# INTRODUCTION TO THE HOST DEFENSE COURSE 2023

Immunology is a relatively new science, even though observations of immune phenomena are ancient. It has long been known that individuals who recovered from an infectious disease often acquired complete, long-lasting immunity to the pathogens. Indeed, during severe epidemics, survivors of previous epidemics - acquired total immunity to the pathogens, were the only individuals available to nurse the sick without risk to themselves – the recent Ebola outbreak an obvious example. The current pandemic with Sars-Covid 2 underscores the essence of understanding immunity at the cellular and molecular levels fighting against deadly pathogens.

The practice of vaccination antedates Koch's conclusive proof that microbial agents cause infectious disease. Von Behring (in the 19th century) discovered antibodies and their importance to immunity. Still, it was not until the 1930's that antibodies were shown to be proteins, and only in the late 1960s were absolute lymphocytes shown to produce specific antibodies. The regulatory interactions of lymphocyte subsets and how lymphocyte subsets are involved in autoimmune diseases have only been shown recently.

Research in immunology has made a rapid and dramatic advance. Immunological investigations have provided insight into structural and functional effector mechanisms of immunity and their relationship to the genetically encoded DNA sequence at the molecular level. At the cellular level, the immune response has been demonstrated to be governed and regulated by functionally distinct subsets of cells. At the genetic level, the realization that a broad spectrum of an immune response to a given stimulus has provided an understanding of how a disease can differ from patient to patient. At the system level, provocative insights on unique ways that bacterial flora and the environment can shape the immune system have led to a significant rethinking of the cause of many diseases and syndromes.

At the practical level, immunology as a discipline has progressed toward a mechanistic understanding of how to manipulate the immune system to benefit humans. This clinical medicine area is still in its infancy, but several highly effective immunologic therapies are already available to practicing physicians. One particular area with advanced knowledge is cell-based immunotherapy. We anticipate that you will take away from this course a fundamental knowledge of immunology and its implication in the practice of medicine.

Our purpose is to provide the principal cellular and molecular mechanisms necessary for understanding the immune system and provide the foundation for building your career as a physician.

Understanding Immunology requires a departure from the "read and memorize" approach to knowledge acquisition. As the practice of Medicine, immersion is not a collection of absolutes but instead requires an understanding of the complex interactions of different cells, tissues, and molecules. The most astounding paradox of the immune system is not only its redundancy but also its heterogeneity. Again, like Medicine, immunology appears to ask more questions than it answers. Ideally, it would help if you spent time thinking about the cellular interactions and processes that constitute an optimal immune response to understand immunology. We anticipate that you find immunology rewarding now and throughout your career.

To fully understand immunology, it is essential that you also have to continue to integrate new information into the basic functional framework.

## GOALS OF THE HOST DEFENSE COURSE

After Host Defense, you will describe the immunologic strategies employed to mount an effective immune response and counter and avert infectious challenge. You will also fully understand how many different immune cells communicate to mount an effective immune response at the cellular and molecular levels. You will describe the cellular and molecular components of the immune system, how they function in normal and pathologic conditions and identify how a clinician can exploit this knowledge to benefit the patient.

## HOST DEFENSE GENERAL INFORMATION

"How should I study for immunology?" The question is commonly asked and the one that must be addressed by the individual student. A combination of lecture and small group attendance, lecture handouts, and classroom notes supplemented with text and contemporary journal articles are the best approach for most students. The lecture handouts provide a summation of the critical concepts that a medical student must know. These concepts then provide the foundation for solving the clinical vignettes in the Small Group Problem Solving sessions. Most importantly, the students must be able to integrate the concepts and understand the immune cells' highly interactive nature.

The course is divided into five primary areas: innate immune function, humoral immunity, cellular immunity, the ways that the effector's arms are amplified and regulated to provide an adequate response to pathogens, and lastly, how diseases can arise from defects in or faulty regulation of the immune system.

Our understanding of immunology is a continually expanding universe. It is essential to understand the fundamental concepts of immunology fully; with this knowledge, you will fully appreciate new clinical immunology developments.

The course's initial portion may seem complicated for those of you who have not previously studied immunology. However, as the course progresses and by the end of the lecture and small group series, you will find that you have obtained not only a principle cellular and molecular understanding of the immune system but that you also have a foundation upon which to build your career as a physician.

For students who are planning to focus on Immunology for their future practice, it may be useful to access a copy of Janeway's, Immunobiology, 9th edition. The text is highly readable, but any text in a rapidly expanding discipline like immunology cannot be entirely up to date. Please note that the reading assignments in Janeway are designated as background reading only. Host Defense's flow does NOT mirror the text chapter sequences, and you will be tested on material given in lectures and small group problem-solving sessions only.

A complete understanding of the Small Group Problem Solving Sessions requires reading the relevant medical journal articles posted on the Host Defense website. These medical journal articles are relevant to concepts presented in lectures and small group sessions. It is highly recommended that you use them as your source of primary immunology knowledge. Reading current literature is what you will be doing the rest of your life as a clinician, no matter what field of medicine you practice.

## TEACHING MODES

To protect the health of all at the HSC from COVID-19, we will present all lectures virtually in an asynchronous mode. However, all small groups sessions are mandatory and will be in synchronous virtual mode

## EXAMINATIONS

There will be two (2) examinations; the second exam is cumulative. Each exam will comprise approximately 50% of your final grade. The examinations will contain 4-5 questions from each lecture and Small Group Problem Solving Session.
Although the recommended text is as current as possible, handout content, content discussed in lectures, small groups, and your lecture/small group notes ALWAYS supersede book content. The textbook is never the definitive source for a test answer.

## EXAMINATION PREPARATION

Conceptually, Host Defense examination preparation should center upon the Handouts. PowerPoint Presentations are supplements to the Handouts.

Overall, the lectures are an opportunity for students to interact with faculty. The student's focus should be on the material covered in both the Handout and the PowerPoint Presentation for any particular lecture. The lectures should serve as a means to solidify and, more importantly, integrate the knowledge.

For the majority of students, examination preparation should begin with the Handouts. At the end of each of the two sections of Host Defense, a summary of the preceding lectures is provided as a PowerPoint Presentation. Each of these occurs just before the examination. Because these are summaries of previous lectures, only PowerPoint Presentations are provided.
Finally, it is imperative to understand that examinations will cover BOTH the broad topics of Host Defense AS WELL AS the detailed information provided in both the Handouts and the PowerPoint Presentations.

## GRADING METHODOLOGY

HD is a PASS or FAIL class. Your final semester grade will be based on absolute percent scores of the two exams.
Pass: a score of greater than or equal to 70%
Fail: a score of less than 70%.

Note: Scores within a grade cut-off within 0.5 percentage points will be rounded up to the higher grade. Those students failing to meet the course's minimum requirements must meet with the course director after discussing the remediation process. The remediation exam will be similar to the other examinations for this course, and a grade of 75% is required to remediate the course.

## SMALL GROUP SESSIONS

### Virtual Synchronous mode

Small group sessions are a *mandatory* component of Host Defense. Please check Sakai for your small group assignments and schedule. Master answers for the small group session will be posted on the Host Defense home page at the Small Group Problem Solving Session conclusion.

## SMALL GROUP SESSION ATTENDANCE

It is expected that each student will attend each small group session. These sessions allow the translation of Host Defense principles to actual case histories. These sessions also provide new knowledge, review, and integrate critical concepts to understand Host Defense successfully. [Just a reminder: questions related to small group sessions will be included on each exam.] Attendance sheets (available during the small group session) need to be signed by each student for each small group session. Completed attendance sheets will be kept on file.
If a small group session is to be missed, an excused absence from Student Affairs is necessary.

## RECOMMENDED TEXTBOOK

*Janeway's Immunobiology*, 9th ed.
Kenneth Murphy
ISBN: 9780815345053

If anyone desires the use of practice exam questions, they can be found at the end of each chapter in Janeway's Immunobiology, ninth edition.

Note: the chapters in Janeway's Immunobiology cover more aspects of immunology, not all covered in the HD lectures.
These practice exam questions are not required nor recommended but can be used by those who desire to use practice exam questions.

## Sakai/LUMEN

Current course information and schedule will be updated as necessary. Please be in the habit of checking the Host Defense Sakai page often.

## IMMUNOLOGY WEBSITES FOR THOSE WITHOUT A PRIOR IMMUNOLOGY BACKGROUND

These are not assigned but do provide an excellent introduction to immunological concepts relevant to Host Defense. See below. They are also found on the Host Defense Website.

Introduction to Immunology

Overview of the Immune System

Antibody Structure

## Summary of essential information for HD

1. HD is structured with pre-recorded lectures, delivered in asynchronous mode. They will be available on the dates as indicated in the syllabus.
2. Small groups are in synchronous mode. Attending is mandatory; you would need permission to be excused from attending.
3. HD only has two exams. The second exam is comprehensive.
4. Exams questions are based on the content of lectures and small groups.
5. To pass the course, you need to have an average of 70% of the two exams.
If your average score is less than 70%, then remediation is needed. However, you could only take the remediation exam if your average is between 60-70%
6. A score of 75% is needed to pass the remediation exam and earning a pass for the course.