Virginia Western Community College
BIO 220
Immunology

Prerequisites

BIO 101 or equivalent and BIO 150 or BIO 205 or equivalent

Course Description

Provides students with an in-depth understanding of the mammalian immune system. Students begin with a detailed study of the immune system components and move on to an integrated look at the immune response with respect to clinical applications and human health. The immune system is a complex network of cells, tissues and effector proteins all of which work together in a very elaborate matrix. This course combines concepts in cell biology, genetics, developmental biology and biochemistry. After developing a sound foundation regarding the function of the immune system, we will look at the immune system with respect to clinical applications and human health. We will learn how the immune system can be manipulated or exploited, and even how it can actually fail and accidentally turn on its host.

Semester Credits: 3 **Lecture Hours: 3**

Required Materials

Textbooks:
The Immune System. Parham. 5th edition. Garland Science. **ISBN: 978-0-393-53335-4 or 978-0-393-53334-7**

Course Outcomes

At the completion of this course, the student should be able to:

- Have a thorough understanding of the history of Immunology and how technological advances have furthered our study of this field;
- Be able to describe the cellular and molecular components of the innate and acquired immune systems;
- Understand the generation of diversity as it applies to both humoral and cell-mediated immune responses;
- Be able to describe the events leading to both humoral and cell-mediated immune responses;
- Understand how congenital and acquired immune deficiencies affect human health;
- Understand how the immune system can be modulated to improve human health.

Evaluation Criteria and Procedures

Normally, assessment entails three or more written lecture exams as well as reading assignments, oral presentations and an in-depth project on the AIDS epidemic. Each lecture exam isfollowed by a peer reviewed journal article that the students must read and answer questions on. Also, students may be required to present immunology based case studies during the semester.

Topical Description

Introduction and History

- Smallpox
- Lady Mary Wortley Montague
- Edward Jenner

Chapter 1: Elements of the Immune System

- Commensals and Pathogens
- Overview - Innate and Adaptive Immunity
    - Receptors
    - Clonal selection and expansion
- Hematopoiesis

Chapter 2: Innate Immunity – The Immediate Response

- Physical Barriers
- The Complement System
- Antimicrobial Peptides

Chapter 3: Innate Immunity – The Induced Response

- Macrophages
    - Toll like receptors
    - NOD-like receptors
- Neutrophils
- The Complement System
- Natural Killer Cells

Chapter 4: Antibody Structure and the Generation of Diversity

- How antibody structure was determined
- Antibody structure
- Generation of antibody diversity before antigen
- Diversification of antibodies diversity after antigen

Chapter 5: Antigen Recognition by T Lymphocytes

- The T Cell Receptor
- Generation of T cell diversity
- Gamma delta T cells
- Antigen processing and presentation
    - Extracellular versus intracellular antigens
- MHC

Chapter 6: The Development of B lymphocytes

- In the bone marrow
- Development of the B cell repertoire following antigen exposure

Chapter 7: The Development of T lymphocytes
- In the thymus
  - Two lineages
- Positive and negative selection

Chapter 8: T Cell Immunity
- Activation of T cell with antigen
  - The dendritic cell
  - Other antigen presenting cells
- Effector cells

Chapter 9: B Cell Immunity
- Antibody production
- Antibody effector functions

Chapter 10: Preventing Infection at the Mucosal Surfaces
- Vulnerability of Mucosa
- Mucins
- Inflammation in the gut
- M Cells
- Gut Dendritic Cells
- IgM and IgA

As time permits: Chapter 13: Immunologic Failures
- Immune evasion
- Inherited Immunodeficiencies
- Acquired Immunodeficiencies

As time permits: Chapter 11: Immunologic Memory and Vaccination (if time permits)
- The secondary immune response
- Disease prevention
- Public Scrutiny

Notes to Instructors

1. Departmental policy dictates that instructors do not always allow students to keep tests.
2. A comprehensive final exam counting 15%-20% of the total grade will be given at the end of the semester.
3. The syllabus should state what the course grade will be based on, such as tests, quizzes, a comprehensive final exam, and any other assignments made by the instructor.
4. The VWCC Biology Department uses a 10-point grading scale.

ADA Statement (PDF)
Title IX Statement (PDF)