BIOM30002 Course Summary Notes

Table of Contents:

Module 1: HIV and Malaria

HIV

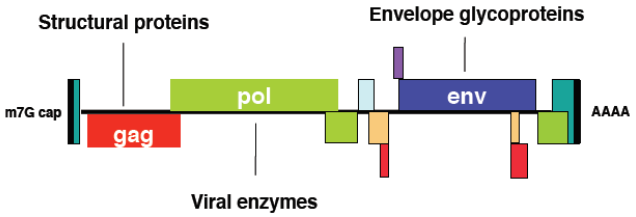
Epidemiology

- Deaths/new infection numbers fairly steady (not really decreasing)
- Australia:
  - Plateaued, approximately 1000 new infections/year
  - Slightly higher in Indigenous population
  - 75% male-to-male transmission in non-Indigenous (also injecting and heterosexual in Indigenous population)
- 37 million people infected worldwide
- AIDS – CD4 count below 200/µL

Family:	Retrovirus
Major human virus:	HIV-1, HIV-2
Size:	80-130 nm
Capsid symmetry:	Icosahedral
Envelope:	Yes
Genome:	Diploid linear 10kb + sense ssRNA;
Genome replicated:	Nucleus
Virus assembly:	Cytoplasm - plasma membrane
Common features:	Slow disease
Diseases:	AIDS; neurologic; arthritis; pneumonia

Virology

- **Complex retrovirus** (reverse transcription of RNA genome)
  - **+ sense ssRNA virus**
  - Many retroviruses exist, HIV is basically the first to cause disease (humans have adapted to others)
- Primate zoonosis
  - Infected 'Sooty Mangabey' have no effects – no immune activation or CD4 decline
  - But infected 'Rhesus Macaque' have similar outcomes to humans



- Important HIV genes
  - Gag – produces structural proteins (capsid, nucleocapisd and matrix)
  - Pol – polymerase, integrase, protease
  - **Env** – envelope glycoproteins
    - **gp160** – cleaved by host protease 'furin' to form:
      - **gp120** – attached to gp41; used to attach/adhere to RBCs
      - **gp41** – embedded in virus membrane
  - **Reverse transcriptase – transcribes DNA from RNA template**
  - A number of regulatory proteins – give survival advantages
    - Tat – regulates virion release
    - Rev – essential for viral replication
    - Vif – infectivity of HIV-1 virions, edits RNA
    - Viral protease – cleaves Gag into structural proteins
    - **Integrase** – integrates viral dsDNA into host genome
    - Vpu – specific to HIV-1, release of virions
- Two forms:
  - **HIV-1** (in **Australia**) and **HIV-2** (primarily in sub-Saharan **Africa**)
  - Each form consists of a number of different '**clades**'

Replication

- Life cycle (takes **approximately 24 hours**)
  - **CD4 binding** (gp120 binds to CD4 receptor)
    - (Chemokine) **co-receptor binding** also occurs
      - Nearly **all infections use CCR5** (**R5**)
        - Cause T-cell destruction