

A woman with blonde hair is looking intently at a molecular model she is holding in her hand. The model consists of black, white, blue, red, and purple spheres connected by white rods. The background is a soft, out-of-focus grey. A dark blue ribbon-like graphic element flows across the top and bottom of the image.

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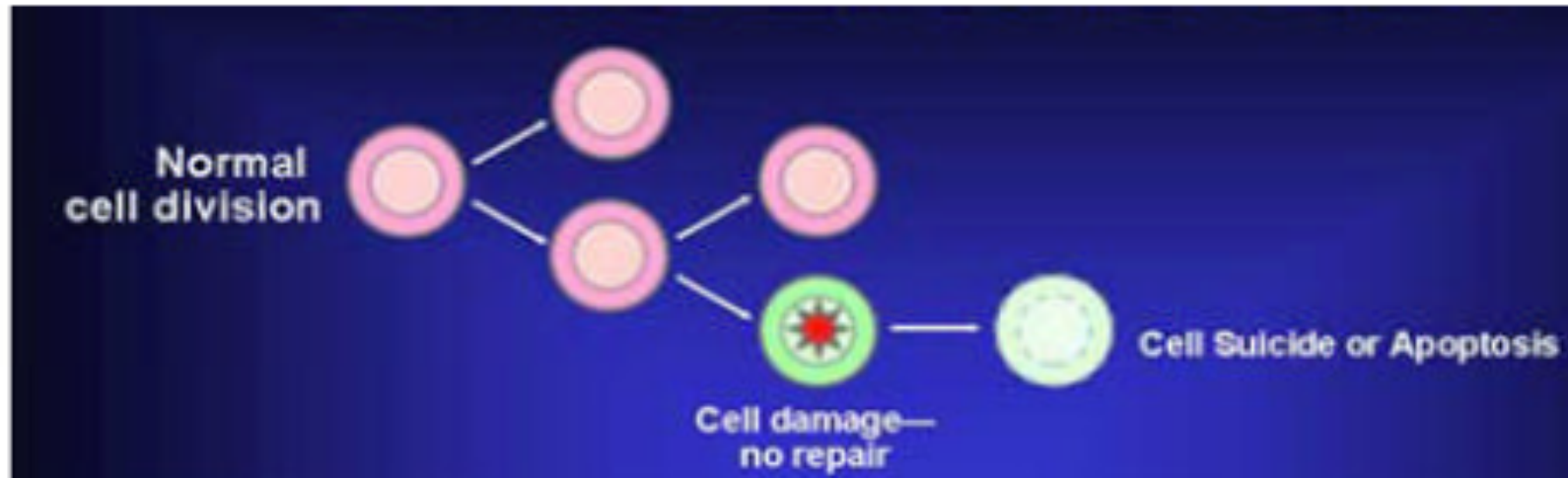
**Biotech Concerto #5**  
*Executive Primer on Oncology*  
December 2008

- Defining Cancer
- Origins of Cancer
- Common Cancer Types
- Cancer Diagnosis
- Cancer Treatments
- Top10 Global Oncology Sales
- Top10 Oncology Deals
- Cancer Treatment Outlook

- Oncology is the branch of medicine that studies cancer and seeks to understand their development, diagnosis, treatment, and prevention.
- Cancer is a term used for diseases in which abnormal cells divide without control and are able to invade other tissues. Cancer cells can spread to other parts of the body through the blood and lymph systems.
- Cancer is not just one disease but many diseases. There are more than hundred different types of cancer. Most cancers are named for the organ or type of cell in which they start.
- Cancer types can be grouped into broader categories:

Category	Description
Carcinoma	Cancer that begins in the skin or in tissues that line or cover internal organs.
Sarcoma	Cancer that begins in bone, cartilage, fat, muscle, blood vessels, or other connective or supportive tissue.
Leukemia	Cancer that starts in blood-forming tissue and causes large numbers of abnormal blood cells.
Lymphoma and Myeloma	Cancer that begin in the cells of the immune system.
Central Nervous System Cancers	Cancer that begin in the tissues of the brain and spinal cord.

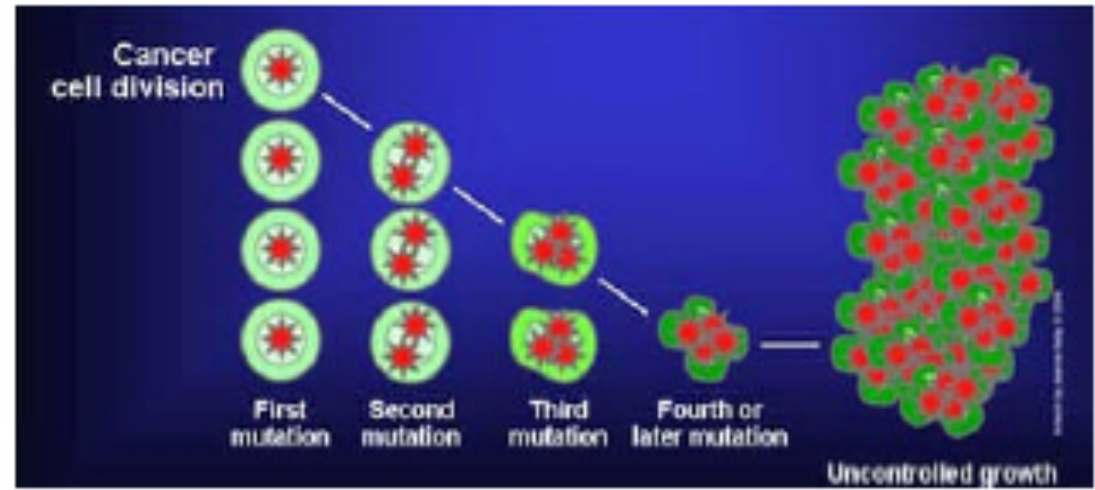
Source: National Cancer Institute



The body is made up of many types of cells. These cells grow and divide in a controlled way to produce more cells as they are needed to keep the body healthy. When cells become old or damaged, they die and are replaced with new cells.

Source: National Cancer Institute

Sometimes the orderly process of normal cell division goes wrong. The genetic material (DNA) of a cell can become damaged or changed, producing mutations that affect normal cell growth and division. When this happens, cells do not die when they should and new cells form when the body does not need them. The extra cells may form a mass of tissue called a tumor:



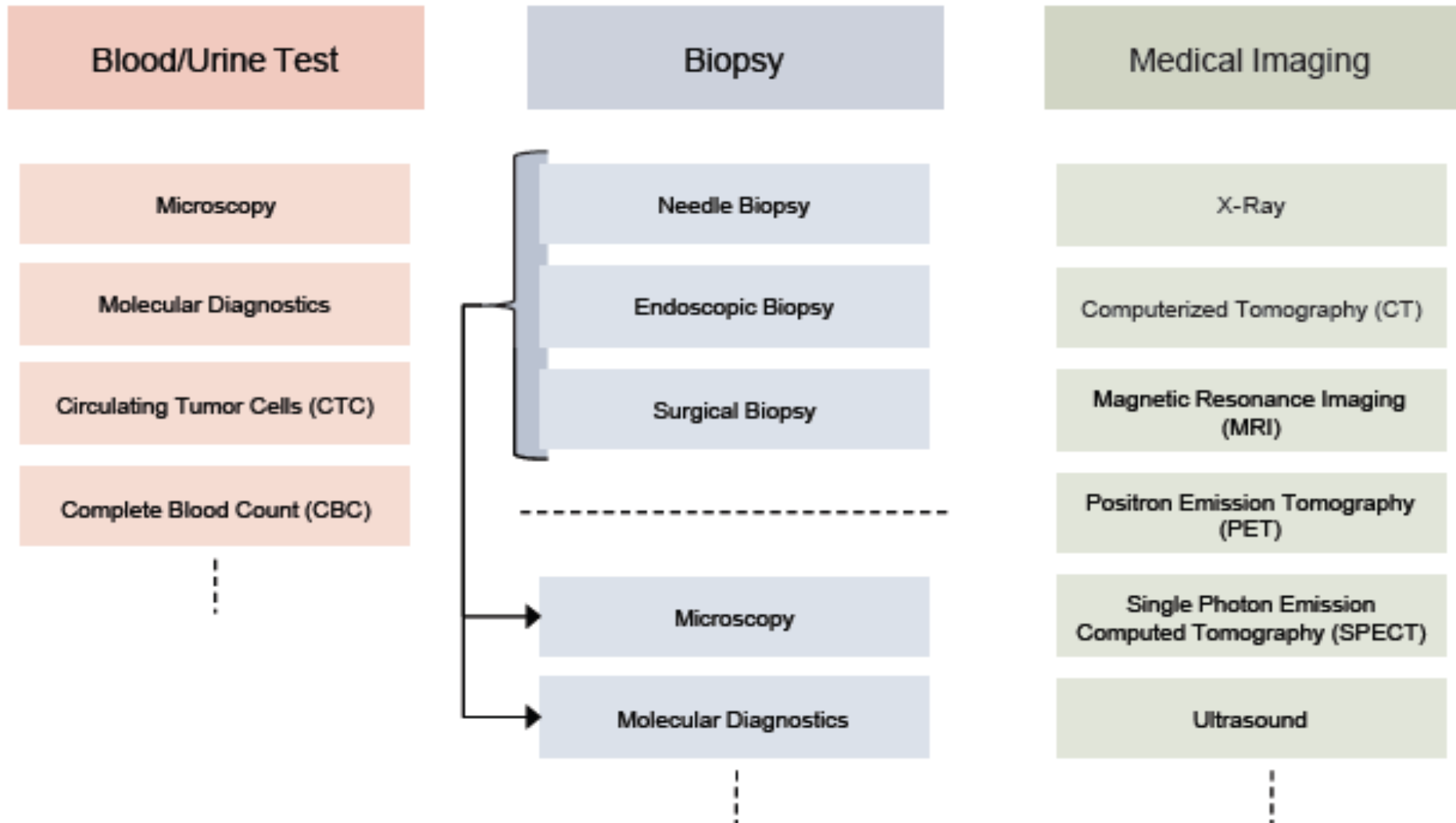
- **Benign tumors aren't cancerous:** Cells in benign tumors do not spread to other parts of the body.
- **Malignant tumors are cancerous:** Cells in these tumors can invade nearby tissues and spread to other parts of the body. The spread of cancer from one part of the body to another is called metastasis.
- **Some cancers do not form tumors, e.g. leukemia is a cancer of the bone marrow and blood.**

Source: National Cancer Institute

Cancer Type	Estimated New Cases*	Estimated Deaths*
Bladder	68'810	14'100
Breast (Female / Male)	182'460 / 1'990	40'480 / 450
Colon and Rectal (Combined)	148'810	49'960
Endometrial	40'100	7'470
Kidney (Renal Cell) Cancer	46'232	11'059
Leukemia (All)	44'270	21'710
Lung (Including Bronchus)	215'020	161'840
Melanoma	62'480	8'420
Non-Hodgkin Lymphoma	66'120	19'160
Pancreatic	37'680	34'290
Prostate	186'320	28'660
Skin (Non-melanoma)	>1'000'000	<1'000
Thyroid	37'340	1'590

\* US Estimates for 2008

Source: American Cancer Society / National Cancer Institute



Therapy	Description
Chemotherapy	Chemotherapy uses drugs to destroy cancer cells. Chemotherapy works by stopping or slowing the growth of cancer cells, which grow and divide quickly. But it can also harm healthy cells that divide quickly. Damage to healthy cells may cause side effects.
Radiation Therapy	Radiation therapy is the use of a certain type of energy to kill cancer cells and shrink tumors. The goal of radiation therapy is to damage as many cancer cells as possible, while limiting harm to nearby healthy tissue.
Surgery	The goal of the surgery can be either the removal of only the tumor, or the entire organ. Advances in surgical techniques have allowed to successfully operate on a growing number of patients. Less invasive operations often can be done to remove tumors while saving as much normal tissue and function as possible.
Targeted Therapies	Targeted cancer therapies use drugs that block the growth and spread of cancer. They interfere with specific molecules involved in the cancer cell process and tumor growth. Emerging targeted therapies may be more effective than current treatments and less harmful to normal cells.

Source: American Cancer Society / National Cancer Institute



Targeted Therapy	Description
Angiogenesis Inhibitors	Drugs that may prevent the formation of blood vessels. In anti-cancer therapy, an angiogenesis inhibitor prevents the growth of new blood vessels needed for tumors to grow.
Targeted Immunotherapy	Therapy attempting to stimulate the patient's own immune system to reject and destroy tumors. Drugs are essentially a collection of monoclonal antibodies. Vaccines are also subject of research for a number of tumors. Bone marrow transplantation from a genetically non-identical donor can be considered a form of immunotherapy.
Signal-transduction Inhibitors	Drugs that block specific enzymes and growth factor receptors involved in cancer cell growth.
Proteasome Inhibitors	Apoptosis-inducing drugs that cause cancer cells to undergo apoptosis (cell death) by interfering with proteins involved in the process.
Tyrosine Kinase Receptor Inhibitors	A tyrosine kinase receptor is a molecular structure on the surface of a cell that binds with substances which in turn triggers a series of reactions inside the cell. By blocking the receptor, the goal is to prevent the cascade of reactions and prevent tumor survival.

Source: National Cancer Institute / OncoLink

# Top 10 Global Oncology Sales (USDm)

Company	Sales		CAGR (%)	Market Share		Market Rank	
	2007	2012		2007	2012	2007	2012
Roche	7.2	14.5	15	16.8	20.7	1	1
Genentech	6.3	10.6	11	14.6	15.1	2	2
Novartis	3.9	5.6	8	9.1	8.1	5	3
Pfizer	2.6	4.5	11	6.1	6.4	6	4
Bristol-Myers Squibb	1.6	3.3	16	3.6	4.7	8	5
GlaxoSmithKline	0.7	3.1	36	1.5	4.5	14	6
Eli Lilly	2.4	3.0	4	5.6	4.2	7	7
AstraZeneca	4.7	2.9	(9)	10.9	4.2	4	8
Sanofi-Aventis	5.0	2.9	(10)	11.7	4.2	3	9
Bayer	1.0	2.6	22	2.2	3.7	10	10
Rest of Market	7.7	17.0	23	17.8	24.2	-	-
<b>Total Market</b>	<b>43.1</b>	<b>70.0</b>	<b>10</b>	<b>100</b>	<b>100</b>	-	-

Source: EDB Group / EvaluatePharma Alpha

# Top 10 Oncology Deals in 2007

Partner A	Partner B	Deal	Value (USD)
AstraZeneca	MedImmune	Acquisition	15.6 bn
Celgene	Pharmion	Acquisition	2.9 bn
Eisai	MGI Pharma	Acquisition	3.9 bn
GlaxoSmithKline	Synta Pharmaceuticals	Co-Development	1.1 bn
Merck	Ariad Pharmaceuticals	Co-Development	1.0 bn
Novartis	Antisoma	Licensing Agreement	890 m
GlaxoSmithKline	OncoMed Pharmaceuticals	Licensing Agreement	1.4 bn
Genentech	Genetics	Licensing Agreement	800 m
Sanofi-Aventis	Regeneron Pharmaceuticals	Licensing Agreement	560 m
McKesson	Oncology Therapeutics Network	Acquisition	575 m

Source: Oncology Business Review

- Cancer represents the fastest growing therapy segment in the pharmaceutical market. The US is the largest market for cancer drugs, followed by Europe and Japan.
- Cancer vaccines and antiangiogenics will record the fastest growth rate between 2007 and 2012.
- Drugs available in the market today do give some respite to patients but fail to address a number of complications. Drug manufactures are now focused on developing target therapies. These drugs attack target cells and thus limit the severity of side effects.
- Targeted therapies have improved treatment outcomes in cancer notably, becoming the leading therapy class in the oncology market. As a result, they are expected to achieve sales of over USD 42 billion by 2017.
- Eight more marketed brands are set to achieve blockbuster status over the 10-year forecast period, driven by the persistent unmet need that still exists across a number of tumor types.

Source: Reuters / Pharmafocus/Datamonitor

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