**SISMID Module 10: Infectious Diseases, Immunology and Within-Host Models**

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**Immune Response Glossary List**

*Adapted from “An Interpretative Introduction to the Immune System” by Steven Hofmeyr in* Design Principles for the Immune System and Other Distributed Autonomous Systems *ed. Segel and Cohen*

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| **Adaptive immune system** | That part of the immune system that uses antigen receptors and adapts or “learns” to recognize specific antigens, and retains a memory of those antigens to enhance future responses |
| **Affinity maturation** | Darwinian process of variation and selection that occurs to B cell receptors in lymph nodes and spleen, leading to the evolution of B cell populations better adapted to recognize specific epitopes |
| **Antibody** | A soluble form of B cell receptors secreted by plasma B cells, with multiple anti-pathogen effector functions |
| **Antigen** | Originally, any substance that causes the production of antibodies; now, more generally, anything that is recognized by antibodies or by the antigen receptors of lymphocytes |
| **Antigen processing** | The process whereby antigen-presenting cells (such as B cells, dendritic cells and macrophages) engulf antigens, digest them, and present fragments of their proteins MHC/peptide complexes |
| **Apoptosis** | Programmed cell death |
| **B cells** | Lymphocytes that mature in the bone marrow and secrete antibody |
| **CD4** | Cell surface molecule often used to identify T-helper lymphocytes, a co-receptor for the TCR complex, binding Class II MHC |
| **CD8** | Cell surface molecule often used to identify cytotoxic T lymphocytes, a co-receptor for the TCR complex, binding Class I MHC |
| **Cellular response** | A historical term, now used to refer to the part of the immune response that is connected with T cells |
| **Central tolerance** | Process of tolerizing immature T cells in the thymus |
| **Chemokines** | Soluble signal molecules that direct cell trafficking |
| **Class I MHC** | MHC, which occurs in almost all cells, that primarily presents (in an “MHC/peptide complex”) peptides generated in the cell’s interior |
| **Class II MHC** | MHC, which only occurs in certain cells of the immune system or when particular cells are activated that mostly presents fragments of proteins that are bound to the cell surface or that have been ingested |
| **Clonal deletion** | Process whereby immature T cells that strongly recognize a self antigen in the thymus die by apoptosis |
| **Cluster of Differentiation (CD)** | System of nomenclature for classifying cell surface proteins on white blood cells, usually identified by monoclonal antibodies—over 350 “CD antigens” are currently described |
| **Complement** | Molecules that participate in the immune response by binding to bound antibodies or certain microbial products, often culminating in cell or pathogen permeabilization |
| **Costimulation** | The mechanism whereby two or more signals participate in the process of activating a lymphocyte |
| **Cross-presentation** | An alternate pathway of Class I presentation that directs peptides derived from ingested proteins normally directed to Class II presentation into the Class I MHC presentation compartment; associated with professional antigen-presenting cells |
| **Cytokines** | Signal molecules that transmit information between cells |
| **Cytotoxic T cells** | T cells that are activated to kill target cells, usually CD8+ |
| **Dendritic cells** | Professional antigen presenting cells, generally considered to be the most potent activators of naïve T cells and required for the initiation of primary responses |
| **Endocytosis** | The process by which cells engulf extracellular material, usually bound to their surface by a receptor. After endocytosis, the material is contained with a cytoplasmic structure called an endosome |
| **Epitopes** | An MHC/peptide complex or specific region of an antigen to which an antigen receptor (TCR, BCR) binds |
| **Humoral response** | A historical term for immune responses involving mainly B cells and their antibodies |
| **Hypermutation** | Mutation at the junctional or hypervariable regions of antigen receptors, typically occurring during affinity maturation |
| **Immunodominance** | The differential expansion of subsets of the potential epitope-specific lymphocyte responses in response to complex antigens |
| **Innate immune system** | That part of the immune system that depends on germline encoded receptors; it generally does not change or adapt to specific pathogens |
| **Inoculum** | Usually, the microorganism or biological material given to an individual as a vaccination in order to stimulate a specific immune response |
| **Interferons** | Types of cytokines originally discovered because of their anti-viral action |
| **Isotypes** | The several structural varieties of the constant regions of antibodies. Isotypes include IgM, IgG (including multiple subtypes), IgA and IgE |
| **ID50** | Infectious Dose 50, the dose of a pathogen minimally required to infect 50% of a culture, population of organisms etc. Similarly, LD50 is a dose required to kill 50% of a population |
| **Leukocytes** | White blood cells, including lymphocytes, neutrophils, eosinophils, basophils, monocytes and macrophages |
| **Lymph nodes** | Small organs, distributed throughout the body, in which an adaptive immune response can develop |
| **Lymphocytes** | T cells and B cells |
| **Macrophages** | Scavenger cells the engulf pathogens, process antigens and signal to other arms of the immune system. Macrophages also have many direct anti-pathogen effector functions |
| **Major histocompatibility complex (MHC)** | The cell surface molecules that restrict T cell receptor recognition. Two classes of these molecules present self and foreign peptide antigen which are then recognized by TCR. Important in self/non-self determination |
| **Memory cells** | Lymphocytes that have been activated in the past and retain a memory of previous antigens, engendering a secondary response to future contact with the antigen |
| **Natural Killer cells** | Cells of the innate immune system that kill tumor cells and intracellular pathogens, recognizing them by alterations in cell surface protein expression |
| **Negative selection** | The process of clonal deletion used to eliminate autoreactive T cells in the thymus |
| **Neutralization** | The process whereby antibodies binding to pathogens prevent binding between the pathogen and its receptors on host cells |
| **Opsonization** | The coating of cells with complement or antibodies, leading to phagocytosis |
| **Pathogens** | Microorganisms such as bacteria, parasites, viruses and fungi that invade the body and cause illness |
| **Peptides** | Protein fragments |
| **Peripheral tolerance** | Mechanisms that occur in individual, autoreactive lymphocytes that have escaped central tolerance to become non-functional or undergo apoptosis, preventing autoimmunity |
| **Phagocytes** | Professional antigen presenting cells that engulf debris, pathogens and other cells (include macrophages and dendritic cells) |
| **Pharmacokinetics** | The study of the fate of substances administered externally to an organism, usually drugs, including liberation, absorption, metabolism, distribution and excretion |
| **Pharmacodynamics** | The study of the physiological effects of drugs on the body |
| **Plasma cells** | Activated B cells that secrete antibodies |
| **Plaque Forming Units (PFU)** | A measure of viral titer, performed by observing the localized growth of individual viruses which lyse their target cells creating a “plaque”. |
| **Positive selection** | The stimulation and maturation in the thymus of T cells with sufficient affinity to antigens presented by self MHC; T cells that do not undergo positive selection in the thymus die by apoptosis |
| **Primary response** | The immune response to antigens that the immune system has never before encountered |
| **Red blood cell (RBC)** | Also erythrocyte; the most abundant blood cell, responsible for transporting oxygen throughout the organism |
| **Regulatory T cell** | A type of CD4 T helper cell that regulates and suppresses effector responses, limiting immune-associated pathology |
| **Repertoire** | The diversity of lymphocyte receptors present in the immune system |
| **Secondary response** | The memory-based immune response to antigens that the body has previously encountered |
| **Signal I** | A necessary signal for activating a lymphocyte, typically provided by the binding of antigen receptors to an antigen epitope |
| **Signal II** | A second signal required for activating a lymphocyte, typically provided by an activation-induced cell surface molecule on the antigen-presenting cell |
| **Th1** | A differentiation state of T helper cells characterized by specific cytokines (including IFN-γ) and associated with cytotoxic T cell activation and the elimination of intracellular pathogens |
| **Th2** | A differentiation state of T helper cells characterized by specific cytokines (including IL-4, IL-5 and IL-13) and associated with humoral responses and the elimination of extracellular pathogens, but also mediate allergy and asthmatic responses |
| **Th17** | A differentiation state of T helper cells characterized by specific cytokines (including IL-17 and IL-22) and associated with anti-microbial immunity at mucosal and epithelial surfaces, but also likely play an important role in autoimmune responses |
| **T cell receptor (TCR)** | The variable antigen receptor on T lymphocytes, generated by V(D)J recombination and restricted by binding to MHC |
| **V(D)J recombination** | Variable, Diversity, Joining recombination, the process by which B and T cell receptors are generated by semi-random recombination of the genomic DNA to create the broad diversity of the immune receptor repertoire |