

1. Introduction to the Immune System: An Overview

LEARNING OBJECTIVES:

1. Gain an overview of the immune system, its natural divisions and components.
2. Understand the concepts of innate vs. adaptive immune responses and the interplay between the two.
3. Become acquainted with the concepts of immune specificity and diversity, and the role of clonal selection in the adaptive response.
4. Be introduced to the fundamentals of T cell antigen recognition in the context of antigen presentation.
5. Understand the importance of CD4⁺ T cell help as the director of a successful immune response to pathogen.

SUMMARY

1. We are protected from dissolution at the hands of microbes by an army of specialists each of which provides an essential piece of a complex defense.
2. The innate arm, the most ancient, is the first to respond. It's components utilize evolutionarily conserved pathogen characteristics to recognize "danger" and act rapidly to tag, engulf, lyse, or wall off the invader.
3. The innate system recruits the more highly evolved adaptive system through specialized reconnaissance experts termed dendritic cells (DC's). These cells engulf bacteria and virally infected cells, digest the pathogen proteins, and present peptides from these proteins to naive CD4⁺ T cells, resulting in their activation and clonal expansion.
4. The adaptive system utilizes a unique gene rearrangement technique to generate awesome diversity and subtlety in antigen recognition: the lymphocyte repertoire.
5. a) CD4⁺ T cells provide cytokine and contact-dependent help to B cells, resulting in a highly specific, high-affinity antibody response.
b) CD4⁺ T cell help and immunoglobulins in turn provide signals to the innate system, greatly facilitating phagocytosis and killing.
6. T cell direction, required for the optimal immune response, is completely dependent on the peptides presented. Highly polymorphic MHC genes, and co-dominant expression of multiple MHC molecules helps ensure that every individual can make a response to some part of every pathogen.