

VIBS 681 Epidemiology Seminar

Animal-targeted interventions in the wild to reduce pathogen spillover risk to humans

Overview

Wild and domestic animals serve as reservoirs for zoonotic pathogens, maintaining pathogen transmission cycles in nature. Zoonotic pathogens may spillover into domestic environments resulting in human disease risk. There is increasing attention in various ways in which the animal hosts can be targeted with management approaches to reduce human disease risk. The goals of animal targeted interventions are typically to (i) reduce the number of animal hosts; (ii) reduce the infection prevalence in animal hosts; and/or, in the case of vector-borne pathogens (iii) reduce vector densities on hosts. Approaches include culling of wildlife; treating of domestic of wild animals with insecticides; vaccination of domestic or wild animals; employing natural enemies, and more.

This graduate student journal club will explore ecological and epidemiological literature on diverse approaches to target animals in management of human disease risk. **We will study the ecology and epidemiology of zoonotic diseases to arrive at attributes of disease systems that either facilitate or complicate management approaches that target the wild and domestic animal host species.** We will conclude the course with recommendations for enhancing the utility of such approaches.

Learning Outcomes

- Understand the circumstances under which wildlife or domestic animals can be targeted to reduce human disease risk
- Critically review published studies that employ host-targeted approaches to protect human health
- Identify the economic, cultural, and ecological factors that must be considered when managing zoonotic diseases
- Explain the modeling approaches that have been used to predict the effectiveness of animal-targeted disease management
- Compare the epidemiological settings when host-targeted approaches have succeeded versus failed in reducing human disease risk.
- Synthesize course concepts by leading the presentation of research articles.

Fall 2021; 1 credit hour
Mondays 12-12:50; VIDI 102

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Materials

Weekly course readings will be distributed via email.

Evaluation

Your grade for this course will be S/U and will be based on attendance, participation in discussions and presentation of research articles. The presentations will involve reading the article/s, preparing and distributing 5-10 questions, and using the questions to facilitate discussion and learning at the meeting.

Students are expected to attend at least 10 discussion periods. An oral exam will be available to students unable to attend at least 10 presentations if absences were excused (<http://student-rules.tamu.edu/rule07>)

TOPICS ARE SUBJECT TO CHANGE BASED ON STUDENT INTEREST . STUDENTS ENCOURAGED TO FIND NEW/RELATED PAPERS TO ADD TO OR REPLACE THESE.

Week	Date	Topic	Presenters	Readings (others may be substituted or added)
1	Aug 30	Orientation; Sign up for weekly presentations	Sarah Hamer	None
2	Sept 6	Vaccines- rabies vaccines for wildlife		Hanlon CA, Niezgoda M, Hamir AN, Schumacher C, Koprowski H, Rupprecht CE (1998) First North American field release of a vaccinia-rabies glycoprotein recombinant virus. <i>J Wildl Dis</i> 34:228–239 Sidwa TJ, Wilson PJ, Moore GM, Oertli EH, Hicks BN, Rohde RE, Johnston DH (2005) Evaluation of oral rabies vaccination programs for control of rabies epizootics in coyotes and gray foxes: 1995–2003. <i>J Am Vet Med Assoc</i> 227:785–792
3	Sept 13	No class		
4	Sept 20	Ivermectin treated bird seed to control WNV		Nguyen C, Gray M, Burton TA, Foy SL, Foster JR, Gendernalik AL, et al. (2019) Evaluation of a novel West Nile virus transmission control strategy that targets <i>Culex tarsalis</i> with endectocide-containing blood meals. <i>PLoS Negl Trop Dis</i> 13(3): e0007210.
5	Sept 27	Lethal anticoagulant paste applied to captured bats		Has the approach backfired? https://www.wired.com/2012/06/vampire-bat-rabies/ Streicker D.G., Recuenco S., Valderrama W., Benavides J.G., Vargas I., Pacheco V., Condori R.E., Montgomery J., Rupprecht C.E., Rohani P., et al. Ecological and anthropogenic drivers of rabies exposure in vampire bats: Implications for transmission and control. <i>Proc. Biol. Sci.</i> 2012;279:3384–3392.
6	Oct 4	Acaricides to reduce tick density on hosts-deer		Teresa J. Wong, Paul J. Schramm, Erik Foster, Micah B. Hahn, Nathaniel H. Schafrick, Kathryn C. Conlon, Lorraine Cameron. The Effectiveness and Implementation of 4-Poster Deer Self-Treatment Devices for Tick-borne Disease Prevention. <i>CDC Review</i> .
7	Oct 11	Acaricides to reduce tick density on hosts-mice		\$74 for a box of 24 ‘tick tubes’ to treat mice! https://ticktubes.com/ Brown, JE, Miller, TM, Machtinger, ET. Tick tubes reduce blacklegged tick burdens on white-footed mice in Pennsylvania, USA. <i>J Appl Entomol.</i> 2020; 144: 542– 545.
8	Oct 18	Vaccinating mice against the Lyme disease bacterium		An ecological approach to preventing human infection: Vaccinating wild mouse reservoirs intervenes in the Lyme disease cycle. Jean I. Tsao, J. Timothy Wootton, Jonas Bunikis, Maria Gabriela Luna, Durland Fish, Alan G. Barbour. <i>Proceedings of the National Academy of Sciences</i> Dec 2004, 101 (52) 18159-18164 Stafford, K.C., Williams, S.C., van Oosterwijk, J.G. <i>et al.</i> Field evaluation of a novel oral reservoir-targeted vaccine against <i>Borrelia burgdorferi</i> utilizing an inactivated whole-cell bacterial antigen expression vehicle. <i>Exp Appl Acarol</i> 80 , 257–268 (2020).

9	Oct 25	Sylvatic plague vaccine		Rocke TE, Tripp DW, Russell RE, et al. Sylvatic Plague Vaccine Partially Protects Prairie Dogs (<i>Cynomys</i> spp.) in Field Trials. <i>Ecohealth</i> . 2017;14(3):438-450. doi:10.1007/s10393-017-1253-x
10	Nov 1	Zooprophylaxis: using livestock to draw mosquitoes away from humans to reduce malaria		Donnelly, B., Berrang-Ford, L., Ross, N.A. <i>et al.</i> A systematic, realist review of zooprophylaxis for malaria control. <i>Malar J</i> 14 , 313 (2015).
11	Nov 8	Endectocide treatment of cows to reduce malaria in humans		Imbahale, S.S., Montaña Lopez, J., Brew, J. <i>et al.</i> Mapping the potential use of endectocide-treated cattle to reduce malaria transmission. <i>Sci Rep</i> 9 , 5826 (2019). https://doi.org/10.1038/s41598-019-42356-x
12	Nov 15	Introduced predators to control vector populations		Ç.H. Şekercioğlu. Guineafowl, ticks and Crimean–Congo hemorrhagic fever in Turkey: the perfect storm? <i>Trends Parasitol</i> , 29 (2013), pp. 1-2, 10.1016/j.pt.2012.10.001 https://www.sciencedaily.com/releases/2012/11/121129232542.htm
13	Nov 22	Maintaining wildlife biodiversity to buffer against disease risk		Keesing F, Brunner J, Duerr S, et al. Hosts as ecological traps for the vector of Lyme disease. <i>Proc Biol Sci</i> . 2009;276(1675):3911-3919. doi:10.1098/rspb.2009.1159
14	Nov 29 *last class*	Restoring predator communities to reduce Lyme risk		Levi T, Kilpatrick AM, Mangel M, Wilmers CC. Deer, predators, and the emergence of Lyme disease. <i>Proc Natl Acad Sci US A</i> . 2012;109(27):10942-10947. doi:10.1073/pnas.1204536109
15	Dec 6	Redefined day- students attend Friday class		
		*There will be NO FINAL EXAM during finals week for VIBS 681		

Other topics considered:

Vaccination of wildlife to prevent Lassa virus spillover into humans in Africa		Nuismer SL, Remien CH, Basinski AJ, Varrelman T, Layman N, Rosenke K, et al. (2020). Bayesian estimation of Lassa virus epidemiological parameters: Implications for spillover prevention using wildlife vaccination. <i>PLoS Negl Trop Dis</i> 14(9): e0007920. New research: https://www.ucdavis.edu/news/9m-preempt-zoonotic-spillover-threats-protect-military-and-local-communities
Culling of pigs to reduce Nipah virus spillover		Parashar UD, Sunn LM, Ong F, Mounts AW, Arif MT, Ksiazek TG, Kamaluddin MA, Mustafa AN, Kaur H, Ding LM, Othman G, Radzi HM, Kitsutani PT, Stockton PC, Arokiasamy J, Gary HE, Jr, Anderson LJ. Case-control study of risk factors for human infection with a new zoonotic paramyxovirus, Nipah virus in Malaysia. <i>J Infect Dis</i> . 2000;181:1755–1759.

COVID-19 Statement

To help protect Aggieland and stop the spread of COVID-19, Texas A&M University urges students to be vaccinated and to wear masks in classrooms and all other academic facilities on campus, including labs. Doing so exemplifies the Aggie Core Values of respect, leadership, integrity, and selfless service by putting community concerns above individual preferences. COVID-19 vaccines and masking — regardless of vaccination status — have been shown to be safe and effective at reducing spread to others, infection, hospitalization, and death.

Academic Integrity Statement

“An Aggie does not lie, cheat, or steal or tolerate those who do”. Refer to the Aggie Honor System website at <http://www.tamu.edu/aggiehonor>.

Americans with Disabilities Act (ADA) Policy

Texas A&M University is committed to providing equitable access to learning opportunities for all students. If you experience barriers to your education due to a disability or think you may have a disability, please contact the Disability Resources office on your campus (resources listed below). Disabilities may include, but are not limited to attentional, learning, mental health, sensory, physical, or chronic health conditions. All students are encouraged to discuss their disability related needs with Disability Resources and their instructors as soon as possible. *Disability Resources is located in the Student Services Building or at (979) 845-1637 or visit disability.tamu.edu.*

Title IX and Statement on Limits to Confidentiality

Texas A&M University is committed to fostering a learning environment that is safe and productive for all. University policies and federal and state laws prohibit gender-based discrimination and sexual harassment, including sexual assault, sexual exploitation, domestic violence, dating violence, and stalking.

With the exception of some medical and mental health providers, all university employees (including full and part-time faculty, staff, paid graduate assistants, student workers, etc.) are Mandatory Reporters and must report to the Title IX Office if the employee experiences, observes, or becomes aware of an incident that meets the following conditions (see [University Rule 08.01.01.M1](#)):

- The incident is reasonably believed to be discrimination or harassment.
- The incident is alleged to have been committed by or against a person who, at the time of the incident, was (1) a student enrolled at the University or (2) an employee of the University.

Mandatory Reporters must file a report regardless of how the information comes to their attention – including but not limited to face-to-face conversations, a written class assignment or paper, class discussion, email, text, or social media post. Although Mandatory Reporters must file a report, in most instances, a person who is subjected to the alleged conduct will be able to control how the report is handled, including whether or not to pursue a formal investigation. The University’s goal is to make sure you are aware of the range of options available to you and to ensure access to the resources you need.

Students wishing to discuss concerns in a confidential setting are encouraged to make an appointment with [Counseling and Psychological Services](#) (CAPS). Students can learn more about filing a report, accessing supportive resources, and navigating the Title IX investigation and resolution process on the University’s [Title IX webpage](#).

Statement on Mental Health and Wellness

Texas A&M University recognizes that mental health and wellness are critical factors that influence a student’s academic success and overall wellbeing. Students are encouraged to engage in healthy self-care by utilizing available resources and services on your campus

Students who need someone to talk to can contact Counseling & Psychological Services (CAPS) or call the TAMU Helpline (979-845-2700) from 4:00 p.m. to 8:00 a.m. weekdays and 24 hours on weekends. 24-hour emergency help is also available through the National Suicide Prevention Hotline (800-273-8255) or at suicidepreventionlifeline.org.