

The Ohio State University College of Public Health

Course Number: PUBHEPI 6411 (1962)

Course Title: Biological Basis of Public Health:
Pathogenesis of Disease & Biological Concepts in Epidemiology

Credits: 3

Class Time & Location:

Fall Semester, 2025

Time: 5:15-8:00 PM, Monday

Location: 140 Cunz Hall LECTURES PRESENTED IN PERSON.

Instructor: Randall E. Harris, MD, PhD, Professor

PhD, 1974, North Carolina State University, Genetics, Statistics
MD, 1983, University of Nebraska, 1983, Medicine
Certification, 1986, Duke University, Pathology
Certification, 1994, Ohio State University, Public Health

Office: Division of Epidemiology
College of Public Health
1841 Neil Avenue, Columbus, Ohio 43210-1351
306 Cunz Hall, Telephone: 614 292-4720

E-mail: Harris.44@osu.edu

Instructor's Office Hours: 2:00-4:00 PM M W 306 Cunz Hall

Faculty Feedback & Response Time:

- **Grading:** You can generally expect feedback within 7 days.
- **E-mail:** I will reply to e-mails within 24 hours on school days.

Prerequisites

Graduate level standing or instructor's permission.

Course Description

The course "Biological Basis of Public Health: *Pathogenesis of Chronic Disease & Biological Concepts in Epidemiology*", chronicles the molecular and epidemiologic evidence supporting the role of various biological mechanisms (inflammation, lipid peroxidation, mutagenesis, angiogenesis, apoptosis, infection) in the pathogenesis of major acute and chronic diseases including arthritis, cancer, cardiovascular disease, diabetes mellitus, neurodegenerative disease, and other life-threatening and debilitating

conditions. The course is organized around the human cell as the primary unit of disease pathology. Cell physiology is therefore presented in some detail in the opening lecture. Subsequently, lectures are presented on the biological basis of each of a number of diseases that contribute to global morbidity and mortality. Genetic and cellular mechanisms of disease are stressed. Separate lectures focus on atherogenesis in the development of myocardial infarction and stroke, inflammation in the development of chronic bronchitis, emphysema, asthma and other forms of lung disease, inflammation and mutagenesis in carcinogenesis, current models of diabetes mellitus types I and II, metabolic disturbances in white and brown fat cells related to obesity, inflammation in the development of Alzheimer's Disease and other neurodegenerative conditions and the pathophysiology of the endocrine system and its role in the maintenance of physiologic homeostasis. Infectious diseases with major current impact on public health are also discussed. These include tuberculosis, malaria and HIV disease. Mechanisms of antibiotic and drug resistance are addressed. A basic framework is developed for molecular epidemiologic investigation of disease pathogenesis. All lecture slides are available on Carmen and the interactive websites utilized in class are available free of charge through the internet

Course Learning Objectives

The course "Biological Basis of Public Health: *Pathogenesis of Chronic Disease & Biological Concepts in Epidemiology*", documents the role of various biological mechanisms (inflammation, lipid peroxidation, mutagenesis, angiogenesis, apoptosis, infection) in the pathogenesis of major acute and chronic diseases including arthritis, cancer, cardiovascular disease, diabetes mellitus, neurodegenerative disease, certain infectious diseases (tuberculosis, malaria and HIV disease) and other life-threatening and debilitating conditions. The course addresses methodological issues in the design, conduct, analysis and interpretation of epidemiologic investigations with special emphasis on molecular epidemiology and investigations of molecular mechanisms of disease.

Specific Learning Objectives:

1. Basic knowledge of the human cell and its working parts.
2. Basic knowledge of the human cell nucleus, DNA structure and replication, gene transcription, mRNA translation, protein synthesis, and the structure and role of histones.
3. Basic knowledge of the molecular process of atherogenesis and the development of myocardial infarction and stroke.
4. Basic knowledge of carcinogenesis including mutagenesis, inflammogenesis involving cyclooxygenase-2(COX-2) and prostaglandin over-expression, dysfunctional apoptosis, angiogenesis, metastasis, and immunosuppression.
5. Basic knowledge of the molecular role of inflammation in the genesis of emphysema, chronic bronchitis, asthma and other chronic lung diseases.
6. Basic knowledge of the molecular pathogenesis of Type I and Type II Diabetes Mellitus.

7. Basic knowledge of white and brown fat metabolism and the function of adipose tissue as an endocrine organ.
8. Basic knowledge of the adipokines secreted by fat cells and their involvement in disease and obesity.
9. Basic knowledge of the molecular pathogenesis of Alzheimer's Disease, Parkinson's Disease, Multiple Sclerosis and other neurodegenerative conditions.
10. Basic knowledge of the Human Leukocyte Antigen (HLA) system and its role in immunity and auto-immunity.
11. Basic knowledge of infectious diseases that have major current impact on global health.
12. Basic knowledge of the human cell and its working parts.
13. Basic knowledge of the human cell nucleus, DNA structure and replication, gene transcription, mRNA translation, protein synthesis, and the structure and role of histones.
14. Basic knowledge of the molecular process of atherogenesis and the development of myocardial infarction and stroke.
15. Basic knowledge of carcinogenesis including mutagenesis, inflammogenesis involving cyclooxygenase-2 (COX-2) and prostaglandin over-expression, dysfunctional apoptosis, angiogenesis, metastasis, and immunosuppression.
16. Basic knowledge of the molecular role of inflammation in the genesis of emphysema, chronic bronchitis, asthma and other chronic lung diseases.
17. Basic knowledge of the molecular pathogenesis of Type I and Type II Diabetes Mellitus.
18. Basic knowledge of white and brown fat metabolism and the function of adipose tissue as an endocrine organ.
19. Basic knowledge of the adipokines secreted by fat cells and their involvement in disease and obesity.
20. Basic knowledge of the molecular pathogenesis of Alzheimer's Disease, Parkinson's Disease, Multiple Sclerosis and other neurodegenerative conditions.
21. Basic knowledge of the Human Leukocyte Antigen (HLA) system and its role in immunity and auto-immunity.
22. Basic knowledge of infectious diseases that have major current impact on global health.

Competencies

MPH Core:

- #1 Apply appropriate descriptive and inferential statistical techniques to public health data and interpret results of statistical analyses in the context of public health research and evaluation.
- #2 Apply foundational principles of environmental health science to categorize sources and types of contaminants, matrices involved, pathways for and modes of exposure, associated health effects and societal issues, approaches to control, and major regulations.

- #3 Apply epidemiologic principles to investigate the distribution of risk factors and disease in the population to improve public health.
- #4 Apply evidence-based concepts of health behavior and health promotion to the design of public health messages and strategies.
- #5 Discuss the major components of the U.S. health care system and be able to apply their understanding to examine health policy and health program issues.
- #6 Demonstrate effective written and oral skills for communicating with different audiences in the context of professional public health activities.
- #7 Develop public health programs and strategies responsive to the diverse cultural values and traditions of the communities being served.
- #8 Apply the core functions of assessment, policy development, and assurance in the analysis of global public health problems and their solutions
- #9 Apply basic principles of ethical analysis to issues of public health practice and policy.
- #10 Collaborate with multidisciplinary groups to recognize and evaluate public health issues and develop strategies for intervention.

Epidemiology Specialization:

- #2 Choose the correct analysis for data obtained from an epidemiologic investigation, including data from surveys, matched and unmatched case-control studies, cohort studies, and clinical trials.
- #3 Analyze and interpret data obtained from an epidemiologic investigation, including data from surveys, matched and unmatched case-control studies, cohort studies, and clinical trials.
- #4 Assess confounding and effect modification in data from an epidemiologic investigation.
- #5 Demonstrate familiarity with the basic content and issues in at least two substantive areas of application in epidemiology (e.g., cardiovascular epidemiology, cancer epidemiology, chronic disease epidemiology, infectious disease epidemiology, injury epidemiology).
- #6 Identify the natural histories of major types of disease and their relevance to epidemiologic investigations.

Text/Readings

Required Lecture Material: Slides corresponding to topics covered in the lectures are posted on Carmen weekly and should be reviewed prior to the in-person lectures given during class time.

Supplemental Text/Readings:

Epidemiology of Chronic Disease: *Global Perspectives (2nd Edition)*
Author: Randall E. Harris
Publisher: Jones & Bartlett Learning, 2020

Carmen Website

There is a Carmen site for this course: <https://carmen.osu.edu>. All course materials are available via Carmen. You will need to use BuckeyePass (buckeyepass.osu.edu) multi-factor authentication to access your courses in Carmen. To ensure that you are able to connect to Carmen at all times, it is recommended that you take the following steps:

- Register multiple devices in case something happens to your primary device. Visit the BuckeyePass - Adding a Device help article for step-by-step instructions (<https://admin.resources.osu.edu/buckeyepass/adding-a-device>)
- Request passcodes to keep as a backup authentication option. When you see the Duo login screen on your computer, click **Enter a Passcode** and then click the **Text me new codes** button that appears. This will text you ten passcodes good for 365 days that can each be used once.
- Download the Duo Mobile application (<https://admin.resources.osu.edu/buckeyepass/installing-the-duo-mobile-application>) to all of your registered devices for the ability to generate one-time codes in the event that you lose cell, data, or Wi-Fi service.

If none of these options will meet the needs of your situation, you can contact the IT Service Desk at 614-688-4357(HELP) and IT support staff will work out a solution with you.

Class Format (how this in-person course works)-

Mode of delivery: This class will be presented in “regular” format.

Enrolled students should attend class in person at 5:15-8:00 PM on Monday each week. The class will meet a total of three (3) lecture hours per week on Monday evenings. Lectures will be presented in person in Classroom 140 Cunz Hall at the scheduled class time, 5:15-8:00 PM on Monday of each week.

Pace of online activities: Lecture slides will be posted several days in advance of the scheduled lectures. A question and answer session will be conducted each week to evaluate students’ understanding of the concepts presented in lecture.

Credit hours and work expectations: This is a 3-credit-hour course. According to Ohio State policy (go.osu.edu/credithours), students should expect to spend around 3 hours per week of time on direct instruction (instructor content and Carmen activities, for example) in addition to 6 hours of homework (reading, preparation for class and presentations, for example).

Attendance and participation requirements: The following is a summary of students' expected participation.

- *Participating in activities for attendance*
You are expected to attend class in person at 5:15-8:00 PM Monday every week. If you have a situation that might cause you to miss a significant amount of class, discuss it with me *as soon as possible*.
- *Office hours and live sessions*
Questions about class material or other issues can be e-mailed to the instructor at (Harris.44@osu.edu) for real time response during office hours and response in at least 24 hours at other times.
- *Participating in class discussions*
As part of your participation during class sessions, you may be assigned to groups for discussion of material presented in lectures and response to questions and answers posed by the instructor or during student presentations. You are also free to ask questions and generate class discussion of relevant issues in class.

Course Technology

For help with your password, university email, Carmen, or any other technology issues, questions, or requests, contact the Ohio State IT Service Desk. Standard support hours are available at ocio.osu.edu/help/hours, and support for urgent issues is available 24/7.

- Self-Service and Chat support: ocio.osu.edu/help
- Phone: 614-688-4357(HELP)
- Email: servicedesk@osu.edu
- TDD: 614-688-8743

Technology skills needed for this course

- Basic computer and web-browsing skills
- Navigating Carmen (go.osu.edu/canvasstudent)

Required equipment

- Computer: current Mac (MacOs) or PC (Windows 10) with high-speed internet connection
- Webcam: built-in or external webcam, fully installed and tested
- Other: a mobile device (smartphone or tablet) to use for BuckeyePass authentication

Required software

- Microsoft Office 365: All Ohio State students are now eligible for free Microsoft Office 365. Full instructions for downloading and installation can be found at go.osu.edu/office365help.

Carmen access

You will need to use BuckeyePass (buckeyepass.osu.edu) multi-factor authentication to access your courses in Carmen. To ensure that you are able to connect to Carmen at all times, it is recommended that you take the following steps:

- Register multiple devices in case something happens to your primary device. Visit the BuckeyePass - Adding a Device help article for step-by-step instructions (go.osu.edu/add-device).
- Request passcodes to keep as a backup authentication option. When you see the Duo login screen on your computer, click Enter a Passcode and then click the Text me new codes button that appears. This will text you ten passcodes good for 365 days that can each be used once.
- Download the Duo Mobile application (go.osu.edu/install-duo) to all of your registered devices for the ability to generate one-time codes in the event that you lose cell, data, or Wi-Fi service

If none of these options will meet the needs of your situation, you can contact the IT Service Desk at 614-688-4357(HELP) and IT support staff will work out a solution with you.

Assignments/Assessments

Students are expected to participate actively in class discussions and to make at least one brief presentation to the class on a relevant topic. Weekly assignments consist of weekly learning statements based on knowledge gained from material presented in class. Each student is required to present an in-class lecture to the class. In-class presentations will focus on scientific articles from the current peer-reviewed literature that discuss specific mechanisms of disease pathogenesis. The course is designed to reflect the impact of new discoveries in molecular biology and epidemiology on the future of public health and medicine. Attendance and participation requirements, and guidelines for weekly learning statements and for student presentations are given below.

Attendance and participation requirements: ATTENDANCE IS MANDATORY.

- *Participating in activities for attendance*
You are expected to attend class, 3:55-5:15 PM, T Th, every week. If you have a situation that might cause you to miss a significant amount of class, discuss it with me *as soon as possible*.
- *Office hours and live sessions*
Questions about class material or other issues can be emailed to the instructor at (Harris.44@osu.edu) for real time response during office hours and response in at least 24 hours at other times. Students are welcome to ask questions to the instructor and the TA in person during office hours.
- *Participating in class discussions*
As part of your participation during class sessions, you are expected to ask questions and contribute to live discussions of the material.

Guidelines for Weekly Learning Statements

- Each student is required to post three learning statements based upon material presented in the lectures and discussion of the preceding week. Statements should be brief and reflect basic understanding of the concepts and material presented. Statements should be posted under “Assignments” for each week of the semester.

Guidelines for in-class presentations

Presentation Time, 15-20 min with 10-15 min for Q & A. Power point slides recommended (10-15 slides).

Recommended Outline of Student Presentation

Brief description of disease & diagnostic criteria

History of Disease

Significant historical events and discoveries

Epidemiology

Global and US epidemiology, age-specific incidence, prevalence, mortality, populations at risk, distribution in time, place and person, controversial issues.

Risk Factors and Preventive Factors

Key epidemiologic findings, case control, cohort studies, randomized clinical trials, meta-analyses.

Mechanisms of Pathogenesis

Cellular and genetic events in the etiopathogenesis of the disease. Cells involved, impact of multiple factors and interactions, molecular targets for prevention and therapy..

Methods of primary, secondary and tertiary prevention

Application of Criteria of Judgment

Question and Answer Session

Grading

Grades are determined by in-class attendance and participation and performance on weekly assignments and in-class presentation and discussion.

Approximate Weights & Criteria for Grade Determination

Class Participation & Attendance	15%
Class Presentation & Discussion	45%
Learning Statements	40%

A	Significant contributions to in-class discussion, outstanding in-class presentation and completed assignments (learning statements).
A-	Significant contributions to in-class discussions, excellent in-class presentation and completed assignments (learning statements).
B+	Significant contributions to in-class discussions, very good in-class presentation and completed assignments (learning statements)..
B	Some contributions to in-class discussions, very good in-class presentation and completed assignments (learning statements)..
B-	Some contributions to in-class discussions, good in-class presentation and/or incomplete assignments (learning statements)..
C	Lack of contributions to in-class discussions and subpar presentation and/or incomplete assignments (learning statements)..

Grading Scale

A	94 to 100	Outstanding work that reflects mastery of material, ability to apply it
A-	90 to <94	Excellent work that reflects mastery of the material
B+	87 to <90	Good work that reflects mastery of most of the material
B	83 to <87	Good work that reflects mastery of some of the material
B-	80 to <83	Good work that reflects mastery of a few aspects of the material
C+	77 to <80	Mediocre work familiarity with, but not mastery of the material
C	73 to <77	Mediocre work that reflects familiarity with most of the material
C-	70 to <73	Mediocre work that reflects little familiarity with the material
D+	67 to <70	
D	60 to <67	
E	Below 60	

Class Policies

Students are expected to focus on the presentation and discussion during class time. Students may use recording devices to record the class. Cell phones and pagers may be used to receive emergency telephone or pager messages, but only if they are rendered inaudible. Laptop and tablet computers may be used, but only to take notes (no music, e-mail, texting, social networking, web browsing, etc.) and no other electronic devices may be used at any time (iPods or other music players).

Copyright Statement

This syllabus and all course materials (e.g., homework assignments, solution keys, course materials) are under copyright by the instructor and cannot be posted elsewhere without written permission.

Generative AI Policy

In this course, students are welcome to explore innovative tools and technologies including generative artificial intelligence (GenAI) in order to gain a better understanding of concepts presented in class.

Office of Student Life, Disability Services:

The university strives to maintain a healthy and accessible environment to support student learning in and out of the classroom. If you anticipate or experience academic barriers based on your disability (including mental health, chronic, or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion.

If you are ill and need to miss class, including if you are staying home and away from others while experiencing symptoms of a viral infection or fever, please let me know immediately. In cases where illness interacts with an underlying medical condition, please consult with Student Life Disability Services to request reasonable accommodations. You can connect with them at sllds@osu.edu; 614-292-3307; or sllds.osu.edu.

Mental Health Services

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or

stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling [614-292-5766](tel:614-292-5766). CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is closed at [614-292-5766](tel:614-292-5766) and 24 hour emergency help is also available 24/7 by dialing 988 to reach the Suicide and Crisis Lifeline.

Religious Beliefs or Practices Accommodations

Ohio State has had a longstanding practice of making reasonable academic accommodations for students' religious beliefs and practices in accordance with applicable law. In 2023, Ohio State updated its practice to align with new state legislation. Under this new provision, students must be in early communication with their instructors regarding any known accommodation requests for religious beliefs and practices, providing notice of specific dates for which they request alternative accommodations within 14 days after the first instructional day of the course. Instructors in turn shall not question the sincerity of a student's religious or spiritual belief system in reviewing such requests and shall keep requests for accommodations confidential.

With sufficient notice, instructors will provide students with reasonable alternative accommodations with regard to examinations and other academic requirements with respect to students' sincerely held religious beliefs and practices by allowing up to three absences each semester for the student to attend or participate in religious activities. Examples of religious accommodations can include, but are not limited to, rescheduling an exam, altering the time of a student's presentation, allowing make-up assignments to substitute for missed class work, or flexibility in due dates or research responsibilities. If concerns arise about a requested accommodation, instructors are to consult their tenure initiating unit head for assistance.

A student's request for time off shall be provided if the student's sincerely held religious belief or practice severely affects the student's ability to take an exam or meet an academic requirement and the student has notified their instructor, in writing during the first 14 days after the course begins, of the date of each absence. Although students are required to provide notice within the first 14 days after a course begins, instructors are strongly encouraged to work with the student to provide a reasonable accommodation if a request is made outside the notice period. A student may not be penalized for an absence approved under this policy.

If students have questions or disputes related to academic accommodations, they should contact their course instructor, and then their department or college office. For questions or to report discrimination or harassment based on religion, individuals should contact the

[Civil Rights Compliance Office](#). (Policy: [Religious Holidays, Holy Days and Observances](#))

Academic Misconduct

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term “academic misconduct” includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee ([Faculty Rule 3335-5-48.7 \(B\)](#)). For additional information, see the [Code of Student Conduct](#).

Intellectual Diversity

Ohio State is committed to fostering a culture of open inquiry and intellectual diversity within the classroom. This course will cover a range of information and may include discussions or debates about controversial issues, beliefs, or policies. Any such discussions and debates are intended to support understanding of the approved curriculum and relevant course objectives rather than promote any specific point of view. Students will be assessed on principles applicable to the field of study and the content covered in the course. Preparing students for citizenship includes helping them develop critical thinking skills that will allow them to reach their own conclusions regarding complex or controversial matters.

Grievances and Solving Problems

A student who encounters a problem related to his/her educational program has a variety of avenues available to seek resolution. According to University Policies, if you have a problem with this class, you should seek to resolve the grievance concerning a grade or academic practice by speaking first with the instructor or professor. Then, if necessary, you may take your case to the department chairperson. Specific procedures are outlined in [Faculty Rule 3335-8-23](#), the [CPH Graduate Student Handbook](#), and the [CPH Undergraduate Student Handbook](#). Grievances against graduate, research, and teaching assistants should be submitted first to the supervising instructor, then to the chairperson of the assistant's department.

Creating an Environment Free from Harassment, Discrimination, and Sexual Misconduct

The Ohio State University is committed to building and maintaining a community to reflect diversity and to improve opportunities for all. All Buckeyes have the right to be free from harassment, discrimination, and sexual misconduct. Ohio State does not discriminate on the basis of age, ancestry, color, disability, ethnicity, gender, gender identity or expression, genetic information, HIV/AIDS status, military status, national

origin, pregnancy (childbirth, false pregnancy, termination of pregnancy, or recovery therefrom), race, religion, sex, sexual orientation, or protected veteran status, or any other bases under the law, in its activities, academic programs, admission, and employment. Members of the university community also have the right to be free from all forms of sexual misconduct: sexual harassment, sexual assault, relationship violence, stalking, and sexual exploitation.

To report harassment, discrimination, sexual misconduct, or retaliation and/or seek confidential and non-confidential resources and supportive measures, contact the Civil Rights Compliance Office:

Online reporting form at <http://civilrights.osu.edu/>,
Call 614-247-5838 or TTY 614-688-8605,
Or Email civilrights@osu.edu

The university is committed to stopping sexual misconduct, preventing its recurrence, eliminating any hostile environment, and remedying its discriminatory effects. All university employees have reporting responsibilities to the Civil Rights Compliance Office to ensure the university can take appropriate action:

- All university employees, except those exempted by legal privilege of confidentiality or expressly identified as a confidential reporter, have an obligation to report incidents of sexual assault immediately.
- The following employees have an obligation to report all other forms of sexual misconduct as soon as practicable but at most within five workdays of becoming aware of such information: 1. Any human resource professional (HRP); 2. Anyone who supervises faculty, staff, students, or volunteers; 3. Chair/director; and 4. Faculty member.

CLASS OUTLINE: Tentative Lecture Schedule (Lecture materials and references are posted on Carmen).

Topic	Date
NO CLASS, LABOR DAY	Week One 9/1
COVID19 Pandemic Cell Physiology, Epidemiologic Transition	Week Two 9/8
Atherosclerosis	Week Three 9/15
Stroke & Hypertension	Week Four 9/22
Cancer	Week Five 9/29
Emphysema, Chronic Bronchitis, Asthma (COPD)	Week Six 10/6
Diabetes Mellitus	Week Seven 10/13
Obesity & Diseases	Week Eight 10/20
Endocrine Diseases	Week Nine 10/27
Infectious Diseases <i>Student Presentations</i>	Week Ten 11/3
NO CLASS, VETERANS DAY	Week Eleven 11/10
Renal & Liver Diseases <i>Student Presentations</i>	Week Twelve 11/17
Alzheimer's Disease & Dementia <i>Student Presentations</i>	Week Thirteen 11/24
Depression & Suicide, PTSD <i>Student Presentations</i>	Week Fourteen 12/1
Opiate Overdose Epidemic, Vaping Smoking & Lung Cancer <i>Student Presentations</i>	Week Fifteen 12/8
FINAL CLASS ASSIGNMENT	Week Sixteen 12/15

Tentative Lecture Outlines & Assignments

Lecture One. COVID19 Pandemic. The lecture presents the epidemiology of the COVID19 pandemic. The origin, discovery of the virus (SARS-CoV2), dissemination of infection, characteristics of disease, reporting of cases and deaths, morbidity and mortality, molecular mechanisms, vaccines, therapy, and chronic effects of COVID19 are discussed. An original bonus chapter in the text, "*Epidemiology of Chronic Disease: Global Perspectives*" will be made available to enrolled students.

Cell Physiology. The lecture briefly describes the cell (structure, membranes, nucleus, genome, organelles, physiology and homeostasis) as the primary element in the biological basis of disease. Utilizing interactive websites (www.cellsalive.com, Cells Alive, University of Arizona; www.cellmovie.com, The Cell, University of Colorado; www.lifesciences.umich.edu, Stem Cells, University of Michigan) basic components of the human cell and their functions are reviewed. Cellular processes such as mitosis, meiosis, angiogenesis and apoptosis are illustrated utilizing dynamic animation models

and photomicrographs. Different cell types and examples of cellular function are given. Basic concepts related to the human defense system are discussed including inflammation and the immune response. A new lecture on the global burden of disease, theories of the aging process, and the epidemiologic transition from acute diseases to chronic diseases occurring in many populations of the world will be presented. Material is drawn from Chapter 1 of the text: *Global Burden of Chronic Disease: The Epidemiologic Transition 2nd Edition*. Initial assignments are given for student presentations on upcoming topics.

Lecture Two. Atherosclerosis. The global burden of atherosclerosis is documented through discussion of the epidemiology of myocardial infarction and stroke. Key epidemiologic findings pertaining to causation versus prevention are discussed. The biological basis of atherosclerosis is presented based upon the classical papers of Russell Ross (Ross R. Atherogenesis is an Inflammatory Disease. *New Engl J Med*, 1999), Chapters 2-4 of the text, and interactive websites such as www.lipidsonline.org. The process of atherogenesis is linked to activation of the cyclooxygenase-2 gene and its enzyme (COX-2) by pro-inflammatory cytokines with subsequent catalysis of the prostaglandin cascade. Interactions of the endothelial lining of blood vessels involving white blood cells (macrophages, monocytes, lymphocytes), blood platelets, and humoral factors including cholesterol, C-reactive protein, nitrates, prostacyclin, thromboxane, and other factors are described using dynamic animated models. Congestive heart failure due to left or right ventricular failure subsequent to coronary heart disease is also addressed.

Lecture Three. Stroke & Hypertension. Topics include the epidemiology of cerebrovascular disease (stroke) and its pathogenesis, brain anatomy and blood circulation, occlusive versus hemorrhagic stroke and the evolution of thromboembolic events leading to stroke. Lecture materials are based upon the internet stroke center website www.strokecenter.org and Chapters 5 and 6 of the text: *Epidemiology of Stroke* and *Epidemiology of Hypertension*.

Lecture Four. Carcinogenesis. Topics include the global burden of cancer with specific focus on the epidemiology of the major types of cancer including lung cancer, breast cancer, prostate cancer, colon cancer, leukemia and lymphoma, the evolutionary process of cancer development including models of carcinogenesis (accumulating somatic mutation model and the inflammogenesis model), and important processes in the evolution of cancer including induction of specific genes (COX-2, oncogenes and tumor suppressor genes), mutagenesis, mitogenesis, apoptosis, angiogenesis, immunosuppression and metastasis. The lecture is based upon Chapters 11-38 of the text and Dr. Harris recent publications “COX-2 and the Inflammogenesis of Cancer”, *Subcellular Biochemistry* 42:193-212, 2007, www.springerlink.com and “COX-2 and the Inflammogenesis of Breast Cancer”, *World J Clin Oncol* 5(4): 677-692, 2014.

Lecture Five. Chronic Obstructive Pulmonary Disease. Topics include the epidemiology of COPD and its disease components (emphysema, chronic bronchitis, asthma and bronchiectasis), lung anatomy and physiology, pathogenesis of emphysema versus chronic bronchitis and the cellular constituents of each condition, the inherent role of smoking and other pro-inflammatory factors in these conditions, biological

mechanisms leading to allergic reactions and bronchial asthma and interaction of pulmonary infection in the genesis of these conditions. Lecture materials draw upon the electron microscopy of the Lawrence Berkeley National Laboratory which shows lung structure and function, imglib.lbl.gov/ImgLib/COLLECTIONS/LUNG_STRUCTURE and Chapters 30 and 40 of the text: *Epidemiology of Chronic obstructive Pulmonary Disease* and *Epidemiology of Asthma*.

Lecture Six. Diabetes Mellitus. Topics include the epidemiology of diabetes (Types I and II), the anatomy and physiology of the pancreas, biologic mechanisms of disease development, the role of insulin depletion versus insulin resistance in the development of Type I versus Type II Diabetes Mellitus, the role of sugar and carbohydrate sources with high glycemic indices, and preventive and therapeutic options for the emerging epidemic of diabetes are outlined. Lectures draw upon material from the outstanding website of Colorado State University (www.vivo.colostate.edu, Biomedical Hypertextbooks, Digestive System plus Chapter 41 of the text: *Epidemiology of Diabetes Mellitus*.

Lecture Seven. Obesity and Disease. Topics include the epidemiology of obesity and its pathogenesis, the physiology of fat metabolism and catabolism and the biology of white fat versus brown fat, secretion of inflammatory cytokines and hormones by adipocytes and the role of diet in the genesis of the current obesity epidemic (Paolo Calabro' and Edward T. H. Yeh, Obesity, "Inflammation and Vascular Diseases: the role of the adipose tissue as an endocrine organ", *Subcellular Biochemistry* 42, 63-92, 2007, www.springerlink.com. Material is also drawn from Chapter 42 of the text: *Epidemiology of Obesity*.

Lecture Eight. Pathophysiology of the Endocrine System. The lecture is drawn from the diagrams and text of this outstanding free website developed by Colorado State University (www.vivo.colostate.edu, Biomedical Hypertextbooks, Endocrine System). Material is also drawn from Chapter 43 of the text: *Epidemiology of Thyroid Disease*. The presentation reviews the human endocrine system and its function in maintenance of physiologic homeostasis. The anatomy and structure of the hypothalamus and pituitary gland, mechanisms of control by hypothalamic releasing hormones, molecular structure and function of pituitary hormones (polypeptides, steroids and lipoproteins) the nature of cell membranes and cytoplasmic hormone receptors and regulation by feedback inhibition and other mechanisms are discussed. Alterations in the endocrine system (thyroid gland, parathyroid gland, adrenal gland) and resulting disease states are introduced and explained.

Lecture Nine. Renal Disease & Liver Disease.

Renal Disease. Topics include basic renal anatomy and biology, the integral role of the kidney in the control of blood pressure, the development of renal nephritis and nephrosis, the link between type 2 diabetes and the development of end stage kidney disease, and

selected treatments for kidney failure including dialysis and kidney transplant. The lecture material is based upon Chapter 44 of the text: *Epidemiology of Kidney Disease*.

Liver Disease. Topics include basic liver anatomy and biology, alcoholic fatty change and cirrhosis of the liver, non-alcoholic fatty change and cirrhosis of the liver, hepatitis B, hepatitis C and other infectious conditions that cause chronic liver disease. The lecture material is based upon Chapter 45 of the text: *Epidemiology of Liver Disease*.

Lecture Ten. Infectious Diseases. Topics include infectious diseases with current dramatic global impact (COVID19, HIV, HPV, HBV, HCV, malaria and tuberculosis), the COVID19 pandemic and other potential emerging epidemics (influenza, ebola), emergence of antibiotic resistance (Drug Resistant Tuberculosis, Methicillin Resistant Staphylococcus Aureus), and biological mechanisms of pathogenesis. Lectures are based upon Chapters 54, 55 7 56 of the text that cover the *Epidemiology of Tuberculosis, Malaria, and HIV Disease*. Segments of the PBS film series “*Rx for Survival: a global health challenge*” narrated by Brad Pitt are available on line documenting current infectious disease problems such as avian influenza, malaria and drug resistant tuberculosis. These include “*Rise of the Superbugs*”, “*Deadly Messengers*” and “*How Safe Are We?*”

Lecture Eleven. Osteoporosis, Arthritis and Autoimmune Disease. Topics include the immune system (overview), importance of the human leukocyte antigen (HLA) system, the epidemiology of autoimmune diseases in women versus men, stem cells, and models of the pathogenesis of autoimmune diseases. The outstanding Harvard video “*Inner Life of Cell: Leukocyte*” demonstrates key immune functions inside the leukocyte and their interaction with the vascular system. Portions of the lecture are drawn from the website “*Cells Alive*” www.cellsalive.com and Chapters 46 and 47 of the text: *Epidemiology of Osteoporosis and Epidemiology of Arthritis*.

Lecture Twelve. Alzheimer’s disease and other Neurodegenerative Conditions. Topics include the epidemiology of neurodegenerative diseases (Alzheimer’s Disease, Parkinson’s Disease, Epilepsy and Multiple Sclerosis), the structure and physiology of the neuron, biologic mechanisms of pathogenesis, and preventive and therapeutic modalities. Suicide, suicidal ideation and depression are also addressed. The lecture makes use of an outstanding interactive website “*Interactive Tour of the Brain*” www.alz.org/alzheimers. Lecture material is also based upon Chapters 48-52 of the text.

Lecture Thirteen. Depression & Suicide. A video on depression by Stanford neuroendocrinologist Robert M. Sapolsky will be shown. Dr. Sapolsky is the author of the best-selling book: “*Why Zebras Don’t Get Ulcers*”. Depression, Stress, Post Traumatic stress Disorder (PTSD) and Suicide will be discussed. Lecture material is based upon Chapter 53 of the text.

Lecture Fourteen. Opiate Overdose Epidemic. The rising tide of opiate abuse in the USA and elsewhere leading to acceleration of deaths rates from opiate overdose will be

addressed. Epidemiologic patterns of abuse, drug distribution, and the pathophysiology of opiate addiction will be discussed.

Lecture Fifteen. Vaping, Smoking and Lung Cancer Risk. A published case control study of vaping (use of electronic cigarettes), cigarette smoking and lung cancer is presented. The study design, methodology, results and interpretation are discussed.

Citation: Bittoni MA, Carbone DP, Harris RE (2024) Vaping, Smoking and Lung Cancer Risk. *J Oncol Res Ther* 9: 10229. DOI:10.29011/2574-710X.10229.

Alignment of Assessments with Core Competencies

Competencies	Assessment 1 (individual discussion)	Assessment 2 (group discussion)	Assessment 3 (learning statements)	Assessment 4 (in-class presentation)
1 Apply appropriate descriptive and inferential statistical techniques to public health data and interpret results of statistical analyses in the context of public health research and evaluation.	X	X	X	X
2 Apply foundational principles of environmental health science to categorize sources and types of contaminants, matrices involved, pathways for and modes of exposure, associated health effects and societal issues, approaches to control, and major regulations.	X	X	X	X
3 Apply epidemiologic principles to investigate the distribution of risk factors and disease in the population to improve public health.	X	X	X	X
4 Apply evidence-based concepts of health behavior and health promotion to the design of public health messages and strategies.	X	X	X	X
5 Discuss the major components of the U.S. health care system and be able to apply their understanding to examine health policy and health program issues.	X	X		
6 Demonstrate effective written and oral skills for communicating with different audiences in the context of professional public health activities.			X	X
7 Develop public health programs and strategies responsive to the diverse cultural values and traditions of the communities being served.	X	X	X	X
8 Apply the core functions of assessment, policy development, and assurance in the analysis of global public health problems and their solutions	X	X	X	X
9 Apply basic principles of ethical analysis to issues of public health practice and policy.	X	X	X	X
10 Collaborate with multidisciplinary groups to recognize and evaluate public health issues and develop strategies for intervention.	X	X		