

Cork Institute of Technology

Masters in Biomedical Sciences - Award

(NFQ – Level 9)

Summer 2007

BM5013 – Advanced Immunology

(Time: 3 Hours)

Dr G. Beasall
Prof T. McCarthy
Dr. K. Dean

Section A: Students must answer ALL questions in this part.

1. Cells of innate immunity include neutrophils, macrophages, dendritic cells, and NK cells. Choose TWO of the four cell-types listed above and describe how each specifically contributes to innate immunity.
2. Adaptive immunity is based on antigen-specificity for cell surface receptors of B- or T-cells. Antigen binding induces a process called clonal selection.
 - a. Describe what is meant by clonal selection.
 - b. List two key features of adaptive immunity that are based on clonal selection and explain their significance in adaptive immunity
3. Compare and contrast the four types of antigen-binding molecules used by the immune system—antibodies, T-cell receptors, MHC class I molecules, and MHC class II—in terms of the following characteristics:
 - a. specificity for antigen
 - b. cellular expression: types of cells and location within the cell
 - c. types of antigens recognized

4. Type III hypersensitivities are characterized by immune complex deposition.
 - a. Describe the clinical consequences of immune complex deposition.
 - b. Name and describe the molecular basis of one clinical immunological test you could use to assess a patient with a suspected Type III hypersensitivity.

5. List two advantages and two disadvantages of using live attenuated organisms as vaccines.

6. HIV-1 infection leads to AIDS, acquired immunodeficiency syndrome. There are three stages to an HIV-1 infection: acute, chronic, and AIDS.
 - a. During the chronic stage of infection, would you expect the viral load of HIV in the blood of an infected individual to vary?
 - b. If the viral load begins to increase in the blood of an HIV-infected individual and the level of CD4⁺ cells decrease, what does this indicate about the infection?
 - c. Describe clinical tests that you might use to monitor viral load and levels of CD4⁺ cells in an HIV-infected individual.

Section B: Essay Questions

Students must answer ONE of the following two options.

7. Essay Choice 1: Immunodeficiency

Patient case: A 12-month old boy has presented with reoccurring gram-positive bacterial pneumonia. He is below the norm for height and weight. He has received the DTaP immunization for diptheria, tetanus toxoids, and acellular pertussis. Blood test results show low total serum immunoglobulin levels. The boy is suspected to have a primary immunodeficiency. How would you proceed?

Using the above patient case as reference, write an essay about **primary immunodeficiency**. In your essay list three specific clinical tests that you might do to assess primary immunodeficiency in this case. Describe why the tests would be done (ie. what information is gained by the test?) and outline the basic molecular principles of the test (ie. how is the test done?).

8. Essay Choice 2: Tolerance and Autoimmunity

Patient case: A 15-year old girl noticed stiffness in her hips and hands in each morning that seemed to abate during the day. During a ski trip with friends, she noticed a rash on her face that persisted upon her return home. Her GP recognized the rash as a classic presentation of systemic lupus erythematosus (SLE). The girl was referred to you, a consultant rheumatologist. How would you proceed?

Using the above patient case as reference, write an essay about **tolerance and autoimmunity**. In your essay list three specific clinical tests that you might do to assess an autoimmune disorder in this case. Describe why the tests would be done (ie. what information is gained by the test?) and outline the basic molecular principles of the test (ie. how is the test done?).