

Birla Institute of Technology and Science, Pilani
First Semester 2022-23
Immunopharmacology (PHA G538)
Mid-Sem Examination

Max. Marks: 45

Closed Book

Duration: 90 Minutes

- Q1.** **A.** There are mainly two pathways through which intracellular pathogens can be killed: one is a component of **(a)** innate immune system and the other is **(b)** adaptive immune system. Name them. **[1]**
B. Two examples of viral immune evasion strategies are described below. For each of the three strategies, please state whether virally-infected cells would be killed by **(a)** and/or **(b)**, and explain how the target cell killing will occur.
- i.** Human cytomegalovirus (HCMV) encodes a protein called US3 that binds to MHC Class I molecules and retains them in the ER, so that they never get presented on the cell surface. **[2]**
 - ii.** Poxviruses encode a protein called crmA, which can inhibit caspases, which are proteins in the apoptosis cascade downstream of granzymes and Fas. **[2]**
- Q2.** Why polysaccharide antigens do not produce any memory B cell response? Why are babies unresponsive to TI-2 antigens? **[2+2]**
- Q3.** Adaptive immunity has evolved in vertebrates but they have also retained innate immunity. What would be the disadvantages of having only an adaptive immune system? **[3]**
- Q4.** Comment on how possession of both types of immunity enhances protection against infection. **[4]**
- Q5.** a) What effect would removal of the thymus will have on a lab mouse? b) Patients with TAP deficiency have partial immunodeficiency. Explain why this is observed. **[2.5+2.5=5]**
- Q6.** A virus enters a cut in the skin of a mouse and infects dendritic cells, stimulating a variety of PRRs both on and within dendritic cells that induce it to produce IL-12. The mouse subsequently mounts an immune response that successfully clears the infection. Which of the following statements is(are) likely to be true about the immune response that occurred? Correct any that are false. **[5×2=10]**
- a. The infected dendritic cells up-regulated CD80/CD86 and MHC class II.
 - b. The dendritic cells encountered and activated naïve T cells in the skin of the mouse.
 - c. Naïve T cells activated by these dendritic cells generated signals that released internal Ca² stores.
 - d. Naïve T cells activated by these dendritic cells were polarized to the TH2 lineage.
 - e. Only effector memory T cells were made in this mouse.
- Q7.** For each of the following situations, indicate which type(s) of immune cell(s), if any, would be expected to produce an immune response. If you think it may not activate any immune response, explain why:
- a. Normal mouse immunized with a soluble protein antigen
 - b. Normal mouse with a viral infection
 - c. Neonatally thymectomized mouse (mouse in which thymus is removed; thymus is the place where T cells are produced) immunized with a protein antigen
 - d. Neonatally thymectomized mouse immunized with the T-independent antigen bacterial lipopolysaccharide (LPS). **[4×2=8]**
- Q8.** Compare and contrast the four types of antigen-binding molecules used by the immune system—antibodies, T-cell receptors, class I MHC molecules, and class II MHC molecules—in terms of the following characteristics: **[6]**
- a. Specificity for antigen (high/low)
 - b. Cellular expression
 - c. Types of antigen recognized