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HST.161 Molecular Biology and Genetics in Modern Medicine  
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## Lecture 18

## Cancer

### Cancer genetics

- all cancer is genetic; mutations in somatic cells cause clones of those cells to acquire malignant properties, including loss of growth control and metastatic capacity
- cancer *can* be familial, indicating inherited mutations that can lead to high likelihood of cancer occurring

### Environmental and other etiological factors

- largest contributions by tobacco and genetic susceptibility

Cells of a tumor seem to derive from a single cell

Tumors are clonal expansions

### Multi-step carcinogenesis:

Normal epithelium [loss of APC] → hyper-proliferative epithelium → early adenoma [activation of K-ras] → intermediate adenoma [loss of 18q] → late adenoma [loss of TP53] → carcinoma [other alterations] → metastasis

Types of genes which predispose to cancer when mutated in the germline

- tumor suppressor genes (most often)
- mutator genes (less often)
- activated oncogenes (rare; examples in familial cancer)

### Oncogenes

- first identified since they could be pulled out of cancer cells, transformed into normal cells, and cause cancer
- normal form: proto-oncogene
- growth-promoting factors

### Tumor suppressor genes

- normal activity: controls cell growth
- one hit doesn't cause a problem; after 2 hits, with both copies gone or mutated, the brakes on cell growth are removed