

INTRODUCTION TO THE HOST DEFENSE COURSE 2022

Immunology is a relatively new science, even though observations of immune phenomena are ancient. It has long been known that often individuals who recovered from an infectious disease 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 is 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 B lymphocytes shown to produce specific antibodies. The regulatory interactions of lymphocyte subsets (T and B cells) 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 immune and non-immune 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 manipulating 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. In practicing 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 answers. Ideally, it would help to understand immunology by thinking about the cellular interactions and processes that constitute an optimal immune response. 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 challenges. 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 individual student must address it. 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 summarize 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 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; achieving this level of understanding will allow you to appreciate new developments in clinical immunology fully.

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 focus on Immunology for their future practice, it may be helpful 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 updated. 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 all health 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 person.

EXAMINATIONS

There will be two (2) examinations; the second is cumulative. Each exam will comprise approximately 50% of your final grade, and 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 the Handout and the PowerPoint Presentation for any particular lecture. The lectures should serve to solidify and, more importantly, integrate the knowledge.

For the majority of students, examination preparation should begin with Handouts. At the end of the two parts of the Host Defense course, a summary of lecture contents and how the contents are integrated is provided in the form of an exam review with a PowerPoint Presentation. Each of the two sessions occurs just before the examination. Because these are summaries of previous lectures, only PowerPoint Presentations are provided (no handout). 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. This year, we will provide five Q&A sessions in person.

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 score: a score greater than or equal to 70%.

Failing score: a score less than 70%.

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

SMALL GROUP SESSIONS

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 **after** each session. Please note that attendance is mandatory and will be tracked through QR codes.

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 will be tracked via QR codes. Students must scan in to each session

If a small group session is to be missed, an excused absence from Student Affairs is necessary. The Course Director and Course Coordinator cannot grant excused absences.

RECOMMENDED TEXTBOOK

Janeway's Immunobiology, 9th ed.

Murphy & Weaver

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 website often.

IMMUNOLOGY WEBSITES FOR THOSE WITHOUT A PRIOR IMMUNOLOGY BACKGROUND

These are not assigned but 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 2022

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 person. Attending is mandatory; you would need permission to be excused from attending.
3. There are five Q&A sessions and two review sessions. They are in-person sessions, optional, and will **not** be recorded.
3. HD only has two exams, and the second exam is comprehensive.
4. Exam questions are based on the content of lectures and small groups.
5. To pass the course, you need to have an average of 70% on the two exams.
If your average score is less than 70%, remediation is needed. However, you can 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 earn a pass for the course.