

PHAR 6724: Introduction to the Immune System and Infectious Disease

Course Syllabus Spring 2020
3.1 Credits



This course adheres to the items listed in the College of Pharmacy Central Syllabus:

https://docs.google.com/a/umn.edu/document/d/1artQ5e1rbzxe8lEtW07BE8k8snZAEgMMz_QcW8yJ-II/edit?pli=1

Course Web Site:

Term: PD1 Spring

Dates: January 15 – May 8, 2020

Day	Time	Duluth Room	Twin Cities Room
Monday	1:25 – 2:15	LSci 163	Moos 1-451
Wednesday	1:25 – 2:15	LSci 163	Moos 1-450
Friday	11:15 – 12:05	LSci 163	Moos 1-450

CPF days: January 16, January 28, March 30 (AM only), April 2, April 7 – (PM only)

Legislative Day: February 20, 2020

Spring Break: March 9-13, 2020 – no classes scheduled

APhA meeting March 20-23, 2020 – no exams scheduled CoP policy

Pharmacy Day: May 1, 2020 – no classes scheduled

Final exams: May 11-15, 2020

Course Instructional Team

Name	Office Location	Phone	Email	Preferred contact	Office hours
Grant Anderson <i>Course Director</i>	(D) LSci 225	218-726-6007	ander163@d.umn.edu	email	TBD
Carston Wagner <i>Course Director</i>	(TC) WDH 8-174	612-625-2614	wagne003@umn.edu	either	TBD
Rory Rimmel	(TC) WDH 8-174	612-624-0472	remme001@umn.edu	email	TBD

Teaching Assistants:

G.T.A. (Duluth): Tanner Schumacher; email: schum490@d.umn.edu

G.T.A. (Twin Cities): Abhishek Kulkarni; email: kulka224@umn.edu, Moyosore Orimoloye; email: orimo005@umn.edu, Wenjuan Zhang; email: zhan6717@umn.edu

Overview of the course

Course content:

This course focuses on the immunological, epidemiological, and pathogenic basis of viral, bacterial, protozoal, fungal and helminthic infectious disease; the biological composition of vaccines and the immunologic response to live attenuated pathogens and microbial extracts; the chemical, cellular and biological principles of the immune system; the biological and molecular response to allergens and hypersensitivity; and an introduction to cellular and molecular aspects of inflammation. Students successfully completing this course will understand the biological basis of infectious disease and the immune system and begin to identify prevention and treatment strategies for infection and immune related disease. This course provides foundational knowledge for content in other courses related to infectious disease, vaccinations, inflammation, hypersensitivity, hematopoiesis, and other immune related diseases.

The concepts of immunology, infectious disease, and treatment of related disease are woven together to provide an integrated, foundational understanding of the nature of disease and options for treatment. The course is strategically aligned with the Introduction to Pharmacotherapy, Principles of Medicinal Chemistry, Principles of Pharmacology, and Applied Learning courses taught in the same semester. Topics aligned between these courses include vaccinations, treatment of bacterial infections with oral antibiotics, inflammation, and allergic reactions.

Course format:

The format for this course is a mixture of in-class lectures, out of class on-line lectures and readings, and in-class activities focused on group learning and problem solving. The majority of the learning will occur in class; however, students are expected to prepare in advance for in class lectures and active learning activities.

Prerequisites

Phar 6702 Integrated Biochemical Sciences

Assumed Entry Knowledge:

The student is assumed to have completed a college-level course in microbiology or bacteriology that has covered:

1. Gram Staining
2. Basic structural characteristics of bacteria, fungi, protozoa, and viruses
3. Biochemical testing for characterization of bacteria

This course also requires a full grounding in biochemistry and cell biology concepts as taught in the Integrated Biochemical Sciences course.

Computer/Technology Requirements

The University of Minnesota computer requirements are listed here:

- <https://canvas.umn.edu/courses/102946>
- Laptop or similar device is required for in class active learning activities

Course Goals & Objectives

Course goals and objectives are based on ACPE Accreditation standards and the specific expertise of the faculty body, who have identified specific learning Domains and Scientific Objectives, which are available by clicking the links below:

Domains: https://docs.google.com/a/d.umn.edu/document/d/1n1lqsjUBzlr_ZCzXJ5UJW7N6FrsGdskgYfzn6K98kkPU/edit

Scientific Foundations: <https://docs.google.com/a/d.umn.edu/document/d/1Zyf4QpHakxB1yubUImbOAL-18uNqzejfurx3tv1F38l/edit>

Learning goals

At the completion of this course, students will be able to:

1) Apply the Pharmacists Patient Care Process and respond to basic questions from patients, practitioners, and others regarding allergies, new drugs, and infectious diseases.

Domains: 1.0, 1.4, 1.6

Scientific Foundations: 5.3.14, 5.8.1, 5.8.3, 5.8.5, 5.8.9, 5.9.1-2

2) Critically review primary literature and other key source information (ie., MMWR, CDC, WHO, NIH, MDH) on common infectious diseases and immunological disorders (i.e., allergies) and apply information as appropriate in a practice setting.

Domains: 6.1, 6.3, 6.4.5, 6.4.6

Scientific Foundations: 6.6.4, 6.7.5, 6.8.2, 6.8.5

3) Describe the mechanisms of antibody-mediated (AMI) and cell-mediated immunity (CMI). Describe the important components and cells of the immune system and their role(s) and function(s) in infection prevention and eradication.

Domains: 6, 6.3.1, 6.4.1, 6.4.2

Scientific Foundations: 1.1.2, 1.1.3, 1.3.1, 1.3.2, 1.3.4, 1.3.5, 1.5.1, 1.5.2, 1.5.4, 1.6.1, 1.6.4, 2.6.5

4) Explain the mechanisms by which vaccines based on AMI and CMI work. Identify which bacteria and viruses are targets of currently available vaccines, and describe the molecular target of the vaccine.

Domains: 6, 6.3.1, 6.4.1, 6.4.2

Scientific Foundations: 1.1.2, 1.1.3, 1.3.1, 1.3.2, 1.3.4, 1.3.5, 1.5.1, 1.5.2, 1.5.4, 1.6.1, 1.6.4, 2.6.5

5) Identify what constitutes an allergy, common allergic symptoms, and differentiate between a severe vs. not severe allergic reaction at the biochemical, cellular, and physiological levels. Define the mechanisms responsible for hypersensitivity to allergens and how they are related to drug immunopathologies.

Domains: 6, 6.3.1, 6.4.1, 6.4.2

Scientific Foundations: 1.1.2, 1.1.3, 1.3.1, 1.3.2, 1.3.4, 1.3.5, 1.5.1, 1.5.2, 1.5.4, 1.6.1, 1.6.4, 2.6.5

6) Describe the possible mechanisms responsible and therapies for immune-related diseases, inflammation, and immunosuppression.

Domains: 6, 6.3.1, 6.4.1, 6.4.2

Scientific Foundations: 1.1.2, 1.1.3, 1.3.1, 1.3.2, 1.3.4, 1.3.5, 1.5.1, 1.5.2, 1.5.4, 1.6.1, 1.6.4, 2.6.5

7) Identify the major pathogenic bacteria, fungi, protozoa, helminths, and viruses and the human diseases they cause.

Describe the life cycle, pathogenesis, transmission, public health implications, and diagnosis.

Domains: 6.3.1, 6.3.2, 1.1, 2.0, 2.1, 2.4

Scientific Foundations: 1.1.1, 1.2, 1.3, 1.4.1

8) Identify and describe emerging infectious pathogens including bacteria, fungi, protozoa, helminths, and viruses.

Domains: 6.3.1, 6.3.2, 1.1, 2.0, 2.1, 2.4

Scientific Foundations: 1.1.1, 1.2, 1.3, 1.4.1

9) Apply fundamentals of medical microbiology and immunology to identify the most likely causative infectious agents for a patient presenting with specific signs and symptoms and other determining patient and environmental factors (e.g., location, age, immunological status, community, ethnicity, etc.).

Domains: 2.1, 6.0, 6.1, 6.3, 6.4.6

Scientific Foundations: 1.3, 5.8.1

Attendance Policy

Students are expected to attend every class for which they are registered. Students are expected to attend classes on the campus where they are enrolled. Some class sessions may involve small- or large-group discussions, for which points will be awarded. If you do not attend class on those days, you will not receive those points. Therefore, it is important to attend all class sessions, or contact the course director for an excused absence. Discussion points may be made up only for excused absences.

Course Materials

The following materials are provided for this course:

- Class Handouts
- Supplemental
 - **University of Minnesota Biomedical Library Access Medicine E-textbooks**
Sherris Medical Microbiology 2018 7th edition, Levison Review of Medical Microbiology and Immunology 2016 14th edition, Jawetz Medical Microbiology 2019 28th Edition

Assessments and Grading

Graded Assessments

The following graded assessments will count toward your final grade for this course in the following amounts:

#	Date	Title Brief description	Assessment Goal (required to link to domain)	Points	% of final grade
1	Jan 25	Innate Immunity Homework assignment	6, 6.3.1, 6.4.1, 6.4.2	10	2%
2	Feb 3	AMI Homework Assignment	6, 6.3.1, 6.4.1, 6.4.2	10	2%
3	Feb 7	Exam: short answer, and MC. This exam will integrate the information presented from Unit 1. Related to Learning Goals 1 and 3.	6, 6.3.1, 6.4.1, 6.4.2	75	15%
4	Feb 10	CMI-TH17 Homework Assignment	6, 6.3.1, 6.4.1, 6.4.2	10	2%
5	Feb 21	CMI-Th17 Quiz: short answer, and MC. This exam will integrate the information presented from Unit 1. Related to Learning Goals 1 and 3.	6, 6.3.1, 6.4.1, 6.4.2	50	10%
6	March 2	Immune System Development-Hypersensitivity Assignment	6, 6.3.1, 6.4.1, 6.4.2	10	2%
7	March 6	Exam: short answer, and MC. This exam will integrate the information presented from Unit 2. Related to all Learning Goals.	6, 6.3.1, 6.4.1, 6.4.2	75	15%
8	March 25	Assignment: Bacterial infection treatment strategies in a community setting. In and out of class group work required. Related to Learning Goals 1, 2, 7, and 9.	6.3.1, 6.3.2, 1.1, 2.0, 2.1, 2.4, 6.0, 6.1, 6.3, 6.4.6, 1.0, 1.4, 1.6	20	4%
9	April 8	Exam: essay, short answer, and MC. This exam will integrate the information presented from Unit 3. Related to Learning Goals 1, 7 and 9.	6.3.1, 6.3.2, 1.1, 2.0, 2.1, 2.4	100	20%
10	April 24	Short paper (1-2 pages) on a single emerging agent. Students can choose from a list, or get prior approval on an agent of their choosing. Fulfills Learning Goal 8 in entirety. Also contributes to Learning Goal 2.	6.1, 6.3, 6.4.5, 6.4.6	20	4%

11	May 8	Short paper (1-2 pages): students will investigate and report on travel vaccinations and malaria prophylaxis for travel to an assigned country. Related to Learning Goals 1, 2, and 7.	6, 6.3.1, 6.4.1, 6.4.2	20	4%
12	Finals week	Exam: essay, short answer, and MC. This exam will integrate the information presented from Unit 4. Related to Learning Goals 1, 7 and 9.	6.3.1, 6.3.2, 1.1, 2.0, 2.1, 2.4	100	20%
				500	100%

Exam Information

Five non-cumulative, proctored exams/quizzes will be administered in this course. The exams collectively will comprise 80% of the final course grade. Exams will be timed and scheduled during regular class times, and will consist of a mix of long-answer, short-answer, matching, and multiple-choice questions. Some questions on the exams may be given to the students 24 hours in advance of the scheduled in-class examination. These questions can be completed outside of class and turned in with the remainder of the exam at the end of the in-class examination.

Absence from Exam

Excused absences from exams require documentation and must follow the College of Pharmacy policies. Make-up examinations must be arranged with the course instructors and will not be administered prior to the regularly scheduled in-class examination.

Challenges to graded assessments

Challenges to graded assessments must be explained in writing and submitted within 7 calendar days of receiving the graded assessment. Challenges submitted for re-grading after this 7-day window will not be considered.

Grading Information

Course Letter Grades

Grade	A	A-	B+	B	B-	C+	C	C-	D	F
%	100-93	92-90	89-87	86-83	82-80	79-77	76-73	72-70	69-60	59-0

Final percentages will be rounded up, using traditional rounding rules, to the next integer to determine the final grade (e.g. 92.49% rounds to 92%, 92.50% rounds up to 93%).

Minimum Passing Level

Per University and College Policy, students who receive a grade below D in this course must successfully repeat the course before advancing to courses requiring this course as a prerequisite.

Phar 6724 Daily Class Schedule

Date	Faculty	Topic	Activities/ Assignments/ Assessments/
Jan. 15, W	Anderson Wagner	Introduction to course Introduction to Immunology	Lecture
Jan 17, F	Wagner	Unit 1 Section 1 Innate Immunity (1) Components of the innate immune system (2) Pattern recognition receptors (3) Inflammation	Lecture, Innate Imm. Homework assignment distributed-due-1/25
Jan. 22, W	Wagner	Innate Immunity (1) Components of the innate immune system (2) Pattern recognition receptors (3) Inflammation	Lectures
Jan 24, F	Wagner	Unit 1 Section 2 Antigens and Antibodies (1) Antigen characteristics (2) Antibody structure and function (3) Monoclonal vs Polyclonal Antibodies	Lecture
Jan 27, M	Wagner	Antibody mediated immunity (1) Immune response characteristics (2) Clonal selection and expansion (3) Antibody diversity (4) Antigen processing and antibody production (5) Antibody directed cytotoxicity	Lecture -AMI Homework assignment distributed due-2/03
Jan 29, W	Wagner	Antibody mediated immunity (1) Immune response characteristics (2) Clonal selection and expansion (3) Antibody diversity (4) Antigen processing and antibody production (5) Antibody directed cytotoxicity	Lecture
Jan 31, F	Wagner	Complement Mediated Immunity (1) Components of complement (2) Classical pathway (3) Non-classical pathway	Lecture
Feb 3, M	Wagner	Antibodies as Drugs (1) Polyclonal antibodies immunization (2) Monoclonal antibody based	Lecture
Feb 5, W	Wagner	Unit 2 Section 1 Cell mediated Immunity (1) MHC I antigen presentation (2) Mechanism of CTL activation and cellular cytotoxicity (3) Regulation of the T-cell responses (3) (4) Cell based Immunotherapy	Lecture
Feb 7, F	Wagner	Exam Unit 1	In-class unit exam

Feb 10, M	Wagner	Cell mediated Immunity (1) MHC I antigen presentation (2) Mechanism of CTL activation and cellular cytotoxicity (3) Checkpoint inhibition (3) Cell based Immunotherapy	Lecture CMI Homework assignment distributed due 2/20
Feb 12, W	Wagner	Cell mediated Immunity (1) MHC I antigen presentation (2) Mechanism of CTL activation and cellular cytotoxicity (3) Checkpoint inhibition (3) Cell based Immunotherapy	Lecture
Feb 14, F	Wagner	Cell mediated Immunity (1) MHC I antigen presentation (2) Mechanism of CTL activation and cellular cytotoxicity (3) Checkpoint inhibition (3) Cell based Immunotherapy	Lecture
Feb 17, M	Wagner	Th17 Cells in Barrier Defense and Inflammatory Disease (1) Th17 cells (2) Microbiota (3) Mucosal barrier (4) Inflammatory disease	Lecture
Feb 19, W	Wagner	Unit 2 Section 2 Immune Cell Development (1) Cells and tissues of the immune system (2) Hematopoiesis (3) Growth factors and receptors (4) B cell tolerance (5) T-cell tolerance (6) Secondary Organs	Lecture
Feb 21, F	Wagner	Quiz – CMI-Th17 cells Unit 2, Section 1	In-class Quiz
Feb 24, M	Wagner	Immune Cell Development (1) Cells and tissues of the immune system (2) Hematopoiesis (2) Growth factors and receptors (3) B cell tolerance (4) T-cell tolerance (5) Secondary Organs	Lecture Imm.Dev./Hypersensitivity Homework assignment distributed due-3/06

Feb 26, W	Wagner	Unit 2 Section 2 Hypersensitivity (1) Type I-IV HS (2) Blood groups (3) Complement	Lecture
Feb 28, F	Wagner	Hypersensitivity (1) Type I-IV HS (2) Blood groups (3) Complement	Lecture
March 2, M	Wagner	Unit 2 Section 3 Immunosuppression 1) Mechanisms of Tissue rejection 2) Tissue matching 3) Drug based mechanisms of immunosuppression 4) Congenital and acquired immune deficiencies	Lecture
March 4, W	Wagner	Immunosuppression 1) Mechanisms of Tissue rejection 2) Tissue matching 3) Drug based mechanisms of immunosuppression 4) Congenital and acquired immune deficiencies	Lecture
March 6, F	Wagner	Exam Unit 2	In-class unit exam
March 16, M	Anderson	Unit 3 Section 1 Bacterial Human Pathogens Topics covered for each group of pathogens Pathogenesis, mechanisms of pathogenesis, transmission, epidemiology, public health implications, diagnosis (select agents), replication (select agents), life cycle (select agents), emerging infectious agents Bacterial human pathogens: <i>Staphylococci</i> , <i>Streptococci</i> , <i>Enterococci</i>	Lecture
March 18, W	Anderson	Bacterial Human Pathogens Bacterial human pathogens: <i>Staphylococci</i> , <i>Streptococci</i> , <i>Enterococci</i>	Lecture On-line lectures
March 20, F	Anderson	Unit 3 Section 1 Bacterial Human Pathogens Bacterial human pathogens: <i>Staphylococci</i> , <i>Streptococci</i> , <i>Enterococci</i>	Lecture
March 23, M	Anderson	Unit 3 Section 2 Pathogen-induced Hypersensitivity Rheumatic fever, Acute glomerulonephritis, Subacute bacterial endocarditis, drug hypersensitivity	Lecture Readings
March 25, W	Anderson	Unit 3 Section 1 Bacterial Human Pathogens Bacterial human pathogens: <i>Corynebacterium</i> , <i>Bacillus</i> , <i>Listeria</i> , <i>Clostridia</i> , <i>Neisseria</i> , <i>Haemophilus</i> , <i>Moraxella</i> , <i>Bordetella</i>	In-class group work activity and assessment
March 27, F	Anderson	Unit 3 Section 1 Bacterial Human Pathogens	Lecture

		Bacterial human pathogens: <i>Corynebacterium</i> , <i>Bacillus</i> , <i>Listeria</i> , <i>Clostridia</i> , <i>Neisseria</i> , <i>Haemophilus</i> , <i>Moraxella</i> , <i>Bordetella</i>	
March 30, M	Anderson	Unit 3 Section 1 Bacterial Human Pathogens Bacterial human pathogens: <i>E. coli</i> , <i>Salmonella</i> , <i>Shigella</i> , <i>Vibrio</i> , <i>Campylobacter</i> , <i>Klebsiella</i> , <i>Enterobacter</i> , <i>Serratia</i> group + <i>Proteus</i> , <i>Providencia</i> , <i>Morganella</i> , <i>Pseudomonas</i>	Lecture
April 1, W	Anderson	Unit 3 Section 1 Bacterial Human Pathogens Bacterial human pathogens: <i>Acinetobacter</i> , <i>Burkholderia</i> , <i>Stenotrophomonas</i> , <i>Chlamydia</i> , <i>Mycoplasma</i> , <i>Legionella</i> & <i>Mycobacteria</i> , <i>Spirochetes</i> , <i>Anaplasma</i> , and <i>Rickettsia</i>	Lecture
April 3, F	Anderson Rimmel	Unit 3 Section 1 Bacterial Human Pathogens Bacterial human pathogens: <i>Acinetobacter</i> , <i>Burkholderia</i> , <i>Stenotrophomonas</i> , <i>Chlamydia</i> , <i>Mycoplasma</i> , <i>Legionella</i> & <i>Mycobacteria</i> , <i>Spirochetes</i> , <i>Anaplasma</i> , and <i>Rickettsia</i>	Lecture
April 6, M	Anderson Rimmel	Unit 3 Section 1 Bacterial Human Pathogens Bacterial human pathogens: To be determined	Lecture
April 8, W	Anderson Rimmel	Exam Unit 3	In-class exam
April 10, F	Anderson	Unit 4 Section 1 Introduction to Travel Medicine Assignment and Emerging Infectious Disease Assignment Viral Human Pathogens <u>Topics covered for each group of pathogens</u> Pathogenesis, mechanisms of pathogenesis, transmission, epidemiology, public health implications, diagnosis (select agents), replication (select agents), life cycle (select agents), emerging infectious agents Herpes simplex viruses (Varicella-Zoster virus, Cytomegalovirus, Epstein-Barr virus, Human herpesvirus-6, HHV-8 (Kaposi's sarcoma associated virus)) Papillomaviruses	Lecture Introduction to assignments
April 13, M	Anderson	Unit 4 Section 1 Viral Human Pathogens Viral human pathogens: Herpes simplex viruses (Varicella-Zoster virus, Cytomegalovirus, Epstein-Barr virus, Human herpesvirus-6, HHV-8 (Kaposi's sarcoma associated virus)) Papillomaviruses	Lecture
April 15, W	Anderson	Unit 4 Section 1 Viral Human Pathogens Exanthem causing viruses: Measles, Mumps, Rubella, Parvovirus B19, HHV 6&7	Lecture

		Gastrointestinal tract viruses: Poliovirus, Norwalk virus, Rotavirus	
April 17, F	Anderson	Unit 4 Section 1 Viral Human Pathogens Respiratory tract viruses: Influenza virus, Parainfluenza virus, Coxsackieviruses, Adenovirus, Reovirus, Coronaviruses, metapneumovirus, rhinovirus Encephalitis viruses: (WEE, EEE, West Nile)	Lecture
April 20, M	Anderson	Unit 4 Section 1 Viral Human Pathogens Hepatitis viruses (A, B, C, D) Rabies virus Human Immunodeficiency Virus	Lecture
April 22, W	Anderson	Unit 4 Section 1 Viral Human Pathogens To be determined	Lecture
April 24, F	Rommel	Unit 4 Section 2 Vaccines from an Immunological and Microbiological perspective (1) Passive vaccination (2) Component vaccines (3) Live vaccines	Lecture Emerging Infectious Disease assignment due
April 27, M	Rommel	Unit 4 Section 2 Vaccines and Autism	Lecture
April 29, W	Rommel	Unit 4 Section 3 Fungal and Protozoal Human Pathogens <u>Topics covered for each group of pathogens</u> Pathogenesis, mechanisms of pathogenesis, transmission, epidemiology, public health implications, diagnosis (select agents), replication (select agents), life cycle (select agents), emerging infectious agents Fungal human pathogens: <i>Dermatophytes, Candida albicans, Aspergillus, Cryptococcus, Histoplasma, Coccidioides, Blastomycosis, Pneumocystis jiroveci</i>	Lecture
May 4, M	Rommel	Unit 4 Section 3 Fungal and Protozoal Human Pathogens Protozoal human pathogens: <i>Plasmodia, Toxoplasma gondii, Cryptosporidia, Enatmoeba histolytica, Trichomonas vaginalis, Giardia lamblia, Trypanosoma</i>	Lecture
May 6, W	Anderson	Unit 4 Section 3 Helminthic Human Pathogens <u>Topics covered for each group of pathogens</u> Pathogenesis, mechanisms of pathogenesis, transmission, epidemiology, public health implications, diagnosis (select agents), replication (select agents), life cycle (select agents), emerging infectious agents Helminthic human pathogens: <i>Enterobius vermicularis, Ascaris, Hookworm, Toxocara canis, Trichinella spiralis, Taenia solium, Diphylobothrium latum, Echinococcus granulosus, Schistosoma</i>	Lecture

May 8, F	Anderson /Rommel	TBD class content	TBD Travel Medicine Assignment due
Finals week	Anderson Rommel	Exam Unit 4	In-class exam