

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

- A. Murphy *et al.*, *Janeway's Immunobiology*, 9<sup>th</sup> Ed. 2017, Garland Press.
- B. Abbas *et al.*, *Cellular and Molecular Immunology*, 9<sup>th</sup> Ed. 2018, Elsevier.
- C. Parham, *The Immune System*, Ed., 2014, Garland Press ("baby *Immunobiology*")
- D. Abbas *et al.*, *Basic Immunology*, 6<sup>th</sup> Ed., YEAR, Elsevier.
- 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
  - 1. *Nature Reviews Immunology*, (*Nature Reviews Rheumatology*, *Nature Reviews Microbiology*)
  - 2. *Annual Reviews of Immunology*
  - 3. Review articles in: *Science*, *Science Immunology*, *Nature*, *Cell*, *Immunity*, *etc.*
  - 4. Mini-reviews in: *Trends in Immunology* (annotated bibliographies), *Frontiers in Immunology*, *Current Opinion in Immunology* (annotated bibliographies),
    - 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.