Spillover

Where, when, and why do pathogens jump to new hosts?

And what happens next?

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Office hours: by appointment, over Zoom

Course site: https://collab.its.virginia.edu/portal/site/d871d235-6da9-40e2-924d-92e59741b639
Location: Online! Zoom link provided on course site, **password = Spillover**
Time: 4-5 pm every Monday through Thursday, July 6 through July 30

About this course

When a pathogen moves into a new host species, we refer to this as spillover. The SARS-CoV-2 pandemic is the worst outcome of spillover that we've experienced in our lifetimes, but it isn't the first, and it won't be the last. Every time a spillover event leads to an epidemic, we ask ourselves: Why did this happen? Can we predict where the next spillover will happen? What will be the next pathogen to make the leap to humans? What wildlife population is it most likely to leap from? And once the pathogen has made the leap, how might it evolve?

We will seek answers to these questions in scientific articles, popular science writing, and discussion. Along the way, you'll learn some of the basic principles and approaches of disease biology and build a foundation with which to understand the ongoing pandemic. During these four weeks, you will also practice skills that will help you in your college-level science classes, like written and oral communication, interpreting graphs, and formulating hypotheses. I encourage you to make use of this small learning community as a safe, structured environment in which to practice and grow – the connections you form here will facilitate the transition to working, learning and communicating with peers and faculty at college.

What you'll learn

During this course, you'll spend a lot of time trying to figure out what we know and how we know it. In other words, you'll be doing the work of a scientist! We have to engage in this process if we want to understand the world around us and make informed decisions. The ongoing pandemic has only accentuated the significance, and the challenges, of collecting and evaluating evidence – it can save lives.

Specifically, you will learn to:

- Read, interpret and critique primary and popular scientific literature

- Discuss scientific ideas with your peers and communicate them in writing
- Use scientific evidence and reasoning to develop hypotheses and predictions for the evolutionary, ecological and social drivers of disease spillovers and epidemics
- Connect human activities to the rich and dynamic environments in which they are situated and understand their consequences for disease spread

How you'll know you're learning

This course will be listed on your transcript, but *it will not be graded.* Hence, you will not assess your progress in this class through graded assignments. You will receive feedback on three key components of the course:

In-class engagement: We will use class periods to review old information, introduce and discuss new information, work through scientific literature together, and practice working with new information. In-class engagement means that you come to each class prepared, having done the pre-reading and posted to the discussion board, and actively participate during each class session. Your engagement will help you to fortify and synthesize the concepts you encountered in prior classes and in out-of-class work. The important learning you will do in this class will come from working with the material and your peers during class.

Pre-reading and Discussion on Piazza: Each week, you will generally have two assigned readings (occasionally, this may be replaced by a podcast, a video or an activity). After completing the reading, you will contribute to several conversations about the pre-work on Piazza, an online discussion board. I will provide several prompts for you to respond to and discuss. This is not a lecture-based course, so we will spend our valuable time together as a group actively working with the content you encountered in the readings, rather than on lecture (i.e. the passive transfer of information from me to you). The discussion boards provide an opportunity for you to reflect and build on the reading, learn from the perspectives of your peers, and direct the class session towards the ideas that are most interesting or challenging to you. <u>Please post on the discussion boards before noon on the day of the associated class</u> so I have time to read through your posts, respond, and direct the class session accordingly.

Weekly writing reflections: At the end of each week, you will write a 300-word reflection on the week's learning. These are opesn-ended. You could write about a new idea you encountered, something you found particularly interesting, a connection you made, (like something you read about in the news that linked to class), or something you're stuck on. A good reflection piece will clearly articulate the topic, explain the specific idea with language that would make sense to a lay reader, and help the reader understand why you think this topic is important, interesting, or problematic. In addition to helping you

review and synthesize material, these written reflections offer you the opportunity to practice writing, a fundamental skill in the sciences that is rarely taught. I will provide general feedback and allow rewrites to give you a chance to work on your editing skills. These will be due by end of the day on Friday, for each week.

Optional term paper: for those who are interested in more practice with writing, I invite you to write a short paper (1000 words) on a topic of your choice, relevant to what we cover in the course. Please let me know by July 17 if this is of interest to you and we will work out details and deadlines.

A bit about course policies

This course is *not graded*, but to reap its benefits, you must commit to fully engage and to work to create the best possible learning environment for yourself and your peers. You will get the most out of this course if you attend each course session, complete work on time, and adhere to the highest standards of academic integrity.

Attendance: In-class participation is where the work happens in this course. We will use class time to dig into concepts through reviews and discussion and practice applying those concepts and using skills, like scientific reasoning and modeling. There is not a textbook or set of recorded lectures. Hence, you will need to be present in class to learn in this course. I understand that things come up, so if you really need to miss a class, please contact me to discuss one week in advance.

Late work policy: This course is designed such that pre-work forms the foundation for the work we do in class. Thus, this pre-work is not beneficial to you as a learner if it is done late.

Academic integrity: Scientific progress requires that we first acknowledge and make sense of the knowledge generated by others. Only then can we identify gaps in our understanding and identify the path forward. Therefore, in this course, it is of the utmost importance that you give credit to ideas, facts, words, phrases, images, etc that you reference in your writing. Plagiarism and related acts actively impede your learning and the broader progress of science, so they will not be tolerated. I trust every student in the course to fully comply with all the provisions of the UVA honor system (https://honor.virginia.edu/).

Wellbeing: As a member of the UVA academic village, I am committed to maintaining an equitable, just, and safe community in my classroom and on our campus.

If you're a first generation student, UVA offers lots of resources, including student groups, career counseling, and financial guidance at the Career Center (https://career.virginia.edu/specific-populations-and-community/first-generation-college-

students) and the Office of the Dean of Students (https://access.odos.virginia.edu/fgli-student-support).

I will not tolerate any form of discrimination or harassment, in any form, and I expect students in this course to hold me and one another to the same standard. Additional resources can be found through the Office for Diversity, Equity and Inclusion (https://vpdiversity.virginia.edu/) and the Office for Equal Opportunity and Civil Rights (https://www.virginia.edu/eop). If you or someone you know feels unsafe, there are resources on campus to help: https://justreportit.virginia.edu/sexual-and-gender-based-harassment-violence.

I encourage you to discuss with me any anticipated barriers to your learning so that we can arrange for appropriate accommodations. If these barriers stem from a disability, including nonvisible disabilities like a chronic disease or learning disability, the Student Disability Access Center (http://www.virginia.edu/studenthealth/sdac/sdac.html) exists to help you develop a learning plan. If you have been working with the Center, please discuss this with me so I can work to implement any accommodations.

Finally, if you are feeling overwhelmed or isolated, know that you are not alone and there are people here at UVA who can help. CAPS, the Student Health Center's Counselling and Psychological Services, can be reached at 434-243-5150 to speak with a counselor. Additional resources are available on their website: https://www.studenthealth.virginia.edu/caps. If you prefer to speak with someone anonymously, you can call the Madison House's HELP line 24/7: 434-295-TALK (http://www.helplineuva.com/).

Credit to Ian Becker for assembling these resources.

What you'll be doing

		Class Session		
Theme	**Date**	**Before**	**During**	**After**
	Week 1			
The basics: what are parasites, and how do they get around?	Monday, July 6	1) Read syllabus; 2) Read Ch. 1 from *Spillover*, parts 1-6; 3) Post on Piazza	Introductions, and some definitions	
	Tuesday, July 7		Meet the parasites	
	Wednesday, July 8	1) Read "Yosemite Outbreak"; 2) Post on Piazza	Steps of spillover	
	Thursday, July 9		Parasite transmission	Reflection due Friday
	Week 2			
Spillover Clue: whodunit,	Monday, July 13	1) Listen to TPWKY episode 35 on	Ecology of spillover	

where'd it happen, and is something up with bats?		Lyme Disease; 2) Post on Piazza		
	Tuesday, July 14		Host range	
	Wednesday, July 15		Hotspots of disease emergence	
	Thursday, July 16	1) Read Ch. 1 to *Viruses: A Very Short Intro*; 2) Post on Piazza	Bats and viruses	Reflection due Friday
	Week 3			
	Monday, July 20	1) Read "Seeking the Source of Ebola"; 2) Post on Piazza	How do you find the source host?	
Contagion: how do pathogens "go viral"?	Tuesday, July 21	Watch TED Talk "Mathematics of Epidemics"	Simulating an epidemic	
	Wednesday, July 22	1) Read Wilder-Smith et al. 2020; 2) Post on Piazza	SARS classic vs. SARS-CoV-2	Reflection due Friday
	Thursday, July 23		Non-human spillover	
	Week 4			
The epidemic has arrived: what happens next?	Monday, July 27	1) Read one of the possible posted articles; 2) Post on Piazza	Inequities in epidemics	
	Tuesday, July 28		Why do parasites harm their hosts?	
	Wednesday, July 29	Follow prompts on Piazza about doing research at UVA	Undergraduate research panel	Reflection due Friday
	Thursday, July 30		Wrap-up	