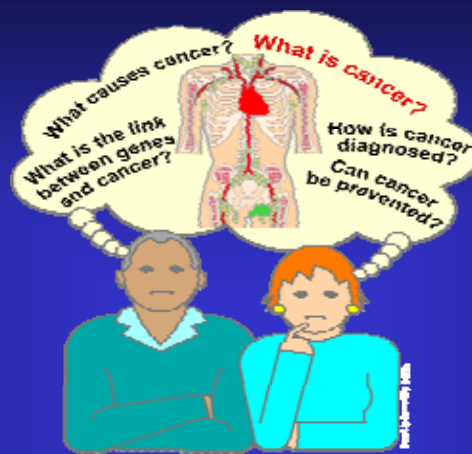
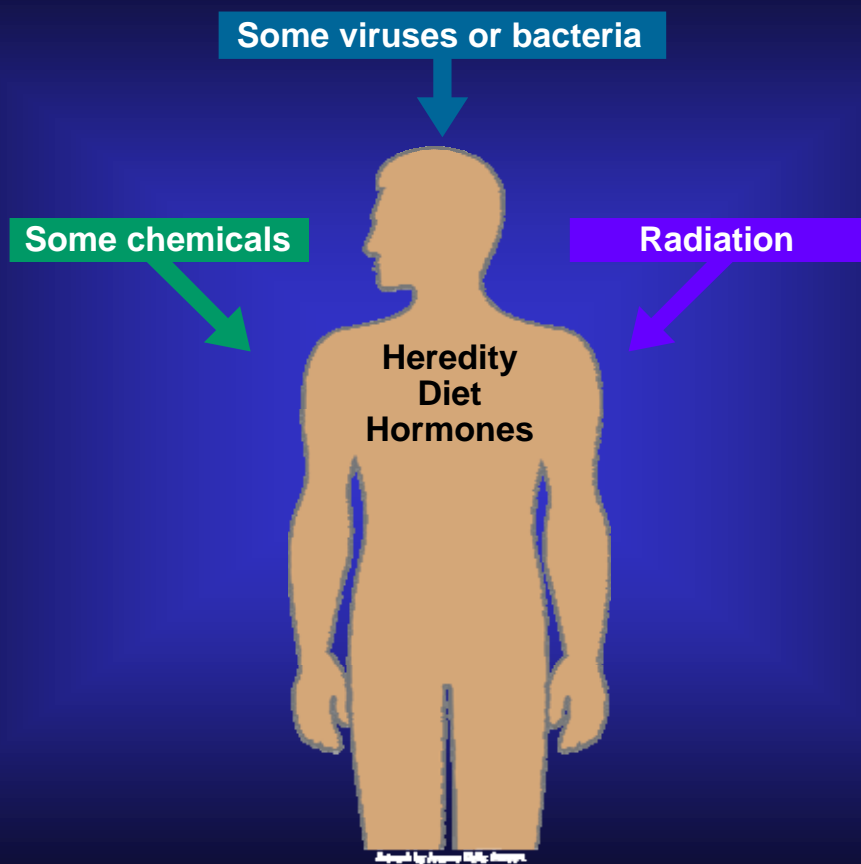


What Is Cancer?



Dr Anil Mohith
Medical Oncologist

What Causes Cancer?



Adapted by Thomson Digital Group

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Different Kinds of Cancer

Some common carcinomas:

- Lung
- Breast (women)
- Colon
- Bladder
- Prostate (men)

Leukemias:

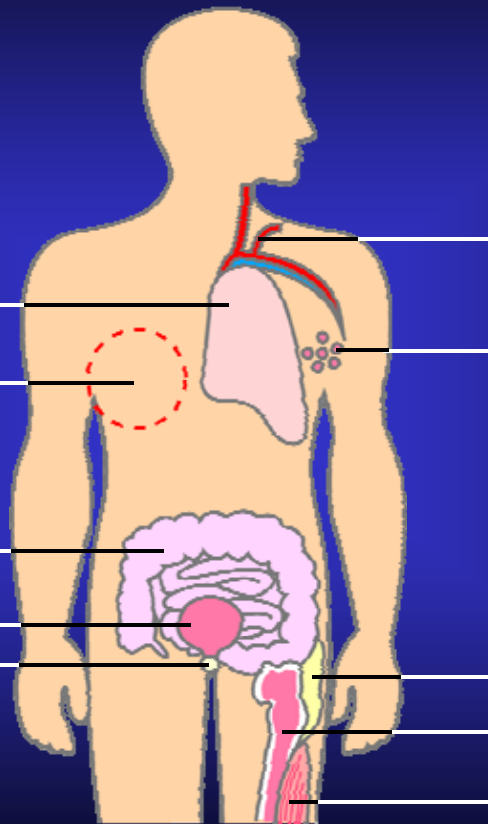
Bloodstream

Lymphomas:

Lymph nodes

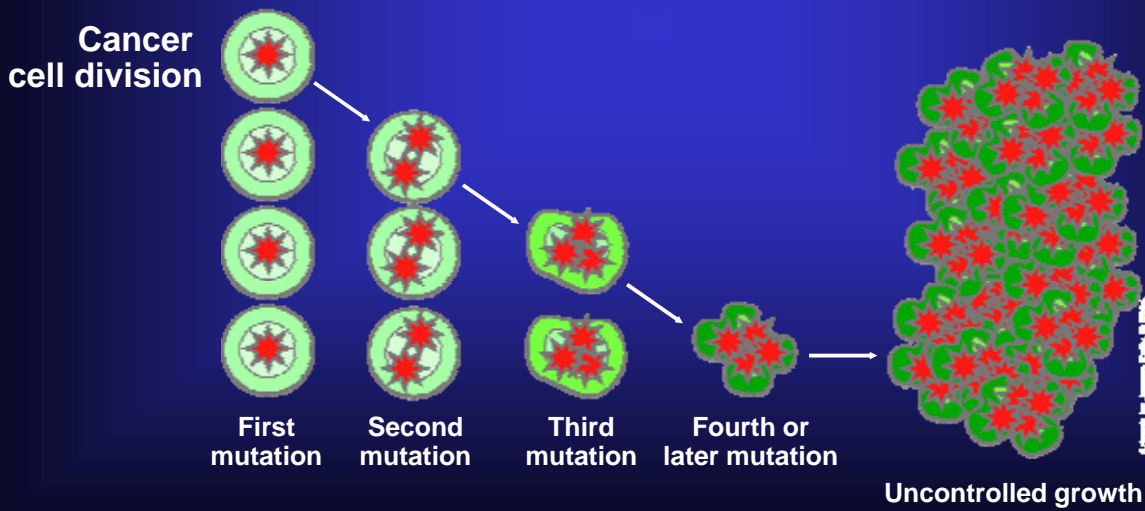
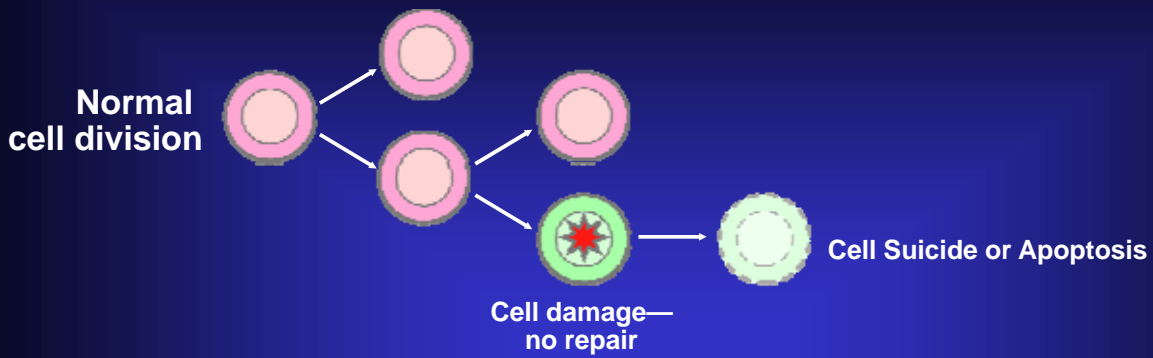
Some common sarcomas:

- Fat
- Bone
- Muscle

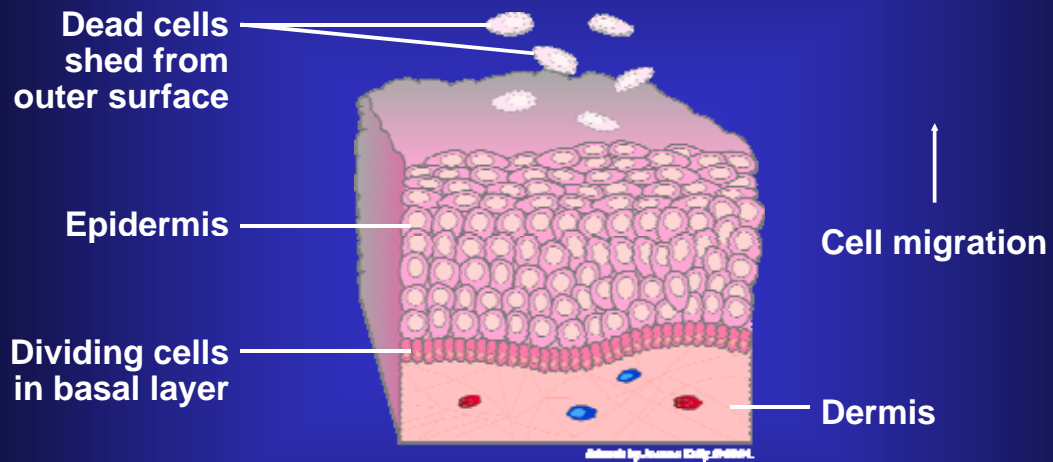


Adapted by American Society of Clinical Oncology

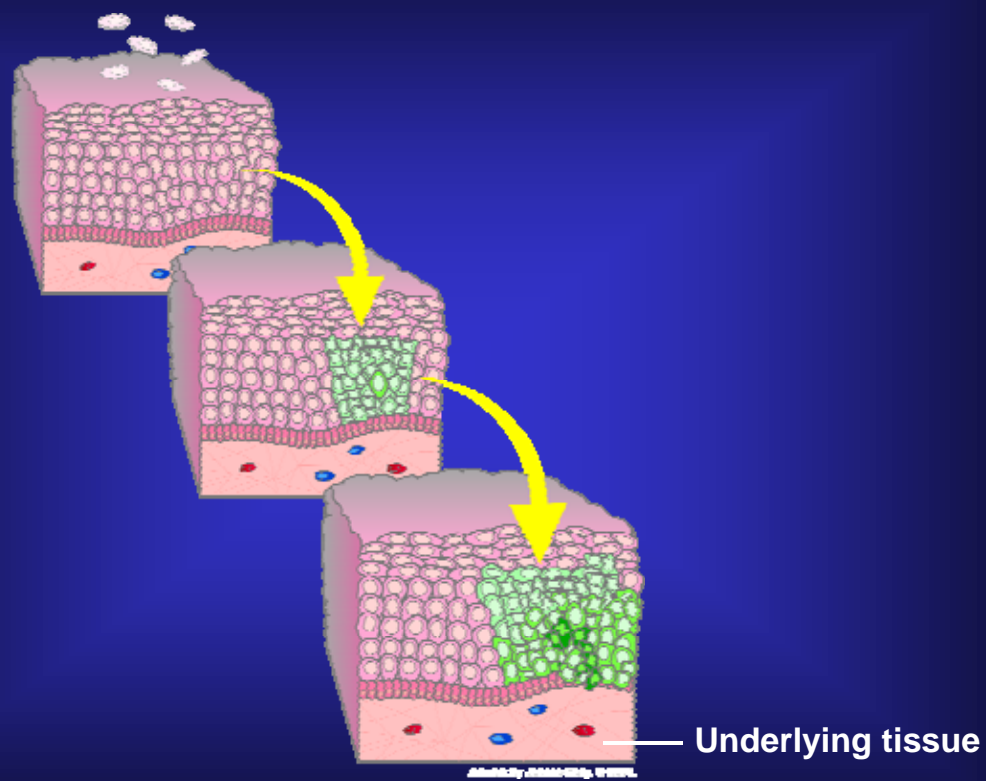
Loss of Normal Growth Control



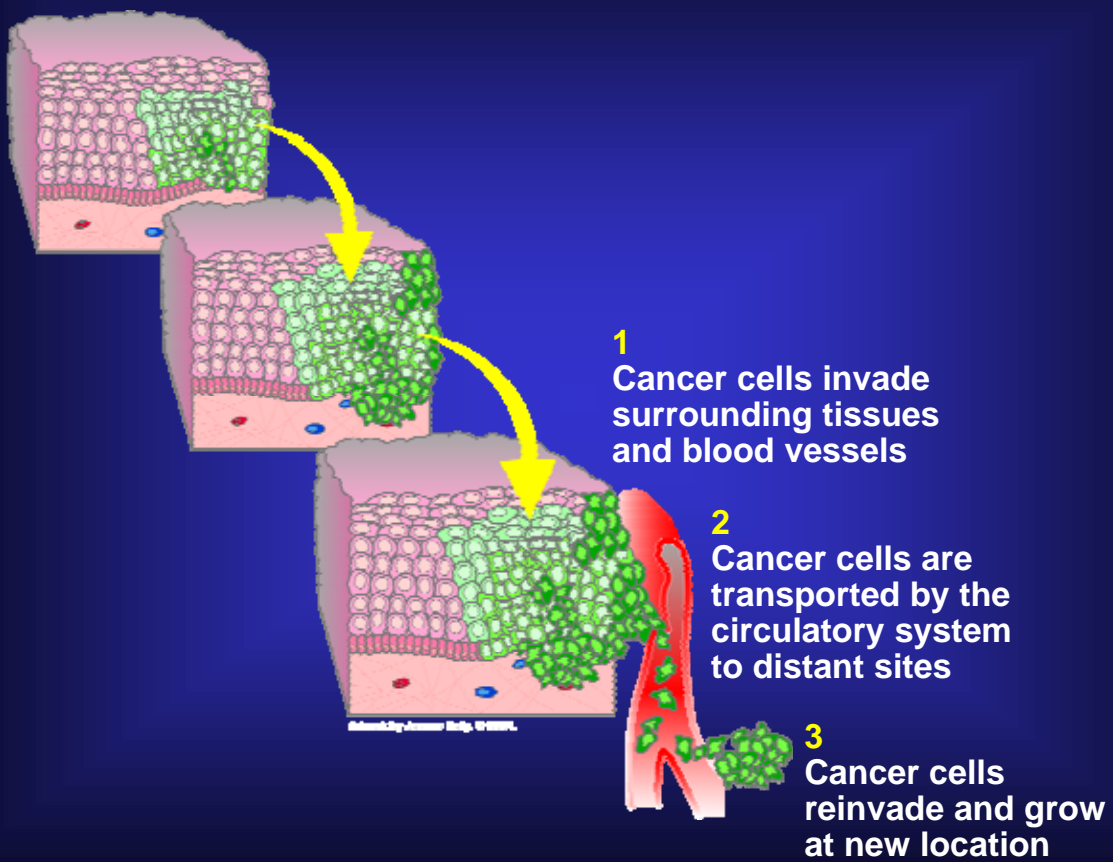
Example of Normal Growth



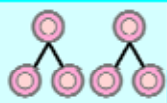










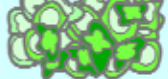


The Beginning of Cancerous Growth



Invasion and Metastasis

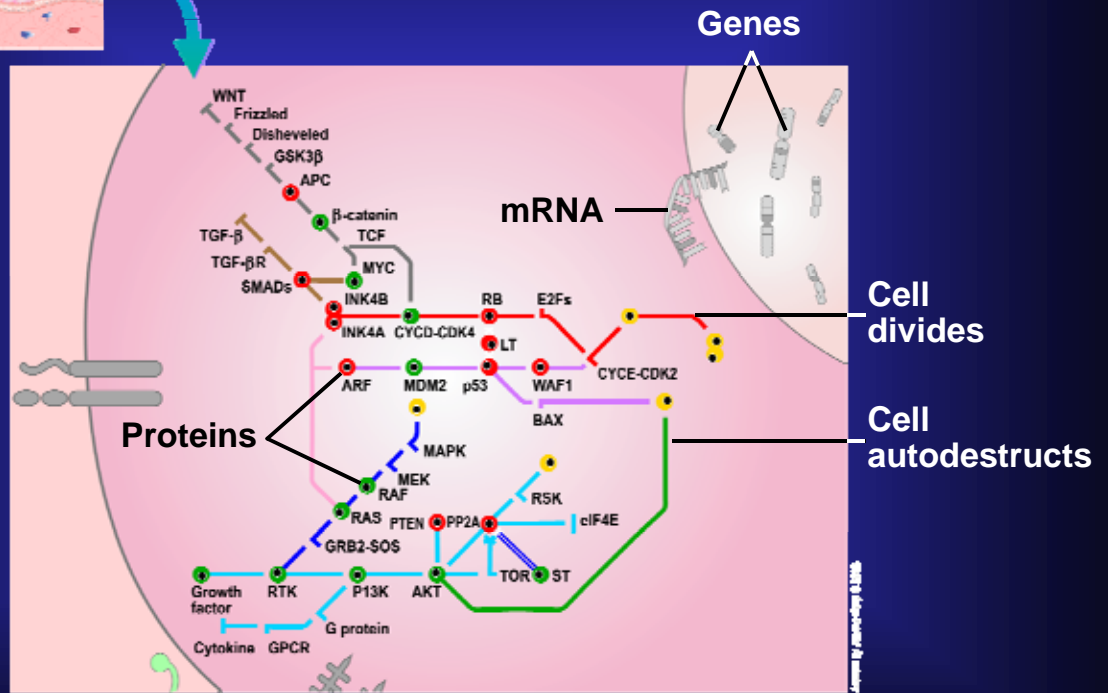


Microscopic Appearance of Cancer Cells

Normal	Cancer	
		Large number of irregularly shaped dividing cells
		Large, variably shaped nuclei
		Small cytoplasmic volume relative to nuclei
		Variation in cell size and shape
		Loss of normal specialized cell features
		Disorganized arrangement of cells
		Poorly defined tumor boundary

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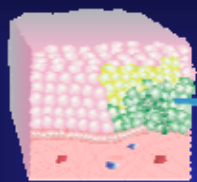
Normal Cell Communication



Some communications pathways



Cancer: A Communication Failure



Colon

Retinoblastoma,
bone, bladder,
lung, breast

Many cancers

Genes

mRNA



Proteins

Sarcomas

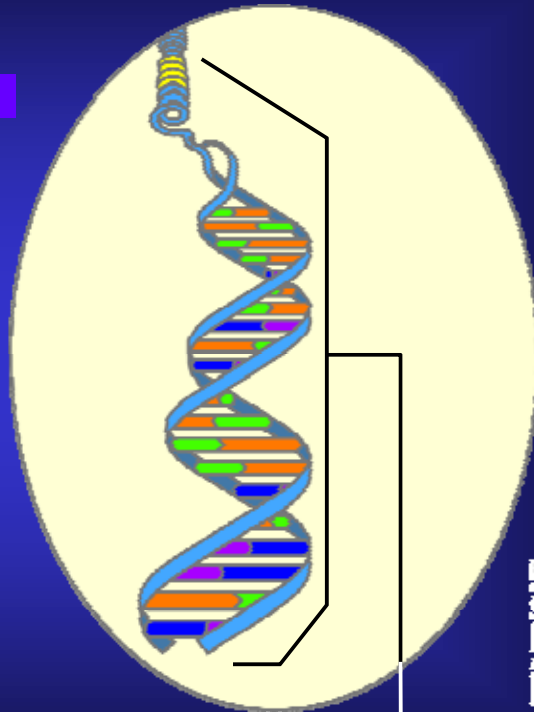
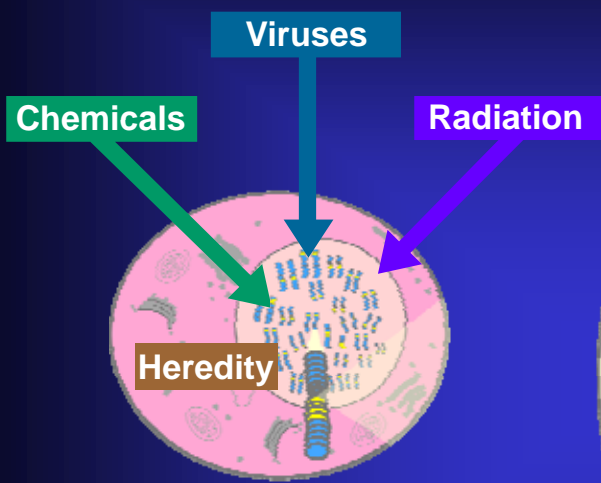
Leukemia,
brain,
breast,
stomach,
lung

Leukemia

Some neuronal tumors



Genes and Cancer



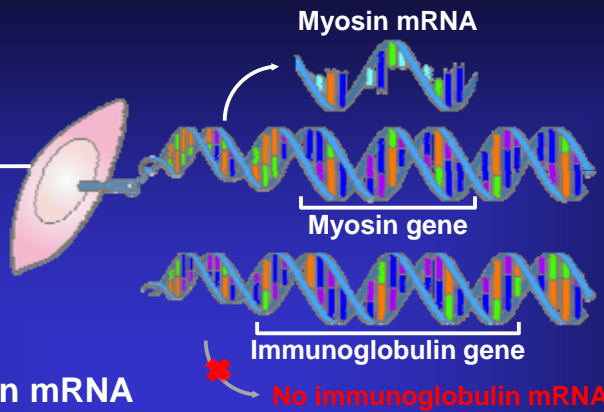
Chromosomes
are DNA
molecules

Approved for Release by NSA on 05-08-2014 pursuant to E.O. 13526

Expression Changes With Cell Type

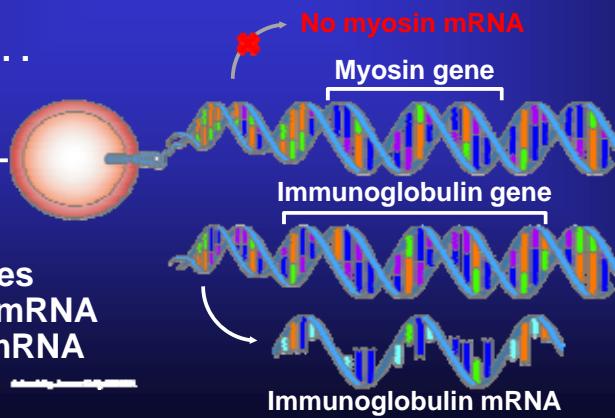
Myocyte has both genes, but . . .

Myocyte makes myosin mRNA and not immunoglobulin mRNA



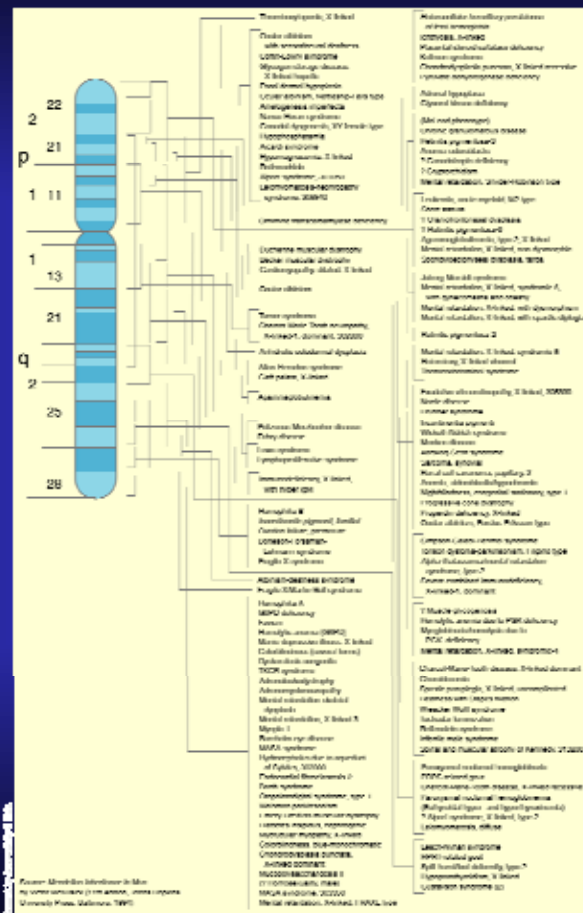
Lymphocyte has both genes, but . . .

Lymphocyte makes immunoglobulin mRNA and not myosin mRNA



Human Genome Project

Chromosome X

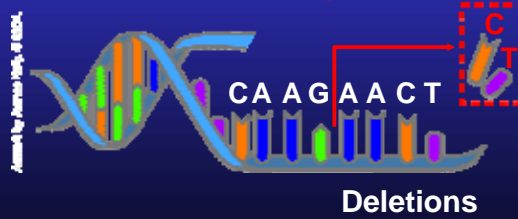
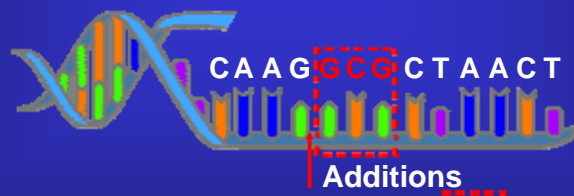
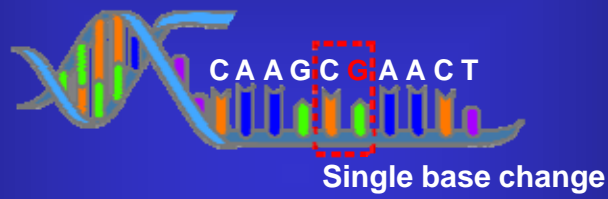


Examples of Dominantly Inherited Cancer Syndromes

Syndrome	Associated Gene
Familial retinoblastoma	<i>RB1</i>
Li-Fraumeni	<i>TP53</i> (p53 protein)
Familial adenomatous polyposis	<i>APC</i>
Hereditary nonpolyposis colorectal cancer	<i>MLH1, MSH2, MSH6, PMS1, PMS2</i>
Wilms' tumor	<i>WT1</i>
Breast and ovarian cancer	<i>BRCA1, BRCA2</i>
von Hippel-Lindau	<i>VHL</i>
Cowden	<i>PTEN</i>

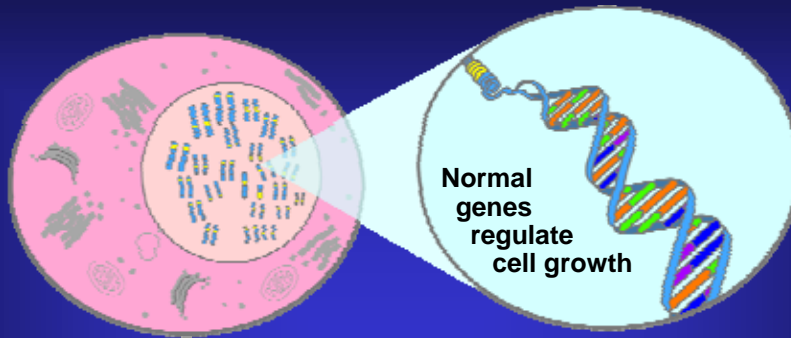
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DNA Mutation

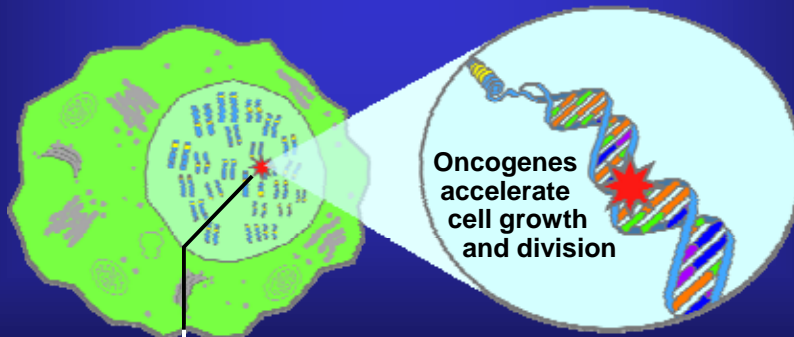


Oncogenes

Normal cell

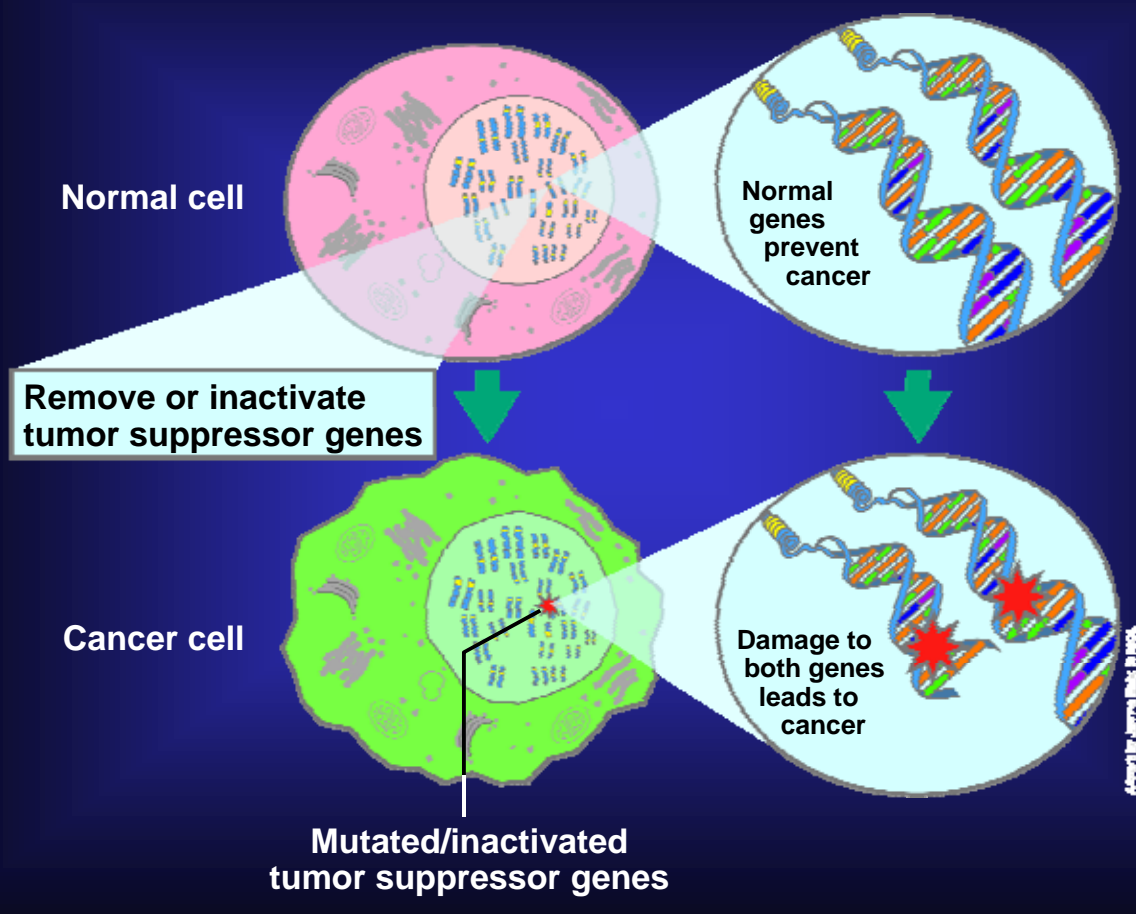


Cancer cell

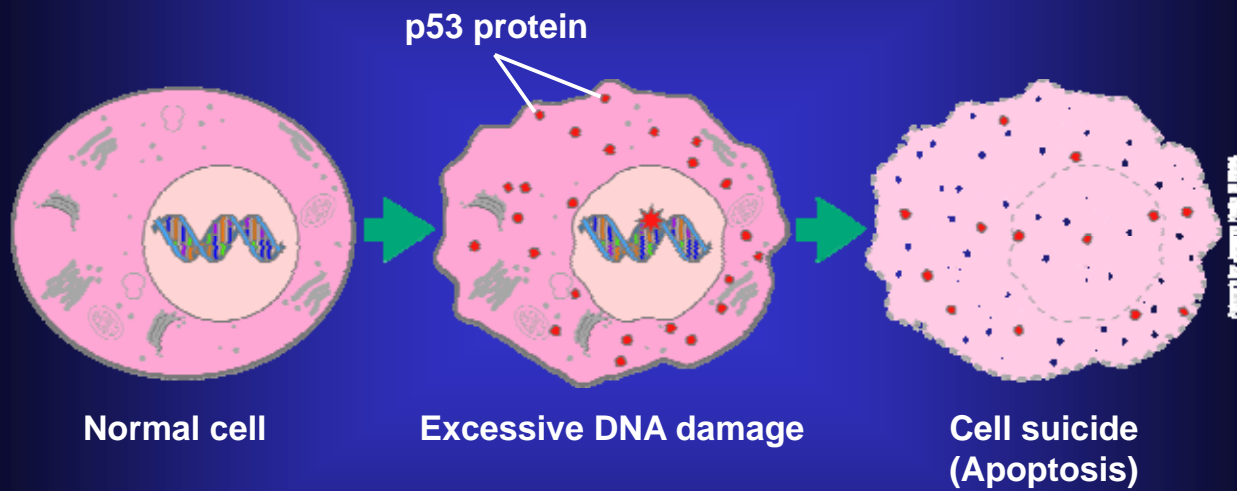


Mutated/damaged oncogene

Tumor Suppressor Genes



p53 Tumor Suppressor Protein Triggers Cell Suicide



DNA Repair Genes

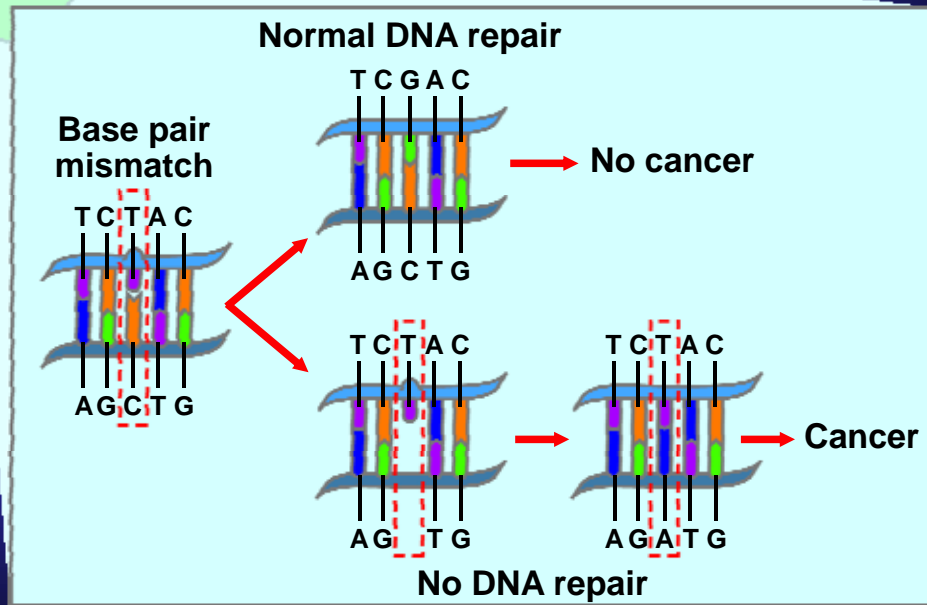
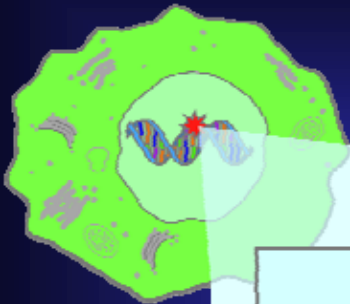


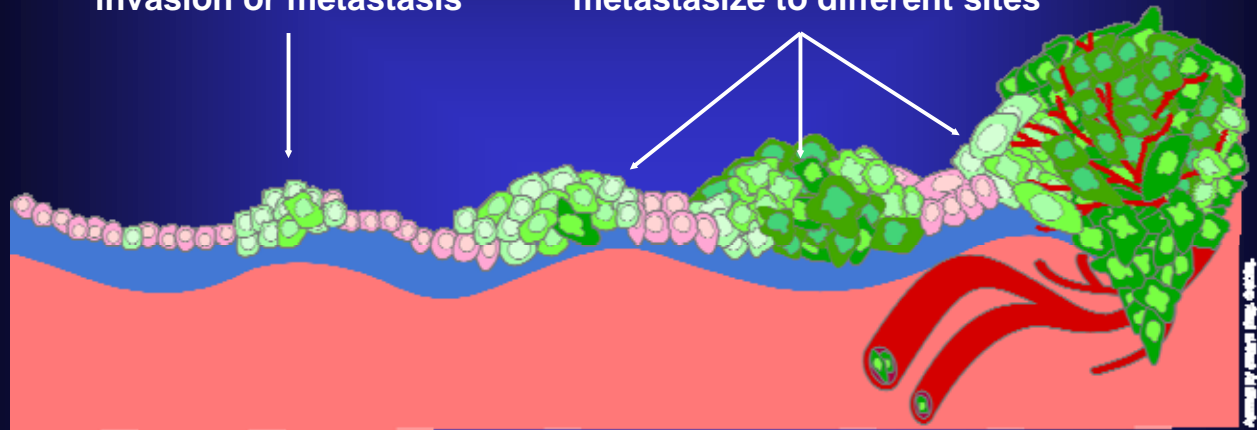
Photo by Lawrence Roth, M.D.

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Cancer Tends to Involve Multiple Mutations

Benign tumor cells grow only locally and cannot spread by invasion or metastasis

Malignant cells invade neighboring tissues, enter blood vessels, and metastasize to different sites



Time

Mutation inactivates suppressor gene

Cells proliferate

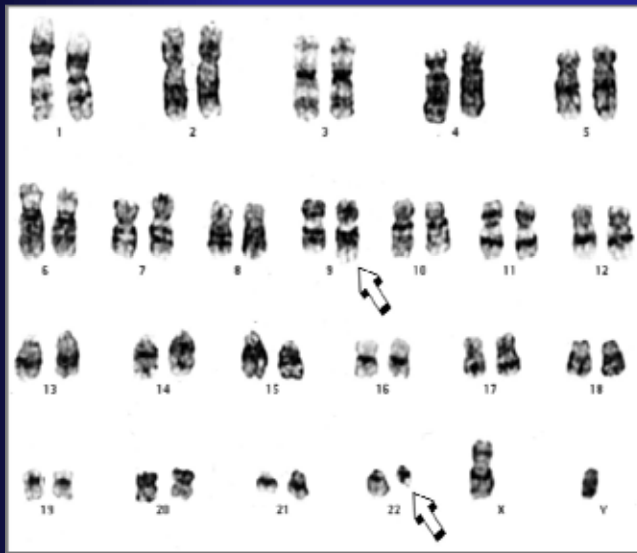
Mutations inactivate DNA repair genes

Proto-oncogenes mutate to oncogenes

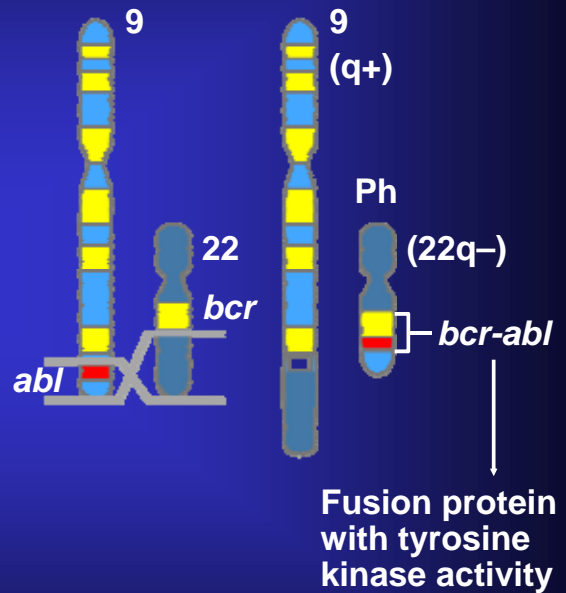
More mutations, more genetic instability, metastatic disease

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Example: Translocation of *Bcr-Abl* Genes

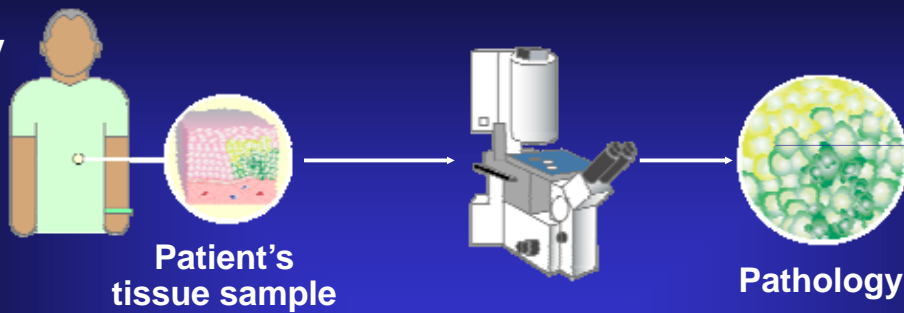


Adapted by J. Bennett MD, Ph.D. ©2004

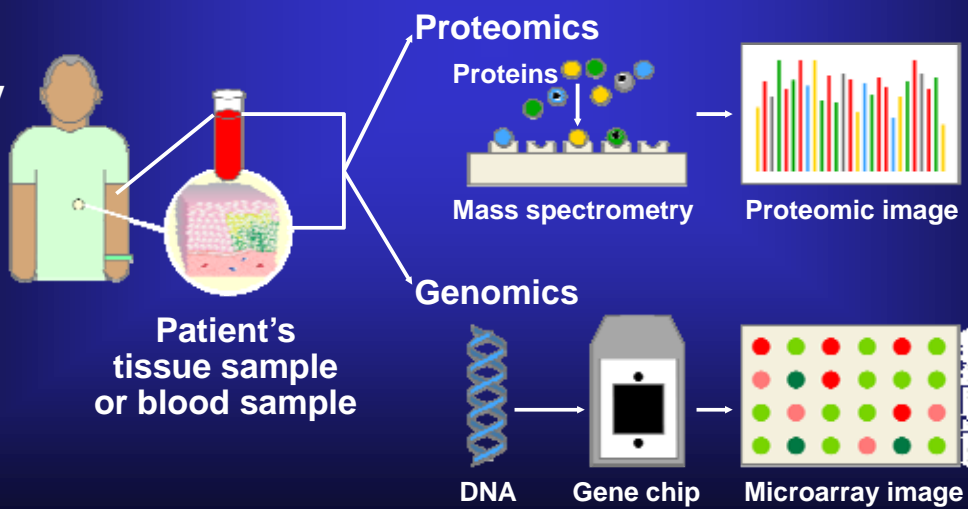


Molecular Diagnostics

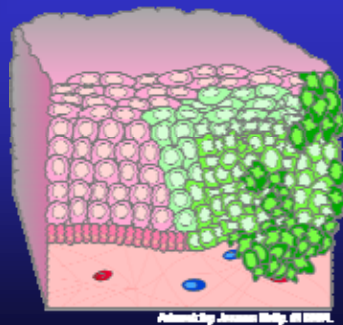
Old Way



New Way



THANK YOU



Adapted by J. Amerson, M.D., M.P.H., M.D.

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