Birla Institute of Technology and Science, Pilani
First Semester 2023-24
Immunopharmacology (PHA G538)
Comprehensive Examination

Max. Marks: 80 **Open Book** **Duration: 180 Minutes**

Q1. The innate immune system developed much before the adaptive immune system, and a majority of animals have only the innate immune system to protect them. Why do you think mammals develop an adaptive immune system? What survival benefit they get from the adaptive immune system? **[5]**

Q2. The immune system functions on interactions, which in turn depend on messengers or mediators. Name these mediators. Can these messengers/ mediators be justifiably called 'Jacks of All Trades'? Justify. **[5]**

Q3. How immunity is intricately dependent on the lymphatic system? Explain if the lymphatic system does not develop in an experimental mouse, what would be the consequences. **[5]**

Q4. Discuss the role of T-cells in autoimmunity. Describe the **difference between** T-cell mediated and B-cell mediated hypersensitivity reactions in detail. **[3+5]**

Q5. B cell and T cell have similarities in function, yet both are different. Elaborate on the statement. **[3]**

Q6. Suppose a person was born without the ability to make the following molecules in their body. What problem would that create? **[3×5]**
A: IL-2; **B:** CD-28; **C:** CD-40L; **D:** IL-4; **E:** Activation-Induced (Cytidine) Deaminase

Q7. Two identical twins have a rare genetic abnormality. One of them can't make C3 protein, and the other can't make C8. What would be the difference in the immune response? **[3]**

Q8. Between TI-1 and TI-2, which one is a better vaccine candidate and why? What are the challenges associated with its use? How those challenges can be addressed? **[2+3+3]**

Q9. Neutralizing antibodies are most effective against viral infections. Neutralizing antibodies are generally monoclonal in origin. Sometimes, activation of polyclonal non-neutralizing antibodies was found to be associated with an increased disease progression. How generation of a non-neutralizing antibody can lead to disease progression? **[5]**

Q10. **i)** You'd previously been working on a vaccine for Salmonella and have immunized wild-type mice in four different ways:

- **a)** purified capsular polysaccharide A
- **b)** capsular polysaccharide A plus a bulky protein that binds to peptide A (A-binding protein; ABP)
- **c)** capsular polysaccharide A + ABP + bacterial DNA

Will any of these immunizations generate a good humoral immune response? Explain why each immunization may or may not induce a humoral immune response. **[2×3]**

ii) Excited about innate immunity, you create a TLR 1-10 (**all-inclusive**) knockout mice. Will any of these immunization strategies work for your TLR 1-10 knockout mice? Briefly explain. **[3]**

Q11. Fascinated by the germinal center reaction, you find a way to eliminate the follicular dendritic cell in a genetically modified mouse. Describe some expected immunological responses of your mouse. **[5]**

Q12. What, in your opinion, is the most important type of T cell or T cell subset required for a positive tuberculin skin test? What do you consider to be the most critical cytokine secreted by T cells during this kind of response?Justify. **[3+3]**

Q13. Digoxin is a relatively small molecule, which is an example of a hapten. Illustrate two distinct conceptual ways in which you could make this hapten immunogenic. No details of the actual chemistry are required. **[3]**

◊◊◊◊ All the best wishes! ◊◊◊◊