8 million people die from cancer every year world wide

The Biology of Cancer

\*\*Suggested Reading List

Some learners have asked for reading suggestions in the field, so we've compiled this list. These are recommended readings, but they are not required for course completion. We hope you find these resources helpful.

**Weinberg RA. *The Biology of Cancer*, 2nd Edition Garland Science: May 18, 2013.**

* This book provides an in-depth description of all of the topics touched on in this course. It requires a basic knowledge of biology.
* <http://www.amazon.com/The-Biology-Cancer-2nd-Edition/dp/0815342209>

**MukherjeeS.*The Emperor of All Maladies: A Biography of Cancer* Scribner: Aug 9, 2011)**

* This book provides a history of cancer and how it affects us. It does not require any prior knowledge of biology.
* <http://www.amazon.com/The-Emperor-All-Maladies-Biography/dp/1439170916>

**Hanahan D, Weinberg RA. Hallmarks of cancer: the next generation. *Cell* 2011 Mar 4;144(5):646-74. PMID: 21376230.**

* This article is available free to the public and describes the hallmarks of cancer.
* <http://dx.doi.org/10.1016/j.cell.2011.02.013>

**Cavallo F, et al. 2011: the immune hallmarks of cancer. *Cancer Immunol Immunother.* 2011 Mar;60(3):319-26. PMID: 21267721.**

* This article is available free to the public and describes how the immune system relates to the hallmarks of cancer.
* <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3042096/>

**Tennat DA, et al. Metabolic transformation in cancer. *Carcinogenesis*. 2009 Aug;30(8):1269-80. PMID: 19321800**

* This article is available free to the public and describes how cancer cells use metabolism differently than normal cells.
* <http://dx.doi.org/10.1093/carcin/bgp070>

**Pienta KJ, et al. The cancer diaspora: Metastasis beyond the seed and soil hypothesis. *Clin Cancer Res*. 2013 Nov 1;19(21):5849-55. PMID: 24100626.**

* This article is available free to the public and describes how cancer cells metastasize.
* <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3835696/>
* Incidence and Etiology of Cancer – Dr. Ken Pienta

Global Health Problem – Problem of cancer is only growing

Disease is increasing in incidence and mortality.

Here is a sense of how it affects people as well as the biology of how it starts. Understand cancer better and treat cancer better.

Six most common: Lung, Colon, Breast, Prostate, Stomach, Liver

Cancer is unctrolled growth. The disease is caused by an uncontrolled division of abnormal cells in a part of the body.

Tumor – a swelling of a part of the body, generally without inflammation, caused by an abnormal growth of tissue, (benign or malignant)

Neoplasm, a new and abnormal growth of tissue in some part of the body.

Cancer is caused by an accumulation of detrimental variation in the genome over the course of a lifetime.

Most of the time, a single mutation is NOT sufficient to induce cancer formation.

Oncology literally means a branch of science that deals with tumors and cancers. “onco” means bulk, mass, or tumor. “logy” means study.

From Greek, Metastasis – migration, change, revolution. Refers to spreading of cancer from primary site to distant organs.

Four main types of cancer:

Carcinoma – arise in the epithelial tissue that is found in the internal and external lining of the body.

Adenocarcinomas develop in an organ or gland.

Squamous cell carcinomas develop in the squamous epithelium of organs, including the skin, bladder, esophagus, lung.

Sarcoma arise from the connective tissue that is found in bones, tendons, cartilage, muscle, and fat.

Leukemia – cancers of the blood that originate in the bone marrow

Lymphoma – cancers of the lymph system

Lymphoma – over growth of “blasts.” Lymph node is just full of cancer.

\*\*Cancer Incidence - How often it is diagnosed.

Cancer is the number one killer in the world.

Rank Order: Lung, Breast, Colon, Prostate, Stomach, Liver

--Cancer and Heart Disease are leading causes of death in the US

\*\*The Common Cancers - Lung is the most common cancer diagnosis in men and women in the US. It is the leading cause of cancer death. We are doing a very poor job detecting and curing lung cancer.

87% of lung cancer deaths in men are likely due to smoking.  
70% of lung cancer deaths in women are likely due to smoking.

Risk of developing lung cancer is 25-times higher in smokers than nonsmokers.

Prevention: stop smoking, decrease exposure to other risks.

National Lung Screening Trial – 55 to 74 years old. 30 pack-year smoking history. (heavy smoking history). This trial looked at yearly low-dose CT scan for three years.

Colon Cancer – 5 foot tube at the end of the digestive system that stores waste. Rectum is the last 6 inches of the colon.

Colon cancer is the third most common cancer diagnosed in men and women. Third leading cause of cancer death in the US.

Risk factor: Age, Diet (high meats, low vegetables), Lifestyle (obesity, smoking, alcohol), Inflammatory Bowel Disease (Crohn’s disease), Family History, Genes (DNA repair, APC, KRAS, TP53).

High-fiber diet, low meat diet, associated with decreased risk of developing colon cancer. POSSIBILITY: low-dose aspirin for prevention

Colonoscopy every 5 to 10 years starting at age 50.

\*\* Breast Cancer – Most common cancer in US women. Approximately 230k cases per years in the US. Approximately 40,000 deaths per year in the US. Second leading cause of cancer death.

Breast cancers are classified by their location and by their histologic subtype.

Risk factors: age, family history, genes, dense breast tissue, lifestyle.

No known proven strategies for preventing breast cancer, except prophylactic mastectomy in high-risk women.

\*Prostate Cancer – size of walnut, sits below bladder, helps protect from UTIs.

The most common cancer in men. 1/7 men will be diagnosed in the US in their lifetime.

Second leading cause of cancer death in men. If it is found early, it is very treatable.

Risk factors: age, ethnicity (higher in African American men, low in Asian men), positive family history, genes (HoxB12, BRCA1, BRCA2, MSH2, MLH1), diet.

No known prevention strategies.

Yearly digital rectal exam starting at age 50.

PSA blood test. Year test.

\*\*Liver Cancer

The liver is a large gland that sits right below the rib cage on the right side.

Processes nutrients absorbed from the intestine.

Makes clotting factors.

Secretes bile to help the body absorb fats.

Liver cancer is one of the most common cancers world-wide. A leading cause of cancer death worldwide. This cancer is very lethal.

Risk factors: twice as common in men, chronic viral hepatitis B or C, alcohol, aflatoxins, lifestyle (obesity, anabolic steroids, smoking).

Prevention: prevent and treat hepatitis infections (best way to prevent cirrhosis and cancer), avoid alcohol abuse, avoid smoking, avoid obesity.

There is no proven strategy for screening for liver cancer. Liver Cancer – alpha-fetoprotein.

\*\*Stomach Cancer - The stomach holds food and starts the process of digestion.

A leading cause of death worldwide.

Risk: man, age, h pylori infection, diet, lifestyle, type A blood

Prevention: Treat h. pylori infection, refrigerate instead of salting/pickling, high-fiber diet, avoid smoking, maintaining a good body weight.

No proven strategy for stomach cancer screening. [End of Lecture]