Draft 10/10/2010

Environment, Climate and Infectious Disease

International Health (IH 591V)/ Environmental and Occupational Health (EOH 591E)

Fall 2003 - Mondays 11:00 a.m. – 12:50 p.m.

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Prerequisites: None

Credit Hours: 2 SPH

Enrollment: 25 students maximum

Time: Mondays, 11:00 a.m. – 12:50 p.m.

Course Material: The syllabus consists of journal articles and other reading material that will be available for individual students to copy for their own use. Most readings will be available on reserve at the Health Sciences (accessible via Blackboard), although guest lecturers may provide limited additional material in class. The recommended paperback for general information on specific infectious diseases is Control of Communicable Diseases, 17th Ed, 2000 (Chin, James, Ed.)

Objectives: This course will explore the role of the environment in the transmission of infectious diseases and the emergence of new pathogens. The course format will be a combination of lectures and classroom discussions guided by a series of questions. Topics include: basic principles of infectious disease transmission, the influence of climate variation and change on infectious diseases, the impact of deforestation and urbanization on emergence or re-emergence of pathogens, infectious disease outbreaks associated with natural disasters, ecological sanitation and infectious disease risks, and infectious disease transmission in indoor environments. Many specific waterborne, foodborne, vector-borne, and zoonotic infections will be used throughout the lectures and discussions to illustrate general principles of environmental

transmission. Three lectures by CDC guest speakers will focus on important vector-borne diseases: Chagas Disease, Schistosomiasis and Malaria. An additional lecture by a CDC guest speaker will examine how natural disasters affect occurrence of infectious diseases. The goal of the course is to provide the student with a clear understanding of the relationship between infectious agents, their hosts and the environmental conditions that affect their interaction and to consider how this information can be used to design effective control measures.

Evaluation:

There will be a mid-term take home exam that is a case study on a specific infectious disease. The mid-term is comprised of selected readings and questions provided by the instructor. Each student will also be required to give an oral presentation on a selected topic and submit a final paper (5-7 pages) on the same topic. The presentation/paper should provide background material on a specific infectious agent, how the agent is transmitted, the role of specific environmental factors in disease transmission and an assessment of available control measures or specific interventions. Students will be evaluated on their understanding of the principles of environment transmission of infectious diseases and their ability to critically review and synthesize information from studies of their topic that are described in the literature. (Please see attached evaluation guidelines.)

All exams are non-collaborative. All students are expected to follow the student honor and conduct code guidelines. A copy of the entire student honor and conduct code can be found online at the following URL: http://www.sph.emory.edu/studentservice/conductcode.html

Mid-term Exam: 20%
Oral Presentation: 40%
Final Paper: 40%

"Environment, Climate and Infectious Disease" Lecture and Reading Schedule:
Mondays, 11 am – 12:50 pm; Location: GCR 113

Class One – September 8, 2003	
Basic principles of environmental transmission of infectious agents	**Christine L. Moe**
Readings:	Wilson ML. "Ecology and Infectious Disease" In: Ecosystem Change and Public Health: A Global Perspective. JL Aron and JA Patz, Eds. Chapter 10. Baltimore: The Johns Hopkins University Press, 2001. pp. 283-324. This reading is available in portable document format (.pdf) on e-reserve at the Health Sciences Library. You can access the e-reserve site through Blackboard or at the following URL:

Class Two – September 15, 2003	
The effect of seasonality and climate on infectious diseases	**Christine L. Moe**
Readings:	Huq A et al. "Health, Climate and Infectious Disease: A Global Perspective". American Academy of Microbiology. 1999. 1-24 http://www.asmusa.org/acasrc/pdfs/climate2.pdf Dowell, SF. Seasonal variation in host susceptibility and cycles of certain infectious diseases. *Emerg Inf Dis* 7(3):369-374

Class Three – September 22, 2003	
The link between climate change and emerging and re-emerging pathogens	**Christine L. Moe**
Readings:	Linthicum KJ et al. Climate and satellite indicators to forecast Rift Valley fever epidemics in Kenya. *Science* 1999 Jul 16;285(5426):397-400. Colwell RR. Global climate and infectious disease: the cholera paradigm. *Science* 1996 Dec 20;274(5295):2025-31. Speelmon EC et al. Cholera incidence and El Niño-related higher ambient temperature. *JAMA* 2000 Jun 21;283(23):3072-4.

Class Four – September 29, 2003	
(I) The impact of deforestation and urbanization on infectious disease; (II) Megacities and sanitation	**Christine L. Moe**
Readings:	Bradley, DJ. Environmental and health problems of developing countries. *Ciba Foundation Symposium* 1993 175:234-44 Patz, JA et al. Effects of environmental change on emerging parasitic diseases. *Int J Parasitology* 2000 30(12-13):1395-405. Gratz NG. Emerging and resurging vector-borne diseases. *Ann Rev Entomology* 1999 44:51-75. UN Human Settlement Programme. Water and Sanitation in the World's Cities (excerpts)

Class Five – October 6, 2003	
Applications of molecular genetics for Chagas disease surveillance and control	**Ellen Dotson, CDC**
Readings:	Dias J. Schofield C. The evolution of Chagas disease (American trypanosomiasis) control after 90 years since Carlos Chagas discovery. *Memorias do Instituto Oswaldo Cruz. 94 Suppl 1:103-21, 1999.* Monteiro FA. Escalante AA. Beard CB. Molecular tools and triatomine systematics: a public health perspective. *Trends in Parasitology. 17(7):344-7, 2001 Jul.* Beard CB. Dotson EM. Pennington PM. Eichler S. Cordon-Rosales C. Durvasula RV. Bacterial symbiosis and paratransgenic control of vector-borne Chagas disease. *International Journal for Parasitology. 31(5-6):621-7, 2001 May 1.*

There is no class on October 13, 2003, due to Fall Break at RSPH, Emory University. The mid-term take-home exam will be distributed in class on October 6 and will be due on October 20.

Class Six – October 20, 2003	
Natural disasters and infectious diseases	**Deborah Moll, CDC**
Readings:	Toole, Michael J. "Communicable Diseases and Disease Control." The Public Health Consequences of Disasters. Eric K. Noji. New York: Oxford University Press, 1997. pp. 79-100.

Class Seven – October 27, 2003	
Monitoring urban water quality – class exercise Students will be asked to select urban streams on campus or in their neighborhoods and collect a water sample to be analyzed in the laboratory.	**Christine L. Moe**
Readings:	A handout will be provided that explains the field assignment (how to collect water samples) and the laboratory exercise (how to analyze water samples for fecal coliform bacteria by membrane filtration). Standard Methods for the Examination of Water and Wastewater. 20th Edition. Sections 9010 – 9060, 9222, 9223

Class Eight – November 3, 2003	
Ecological Sanitation	**Christine L. Moe**
Readings:	Richard Carr. Excreta-related infections and the role of sanitation in the control of transmission. In: Water Quality: Guidelines, Standards and Health, L. Fewtrell and J. Bartram, eds., London: IWA Publishing, WHO, 2001. pp. 89-113. Feachem, Richard G., David J. Bradley, Hemda Garelick, D. Duncan Mara. Sanitation and Disease: Health Aspects of Excreta and Wastewater Management. Chichester: Wiley, 1983. 23-51. Esrey, Steven A., Ingvar Andersson, Astrid Hillers, Ron Sawyer. Closing the Loop: Ecological sanitation for food security. Mexico: Swedish International Development Cooperation Agency, 2000. p. 7-13, 15-21, 33-38, 43-49.

Class Nine – November 10, 2003	
Schistosomiasis	**Evan Secor, CDC**
Readings:	Sturrock, RF, Diaw OT, Talla I, Niang M, Piau JP, Capron A. Seasonality in the transmission of schistosomiasis and in populations of its snail intermediate hosts in and around a sugar irrigation scheme at Richard Toll, Senegal. *Parasitology* 123 Suppl:S77-89, 2001. Kloos H, Fulford AJ, Butterworth, AE, Sturrock RF, Ouma JH, Kariuki HC, Thiongo FW, Dalton PR, Klumpp RK. Spatial patterns of human water contact and *Schistosoma mansoni* transmission and infection in four rural areas in Machakos District, Kenya. *Social Science and Medicine* 44(7):949-68, 1997. Karanja, DMS, AW Hightower, DG Colley, PNM Mwinzi, K Galil, J Andove and WE Secor. Resistance to reinfection with *Schistosoma mansoni* in occupationally exposed adults and effect of HIV-1 co-infection on susceptibility to schistosomiasis: a longitudinal study. Lancet 360 (Aug 24, 2002):592-596.

Class Ten – November 17, 2003	
Models for predicting disease emergence	**Leslie Real, Emory**
Readings:	**TBD**

Class Eleven – November 24, 2003	
Malaria and climate change	**John MacArthur, CDC**
Readings:	Reiter, P. From Shakespeare to Defoe: Malaria in England in the Little Ice age. *Emerging Infectious Diseases*, 2000;6:1-11 http://www.cdc.gov/ncidod/eid/vol6no1/reiter.htm Epstein, P.R. Is Global Warming Harmful to Health? *Scientific American*, 2000; Aug:50-57

Classes Twelve, Thirteen and Final exam – December 1 & 8, 2003
Student Presentations

Final exams are due December 15, 2003 by 5 p.m. You must provide a hard copy of your exam to Hannah Cluck (#766, 7th floor of the Grace Crum Rollins building) before the deadline. Email submissions will not be accepted because of possible server failure.

Contact Information for Guest Lecturers:

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