Lung cancer detection

Lung masses evident on chest X-ray
Lung masses evident by computed tomography (CT)

Colon Cancer Progression

Normal colon (endoscopy)
Colon polyp
Colon carcinoma
Section of colon with carcinoma (circled)

Leukemia is a overabundance of abnormal cells in the blood

Normal blood smear
Leukemic cells in a blood smear
Cancer develops in stages

Normal Tissue

Hyperplasia

Benign Tumor (e.g., an adenoma)

Metastatic Spread

Advanced Primary Cancer (locally invasive)

In Situ Cancer (e.g., an adenocarcinoma)

Chromosomal Abnormalities are Common in Cancer Cells

chromosomes of a normal cell

chromosomes of a cancer cell

Steps in Tumor Progression

Atypical Adenomatous Hyperplasia (AAH)

Adenoma

Adenocarcinoma

blood vessels

Causes of cancer: compounds that are more carcinogenic are also more mutagenic

Inference: cancer cells are likely to carry mutant genes

More Potent carcinogen

More Potent mutagen

Inference: cancer cells are likely to carry mutant genes
Conversion of benzo(a)pyrene to mutagenic epoxides

Benzo(a)pyrene (B(a)P)

Benzo(a)pyrene (B(a)P) undergoes metabolic conversion by cytochrome P450 enzymes in the liver.

B(a)P 7,8 epoxide

Epoxide hydrolase

B(a)P 7,8 dihydrodiol

B(a)P 7,8 dihydrodiol

7,8 dihydrodiol 9,10 epoxide

7,8 dihydrodiol 9,10 epoxide

B(a)P 7,8 epoxide

(a)B(a)P

OH

OH

OH

OH

Chromosomal Abnormalities are Common in Cancer Cells

Chromosomes of a normal cell

Chromosomes of a cancer cell

Clonal Evolution Theory of Tumor Development

Numbers represent sequential mutations to cellular genes

Tobacco Use in the US, 1900-1999

*Age-adjusted to 2000 US standard population.

Cancer-associated mutations affect:
- proliferation
- cell death
- angiogenesis
- cell motility
- invasion
- other

Cancer develops in stages:
- Normal Tissue
- Hyperplasia
- Benign Tumor (e.g., an adenoma)
- Metastatic Spread
- Advanced Primary Cancer (locally invasive)
- In Situ Cancer (e.g., an adenocarcinoma)

Tumors and Angiogenesis:
- Proangiogenic factor, VEGF
- Angiogenic inhibitor

Somatic mutation Proangiogenic factors secreted by tumor and stroma
Small avascular tumor = Angiogenic inhibitor = Proangiogenic factor, VEGF


Cancer develops in stages

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