**Adaptive Immune Receptor Repertoire (AIRR) Community Webinar**

**with 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 of the immune system*

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 B-cell & T-cell receptors (**BcRs** & **TcRs**)

C. Basic structure of the immune system

1. Cells, tissues and compartments

a. Sites of antigen entry *vs.* where it becomes 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 BcR and TcR diversification

B. Positive and negative selection

C. B-cell and T-cell subsets

D. A*daptive-immune receptor repertoires (****AIRRs****)*

1. What is an AIRR?

2. How AIRRs are currently assessed *via* high-throughput sequencing (**AIRR-seq**).

*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, marginal zone (**MZ**)/extra-follicular B cells

2. Follicular B cells

C. Role of co-stimulation in determining the type of 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*, 9th Ed. 2017, Garland Press.

B. Abbas *et al*., *Cellular and Molecular Immunology,* 9th Ed. 2018, Elsevier.

C. Parham, *The* *Immune System*, Ed., 2014, Garland Press (“baby *Immunobiology*”)

D. Abbas *et al.*, *Basic Immunology,* 6th 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.