Adaptive Immune Receptor Repertoire (AIRR) Community Webinar
and The Antibody Society
Part I June 3rd 2021; Part II June 15th 2021

Presenter: Jamie Scott, MD, PhD, Professor Emerita, Simon Fraser University, Canada

Title: Fundamentals of the Immune System

The times appearing below are estimates.

General Outline:

June 3, 2021 Part I: Organization of the immune system

40-min session

Chapter 1: Overview
A. Humoral and cellular immunity
B. Innate and adaptive immune responses and their receptors
   1. Innate immunity’s PAMP recognition receptors
   2. Adaptive immunity’s BcRs and TcRs
C. Basic structure of the immune system
   1. Cells, tissues and compartments
      a. Where antigen enters and where it is concentrated
      b. Antigen presentation to naïve and memory B and T cells
   2. “Superhighway” of the immune system: the circulatory and lymphatic systems.
D. General timing and dynamics of immune responses
   1. Innate immune responses recruit and orchestrate adaptive immune responses
   2. The interaction/linkage between innate and adaptive immune responses

5-min break

30-min session

Chapter 2: Lymphocyte development
A. Genetic basis of B-cell and T-cell receptor diversification
B. Positive and negative selection
C. B- and T-cell subsets
D. Adaptive-immune receptor repertoires (AIRRs)
   1. What AIRRs are
   2. How they are currently assessed via high-throughput sequencing.

5-min break

30-min session

Chapter 3: Clonal responses of T-cells and B-cells
(in the context of lymphoid compartments where antigen is concentrated and presented to naïve and memory cells)
A. Signaling, activation, proliferation and differentiation of T-cells
1. CD8 cytotoxic T cells
2. CD4 helper and regulatory T cells
B. Signaling, activation, proliferation and differentiation of B-cells
   1. B1, MZ/extrafollicular B cells
   2. Follicular B cells
C. Role of co-stimulation in determining the type immune response generated (including anergy/tolerance)

End of Part I
June 15, 2021  Part II: The immune system in action

40-min session

Chapter 4: Orchestration of systemic and mucosal immune responses
   A. Cutaneous immune response
   B. Mucosal immune response
   C. Examples of immune responses as variations on a common theme, reiterating the dynamics of the immune response (with emphasis on the role of AIRRs).
      1. Vaccination
      2. Viral infection
      3. Cancer (can’t describe initiation)
      4. Autoimmunity (can’t describe initiation)
      5. Fit engineered immunotherapies into each subject
         a. Therapeutic antibodies
         b. Genetic engineering of autologous immune cells
            - CAR-T cells
            - Dendritic-cell vaccines
            - Other genetic engineering (including CRISPR)

10-min break

40-min session

Chapter 5: Importance of “big immunological data” to our understanding of immune responses, and to development of specific and personalized therapies.
   A. AIRR-sequencing (AIRR-seq) data
      Examples from the recent literature

   B. Systems immunology and the future of
      Examples from the literature

   C. The need for open science and FAIR data sharing practices

On-line question & answer period

End of Part II
Appendices

Appendix I: *Topics not covered, but could be discussed one-on-one in online discussion periods*

A. PAMP receptors and signaling in the innate immune response
B. Co-receptors and signaling in the adaptive immune response
C. Aging and immunosenescence
D. Immune responses not covered
   1. Transplantation
   2. Bacterial, fungal and parasitic infections
   3. Acute viral infections
   4. Primary and secondary immunodeficiencies

Appendix II: Recommended textbooks (More difficult -> less difficult)

E. Other well-known immunology textbooks
   1. First author *et al.*, *Kuby’s Immunology*, Ed. YEAR, Press.
      a. I haven’t used it ever.
   2. First author *et al.*, *Roitt’s Immunology*, Ed. YEAR, Press
      a. I haven’t used it for ~15 years.
   3. Both of these texts put more emphasis on experimental underpinnings
F. Topic-focused review articles in peer-reviewed journals
   2. *Annual Reviews of Immunology*
      a. Tend to be more focused and to present a “new perspective”, thus be more biased
   5. Be suspicious of perspectives/descriptions in “low impact” journals or surfing/googling the web; *peer review is an important criterion for trustworthiness*!
   6. Trust conclusions/perspectives that appear in different articles by independent authors.
      Independent and consistent outcomes, taken together, underpin the scientific community’s understanding of immune processes.