Module 1: Primary Immunodeficiency

Objectives: Upon completing the assignments for this module, the student will be able to:

1. Define:
   a. immunodeficiency
   b. primary immunodeficiency

2. Illustrate which specific cell types are defective in primary immunodeficiency disorders.

3. Summarize the basic information about primary immunodeficiency disorders.

4. Explain combined immunodeficiencies (CIDs) and their impact on the adaptive immune system.

5. Summarize severe combined immunodeficiency (SCID) including:
   a. events that result in SCID
   b. impact on T and B cells
   c. common symptoms/signs
   d. common defects

6. Explain the immune defect that leads to the following conditions:
   a. Autoimmune Polyendocrineopathy and Ectodermal Dystrophy (APECED)
   b. Wiskott-Aldrich Syndrome
   c. X-linked Agammaglobulinemia (Burton’s Hypogammaglobulinemia)
   d. Common Variable Immunodeficiency (CVID)
   e. Immune Dysregulation, Polyendocrinopathy, Enteropathy, X-linked Syndrome (IPEX)
   f. DiGeorge Syndrome
   g. Chronic Granulomatous Disease
   h. Chediak-Higashi Syndrome
   i. Bare-Lymphocyte Syndrome (BLS)
   j. Hyper IgM Syndrome
   k. Hyper IgE Syndrome (Job Syndrome)
   l. Selective IgA Deficiency
   m. Leukocyte Adhesion Deficiency
   n. Mendelian Susceptibility to Mycobacterial Disease (MSMD)

7. Summarize the effects of the immune defect of the conditions listed in objective 6 including:
   a. cells affected
   b. symptoms and/or characterizations
   c. prognosis (when appropriate)
8. Recall, when appropriate, which conditions listed in objective 6 are:
   a. X-linked
   b. autosomal recessive or dominant
   c. associated chromosome and/or gene

9. Categorize the immune defect for each condition listed in objective 6 as being:
   a. Lymphoid
      i. T cell line
      ii. B cell line
      iii. Combined
   b. Myeloid
   c. Thymic

10. Explain how complement deficiencies and their effect on immunity.

11. List the treatment options for primary immunodeficiencies based on cause.

12. Compare treatment options for primary immunodeficiencies.

Assignments
1. Read Chapter 1, Kuby Immunology, 7th Ed. Pages 22-23
2. Read Chapter 18, Kuby Immunology, 7th Ed. Pages 593-604
3. OPTIONAL: Visit the following and watch the videos to learn more about the specific syndromes:
   DiGeorge Syndrome: http://www.youtube.com/watch?v=a3yjnjB-Vpc
   Severe combined immunodeficiency: http://www.youtube.com/watch?v=I3izRe7xl7A
   X linked agammaglobulinemia: http://www.youtube.com/watch?v=aqrSPh_P3bU
   IgA Deficiency: http://www.youtube.com/watch?v=pkJI-lqx6IM
5. OPTIONAL: Visit the Immune Deficiency Foundation website to learn more http://primaryimmune.org/
6. Test your knowledge by answering questions 1 through 10 at the end of the chapter
Module 2: Secondary Immunodeficiencies

Objectives: Upon completing the assignments for this module, the student will be able to:

1. Summarize the mechanism by which various agents/conditions induce secondary immunodeficiency.

2. Explain hypogammaglobulinemia including:
   a. symptoms
   b. treatment
   c. cause(s)

3. Explain agent-induced immunodeficiency
   a. examples of causes
   b. treatment(s)

4. Discuss the effect of age on immune function.

5. Discuss HIV infection in terms of:
   a. Symptoms
   b. Mode of transmission
   c. Affected cell lines

6. Define retrovirus and provirus.

7. Describe the life cycle of HIV.

8. Express how HIV infects a target cell.

9. Explain the activation of provirus

10. Recall the two forms of HIV.

11. Summarize the effect HIV has on the immune system.

12. Recall the stages of HIV infection including:
    a. CD4+ T cell counts

13. List the criteria for diagnosis of acquired immune deficiency syndrome (AIDS).

14. Give examples of laboratory tests used for HIV detection and monitoring of disease progression.
15. Discuss treatment of HIV including
   a. strategies for developing pharmaceutical agents
   b. drug classes
   c. highly active antiretroviral therapy (HARRT)

16. Discuss vaccine development for HIV including:
   a. the problems associated with development
   b. examples of vaccine design

17. Differentiate primary and secondary immunodeficiency disorders.

Assignments
1. Read Chapter 18, Kuby Immunology, 7th Ed. Pages 606-622
2. View the animation of the lifecycle of the HIV virus at the following website
   http://www.hhmi.org/biointeractive/hiv-life-cycle
3. Test your knowledge by answering the study questions 11 through 16 at the end of the chapter.
Module 3: Cancer and the Immune System

Objectives: Upon completing the assignments for this module, the student will be able to:

1. Define the following terms:
   a. Neoplasm
   b. Benign
   c. Malignant
   d. Metastasis
   e. Hypertrophy
   f. Hyperplasia
   g. Metaplasia
   h. Dysplasia
   i. Senescence
   j. Remission
   k. Relapse
   l. Leukemia
   m. Lymphoma
   n. Myeloma
   o. Sarcoma
   p. Carcinoma
   q. Carcinogen
   r. Proto-oncogene
   s. Cellular oncogene
   t. Oncogene

2. Communicate causes of cell transformation.

3. Identify examples of tumor growth and metastasis.

4. Describe the transformation from a normal cell into a cancer cell.

5. List some known carcinogens that can cause transformation.

6. Recall viruses that are considered carcinogens and the cancers they are associated with.

7. Describe the process of malignant transformation including the relationship of proto-oncogenes to oncogenes.

8. Differentiate between the following:
   a. Invasive vs. in situ cancer
   b. Leukemia and lymphoma
   c. Acute leukemia vs. Chronic leukemia

9. State the hallmarks used to characterize the transition of normal cells to cancerous cells.
   a. Recall two underlying factors that influence the hallmarks

10. Describe how a primary tumor can metastasize and form secondary tumors.

11. Communicate the role of the following genes in cancer including function:
    a. Oncogenes
    b. Tumor suppressor genes
    c. Apoptotic genes
    d. Proto-oncogene

13. Discuss the following tumor-associated transplantation antigens:
   a. carcinoembryonic antigen (CEA)
   b. alpha-fetoprotein (AFP)

14. Recall the two ways in which cancers are classified.

Assignments
1. Read Chapter 18, Kuby Immunology, 7th Ed. pages 627-638
2. Visit the American Cancer Society website and read about:
   - Acute Lymphocytic Leukemia:  
   - Chronic Lymphocytic Leukemia:  
   - The basics of lymphoma  
     http://www.cancer.org/cancer/lymphoma/index and then read about:
     o Hodgkin lymphoma:  
     o Non-Hodgkin lymphoma  

4. Visit the following websites about the differences between lymphoma and leukemia:  
   http://www.lymphomainfo.net/articles/lymphoma/the-difference-between-lymphoma-and-leukemia
   http://www.lymphomainfo.net/articles/lymphoma/difference-between-leukemia-and-lymphoma

5. Go to the Science Education  
6. Visit the National Cancer Institute and read about Cancer Classifications  
   http://training.seer.cancer.gov/disease/categories/classification.html
7. Go the Cancer Quest  
   http://www.cancerquest.org/cancer-biology-animations.html and from the list select the videos on Metastasis: Cancer Cell Migration and Drug Resistance.
8. Read over the Unit 13 Cancer Terminology Handout
Module 4: The Immune Response to Cancer

1. Explain the basics of cell-intrinsic mechanisms for preventing cancer.

2. Describe the three proposed mechanisms used by the immune system to control cancer.

3. Explain the immunoediting model including:
   a. the three proposed phases

4. Explain how the innate immune system mediates or inhibits cancer including:
   a. cells involved
   b. cytokines
   c. prognosis

5. Discuss the role of NK cells and macrophages in cancer suppression including:
   a. recognition mechanisms
   b. inducing signals
   c. killing mechanisms

6. Discuss the role of the following in cancer:
   a. cytotoxic T cells
   b. B cells
   c. regulator T cells
   d. Cytokines
   e. Chronic inflammation
   f. Anti-tumor antibodies

7. Summarize the mechanisms that allow tumors to evade the immune system.

Assignments
1. Read Chapter 19, Kuby Immunology, 7th Ed. pages 638-644
Module 5: Cancer Therapy

1. Recall the four categories of cancer drug therapy.

2. Summarize how immunotherapy helps eliminate cancer/tumors.

3. Discuss the role of the following in treating cancer including mechanisms of action:
   a. Chemotherapy
   b. Cytokines
   c. Monoclonal Antibodies
   d. Adjuvants
   e. Vaccines
   f. T cell therapies
   g. Costimulatory signals

4. Recall the areas of the body that can be damaged by chemotherapy including side-effects.

5. Explain the basic principles of targeted therapies.

6. Contrast chemotherapy and targeted therapies.

7. Explain the three types of targeted therapies including:
   a. mechanism of action (target of action)

8. Explain monoclonal antibody therapy include:
   a. mechanism of action
   b. radioimmunotherapy
   c. immunotoxin therapy

9. Summarize the principle of dendritic cell vaccines

Assignments

1. Read Chapter 18, Kuby Immunology, 7th Ed. pages 644-649
2. Go to the National Cancer Institute website
   http://www.cancer.gov/flash/targetedtherapies/flex/main.html#app=931b&121b-id=M01-S01-A0 and complete the tutorial on targeted therapies.
3. Go to the Inside Cancer website and under the section Diagnosis and Treatment choose Pharmacogenetics, watch the short presentation (no sound but good animations).
4. Go to the Cancer Treatment Centers of America website and watch the short video on Chemotherapy.
5. Go to the American Cancer Society website and review the different treatments for cancer.
6. Go to the American Cancer Society website. Under the section on “Chemotherapy Principles”, view the subsections “What is chemotherapy?”, “How does chemotherapy work?”, and “What are the different types of chemotherapy drugs?”
7. Complete, optional ungraded self-assessment for Unit 14
8. Complete the Unit 14 Quiz