Location and meeting times Mo/We 10:30am – 11:50am, George Auditorium

Course Description:

This course is designed to introduce students with no or minimal formal training in biological sciences an overview of the field with an emphasis on its application to significant public health problems. The primary emphasis of this course is to provide the necessary information to individuals with diverse backgrounds so that they have a good working knowledge of biomedical sciences and how it influences our lives and shapes public health. This course will provide an introduction to the field of biomedical sciences through discussion of disorders of public health relevance, including infectious and transmissible vectors, genetic disease and chronic disorders such as type II diabetes and obesity. Concepts of laboratory methods including quality control, normal ranges, and universal precautions and data interpretation are described.

Prerequisite: One semester of college science, e.g., biology, chemistry, physics or a comparable course.

Learning objectives for BMS505:

- You will be able to describe the role of biomedical sciences in the ecological model of public health.
- You will learn to understand and communicate basic biological and genetic terminologies.
- You will learn about emerging biological technologies and how they can be applied to diagnosis and prevention of human disease.
- You will learn to identify the political, legal, social, ethical and economic issues associated with integrating basic biology into public health.
- You will learn where to locate and how to acquire accurate and practical biological information that impacts public health issues.
- You will be able to describe the role of the New York State Department of Health and the Wadsworth Laboratories in the control of infectious and genetic diseases in New York State.
- You will be able to explain the use of laboratory procedures for understanding and diagnosing selected infectious diseases and genetic conditions.
- You will be able to describe existing and proposed programs in newborn, carrier, and cancer screening, and discuss pros and cons of each program, including medical, economic, ethical, legal, social and political factors.

Public Health Biology Competencies for BMS505:

1. Specify the role of the immune system in population health.
2. Describe how behavior alters human biology.
3. Identify the ethical, social and legal issues implied by public health biology.
4. Explain the biological and molecular basis of public health.
5. Explain the role of biology in the ecological model of population-based health.
6. Explain how genetics and genomics affect disease processes and public health policy and practice.
7. Articulate how biological, chemical and physical agents affect human health.
8. Apply biological principles to development and implementation of disease prevention, control or management programs.
9. Apply evidence-based biological and molecular concepts to inform public health laws, policies and regulations.
10. Integrate general biological and molecular concepts into public health.

Public Health Biology Illustrative Competencies for BMS505: The ability to incorporate public health biology – the biological and molecular context of public health into public health practice.

1. Specify the role of the immune system in population health.
   a) Explain what a vaccine is and why we have effective vaccines for some infectious disease but not all.
   b) Explain the function of the immune system.
   c) Identify immune responses to pathogens, manipulation of immune response for vaccines or immunotherapy, and failure or aberrant immune responses.
   d) Explain the biological principles and vaccination strategies that allowed smallpox eradication.
   e) Describe the role, benefits, and limitations of vaccines in assuring the health of populations.

2. Describe how behavior alters human biology.
   a) Describe the influences of environment and human physiology on behavioral health, including: genetics, substance use, family, culture, ethnicity, trauma, cognition, and developmental status.
   b) Relate biological and genetic changes resulting from smoking.
   c) Analyze the interaction of genetics, lifestyle, and the environment in the health of a population.

3. Identify the ethical, social and legal issues implied by public health biology.
   a) Assess the pros and cons of using individual information in the design, implementation, and evaluation of public health activities and initiatives.
   b) Discuss the biological underpinnings and public health issues of drug interactions in diverse populations.

4. Explain the biological and molecular basis of public health.
   a) Explain the biological and molecular characteristics of cancer, heart disease, stroke, aging, and other chronic diseases.
   b) Integrate general biological and molecular principles into public health problems such as infectious disease, disease susceptibility and drug resistance, and assisted reproduction.
   c) Explain the relationships among nutrition, physical activity, and health.

5. Explain the role of biology in the ecological model of population-based health.
   a) Discuss the biology of major determinants of national and global public health, e.g. smoking, obesity, malnutrition.
   b) Relate the biological factors with other components of the ecological model for emerging infections in the global environment.

6. Explain how genetics and genomics affect disease processes and public health policy and practice.
   a) Define the basic terms, vocabulary, and underlying principles associated with genetics and genomics.
   b) Integrate traditional approaches in genetics with genomic and proteomic approaches.
   c) Determine the role of genetic factors in the susceptibility to and progression of disease.
   d) Discuss cancer as a genetic disease.
   e) Explain the genetic changes that are key in generating emerging infectious diseases such as avian flu.

7. Calculate how biological, chemical, and physical agents affect human health.
   a) Describe human, molecular, cellular, and physiological interactions with exogenous agents.
   b) Discuss environmental factors affecting expression of determinates of susceptibility to disease during development.
   c) Describe the various ways by which chemicals can directly or indirectly affect human health.
   d) Discuss the effects of chemicals on the ecosystem, for example, global warming and the ozone layer.

8. Apply biological principles to development and implementation of disease prevention, control or management of programs.
   a) Assess biological principles of public health laboratory tests.
   b) Describe the ecological principles of disease and how these principles affect the likelihood of control.
   c) Assess factors that affect accessibility, adequacy, and safety of the food supply and the relationship to the assessment and analysis of community food systems.
9. **Apply evidence-based biological and molecular concepts to inform public health laws, policies, and regulations.**
   a) Determine appropriate use of data, statistical methods, and laboratory procedures for problem identification and resolution, and program planning, implementation and evaluation.
   b) Discuss population dynamics in terms of reproduction, assisted reproduction, fecundity, selection, allele frequencies, fitness and evolution.
   c) Discuss the principles of cell biology and development underlying the potential and controversy surrounding stem cells.

10. **Integrate general biological and molecular concepts into public health.**
    a) Discuss the evolution of concepts about health and the cause of disease.
    b) Discuss the multiple factors that influence infectious disease epidemics.
    c) Integrate biological approaches to air, food, and water safety.

**Evaluation:**

*Exams:* (2) 50% (25% each)

Exams are closed book, in class, multiple choice and/or essay answer. Exam questions will focus on the biological aspects of the course.

*Short Term Papers (2):*

Two short papers (3-5 pages) on a choice of topics applying information from the course to important public Health issues will be required of each student. One of these papers may be on topics selected by the student (with input from the course director)

**Grading Scale:**

\[\begin{align*}
A & = 93-100 \\
A- & = 90-92 \\
B+ & = 87-89 \\
B & = 83-88 \\
B- & = 80-82 \\
C+ & = 77-79 \\
C & = 73-78 \\
C- & = 70-72 \\
D+ & = 67-69 \\
D & = 63-68 \\
D- & = 60-62 \\
E & = 0-59
\end{align*}\]

**Note 1:** The “earned” grad of “E” is treated mathematically as a “30”.

**Note 2:** Plagiarism without proper citation from any and all sources will result in a grade of “E” for the course. Consult the Graduate Student Bulletins or the course Instructors if you have any questions.
SCHEDULE

Lecture 1  Monday  August 27  Introduction
  • How do we measure health?
  • “Top 10” Diseases by socioeconomic status

BLOCK ONE: Diet, Diabetes and Obesity

Lecture 2  Wednesday  August 29  Obesity and Diet
  • BMI, Food/caloric Intake
  • Glucose and Insulin

  Monday  September 3  NO CLASS (Labor Day)

Lecture 3  Wednesday  September 5  Physiology of Digestion
  • Metabolism of polysaccharides and fats
  • Intervention Strategies

Lecture 4  Monday  September 10  What’s in your diet?
  • High Fructose Corn Syrup
  • Physiological and Psychological Effects

Lecture 5  Wednesday  September 12  Type II Diabetes
  • Incidence, Treatment and Health Implications
  • Public Health Implications

  Monday  September 17  NO CLASS (Rosh Hashanah)

BLOCK TWO: Basic Cell Biology

Lecture 6  Wednesday  September 19  Cells: The Basic Units of Life
  • Eukaryotic Cells
  • Membrane Structure
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<th>Lecture 7</th>
<th>Monday</th>
<th>September 24</th>
<th>Cells: The Basic Units of Life</th>
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<td>● Tissue Organization</td>
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<td>September 26</td>
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<td>Lecture 9</td>
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<td>Life and Death of the Cell</td>
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<td>● DNA Damage/DNA Repair</td>
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<td>• West Nile Virus</td>
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<td>• Influenza Virus</td>
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<td>Endemic Diseases</td>
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BLOCK 4 GENETICS

Lecture 24  Monday  December 3  Meiosis/Fertilization
  • Spermatogenesis
  • Oogenesis
  • Fertilization

Lecture 25  Wednesday  December 5  Genetic Diseases
  • Genetic Diseases
  • PKU
  • Hemoglobinopathies
  • Down’s Syndrome

Lecture 26  Wednesday  December 10  Newborn Screening
  • Prenatal Diagnosis
  • Newborn Screening

Lecture 25  Wednesday  November 30  Neurodegenerative Diseases
  • Alzheimer’s Disease