

Course Syllabus for Biology 553/653: Chronic Disease Biology

Professor:

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Office hours:

Tuesdays 5:15-5:45pm, Thursdays 3:00-3:45; other times by appointment (It's best to set up appointments by email).

Prerequisites:

Biology 553 undergraduate students should have taken Biol 240, Biol 242, and Biol 372 (Biology 329 is recommended);

Biology 653 graduate students should have taken Biol 669 (or an advanced undergraduate course in evolution or population genetics; advanced courses in cell biology, biochemistry and molecular biology are recommended)

Prerequisites for either course can be waived by consent of instructor

Objectives:

- (1) Students should obtain an overview of the biological bases of chronic disease
- (2) Students should be able to apply hypothetical-deductive thinking to problems of disease causation and pathogenesis
- (3) Students should understand how evolutionary principles provide a framework for understanding cellular and molecular processes of chronic pathogenesis

Course Requirements:

Attendance: Undergraduate and graduate students will attend two 75-minute sessions per week. Graduate students will average one additional meeting per week (see below).

Reading: There are no formal texts for the course. Readings on selected topics will be made available during the semester. Students who have not taken Biology 372 should read during the first two weeks of the course Chapters 2, 3, 4, 6, 7, 8, 9, 10 & 11 of *Plague Time*, which can be obtained on-line. The full reference is Ewald, P.W. 2002. *Plague Time. The new germ theory of disease*. Anchor Press: NY. The older hardback version of *Plague Time* (published in 2000 by Free Press with a different subtitle) is also okay (used copies of the hardback version are cheap at amazon.com).

Grading:

Exams:

- One mid-term exam (February 21st) worth 100 points
- A comprehensive final exam (Saturday, April 29, 4:45pm-7:15pm) worth 200 points
- Attendance: 50 points (2 points for each class attended)

Term paper and oral presentation [a requirement for the graduate section (Biol 653) only]:

A paper worth 100 points and an oral presentation worth 25 points (see below).

Letter grades Final grades will be given assigning pluses and minuses for each letter grade according to the standard breakdown of points:

A+	A	A-	B+	B	B-	C+	C	C-	D	F
96.7-100%	93.3-96.6%	90.0-93.2%	86.7-89.9%	83.3-86.6%	80.0-83.2%	77.6-79.9%	73.3-77.5%	70.0-73.2%	60.0-69.9%	0.0-59.9%

Last day to withdraw: March 9th (set by College of Arts and Sciences)

Graduate Student Requirements (Biology 653)

Project:

Graduate students will investigate a particular hypothesis or a set of alternative hypotheses using information gathered from the literature and other sources of data, such as on-line data bases.

Extra hour per week:

Graduate students will meet for additional sessions (about one per week) to hear presentations and discuss their projects with the instructor. At the beginning of the semester these meetings will involve a broad array of issues. Once each graduate student has settled on a project, these meetings will involve discussion of papers relevant to the projects of the students.

Reports:

Oral report: Each graduate student will give a 15-minute presentation of the student's project. In this presentation the student will describe the hypotheses being tested, the strategy for enacting the plan, what was found, and any unresolved issues that will be worked on for the final written report. This report will be presented to the class during the final two weeks of the semester

Final written report: This report will be the culmination of the graduate student research project. It will be due on May 1st at 5:00pm.

Student Learning Objectives

Integrative thinking: Large amounts of information will be presented. Lectures and exam questions are designed to develop and test not only a mastery of this information but the ability to integrate this information into broadly relevant conceptual frameworks.

Critical thinking: Information will be presented alternative hypothesis which students will need to evaluate by considering both supportive and contradictory evidence.

Course Topics

Causes of chronic diseases: genes, parasites, and the environment

- Chronic genetic diseases

 - fitness load, mutation rate, and the maintenance of genetic diseases

 - self-destructive genetic defenses

 - genetic load

 - senescence theory and the timing of chronic diseases

- Infections as causes chronic disease

 - acute vs chronic diseases

 - chronic effects of acute infections

 - chronicity persistent infections

 - persistence favors chronicity of disease

 - natural selection for persistent infection

 - implications for the yet-to-be-discovered causes of chronic diseases and for long-term control

- Noninfectious environmental factors: diet, toxic chemicals, radiation, physical trauma

 - genetic vulnerabilities to diet

 - Prolonged effects of short-term exposure

 - Chronic exposure

Assessing causation for specific diseases

- Atherosclerosis

- Role of atherosclerosis in heart attack, stroke, impotence
- Pathogenesis
- Risk factors and models of causation
- Interplay between genetics, germs, and the environment
- Neurological diseases
 - Alzheimer's
 - pathogenesis and progression
 - genetic mutations and familial Alzheimer's
 - Epsilon 4, infections, and sporadic Alzheimer's
 - Multiple sclerosis
 - pathogenesis
 - autoimmunity and infection
 - epidemiology: implications for causation
 - Parkinsons and Parkinsonisms, and choreas
 - symptomology
 - causation
 - genetic: Huntington's chorea
 - infectious?: encephalitis lethargica and *Streptococcus pyogenes*
 - autoimmunity triggered by infection: Sydenham's chorea and *S. pyogenes*
 - environmental toxin: lytico bodig
 - unknown causes: Parkinson's disease
 - Amyotrophic lateral sclerosis
 - manifestations, incidence, and lethality
 - pathogenesis
 - etiology: echoviral infection?
 - Lyme disease
 - manifestations
 - etiologic agent: *Borrelia burgdorferi*
 - life cycle and geography
 - related *Borrelia* and the geographic scope of Borrelioses
 - Mental illnesses
 - Clues about mental illness from syphilis and syphilitic insanity: The Great Imitator or The Great Illustrator?
 - schizophrenia
 - bipolar disorder
 - autism
 - major depression
 - obsessive compulsive disorders
- Diabetes
 - definitions, manifestations, and treatments
 - type 1 diabetes: infection and autoimmunity
 - type 2 diabetes: infection, diet, and genetics
 - geographic racial comparisons to assess causation
- Cancer
 - cellular barriers to cancer
 - mutational correction
 - P53
 - retinoblastoma
 - apoptosis
 - control of telomerase
 - pigmentation
 - anti-pathogen mechanisms
 - environmental causes of mutations
 - radiation
 - chemical carcinogens
 - pathogens
 - infectious causation
 - infectious causation of mutation

---manipulation of cellular barriers to cancer: HPV, HBV, HTLV-1, EBV

---suppressed immunity: HIV

---relative importance of infectious causation

----theoretical argument based on evolution of protection

----specific examples

-----accepted examples: liver cancer, Adult T-cell leukemia, MALT, cervical cancer, head and neck cancer, Burkitt's lymphoma

-----debated examples: breast cancer, hodgkin's lymphoma, non-hodgkin's lymphomas, childhood leukemia, colon cancer

--Infectious cancer cells

---Transmissible venereal tumor

---HeLa cell lines

--Heredity and cancer

--Overview of causes of cancer

--Prevention of cancer

Causes of chronic disease: overview of genes, germs, and the environment.

-Current status

-Expectations for the future