Tumor viruses

Oncogenic viruses
Tumor viruses

• Viruses can cause benign or malignant tumors in many species of animals

• A few viruses are associated with human tumors
Malignant transformation of cells

- Altered morphology
- Altered growth control
- Altered cellular properties
- Altered biochemical properties

can be induced by tumor viruses
Tumorigenesis

- **Provirus:** the genes enter the cell by infection by tumor virus
- **Oncogene:**
  - Viral or
  - already present in the cell
  - cellular oncogenes (c-onc) are activated by viruses to overproduce the growth factors
- Tumor supressor gene (p53): **inactivation** of this gene
- Micro-RNA genes
Human Tumor viruses

• RNA viruses:
  • Human T-cell lymphotropic virus (HTLV-I):
    – Adult acute T-cell lymphocytic leukemia (ATLL)
    – No viral oncogene (different from animal tumor retroviruses)
    – Tax and rex regulatory genes (complex retrovirus)
    – Incubation period is long
Tumor viruses

– Human papillomavirus:
  • E6 and E7 genes
  • Encode proteins that interfere with p53 and Rb(retinoblastom) tumor suppressor genes (inactivation)
  • Mostly the HPV (especially highly oncogenic types 16 and 18) is integrated into cellular DNA
Tumor viruses

– EBV:

• Induces B cell proliferation
• Activation of a cellular oncogene
• Burkitt lymphoma: c-myc oncogene in chromosome 8 is translocated to chromosome 14 where large amounts of c-myc RNA are synthesized.
Tumor viruses

– HBV:
  • Primer hepatocellular carcinoma: integration may activate an oncogen

– HCV:
  • Chronic infection

– HHV-8:
  • ?
Animal tumor viruses

• DNA Viruses:
  – SV40
  – Adenovirus
  – Poxvirus

• RNA viruses
  – Retroviruses: viral oncogene (highly oncogenic)

No evidence that they cause tumors in humans