

## SCIENCE

### *An Introduction to the Biology of Cancer*

- I. CELLS AND THE DEVELOPMENT OF CANCER 25%
  - A. An Introduction to Cells
    - 1. Cell Structure
      - a. Nucleus and DNA
      - b. Organelles
      - c. Cytoskeletal Elements and the Cell Membrane
    - 2. Cell Function
      - a. General cell activities
      - b. Differentiated cellular function
    - 3. The Cell Cycle and Cell Division
      - a. Interphase (G1, S, G2)
      - b. Mitosis (prophase, prometaphase, metaphase, anaphase, telophase) and cytokinesis
      - c. Cell cycle checkpoints
    - 4. Cell Death
      - a. Apoptosis
      - b. Necrosis
      - c. Other types of cell death
  - B. The Development of Cancer
    - 1. Gene Changes
      - a. Proto-oncogenes/oncogenes
      - b. Tumor suppressor genes
      - c. DNA repair genes
    - 2. Tumors
      - a. The formation of tumors
      - b. Tumor types
    - 3. Angiogenesis and Metastasis
- II. CAUSES OF CANCER: THE ROLE OF GENETICS AND THE ENVIRONMENT 25%
  - A. Genetics
  - B. Age
  - C. Obesity
    - 1. Insulin
    - 2. Sex Hormones
    - 3. Growth Factors
  - D. Diseases
    - 1. Viral Causes
      - a. Epstein-Barr virus
      - b. Kaposi's sarcoma-associated herpesvirus/human herpesvirus 8
      - c. Human papillomavirus
      - d. Human T-lymphocyte virus-1
    - 2. Bacterial Causes

3. Autoimmune Diseases
4. Other Disease States Associated with Cancer
- E. Environmental Exposure
  1. Tobacco and Smoking
  2. Alcohol
  3. Pollution
  4. Other Environmental Cancer-Causing Agents
    - a. Asbestos
    - b. Radon
    - c. UV radiation

### III. THE PREVENTION, DETECTION, AND PROGRESSION OF CANCER 25%

- A. Early Detection and Prevention
  1. Screening Tests
    - a. Fecal occult blood, colonoscopy, and other colon cancer screening methods
    - b. Breast exams and mammograms to screen for breast cancer
    - c. Pap smear, HPV testing, HPV vaccination, and CA-125 to detect reproductive cancers
- B. Diagnosis
  1. Symptoms
  2. Biopsy
    - a. Grading
    - b. Staging

### IV. TYPES AND TREATMENT OF CANCER 25%

- A. Types of Cancer
  1. Carcinomas
  2. Adenocarcinomas
  3. Melanomas
  4. Sarcomas
    - a. Osteosarcomas
  5. Lymphoma
  6. Leukemia
  7. Myeloma
  8. Blastoma
- B. Treatments for Cancer
  1. Chemotherapy
    - a. What is chemotherapy?
    - b. Administration of chemotherapy
    - c. Side effects of treatment
    - d. Examples of chemotherapeutic agents
  2. Radiation Treatment
  3. Surgery
  4. Combining Chemotherapy, Radiation Therapy, and Surgery
    - a. Surgery and chemotherapy
    - b. Surgery and radiation

- c. Chemotherapy and radiation
- 5. Immunotherapy
  - a. Immune checkpoint inhibitors
  - b. Adoptive cell transfer
  - c. Other types of immunotherapy