Ecology of Infectious Diseases
BZ 418, Fall 2016, 11am – 2.15pm, Fridays.
This lecture course will examine basic principles of disease ecology: the distribution and determinants of disease, the control of health problems, and the medical detective work required to understand disease outbreaks, especially zoonoses (pathogens transmitted from wildlife to humans). Simultaneously, we will use ecological theory to understand infectious disease emergence and spread in human, veterinary and wildlife systems. We will use case studies from developed and developing countries to explore the science surrounding public health issues such as vaccination, globalization, One Health and disease control.

Course objectives
1. To learn basic methods of epidemiology and disease ecology.
2. To understand basic ecological concepts of disease transmission and emergence.
3. To gain familiarity of the ecology and epidemiology of a range of current health issues especially zoonotic emerging diseases, One Health etc.

Class organization
Instructor
Daniel Salkeld, Ph.D.
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Office hours: 2.30-3.30pm Fridays, or by appointment.

Recitations – The curriculum includes discussion/work sections designed to learn epidemiologic and ecological tools, and to clarify and extend lectures and reading assignments. Recitations begin in week 2 and will follow on from the lecture session.

Readings – Original journal articles from the primary literature, along with some reviews, are assigned for most of the lectures. The readings will be available online, or will be posted on the coursework website. There is no required textbook for the course, although David Quammen’s ‘Spillover’ is strongly recommended.

Evaluation – Grades will be based on the examinations and assignments listed below. Letter grades, divided along the – to + range will be assigned as A (>89%), B (80-89%), C (70-79%), and D (60-69%). To attain an A you will need to demonstrate originality and creative thinking.

Attendance & participation (5%) – Marks will be awarded based on attendance, participation, and preparedness during recitations and lectures. Attendance at lectures is expected.

Examinations (60%) – Examinations will cover material presented in lectures, recitations and readings, and will include material discussed in class that is not necessarily included in lecture materials that are posted online. The exam format is multiple choice and short answer questions. There will be a mid-term exam (25%) in class, and a final exam (35%) which will include material from the entire semester.

Project (35%) – Each student will research a zoonotic infectious disease, construct a relevant database and develop ecological and epidemiologic perspectives on disease dynamics and control. Sub-
components of this project (e.g., databases, oral presentations) will be submitted through the semester, and a final written report will be due during week 14 of the class.

**Ecology of Infectious Diseases (subject to change)**

Week 1 – *Introduction & the epidemiology of an emerging disease.* Course overview, introduction to epidemiology and biology of disease, epidemic curves. R: *Lipsitch et al. 2003; Low & McGeer 2003; ‘Dinner at the Rat Farm’ – Chapter IV in Quammen’s ‘Spillover.’*


Week 5 – *Identifying the disease agent.* False positives & true negatives. Recitation: projects & accessing data.


Week 7 – *Mid-term exam.* In classroom. Bring a calculator.

Week 8 – *Eco-epidemiology of Lyme disease.* Ticks, squirrels, biodiversity and emerging diseases. R: *Chapters 48-53 (The deer, the parrot, and the kid next door) in Spillover; Logiudice et al. 2003; Pongsiri et al. 2009; Salkeld et al. 2013, **Venton 2015*** Recitation: Host community models.


Week 10 – *Disease surveillance, SIR models & superspreaders.* West Nile virus, typhoid Mary & susceptibility.


Week 12 – *Zika.* Mosquito-borne diseases, pesticides and disease control. Recitation: projects.

Week 13 – *Thanksgiving break.*

Week 14 – *Carnivores are good for your health.* Carnivores, trophic cascades, hanta outbreaks and conservation. R: Ostfeld & Holt 2004; Nunez et al. 2014. Recitation: Contagion. *****Case study project submission.

Week 16 – FINAL EXAM.

References:


