

- An understanding of the basics of the cell cycle and cell division by mitosis.
 1. Cell: SMALL AND DISCRETE STRUCTURES FULL OF THE CHEMICALS OF LIFE, AN ORGANISM'S FUNCTION IS THE SUM OF HOW ITS CELLS INTERACT
 2. Phase of the cell cycle:
 - a. Birth
 - b. G1- first growth (cell growth)
 - c. S- Synthesis s phase (DNA replication)
 - d. G2- Second Growth (prep Mitosis)
 - e. Death
 - f. Miosis (m phase → karyokinesis, cytokinesis)
 3. Mitosis—parent cell → dna replicates → 2 daughter cells (preserves genetic similarity)
 - With the exception of cells that produce sperm and eggs (or gametes), all cells divide by mitosis.
 - In mitosis, a parent cell duplicates all of its genetic material and then divides to form two, genetically identical daughter cells (barring mutation, of course).
 - Mitosis is part of the cell cycle, the stages of which are labeled as G1, S, G2 and mitosis. A cell grows and does its jobs (G1), copies its DNA (S) and then gets ready to divide (G2).
 - The cell cycle is controlled by genes. Genes called oncogenes promote mitosis, whereas tumor-suppressor genes inhibit mitosis.
- An understanding that cancer is a family of diseases characterized by uncontrolled mitosis, and to appreciate the complexity of genetic changes that underlie these diseases.
 - Cancer arises when regulation of the cell cycle fails and mitosis becomes uncontrolled. For example, genes that either promote or inhibit mitosis may suffer mutations and so not function properly.
 - Cancer is a variable disease with variable causes, including exposure to environmental carcinogens such as tobacco smoke and the rays coming from tanning beds. Not too many cancers are caused by genetic changes that can be inherited, but more may be caused by infectious agents (such as viruses) than we once thought.
 - Thus, it makes more sense to think of cancer not as a single disease but as a family of diseases that share one important feature in common – uncontrolled cell division.
 - The disease begins with the growth of a primary tumor that may spread to other parts of the body (a process called metastasis) to form secondary tumors. This

spread sometimes is helped by tumors stimulating the formation of new blood vessels close to them, a process called angiogenesis.

1. Oncogenes—stimulate mitosis
2. Tumor-suppressor genes—inhibit mitosis

- To understand methods of diagnosis and treatment.
 - o Diagnosis often begins with a patient noticing troubling symptoms, such as a persistent cough. Biopsies and various forms of imaging are then used to determine the kind of cancer involved, its stage of development and its exact location(s) in the body.
 - o Secondary tumors are harder to treat than primary tumors, but new treatments for cancer are under constant development. Standard therapies involve surgery and/or the use of radiation and/or drugs (chemotherapies) to slow or halt cell division. For example, the drug Taxol disrupts the little spindles that move chromosomes during mitosis.
 - Imaging-
 - CT scan, PET scan, composite. Metastatic and melanoma
 - MRI. Eye cancer. Magnetic resonance imaging
 - Cat scan. Computer assisted tomography
 - Biopsy
 - Treatments-
 - Surgery
 - Radiotherapy (brachytherapy- radioactive seeds placed around prostate gland)
 - Chemotherapy (rapidly dividing cells are vulnerable)(flourorocil is a chemo drug)
 - Targeted therapy (cells with certain mutations are made less sensitive to factors that stimulate mitosis)
 - Newer therapies are more targeted. For example, the drug Avastin blocks angiogenesis, starving tumor cells and making metastasis less likely. Another approach is to block the responses of cancer cells to molecules that occur naturally in the body and which stimulate cell division.
 - Perhaps most exciting are developments in which the mutations in an individual's tumor are identified and then a mutation-specific therapy is given - we might call this individualized therapy.

- To understand how cancer is caused and the biology of how a primary tumor may spread throughout the body.
 - Cancer- s group of disease in which cells divide out of control to form a primary tumor and then spread to form more tumors in other parts of the body.
- To grasp in as vivid a manner as possible the importance of knowing one's family history and living a healthy lifestyle to reducing one's risk of developing cancer.
- Despite progress with particular kinds of cancer, the disease overall remains the second leading cause of death in the U.S. (heart disease is number one, but not by much of a lead), and the most common kind of cancer is that of the skin followed by the lung. About one out of every three Americans will develop cancer if they live long enough. Of course, developing cancer isn't the same as dying from cancer.
- You can reduce your odds of developing cancer by knowing your family history, lowering your exposure to recognized risk factors (such as tanning beds) and getting yourself screened on an appropriate schedule. A colonoscopy isn't much fun, but neither is colon cancer.