XVI. Cancer

A) Characteristics of cancer cells

1) uncontrolled proliferation - can be benign

2) capable of invading surrounding tissues - malignant

a) loss of adhesion to original neighbors

b) escape from tissue of origin

c) burrow through other tissues towards blood vessels

d) cross basal lamina and endothelial lining of a blood vessel

e) exit the bloodstream and circulate

B) Cancer cells are classified according to their tissues of origin

1) carcinomas arise from epithelial cells

2) sarcomas arise from connective tissue

3) leukemias derive from hematopoietic cells

4) other cancers derive from cells of the nervous system

C) tumors can maintain some characteristics of the original tissues

D) monoclonal origin of cancer cells

E) cancer is generally caused by a genetic change

1) chemical carcinogens cause nucleotide changes

2) ionizing radiation such as X rays cause

3) viruses can insert foreign DNA into the genome

F) A single event is not enough to cause cancer

G) Cancers usually develop in slow stages

H) Tumor initiators vs tumor promoters

I) Increased proliferation is not always sufficient to form a tumor

J) Blood vessels must supply the tumor with nutrients

K) Cells must develop mutations that lead to metastasis

L) Oncogenes stimulate tumorigenesis, found in many tumors

1) Oncogenes are activated versions of proto-oncogenes

a) point mutation

b) amplification

c) translocation next to a powerful promoter or enhancer

2) first oncogene was identified in a retrovirus

a) rous sarcoma virus (rsv) causes sarcomas in chicken

b) rsv was found to contain v-src

3) oncogenes from tumors can be identified via transfections

a) NIH3T3 cell model system

i) characteristics of NIH3T3 cells

ii) characteristics of transformed cells - foci

a. lowered requirement for growth factors

b. loss of anchorage dependence

c. loss of density dependence

d. diminished adhesion to surfaces

e. failure to produce stress fibers

f. increased proliferation

g. can cause tumors in nude mice

iii) transfection studies

iv) Identification of oncogenic ras (RasV12)

c) REF model system

i) Ras + myc induce transformation in these cells

ii) ras and jun also cooperate to transform REF cells

4) oncogenes can sometimes be identified by karyotyping tumor cells

5) oncogenes can be studied in transgenic mice

M) many signaling proteins are proto-oncoproteins

1) sis is an activated form of PDGF

2) erb-B

3) RasV12 is found in human cancer, and induces foci in NIH3T3 cells

4) v-src

5) AP-1

6) GαS

N) Tumor suppresser genes

1) retinoblastoma

2) p53 is mutated in many human cancers

3) some DNA viruses inactivate tumor suppresser genes

a) SV40 (polyomavirus family) infects monkeys

b) papillomavirus are distantly related to polyomavirus family

c) products of DNA tumor viruses can bind tumor suppressers

i) some products target the Rb protein

ii) viral products also target p53