

Biology 067: Emerging Diseases

Fall 2003

Tu/Th 11:30-12:55 Druckenmiller 016

Anne McBride

Office: Druckenmiller 230B, 798-7109

e-mail: amcbride@bowdoin.edu

New and old disease-causing agents emerge out of obscurity every year and have an enormous impact on the world we live in, as seen during the recent SARS outbreak and in recurrent influenza epidemics over the 20th century. In Bio067, we will discuss the biology of bacteria, viruses and other agents that cause infectious diseases: how these agents infect hosts, how the host immune system combats the infection and how the agents elude the immune system. We will also focus on how scientists study infectious diseases in the laboratory and field. Effective control of infectious diseases requires the coordination of numerous fields of study and in studying the scientific processes involved, we will gain a greater understanding of how infectious diseases are controlled and prevented. Throughout the course, we will also look at the interplay between infectious diseases and social, political, economic and environmental forces.

Office Hours and Communication

I will be in my office or lab on **Mondays 10:30 am-noon and Tuesdays 2-3 pm**. You can also **set up a time** to talk to me by **emailing me some times you are free; I will respond promptly** to say which of the times works for me. You should also **feel free to drop by my office/lab** (230B and 236B, respectively) if you are in Druckenmiller and have something you wish to discuss, although there is no guarantee where I will be at any given moment.

Email is a very handy form of communication; I check my email regularly and will respond to questions over email. **My responses to scientific questions** related to the class (e.g. how does DNA allow a cell to produce RNA?) **will be sent to everyone** in the class **anonymously**, which should become particularly useful around exam time. **You should become accustomed to checking your email at least once every day or two.**

As the semester continues, the **course website** will grow with useful information and links relevant to infectious diseases. I **welcome any suggestions for enhancing the site**, from information that you would like posted, to articles you have found that relate to what we are discussing, to relevant webpages (from bonafide sources). The URL for the course home page is: <http://academic.bowdoin.edu/courses/f03/bio067/>.

Dates to remember

Thurs., Oct. 16

***Wed., Oct. 22 or Thurs., Oct 23**

Thurs., Oct. 30

*Sun., Nov. 10 (1-3:30 pm)

or Mon., Nov. 11 (7-9:30 pm)

or Tues., Nov. 12 (10 am-12:30 pm)

*Fri., Dec. 19

***outside of regular class meeting time**

Midterm exam (in class)

“And the Band Played On” (evening showings)

Dr. Geoffrey Beckett lecture (in class)

Antimicrobial resistance laboratory session

Final exam, 9 am

Requirements and Grading Criteria

Class participation: 25%

The participation portion of the grade combines a number of aspects that are critical to enhancing one's understanding of infectious diseases.

- 1. Discussions:** Over the course of the semester, **four** classes (Sept. 11, Oct. 2, Oct. 28, Nov. 25) will be dedicated to **small group discussions** of readings and issues we have talked about in class. **Individual preparation** for these discussions will be **critical** for their success and therefore each person will write a **one-page "Discussion Preparation,"** which will be **handed in at the end of class**. This preparation will include three sections: **questions/comments/ thoughts** inspired by the reading, a short **summary** of the reading, and a **highlighted passage** for group consideration. You should make sure that you **attend** these classes and **actively participate** in the discussions. **I will read** your preparations and **make comments** and **suggestions for improvement**. **Handing** the preparations in **on time** and **participating** in discussions is more important than the mark on each preparation ($\sqrt{\quad}$, $\sqrt{+}$, $\sqrt{-}$).
- 2. Infectious Diseases in the News:** Each day reports on infectious diseases appear throughout the media. We will follow infectious diseases in the news as a class by having a **short (3-5 min.) group presentation** each day about an **article you have found that relates to infectious disease**. The group will **summarize the main points** of the article and tell us an **interesting fact related to the disease** (how it might be treated, when it has surfaced before etc.).
- 3. Class:** The more actively everyone becomes involved during class, the more **dynamic, exciting, and comprehensible infectious diseases** will become. Active participation includes **asking questions, responding** to my queries, and **making comments** that are **relevant** to the topic we are discussing. You can also participate by coming to **talk with me** after class or at other times.
- 4. Practice problems and help sessions:** One of the best ways to **prepare for exams** is to work through **practice problems**. I will be posting practice problems a week before each exam. Although you will not turn in your answers, it is in your best interest to **work on the questions earlier** rather than later and to **attend** the optional **help sessions** if you are confused by a problem or wish to know whether you are on the right track.

Bacterial resistance experiment: 5%

The rise of antimicrobial resistance within bacterial and viral populations threatens public health worldwide. In November we will **design, perform, and discuss** the **results** of an **experiment to test** the **antimicrobial resistance** of bacteria isolated from different locations around the Bowdoin campus.

Final group project: 30%

The diseases we have time to cover in this course represent only a small percentage of the microbes with major impacts on the world we live in. To expand our understanding of the role of infectious microbes in the world today, **over the course of the semester groups of 3-4** will **prepare presentations** about a **topic we have not discussed in class** (e.g. malaria in Africa, measles in Brazil). Groups will present their work in **two poster sessions** during class on **Dec. 4 and 9**.

Midterm exam: 15%

Final exam: 25%

Reminder of grades as defined in the Bowdoin College Course Catalog 2003-2004, pp. 30-31:

"A, the student has **mastered material** of the course and has demonstrated **exceptional critical skills** and **originality**;
B, the student has demonstrated a **thorough and above average understanding** of the **material** of the course;
C, the student has demonstrated a **thorough and satisfactory understanding** of the **material** of the course;
D, the student has demonstrated a **marginally satisfactory understanding** of the **basic material** of the course;
F, the student has **not** demonstrated a **satisfactory understanding** of the **basic material** of the course."

Key for reading assignments: T = text; E = e-reserve; H= hard-copy reserve in Hatch W = website

Week		Readings	Noteworthy dates
9/4	Introduction to infectious disease	Lederberg, J. "Infectious History" (E/H) Garrett, Preface and Introduction (T) Gerstman, B. "Epidemiology Past and Present" (E)	
9/9	Bacteria	*Hall, S. "The Return of Tuberculosis" (H) * Koch, R. "The etiology of tuberculosis" (E/H) Mims, Ch. 1 (T)	Tuberculosis discussion Thurs., Sept. 11
9/16 9/18	Viruses Host defenses	Garrett, Ch. 1& 2 (T) Gerstman, B. "Selected Epidemiologic Disease Concepts" (E) Mims, Ch. 2 (T) Hall, S. "Innate Defenses that Hold the Fort" in Arousing the Fury of the Immune System pp. 18-21. (T)	
9/23 9/25	Adaptive immunity Ebola	Hall, S. "The Killers that Save Us" in Arousing the Fury of the Immune System pp. 7-17, 22,23. (T) <i>optional: Mims, Ch. 3 (focus p. 45-51, 67-69) (T)</i> Garrett, Ch. 5 (T) CDC Ebola website	
9/30	Influenza	CDC influenza website (The Disease and The Viruses) Garrett, Ch. 6 (T) * Nichol, K. "The effectiveness of vaccination against influenza in healthy working adults" (E/H) * Laver, Bischofberger and Webster "Disarming Flu Viruses" (W)	Influenza discussion Thurs. Oct. 2 Practice Exam posted Fri.
10/7	The genetic revolution and the fight against SARS and anthrax	Garrett, Ch. 8 (T) Pearson, H. Clarke, T., Abbott, A., Knight, J., Cyranoski, D. "SARS: What have we learned?" + editorial "We have been warned" (H) Wright, L. "To Vanquish a Virus" (W) Young, JAT and Collier, RJ "Attacking Anthrax" (W) Cieslak TJ, Eitzen EM Jr. "Clinical and epidemiologic principles of anthrax" (W)	Final project topic choice due Thurs., Oct. 9
10/14	Urban life, microbes and STDs	Garrett, Ch. 9, 10 (T)	Review session 9:30 Tues., Oct. 14 Midterm exam Thurs., Oct. 16
10/21	FALL BREAK		
10/23	AIDS, the early years	Garrett, Ch. 11 (long chapter--focus on African outbreak) (T) Human Immunodeficiency Infection: Overview and step-by-step animation (CELLS Alive!) (W)	"And the Band Played On" Wed, Thurs. pm
10/28 10/30	AIDS therapy and controversy Beckett lecture	* Cohen, J. "The Duesberg Phenomenon" (E/H) *Cohen J. "Confronting the limits of success" (H)	AIDS discussion Tues., Oct. 28
11/4	Microbial survival strategies	Levy, S. "The Challenge of Antibiotic Resistance" (E) Mims, Ch. 5, 6 (T) Optional: Ewald, P. "Guarding against the most dangerous emerging pathogens: Insights from evolutionary biology" (W)	Final project outline with reference list due Fri., Nov. 7

Week		Readings	Noteworthy dates
11/11	Antimicrobial resistance experiment	Lab handout	Lab: Sun., Nov. 10 (1-3:30 pm) or Mon., Nov. 11 (7-9:30 pm) or Tues., Nov. 12 (10 am-12:30 pm)
11/13	Hantavirus	Garrett, Ch. 15 (T)	
11/18	Lyme disease	Kanigel, R. "A Bull's-eye on Lyme Disease" pp. 57-71 in Arousing the Fury of the Immune System (T) Karow, J. "Battling Lyme Disease" (W) Grann, D. "Stalking Dr. Steere" (E/H) CDC Lyme Disease website	Discussion of resistance results Tues., Nov. 18
11/20	Prions	Oldstone, M. "Mad Cow Disease and Englishmen" (E/H) Karow, J. "Stopping Prions from Going Mad" (W)	
11/25	Bioterrorism	* Hamburg, MA "Preparing for and Preventing Bioterrorism" (E) * Berche, P. "The threat of smallpox and bioterrorism" (E) Atlas RM "National security and the biological research community" (H) Enserink M. "Entering the twilight zone of what material to censor" (H)	Bioterrorism discussion Tues., Nov. 25
12/2	Humans, the environment and disease	Garrett, Ch. 16	Final project summary due Tues., Dec. 2
12/4	Symposium I		
12/9	Symposium II		
12/11	What lies ahead?	Garrett, Ch. 17 Mims, Ch. 11	

Help session Wed. Dec. 17, 7:30 pm

Final Exam: Fri. Dec. 19, 9 am

*** Asterisk denotes articles that should be summarized in your discussion preparations**

Since Biology 067 will be interactive, we may find that there are some topics we wish to discuss in more depth than would be allowed by the time allotted above. In addition, Dr. Sarah Fortune may come to talk with us about her work as an Infectious Disease specialist. Therefore, this outline may change as the semester progresses.

Texts

Garrett, L. (1994) *The Coming Plague: Newly Emerging Diseases in a World out of Balance* (New York: Penguin Books)

Mims, C. (2000) *The War Within Us: Everyman's Guide to Infection and Immunity* (London: Academic Press)

Shared Text

Howard Hughes Medical Institute Report (1998) *New Ways to Boost the Body's Defenses: Arousing the Fury of the Immune System* (Chevy Chase: Howard Hughes Medical Institute)

Other reading assignments

Electronic and hard-copy reserves can be found at: <http://phebe.bowdoin.edu/search/?searchtype=p&searcharg=mcbride>

Caveat: Occasionally e-reserves will work with only Netscape or Internet Explorer from a particular computer. So if you try one browser and it does not work, try a different browser before contacting a librarian or me.

Week of 9/4

E/H Lederberg, J. (2000) "Infectious History" *Science* **288**: 287-293.

E Gerstman, B. (1998) "Epidemiology Past and Present" Chapter 1 in Epidemiology Kept Simple (New York: Wiley-Liss), pp. 1-15.

Week of 9/9

H Hall, S. (1996) "The Return of Tuberculosis" in The Race Against Lethal Microbes (Chevy Chase: Howard Hughes Medical Institute), pp. 6-21.

E/H Koch, R. (1882, 1884) "The etiology of tuberculosis" in Milestones in Microbiology, ed. T. Brock (1961), (Washington, DC: ASM Press) pp. 109-118.

Week of 9/16

E/H Gerstman, B. (1998) "Selected Epidemiologic Disease Concepts," Chapter 2 in Epidemiology Kept Simple (New York: Wiley-Liss), pp. 19-33.

Week of 9/23

W Special Pathogens Branch, Centers for Disease Control and Prevention (2003) "Ebola Hemorrhagic Fever." <http://www.cdc.gov/ncidod/dvrd/spb/mnpages/dispages/ebola.htm> [Aug. 28, 2003].

Week of 9/30

W National Center for Infectious Diseases, Centers for Disease Control and Prevention (2003) "Flu in the United States" <http://www.cdc.gov/ncidod/diseases/flu/fluvirus.htm> [Aug. 28, 2003].

E/H Nichol KL, Lind A, Margolis KL, Murdoch M, McFadden R, Hauge M, Magnan S, Drake M. (1995) "The effectiveness of vaccination against influenza in healthy working adults" *N Engl J Med* **333**: 889-893.

W Laver, Bischofberger and Webster (1999) "Disarming Flu Viruses" *Sci. Am.* **280**: 78-87. Accessible at: http://www.sciam.com/print_version.cfm?articleID=00023064-8039-1CD6-B4A8809EC588EEDE [Aug. 28, 2003].

Week of 10/7

H Pearson, H. Clarke, T., Abbott, A., Knight, J., Cyranoski, D. (2003) "SARS: What have we learned?" *Nature* **424**: 121-126. (+ editorial "We have been warned", p. 113)

W Wright, L., *Scientific American* (2003) "To Vanquish a Virus" http://www.sciam.com/print_version.cfm?articleID=000B9459-E009-1F16-B4FD80A84189EEDE [Aug. 28, 2003].

- W Young, JAT, Collier, RJ (2002) (2002) "Attacking Anthrax" *Sci. Am.* **286**: 48-54. Accessible at: http://www.sciam.com/print_version.cfm?articleID=000D80E9-C5DC-1CC6-B4A8809EC588EEDF [Aug. 28, 2003].
- W Cieslak TJ, Eitzen EM Jr. (1999) Clinical and epidemiologic principles of anthrax. *Emerg Infect Dis.* **5**:552-5. Accessible at: <http://www.cdc.gov/ncidod/eid/vol5no4/pdf/cieslak.pdf> [Aug. 28, 2003].

Week of 10/23

- W Quill Graphics, CELLS Alive! (2003) "Human Immunodeficiency Infection: Overview and step-by-step animation" <http://www.cellsalive.com/hiv1.htm> [Aug. 28, 2003].

Week of 10/28

- E/H Cohen, J. (1994) "The Duesberg Phenomenon" *Science* **266**: 1642-1649.
- H Cohen J. (2002) "Confronting the Limits of Success" *Science.* **296**: 2320-4.

Week of 11/4

- E Levy, S. "The Challenge of Antibiotic Resistance" (1998) *Sci. Am.* **278**: 46-53.

Optional

- W Ewald, P. "Guarding against the most dangerous emerging pathogens: Insights from evolutionary biology" (1996) *Emerg Infect Dis.* **2**: 245-258. <http://www.cdc.gov/ncidod/eid/vol2no4/ewald.htm>

Week of 11/18

- W Karow, J., Scientific American (2000) "Battling Lyme Disease" http://www.sciam.com/print_version.cfm?articleID=00026621-4FE9-1C75-9B81809EC588EF21 [Aug. 28, 2003].
- E/H Grann, D. (June 17, 2001) "Stalking Dr. Steere" *NY Times Magazine* pp. 52-57.
- W Division of Vector-Borne Infectious Diseases, Centers for Disease Control (2001) "CDC Lyme Disease Home Page" <http://www.cdc.gov/ncidod/dvbid/lyme/index.htm> [Aug. 28, 2003].
- E/H Oldstone, M. (1998) "Mad Cow Disease and Englishmen" Chapter 13 in *Viruses, Plagues and History* (New York: Oxford University Press), pp. 158-171.
- W Karow, J., Scientific American (2000) "Stopping Prions from Going Mad" http://www.sciam.com/print_version.cfm?articleID=000C8E3C-4EB4-1C75-9B81809EC588EF21 [Aug. 28, 2003].

Week of 11/25

- E Hamburg, MA (2001-2002) "Preparing for and Preventing Bioterrorism" *Issues in Science & Technology*, **18**: 27-30.
- E Berche, P. "The threat of smallpox and bioterrorism" (2001) *Trends Microbiol* **9**: 15-18.
- H Atlas RM (2002) "National security and the biological research community" *Science.* **298**:753-4.
- H Enserink M. (2002) "Entering the twilight zone of what material to censor" *Science.* **298**:1548.

Other articles of interest

- Farmer, P. (1996) "Social Inequities and Emerging Infectious Diseases" *Emerg Infect Dis* **2**: 259-269. Accessible at: <http://www.cdc.gov/ncidod/eid/vol2no4/farmer.htm> [Aug. 28, 2003].
- Pines, M. (1996) "Can AIDS be tamed?" in *The Race Against Lethal Microbes* (Chevy Chase: Howard Hughes Medical Institute), pp. 46-53.
- Sandell, J. (1995) 'Viral Chic': The Propaganda of Health Care in the United States" *Bad subjects*, Issue 21. <http://eserver.org/bs/21/sandell.html> [Aug. 28, 2003]. (This article is not from a peer-reviewed journal. What do you think of it? Would you recommend it as a good article?)