Microbiology - Viruses

Viruses and Cancer
Latent Viral Infection
Prions

Oncogenesis

- Cancers develop when cells are released from normal control on their division
  - This may also involve release from the tissue in which the transformed cells arose, leading to metastasis
  - Cancers usually arise from mutation of proto-oncogenes, which encode regulatory proteins
- Viral infection may increase the risk of malignant transformation if
  - Viral gene products influence mutation frequency in host cells
  - Viral genomes disrupt critical host genes

Human Viruses and Cancer

- No human virus causes cancer in more than a small minority of infected persons
- Nevertheless, viral infection is the second leading known cause of human cancers
- Human oncogenic viruses belong to several different families
- A common feature is integration of the viral genome into the host cell genome at some point in viral multiplication
Human Papillomavirus (HPV)

- Papovavirus family
- Very common sexually transmitted infection
- Certain genotypic forms show a very strong association with cervical cancer

Epstein-Barr Virus (EBV)

- Herpesvirus family
- Extremely common virus infection; estimated 80% of Americans show evidence of exposure
- Most commonly associated with infectious mononucleosis
- Increases risk for Burkitt’s lymphoma and nasopharyngeal carcinoma
**Hepatitis B Virus (HBV)**

- Hepadnavirus family
- Transmitted sexually and by other close contact
- Of greatest concern among *bloodborne pathogens*
- May be controlled by vaccination
- Associated with increased risk for hepatic carcinoma: liver cancer

**HTLV I**

- *Human T lymphotropic virus*, a retrovirus (same family as HIV)
- Associated with increased risk for certain lymphomas and leukemias

**Latent Infection**

- Characteristic of Herpesviruses
  - Herpes Simplex Viruses I and II (HSV)
  - EBV
  - Cytomegalovirus (CMV)
- After initial infection, the viral genome may persist in host cells without active production of virions
- This prevents host defense from “seeing” the virus
- Physiological changes may trigger reactivation of active multiplication
Prions

- Infectious proteins
- Misfolded form of a normal cell protein, PrP
- May cause normal copies to likewise misfold; this is how a prion “multiplies”
- Most common human prion disease is *Creutzfeldt-Jacob Disease* (CJD)