

BIO 4492: Infectious disease: history, pathology, and prevention FALL 2021

Professor

Dr. Petra Levin
Rebstock 301
plevin@wustl.edu
314-935-7888
Email to schedule appointments

Assistant to the Instructor

Adrienne Brauer
Rebstock 303
abrauer@wustl.edu
Office Hours:
Mondays 3 to 4pm R309

NOTE: SYLLABUS IS FOR COURSE INFORMATION AND ASSIGNMENT PLANNING

In an attempt to remain as up to date as possible with what continues to be an astoundingly fluid situation, the instructor reserves the right to update course readings up to two weeks in advance.

COURSE DESCRIPTION

Leveraging the primary research literature, this course examines the history and pathology of infectious disease, the development of antibiotics and vaccines, the rise of antibiotic resistance, and the emergence and reemergence of diseases. In addition to gaining insights into the underlying causes and treatment of infectious disease, students will hone their ability to identify important biological questions, develop testable hypotheses, design experiments tailored to particular questions, and evaluate results. Through a series of written and oral assignments, students develop the skills to communicate about science effectively to both the research community and the general public. Prerequisites: One semester of Biology 500: Independent Research. Preference will be given to students who have completed Biology 349: Foundations of Microbiology. Area A. 3.0 units.

NOTE: For 2021 this course will focus on understanding the biology and pathology of SARS-CoV2 and the COVID 19 pandemic.

Background:

In 1900, Americans were more likely to die from a single infectious disease, Tuberculosis, than from cancer. A small cut, if infected, could quickly become life threatening. Viruses were an unknown entity. The discovery of compounds with potent antimicrobial activity, the development of vaccines against diseases from polio to measles, mumps, and rubella, and technological advances that provided even the remotest of locations access to clean water, reversed this trend, eliminating infectious disease as a major cause of death in the developed world.

One hundred twenty years later, however, the tides have turned. Not only are we in the midst of a global pandemic that is looking increasing like it will be as lethal as the Spanish Flu of 1918, antibiotics are increasingly ineffective, vaccination rates are at an all-time low in many counties, and global warming is facilitating the comeback of vector borne diseases that were once eradicated from the continental US. If trends continue, infectious disease will again replace cancer as the leading cause of mortality in the developed world.

Focusing on SARS-CoV-2 the objectives of this course are three-fold:

1. Gain insight into the origins, pathology, and treatment for SARS-CoV-2 and COVID19
2. Develop skills necessary for critical analysis of the primary literature
3. Hone the ability to communicate science effectively to both professional and lay audiences

Suggested Reading

For those of you who have **not** had college level microbiology, we highly recommend obtaining a copy of **Microbiology: An Evolving Science** by Slonczewski and Foster.

Additional Reading

The best way to become a better writer is to read, read, and read some more. There is a great deal of fantastic science writing available online, not to mention a lifetime supply of fantastic books. To get you started I would suggest following the American Society for Microbiology blog "Small Things Considered" <http://schaechter.asmblog.org/schaechter/>.

EXPECTATIONS

Students are expected to work independently unless otherwise noted.

Read and Participate (300 pts):

- Students will be allowed one (1) unexcused absence per semester after which absences will count *against* participation grade. (See additional information on COVID attendance policy below)
- Students are expected to come to class having read assigned primary research articles and related material. PDFs of course materials will be available on the course website one week before class (bb.wustl.edu).
- Class discussion will focus on analysis of the question(s) addressed in the week's reading material and the approaches used to answer the question. Alternative approaches will be proposed and evaluated.
- For articles from the primary literature, students should be able to: 1) identify the question(s) being addressed; 2) describe the approaches used to address the question; 3) summarize the data in figures and tables (e.g., hypothesis, method, authors' interpretation, your interpretation); 4) assess the significance and/or validity of the authors' conclusions; and where appropriate, 5) propose follow-on experiments.
- Class participation will count towards 30% of the final grade.

Write (500 points total):

- To foster the ability to write clearly and concisely, students will complete 10 written assignments over the course of the semester.
 - Three 250-word summaries of assigned primary research articles (25 pts each)
 - One critical review of a primary research article on from the bioRxiv (50 pts)
 - One single page Specific Aims on experimental questions related to your BIO500 research or equivalent. (50 pts for 1st draft & 50 points for the revision)
 - One 250 word "lay" summary of an assigned primary research article (25 pts)
 - One 3000 word essay pitched at a popular audience, focusing on a COVID-2019 related topic (250 pts--1st draft & revision scores averaged)
- All writing assignments are to be submitted as word documents by 5pm on their due date through the course Canvas Website.
- Late Policy: Total points for late assignments will be reduced 10% every 24-hour period after the assigned due date and time.
- Writing assignments will be evaluated and returned with constructive feedback.
- If your score on an assignment that does not include a revision is less than 75% of possible points you will be permitted one rewrite. Rewrites will only be allowed for one assignment over the course of the semester so choose carefully. Rewrites are due within

one week of the original assignment's return. Scores for original and rewrites will be averaged to calculate your final grade.

- For the 3000-word capstone essay, students are expected to incorporate the instructor and AI comments and suggestions for improvement at each stage of the process.

Present (200 pts):

- In consultation with Dr. Levin and Ms. Brauer, students are expected to develop a 30-minute PowerPoint presentation related to the topic of their final essay. The last three weeks of class will be devoted to student led presentations focusing on the topic of their final essays.
- In addition to deadlines noted on the syllabus, students are expected to schedule a practice talk with Dr. Levin and Ms. Brauer at least one week prior to their final presentation.
- Oral Presentation will count towards 20% of the final grade or 200 points total (10% content; 10% presentation design and implementation)

COURSE WEB SITE

All materials are available on Canvas under BIO 4492.

PLAGIARISM AND CHEATING:

Unless explicitly told otherwise, you are expected to work independently. Plagiarizing from either the primary literature or from another student will result in a failing grade for the assignment, and potentially the course. Please check assignments using Turnitin to detect potential plagiarism and other academic integrity concerns. If students do not have an account with Turnitin and/or do not utilize Turnitin when submitting their papers and assignments, the instructor may upload your paper or assignment to Turnitin for processing and review. For additional details please see: <https://wustl.edu/about/compliance-policies/academic-policies/undergraduate-student-academic-integrity-policy/>

OTHER IMPORTANT NOTES:

- This is an upper level biology course that moves quickly that covers a significant amount of ground in a short period of time. It is critical to stay on top of the material. **Extra credit is NOT an option.**
- If you feel like you are falling behind or simply have questions about the material, please, please talk to either the instructor or the AI. We are here to help you!
- As a seminar, course participation is an essential part of this class and counts towards 30% of your grade. Missing more than one class, or repeatedly being tardy, will have a substantial negative impact on your final grade (Not to mention burning hundreds of dollars in hard earned cash. See: <http://cmcforum.com/life/02142013-Cmçnumbers-what-happens-when-you-skip-class>).

Washington University COVID Policy Information:

While on campus, it is imperative that students follow all public health guidelines established to reduce the risk of COVID-19 transmission within our community. The full set of University protocols can be found at <https://covid19.wustl.edu/health-safety/>. This includes:

- Completing a self-screening using the [WashU COVID-19 Screening](#) app every day before coming to campus or leaving your residence hall room. If you do not receive a green check and pass the screening, you are not permitted to come to campus or leave your residence hall room. You must contact the COVID Call Center (314-362-5056) or the Habib Health and Wellness Center (314 935-6666) immediately. Note: In addition to the symptoms listed in the screening tool, everyone also should pay attention to symptoms that are new or different for you, including things like headache and congestion, particularly in combination with diarrhea. These can also be signs of COVID-19. Call the COVID Call Center or Habib to report these symptoms.
- Complying with universal masking. All individuals on campus must wear disposable masks or cloth face coverings while occupying indoor public settings, including: multi-person offices, hallways, stairwells, elevators, meeting rooms, classrooms and restrooms. Masks are encouraged but not required for outdoor activities, particularly at large events or in crowded settings. Students with disabilities for whom masked instructors or classmates create a communication barrier are encouraged to contact Disability Resources (www.disability.wustl.edu) or talk to their instructor for assistance in determining reasonable adjustments. Adjustments may involve amplification devices, captioning, or clear masks but will not allow for the disregard of mask policies.
- Maintaining physical distancing as needed. While distancing requirements have been removed for vaccinated students, those who are not fully vaccinated are strongly encouraged, for their own health, to maintain a distance of 6 ft from others in the classroom. If you are not able to be vaccinated or have conditions that may put you at increased risk of failed immunity and classroom activities would bring you in frequent proximity to other students, contact your instructor to discuss alternatives.
- Practicing healthy personal hygiene, including frequent handwashing with soap and warm water for at least 20 seconds and/or using hand sanitizer with at least 60% alcohol.

University-Wide Policies:

Reporting Sexual Harassment

If a student discusses or discloses an instance of sexual assault, sex discrimination, sexual harassment, dating violence, domestic violence or stalking, or if a faculty member otherwise observes or becomes aware of such an allegation, the faculty member will keep the information as private as possible, but as a faculty member of Washington University, they are required to immediately report it to the Department Chair or Dean or directly to Ms. Cynthia Copeland, the University's Associate Title IX Coordinator, at (314) 935-3411, cmcopeland@wustl.edu. Additionally, you can report incidents or complaints to the Office of Student Conduct and Community Standards or by contacting WUPD at (314) 935-5555 or your local law enforcement agency. See: [Title IX](#)

Reasonable Accommodations for Disabled Students

Washington University in St. Louis supports the rights of enrolled students to a full and equal educational opportunity and, in compliance with federal, state, and local requirements, is committed to reasonable accommodations for individuals with documented disabilities. Disabled students for whom accommodations may be necessary must be registered with, and provide their instructors official notification through, WUSTL's Disability Resources (www.disability.wustl.edu). Once established, responsibility for disability-related accommodations and access is shared by DR, faculty, and the student. Please contact Disability Resources at 314.935.5970 or disabilityresources@wustl.edu.

Statement on Military Service Leave

Washington University recognizes that students serving in the U.S. Armed Forces and their family members may encounter situations where military service forces them to withdraw from a course of study, sometimes with little notice. Students may contact the Office of Military and Veteran Services at (314) 935-2609 or veterans@wustl.edu and their academic dean for guidance and assistance. See: <https://veterans.wustl.edu/policies/policy-for-military-students/>.

Preferred Name and Gender Inclusive Pronouns

In order to affirm each person's gender identity and lived experiences, it is important that we ask and check in with others about pronouns. This simple effort can make a profound difference in a person's experience of safety, respect, and support. See: <https://students.wustl.edu/gender-pronouns-information/>, <https://registrar.wustl.edu/student-records/ssn-name-changes/preferred-name/>.

Emergency Preparedness

Before an emergency, familiarize yourself with the building(s) that you frequent. Know the layout, including exit locations, stairwells and the Emergency Assembly Point (EAP). Review the "Quick Guide for Emergencies" that is found near the door in many classrooms for specific emergency information and instructions. For additional Information and EAP maps, visit emergency.wustl.edu. To ensure that you receive emergency notifications, make sure your information and cell phone number is updated in SIS, and/or download. The WUSTL app and enable notifications.

To report an emergency: Danforth Campus: (314) 935-5555 School of Medicine Campus: (314) 362-4357 North/West/South and Off Campus: 911 then (314) 935-5555

Resources for Students:

Disability Resources

At Washington University we strive to make the academic experience accessible and inclusive. If you anticipate or experience barriers based on disability, please contact Disability Resources at 314.935.5970, disabilityresources@wustl.edu, or visit our website for information about requesting academic accommodations. See: <https://students.wustl.edu/disability-resources/>.

Confidential Resources for Instances of Sexual Assault, Sex Discrimination, Sexual Harassment, Dating Violence, Domestic Violence, or Stalking

The University is committed to offering reasonable academic accommodations (e.g. a no-contact order, course changes) to students who are victims of relationship or sexual violence, regardless of whether they seek criminal or disciplinary action. If a student needs to explore options for medical care, protections, or reporting, or would like to receive individual counseling services, there are free, confidential support resources and professional counseling services available through the Relationship and Sexual Violence Prevention (RSVP) Center. If you need to request such accommodations, please contact RSVP to schedule an appointment with a confidential and licensed counselor. Although information shared with counselors is confidential, requests for accommodations will be coordinated with the appropriate University administrators and faculty. The RSVP Center is in Seigle Hall, Suite 435, and can be reached at resvpcenter@wustl.edu or (314) 935-3445. For after-hours emergency response, call (314) 935-6666 or (314) 935-5555 and ask to speak with an RSVP Counselor on call.

Bias Reporting and Support System (BRSS)

The University has a process through which students, faculty, staff, and community members who have experienced or witnessed incidents of bias, prejudice, or discrimination against a student can report their experiences to the University's Bias Report and Support System (BRSS) team. See: brss.wustl.edu.

Mental Health Services

Mental Health Services' professional staff members work with students to resolve personal and interpersonal difficulties, many of which can affect a student's academic experience. These include conflicts with or worry about friends or family, concerns about eating or drinking patterns, and feelings of

anxiety, depression, and thoughts of suicide. See: <https://students.wustl.edu/mental-health-services/>. Additionally, see the mental health services offered through the RSVP Center listed above.

WashU Cares

WashU Cares specializes in connecting students to mental, medical, financial and academic resources by using supportive case management. We seek to empower students to be successful through life's challenges and to have ownership of their own experiences. Our services are designed to support Danforth Campus students. If you feel concerned about a student who may need help connecting to resources we accept referrals from all students, faculty, and staff. If you are concerned about a student, you can file a report here: <https://washucares.wustl.edu/> and a WashU Cares Case Manager will reach out to you to get more information about your concern.

The Writing Center

The Writing Center, located in Olin Library, offers free one-on-one writing tutorials to WashU students, as well as workshops designed to help students become better writers. The Writing Center staff can assist by providing feedback on the strength of an argument, clarity, and organization. Contact them at 935-4981 or writing@wustl.edu. Visit them at: <https://writingcenter.wustl.edu/>.

The Learning Center

The Learning Center works collaboratively with University partners to provide undergraduate students key resources, like academic peer mentoring, to enhance their academic progress. Contact them at <https://ctl.wustl.edu/learningcenter/> to find out what support they may offer for your classes.

	Topic	Reading
8/31	Introduction to reading and writing about science	<p>Ed Yong Ed Yong Deconstruction Discussion of dos and don'ts of good science writing</p>
9/2	Corona Viruses Biology & history	<p>Slide Deck on Influenza and COVID</p> <p>Hoffman et al, 2020 Thomas, 2020 Lytras et al, 2021</p> <p>Writing assignment 1 due 250 word "highlight" summary of Hoffman et al, 2020</p>
9/7	The immune system	<p>Slide deck on the Immune System Ed Yong, Immunology is where intuition goes to die</p>
9/9	COVID-19 and Immunity	<p>Wajnberg, et al, 2020 Addetia et al, 2020</p> <p>Writing assignment 2 due 250 word "highlight" summary of Addetia et al, 2020</p>
9/14	COVID-19 Symptoms I Lungs	<p>https://www.nytimes.com/video/health/10000007056651/covid-ards-acute-respiratory-distress-syndrome.html</p> <p>Mason, 2020 Olds and Kobbani, 2020 Kuba et al, 2005</p> <p>Assignment 4 Peer Review Materials:</p> <ul style="list-style-type: none"> • Drubin, Any jackass can trash a manuscript but it takes good scholarship to create one, 2011 • Example peer review of one of Dr. Levin's manuscripts • Slobodin et al, 2021 BIORXIV
9/16	COVID-19 Symptoms II Nervous system and heart	<p>Xydakis et al, 2021 Perez-Bermejo, et al, 2021 What COVID-19 does to the Heart, Yong 2020</p> <p>Writing assignment 3 due 250 word "highlight" summary of Pérez-Bermejo</p>
9/21	Covid Symptoms II Overreaction	<p>Hamblin, Why Some People Get Sicker Than Others, 2020 Tweeetorial on Type 1 interferon signaling and COVID Gale, Covid-19 scientists flag key immune function as a turning point in life threatening cases, 2020</p> <p>Zhang et al 2020 Bastard et al, 2020 Zeberg & Pääbo 2020</p>

9/23	<p>Transmission I Airborne vs large droplets vs surfaces</p> <p>Guest Instructor: Dr. Sarah Anderson</p>	<p>The 60 year old scientific screwup that helped Covid kill, <i>Wired</i></p> <p>Stadnytskyi et al, 2020 Riley, 1959</p> <p>Writing assignment 4 due: Peer Review of BioRxiv paper by Slobodin et al</p>
9/28	<p>Special Guest Lecture</p>	<p>Dr. Audrey Odom-John, Chief of the Division of Pediatric Infectious Diseases at Children's Hospital of Philadelphia. Multisystem Inflammatory Syndrome in Children</p> <p><i>How to tell if your child's rash could be MIS-C, Daily Mail</i></p> <p>Blatz et al, 2021 Belay et al, 2021</p>
9/30	<p>Transmission II Super spreader events</p>	<p>This Overlooked Variable Is the Key to the Pandemic, 2002</p> <p>Link to information on White House super spreader event: https://public.tableau.com/profile/peter.james.walker#!/vizhome/COVID-19attheWhiteHouse-ContactTracking/OverviewDash</p> <p>Hamner et al, 2020 Brown, 2021</p> <p>Writing Assignment 5, Specific Aims Version 1 Due</p>
10/5	<p>Testing and Surveillance</p>	<p>BinaxNOW FAQ</p> <p>Larsen and Wigginton, 2020 Peccia, 2020</p> <p>Washington University develops COVID-19 saliva test, 2020 Lalli et al, 2021</p> <p>YouTube explanations of LAMP and Colorimetric LAMP</p>
10/7	<p>Masking</p>	<p>Reducing transmission of SARS-CoV2</p> <p>The false idea that masks make you sicker, Atlantic 2020</p> <p>The science of masking kids at school remains uncertain,</p> <p><i>Intelligencer</i> 2020 Hendrix, et al 2020 Budzyn, et al 2021 Jehn et al 2021</p>

		Writing Assignment 5, Specific Aims Version 2 Due
10/12		FALL BREAK
10/14	Underlying Conditions: Obesity	<p>Why COVID-19 is more deadly in people with obesity—even if they're young</p> <p>Popkin et al, 2020 Foulkes et al, 2021</p> <p>Writing Assignment 6, Lay Summary Due</p>
10/19	Underlying Conditions: Age and Other Risk Factors	<p>CDC Table: Risk for COVID-19 infection, hospitalization and death by age group</p> <p>The coronavirus is most deadly if you are older and male — new data reveal the risks.</p> <p>Wambier, 2020 Skevaki et al</p>
10/21	Long Haulers	<p>Long haulers are redefining COVID, Atlantic 2020</p> <p>Long haulers are fighting for their future, Atlantic 2021</p> <p>COVID-19's lasting misery, Nature 2020</p> <p>Report: What does COVID-19 recovery actually look like?- Patient led research 2020</p> <p>Writing Assignment 7, Pitch Paragraph and list of 10 primary sources</p>
10/26	Therapies: Real	<p>Coronavirus RNA Proofreading: Molecular Basis and Therapeutic Targeting, Cell 2020</p> <p>Molnupiravir--Wikipedia</p> <p>Merck says COVID-19 pill cuts risk of death hospitalization, Associated Press 2021</p> <p>Dexamethasone in Hospitalized Patients with Covid-19 — Preliminary Report, NEJM 2020</p> <p>The 'very, very bad look' of remdesivir, the first FDA-approved COVID-19 drug, Science 2020</p> <p>Dougan et al, 2021</p>

10/28	Therapies: Imagined	<p>Treating COVID-19—Off-Label Drug Use, Compassionate Use, and Randomized Clinical Trials During Pandemics, JAMA 2020</p> <p>Hydroxychloroquine Still Doesn't Do Anything, New Data Shows, Wired 2020</p> <p>Effect of Hydroxychloroquine in Hospitalized Patients with Covid-19, The RECOVERY Collaborative Group, 2020</p> <p>Caly, 2020 Popp et al, 2020</p> <p>Oral Presentation: DRAFT PRESENTATION due</p>
11/2	Vaccines: mRNA and adenovirus	<p>The Story of mRNA: From a Loose Idea to a Tool, STAT 2020</p> <p>Should You Mix and Match Your COVID Vaccine Booster, The Atlantic 2021</p> <p>Feng et al, 2020 Karikó et al, 2008</p>
11/4	Vaccine efficacy and variants	<p>Delta has changed the pandemic endgame, The Atlantic 2021</p> <p>Opinion: Covid Vaccine Policy Should Consider 'Hybrid Immunity', The New York Times, 2021</p> <p>Brosh-Nissimov et al, 2021 Singh et al, 2021 Planas et al, 2021</p>
11/9	Preparing for the next pandemic	<p>https://www.nytimes.com/video/health/100000007293397/covid-pandemics-causes-documentary.html</p> <p>Emerging COVID-19 success story: South Korea learned the lessons of MERS, Our World in Data 2021</p> <p>Is America Prepared for the Pandemic After COVID-19, The Atlantic 2021</p> <p>How Public Health Took Part in Its Own Downfall, The Atlantic 2021</p> <p>Policy Forum: Ecology and economics for pandemic prevention, Science 2021</p>
11/11	STUDENT PRESENTATIONS	<p>Writing Assignment 7: Capstone Review figures and annotated bibliography due</p>

11/16	STUDENT PRESENTATIONS	
11/18	Movie	Documentary: Totally Under Control, 2020 "An in-depth look at how the United States government handled the response to the COVID-19 outbreak during the early months of the pandemic."
11/23	STUDENT PRESENTATIONS	Writing Assignment 7: Capstone Review high quality draft due
11/25		Thanksgiving!!!
11/30	STUDENT PRESENTATIONS	
12/2	STUDENT PRESENTATIONS	
12/7	STUDENT PRESENTATIONS	
12/9	WRAP UP DISCUSSION	Writing Assignment 7: Capstone Review FINAL VERSION due