bacterium and enters it into another.
- **Conjugation:** two bacteria create a **pilus** and transfer genetic information **via plasmids**. The genes that are transferred can give rise to metabolic capabilities, resistance and fertility.
- **Mutation:** random alterations in the genome occurring during or before replication.
- **Transformation:** taking up the genome of a deceased bacterium.

Bacterial Phyla:

- Cyanobacteria: precursor to plant chloroplasts.
- Spirocahetes: include lyme disease and syphilis pathogen
- Proteobacteria: E.coli, are precursors to mitochondria.
- Actinomycetes: include TB pathogen.
- Mycoplasmas: include the pneumonia pathogen.

Lecture 4

Fungi:

- Are more closely related to animals than they are to plants.
- They are heterotrophic, **not photosynthetic.**
- Their feeding structure is known as a **mycelium**
- The mycelium consists of a network of **hyphae.**
- **Hyphae** may be divided by septa.

Nutrition and ecology:

- food is digested externally,
- reserves are stored as glycogen, fats and oils.

Reproduction:

- either from sexual or asexual spores or budding.
- dikaryones (n+n) formed by the plasmogamy of compatible mating types.

Saprophytic fungi decompose cellulose and **lignin** and are major recyclers of organic matter.

Parasitic fungi:

- Are more commonly found in plants but do exist in humans.
- Include rusts, blights, wilts and rots of plants.
- **Mycoses** (human).
- Plants combat parasitic fungal infections with a hypersensitized response which involves the collapsing of a cell in the presence of fungal invaders.

Fungal association:

- **Mycorrhizae;** found on plant roots. Gives nutrients from soil to plants in exchange for sugars.
- **Endophytes;** found on leaf tissue, provides toxins for defense against predators.
- **Lichens;** in symbiosis with either algae or cyanobacteria.

Yeasts are single celled rather than filamentous fungi.

Phyla: Ascomycota, Basidiomycota, Zygomycota, Chytridiomycota.

Lecture 5 – Medical Mycology

Human mycoses:

- are much less common due to the low O_2 environment and efficiency of the immune system.
- can be difficult to treat because their biochemistry is very similar.

Levels of infection:

- **Superficial**:
  - on the surface of the body (dead skin layer).
  - dermatophyte infections and onychomycosis.
- **Subcutaneous:**
  - infections penetrating the skin layer.
  - candida albicans (thrush).
- **Systemic:**
  - infections affecting organs and deep tissue.
  - invasive opportunists (penicilliosis) only usually exist in immune-compromised individuals.
  - primary pathogens (paracoccidioidomycosis) can cause infections in healthy individuals if the spore dose is high enough.

Treatment:

- Antifungals usually have adverse side effects due to the similarity of the human and fungal biochemistry.
- 5 – Flucytosine
- Griseofulvin – attacks microtubules.
- Polyenes – enter lipid membrane causing it to be more leaky.