

Term Test 3: MICR422 November 30, 2001.

You have 50 minutes to complete this test. Except where specified, you should answer in complete sentences and/or essay format. Diagrams are acceptable additions to essays, however are NOT a substitute for a coherent, written answer. Try and keep your answers confined to the space provided, but you may use the back of the page if necessary. The TOTAL marks for each question, 1-10, are shown in the margins.

5 marks

1. **For each of the following cell components or processes, indicate whether it is involved in the processing and presentation of exogenous antigens (EX), endogenous antigens (EN), or both (B).**

- 1)._____ Class 1 MHC molecules
- 2)._____ Class 2 MHC molecules.
- 3)._____ Phagocytosis or endocytosis.
- 4)._____ Beta-2 Microglobulin.
- 5)._____ Lysosomal Enzymes.

5 marks

2. **Indicate whether each of the properties listed below applies to the T-cell receptor (TCR), B-cell immunoglobulin/antibody (Ig), or both (B).**

- 1)._____ Is associated with CD3
- 2)._____ Exists in membrane-bound and secreted forms.
- 3)._____ Is MHC-restricted.
- 4)._____ Exhibits diversity generated by joining/rearrangement of gene segments.
- 5)._____ Undergoes affinity maturation through somatic hypermutation.

5 marks

3. **Indicate whether each of the following properties is normally exhibited by T_H cells (TH), CTLs (CTL), or both (B).**

1. _____ Requires IL-2 for proliferation.
2. _____ Expresses CD4
3. _____ Expresses CD8
4. _____ Produces perforin
5. _____ Regulates antibody class-switching by B cells through cytokine secretion.

5 marks

4. **Indicate whether the following statements concerning lymphocyte maturation and activation apply to B cells (B), T cells (T), or both (BT).**

- _____ Are released from the thymus as mature, functional lymphocytes
- _____ Undergo both positive and negative selection prior to release as mature cells.
- _____ Most of the immature cells generated die before reaching maturity.
- _____ Require stimulation through CD28 to become fully activated.
- _____ Require stimulation through CD40 to become fully activated.

5 marks

5. **Give a SHORT, 1 sentence definition or explain the importance of each of the following terms.**

Membrane Attack Complex: _____

Name: _____

Chemotaxis: _____

Superantigen: _____

T-Independent Antigen: _____

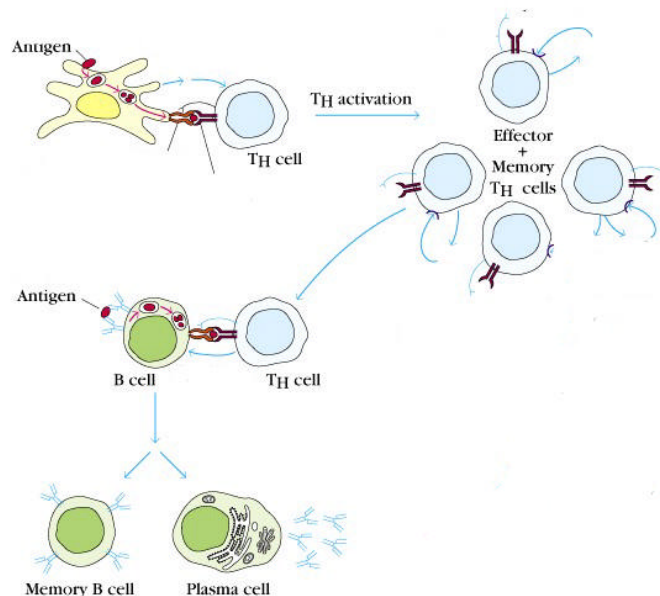
Positive Selection: _____

15 marks

6. Choose ONE of the following 3 topics, and write a brief (1-2 page) answer in essay format. Diagrams are permissible, but will not be accepted as a substitute for a well-written response. (15 marks).

A. The purpose of any vaccine is to develop a strong immune response to antigen. Most commonly, this requires the development of a strong antibody response. Initial immunization commonly results in IgM antibodies being secreted and detectable in the blood. As discussed in the course, most antigens require T cell help to produce antibodies. With reference to the following diagram (from Chapter 1 in your text), discuss the basic cell-cell interactions which result in the production of IgM antibodies following immunization with the protein antigen Bovine Serum Albumin. You should make reference in your answer to the following points:

1. Name the APC which originally presents antigen, and the antigen-processing pathway used to generate peptide-MHC complexes.
2. Discuss the signals necessary to activate T helper cells, including the primary antigen-specific interaction and any secondary costimulatory interactions.
3. Identify relevant cytokines produced by the T cells necessary to the evolution of the immune response.
4. Will the resulting response be a T_H1 or T_H2 response? What cytokines are produced by the T cells which influence this differentiation pathway?
5. Discuss the signals necessary to activate B cells, including the primary antigen-specific interaction and any secondary costimulatory interactions.
6. How does the cytokine profile of the immune response generate IgM antibodies?



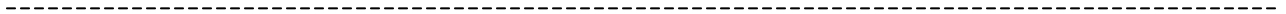
OR



B. Discuss the roles of the 3 main types of professional antigen-presenting cells in T cell activation, according to the following criteria.

- i) Name the 3 APCs
- ii) Method of antigen uptake
- iii) Level of Class II MHC expression
- iv) Expression of costimulatory molecules
- v) Ability to activate naïve or memory/effector T cells.
- vi) Changes following activation.

OR



C. Considerable evidence indicates the existence of two T_H -cell subsets, differing in the pattern of cytokines they secrete. Describe the role of these two subsets in the immune response, making reference to the following points: Name 2 cytokines which tend to produce T_H1 , and 2 cytokines which tend to produce T_H2 responses . Name 2 cytokines that are produced by each T_H subset, and identify the type of immune response produced by each subset. What types of antigen/pathogen are most likely to produce either a T_H1 or T_H2 response? What other cell types are stimulated by T_H1 or T_H2 cytokines which result in the response? Which subset has been linked to the development of allergy?

Name: _____

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