

Course Title: Public Health Biology & Physiology
Course Number: ENOH 0560J030
Course Location: Online / Web based
Course Date & Time: Spring Semester January 17, 2022 - May 9, 2022
Course Instructor: Stephan Schwander MD. PhD
Office Hours: Wednesdays 12:00 noon – 12:45 p.m. via Zoom Link

<https://rutgers.zoom.us/j/7932764964?pwd=ZzNmZ3hWV2hGYnNXemFCS3c0UmlYUT09>

Zoom link for course participants ONLY!

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Weekly Reading:

Reading material related to the weekly lecture and discussion topics are provided in the specific class assignments and weekly modules. Reading material consists of journal articles and/or specific website texts.

Suggested Course Textbook:

This book can be used to complement the course readings.

Essentials of Public Health Biology: A Guide for the Study of Pathophysiology. Textbook Cover
Publisher: Jones & Bartlett Publishers. ISBN: 9780763744649 / 0763744646.

Note: the weekly lectures and readings deviate from the book in many aspects.

Images, photos, graphs, and tables for the various classes will be taken from scientific journal articles, lecturer's own sources (previous lectures and research material), the online encyclopedia of medical images and for example CDC and WHO websites. Each of the lecturers is free to provide education material according to their own judgment.

Course Description: The goal of public health activities is to promote and enable wellbeing and health and prevent disease development for all. In pursuing the understanding of the many components that contribute to this goal, public health students require appreciating basic

concepts of the functioning of the human body in health and disease. This includes familiarity with the impact on health of environmental and infectious exposures as well as the impact of the social determinants of health.

This introductory course will provide insights into the biological basis, structure, and physiology (the functioning) of the cellular, immune, pulmonary, cardiovascular, and gastrointestinal systems in health and disease. Immune mechanisms and vaccinations as major means of protective public health interventions will be explored and selected infectious pathogens (bacteria, viruses, protozoa, and helminths) discussed with COVID and tuberculosis portrayed in greater depth as exemplary infections with major global impact. Additional focus will be laid on cancer, Alzheimer's disease, and the role of gender and the microbiome. A variety of health prevention options and recommendations, including technical approaches, will be reviewed, and discussed in the context of the various class topics.

Selected Department Competencies Addressed:

Each Department identifies competencies for each degree offered. The competencies addressed in this course for the MPH for the Department of ENOH include:

- Explain biological and genetic factors that affect a population's health
- Differentiate between infectious pathogens (virus, bacteria, fungi, parasite)
- Explain the major human organ systems in healthy and disease states
- Explain the basic functions of the human immune system and its role in vaccination

Please visit the Department webpages on the School of Public Health's website at <http://sph.rutgers.edu/> for additional competencies addressed by this course for other degrees and departments.

Course Objectives:

By the completion of this course, students will be able to:

1. Explain the physiology and mechanisms of major human organ systems including the immune system.
2. Describe how infectious and noninfectious insults can cause disease of these systems
3. Illustrate how selected infectious pathogens are acquired, cause disease, and alter and escape human immune responses
4. Describe the scope of and develop public health measures to alter disease-inducing lifestyles or exposures that are harmful to the human body
5. Make recommendations on how to use public health approaches to preventing disease

Course Requirements and Grading:

- Weekly assignments & reflections 15%

• Midterm Exam	20%
• Public Health Expert Statement and Funding Request Outline	5%
• Public Health Expert Statement and Funding Request	35%
• Final Exam	<u>25%</u>
	Total 100%

Course Schedule:

Week 1. Week of January 17, 2022

Stephan Schwander MD, PhD.

COURSE STRUCTURE AND INTRODUCTORY CONSIDERATIONS

1. Syllabus and Competencies - Overview of the course and course requirements.
2. History of Science and Modern Science
3. Social determinants of health
4. Our cultures are our source of health-Target group specific diabetes & nutrition education

J-Y. Hong PhD

BASICS OF TOXICOLOGY

1. Toxicity of major environmental pollutants
2. Exposure to toxic substances in air, water, and soil

WEEK 2. Week of January 24, 2022

Stephan Schwander MD, PhD.

IMMUNE SYSTEM

1. The cell - basis of life
2. Overview of the immune system (organ structure, barriers, diagnostics)
3. Adaptive, and innate immunity, Immune cell types and immunosuppressive states

Accompanying readings

- Cellular and Molecular Immunology, by Abul K. Abbas, Andrew H. Lichtman and Shiv Pillai. Updated 6th ed. Chapter 1, properties and overview of immune responses, pages 3 – 17. Chapter 2, innate immunity, pages 27–31, 35-38, 41-42, cells and tissue of the immune system. Pages 52-64.

WEEK 3. Week of January 31, 2022

Stephan Schwander MD, PhD.

INFLAMMATION

1. Overview
2. Inflammatory response, mediators, and therapeutics
3. Examples of common inflammatory diseases
4. Disease examples. Tuberculosis as a case study

Accompanying readings

- Kumar: Robbins and Cotran Pathologic Basis of Disease, 8th ed. Chapter 2, acute and chronic inflammation ([Rutgers library e-Book](#))
- Review of medical microbiology and immunology, 10th ed., 2008 Warren Levinson ([Rutgers library e-Book](#))
- Cellular and Molecular Immunology, by Abul K. Abbas, Andrew H. Lichtman and Shiv Pillai. Updated 6th ed. Chapter 15. Immunity to Intracellular Bacteria, pages 355-362
- Maxcy-Rosenau-Last Public Health and Preventive Medicine, 15th Edition Robert B. Wallace, MD, MSc, BSM, Editor, Chapter 12 I, tuberculosis, pages 248-257. ([Rutgers library e-Book](#))
- Interaction of Mycobacterium tuberculosis with the host: consequences for vaccine development, Jes Dieterich and T. Mark Doherty. *APMIS* 117: 440–457
- Confronting the scientific obstacles to global control of tuberculosis. Douglas B. Young et al. *The Journal of Clinical Investigation* 2008, 118: 1255-1263
- <http://www.who.int/tb/en/>
- <http://www.stoptb.org/>

WEEK 4. Week of February 7, 2022

Stephan Schwander MD, PhD.

THE RESPIRATORY SYSTEM

1. Overview and anatomy
2. Physiology (breathing and gas exchange).
3. Inflammation, respiratory symptoms & common lung disorders
4. Asthma – A case study

Accompanying readings

- Oxford Handbook of Tropical Medicine, 2nd edition. Chapter 2E, acute respiratory infections/pneumonia ([UMDNJ library e-Book](#))
- Mason: Murray & Nadel's Textbook of Respiratory Medicine, 4th ed ([UMDNJ library e-Book](#)): from chapter 14, origin of pulmonary mononuclear and dendritic cells, functions of pulmonary macrophages and dendritic cells; from chapter 15, specific immune responses in the lung; from chapter 31, common cold, pneumonias, adeno and influenza viruses; from chapter, 32 pyogenic bacterial pneumonias; from chapter 34, selected fungal infections; from chapter 36, chronic bronchitis and emphysema, chronic obstructive pulmonary disease.

WEEK 5. Week of February 14, 2022

Robert Laumbach MD, MPH

CARDIOVASCULAR SYSTEM

1. Importance of cardiovascular disease
2. Anatomy of the cardiovascular system
3. Physiology of the cardiovascular system
4. Pathology of the cardiovascular system
5. Primary, secondary, and tertiary prevention

Accompanying readings

Coronary Heart Disease in Clinical Practice, by Satish Mittal, MBBS (Chapters: Normal Status, Risk Factors, Risk Assessment, Atherogenesis, Prevention) ([UMDNJ library e-Book](#))

Maxcy-Rosenau-Last Public Health and Preventive Medicine, 15th Edition Robert B. Wallace, MD, MSc, BSM, Editor, chapter 62, heart disease, pages 1071-1084 ([UMDNJ library e-Book](#))

Students familiarize themselves with the instructions for student MOCK PUBLIC HEALTH EXPERT STATEMENT AND FUNDING REQUEST. In Week 9 (week of March 21): course participants submit an outline for their MOCK PUBLIC HEALTH EXPERT STATEMENT AND FUNDING REQUEST. Students create working groups (five working groups with four students, one working group with five students) and in their group agree on one of the six topic options for their project. In Week 13 (week of April 18): course participants present their final MOCK PUBLIC HEALTH EXPERT STATEMENT AND FUNDING REQUEST

WEEK 6. Week of February 21, 2022

MIDTERM EXAM (1HR 30 MIN)

WEEK 7. Week of February 28, 2022

Stephan Schwander MD, PhD.

NEGLECTED DISEASES IN TROPICAL CLIMATE ZONES – PARASITIC DISEASES – DISEASE VECTORS - ZOONOSES

Helminths (schistosomiasis, ascariasis, soil-transmitted helminth infections, onchocerciasis, lymphatic filariasis); protozoa (malaria, entameba, trypanosomiasis, leishmaniasis), bacteria (leprosy), viruses (Dengue, Zika). Fungal Infections.

Accompanying readings

- Review of medical microbiology and immunology, 10th ed., 2008 Warren Levinson. Chapters 51 (intestinal and urogenital protozoa) and 52: (blood & tissue protozoa)
- Oxford Handbook of Tropical Medicine, 2nd edition, chapter 2A, malaria, visceral leishmaniasis (kala-azar), African trypanosomiasis. Gastroenterology: schistosomiasis (bilharzia), Dermatology: onchocerciasis ('river blindness'), Neurology: Leprosy ([UMDNJ library e-Book](#))
- Cellular and Molecular Immunology by Abul K. Abbas, Andrew H. Lichtman and Shiv Pillai. Updated 6th ed. Chapter 15, immunity to parasites, pages 365-370

- Maxcy-Rosenau-Last Public Health and Preventive Medicine, 15th Edition Robert B. Wallace, MD, MSc, BSM, Editor, chapter 17, opportunistic fungal infections, pages 461-467. (UMDNJ library e-Book)

WEEK 8. Week of March 07, 2022

Helmut Zarbl, Ph.D., B.Sc.

CANCER

1. Molecular Epidemiology
2. Biomarkers

Accompanying readings

The Hallmarks of Cancer Review Douglas Hanahan* and Robert A. Weinberg, Cell, Vol. 100, 57–70, January 7, 2000

SPRING RECESS

Saturday, March 13 – Sunday, March 20, 2022

WEEK 9. Week of March 21, 2022

Devin English PhD

1. Biological, physiological, and psychological effects of racism

Stephan Schwander MD, PhD.

2. Poverty and health
3. Gender and health

Course participants

Students submit Outline for their Public Health Expert Statement and Funding Request Outline

WEEK 10. Week of March 28, 2022

Stephan Schwander MD, PhD.

EMERGING TOPICS OF PUBLIC HEALTH RELEVANCE

1. Microbiome
2. Antibiotic Resistance
3. Aging effects on health

WEEK 11. Week of April 04, 2022

Stephan Schwander MD, PhD.

PANDEMICS

1. COVID-19
2. Tuberculosis
3. HIV-AIDS

Accompanying readings

<http://www.unaids.org/en/KnowledgeCentre/Default.asp>

- <http://www.theglobalfund.org/en/>
- Gates Foundation
- Cellular and Molecular Immunology, by Abul K. Abbas, Andrew H. Lichtman and Shiv Pillai. Updated 6th ed. Chapter 20, acquired secondary immunodeficiencies pages 475-486
- Maxcy-Rosenau-Last Public Health and Preventive Medicine, 15th Edition Robert B. Wallace, MD, MSc, BSM, Editor, Chapter 11, pages 189-196. The epidemiology and Prevention of Human Immunodeficiency Virus (HIV) Infection and Acquired Immunodeficiency Syndrome (AIDS) ([UMDNJ library e-Book](#))
- Oxford Handbook of Tropical Medicine, 2nd edition. Chapter 2B HIV/sexually transmitted infections ([UMDNJ library e-Book](#))
- Maxcy-Rosenau-Last Public Health and Preventive Medicine, 15th Edition Robert B. Wallace, MD, MSc, BSM, Editor, Chapter 10 Epidemiology and Trends in Sexually Transmitted Diseases (pages 155-167) ([UMDNJ library e-Book](#))

WEEK 12. Week of April 11, 2022

Stephan Schwander MD, PhD.

VACCINATIONS

1. Principles of action
2. Vaccine types and vaccine components
3. Vaccinations against common infectious diseases of children and adults
4. Vaccines in development and challenges in vaccine development/field trials

Assigned literature

- Cellular and Molecular Immunology, by Abul K. Abbas, Andrew H. Lichtman and Shiv Pillai. Updated 6th ed. Chapter 15, strategies for vaccine development, pages 370-372.
- Mandell: Mandell, Douglas, and Bennett's Principles and Practice of Infectious Diseases, 7th ed. Part IV Special Problems. Section D, immunization
- Recommended Adult Immunization Schedule, United States, 2009, *MMWR January 9, 2009 / Vol. 57 / No. 53*.
- Recommended Immunization Schedules for Persons Aged 0 Through 18 Years — United States, 2009, *MMWR January 2, 2009 / Vol. 57 / Nos. 51 & 52*.

- Aeras – Global TB Vaccine Foundation, Rockville MD, <http://www.aeras.org/home/home.php>
- *Nature Reviews Microbiology* 4, 469-476 (June 2006)

WEEK 13. Week of April 18, 2022

Course participants present

MOCK PUBLIC HEALTH EXPERT STATEMENT AND FUNDING REQUEST

WEEK 14. Week of APRIL 25, 2022

Mark A. Gluck, Professor, Rutgers Center for Molecular and Behavioral Neuroscience
AGING AND ALZHEIMER'S DISEASE IN AFRICAN AMERICANS

WEEK 15. Week of MAY 02, 2022

FINAL EXAM

School of Public Health Honor Code: The School of Public Health Honor Code is found in the student bulletin (sph.rutgers.edu/academics/catalog/index.html). Each student bears a fundamental responsibility for maintaining academic integrity and intellectual honesty in his or her graduate work. For example, all students are expected to observe the generally accepted principles of scholarly work, to submit their own rather than another's work, to refrain from falsifying data, and to refrain from receiving and/or giving aid on examinations or other assigned work requiring independent effort. In submitting written material, the writer takes full responsibility for the work as a whole and implies that, except as properly noted by use of quotation marks, footnotes, etc., both the ideas and the works used are his or her own. In addition to maintaining personal academic integrity, each student is expected to contribute to the academic integrity of the school community by not facilitating inappropriate use of her/his own work by others and by reporting acts of academic dishonesty by others to an appropriate school authority. It should be clearly understood that plagiarism, cheating, or other forms of academic dishonesty will not be tolerated and can lead to sanctions up to and including separation from the Rutgers School of Public Health.

Policy Concerning Use of Recording Devices and Other Electronic Communications Systems:

When personally owned communication/recording devices are used by students to record lectures and/or classroom lessons, such use must be authorized by the faculty member or instructor who must give either oral or written permission prior to the start of the semester and identify restrictions, if any, on the use of mobile communications or recording devices.

Students with Disabilities

Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student must Apply for Services by first completing a Registration Form with the Rutgers Office of Disability Services (ODS) at ods.rutgers.edu. The student will also be required to participate in an ODS intake interview and provide documentation. If

reasonable accommodations are granted, ODS will provide you with a Letter of Accommodations which should be shared with your instructors as early in your courses as possible.

Graduate Student Computer Policy

Students are required to possess a personal laptop, no older than approximately two years, that must meet minimum requirements which may be found online at:
sph.rutgers.edu/student-life/computer-support.html.

Policy Concerning Use of Turnitin

Students agree that by taking this course all required papers may be subject to submission for textual similarity review to Turnitin.com (directly or via learning management system, i.e. Canvas) for the detection of plagiarism. All submitted papers will be included as source documents in the Turnitin.com reference database solely for the purpose of detecting plagiarism of such papers. Use of the Turnitin.com service is subject to the Usage Policy posted on the Turnitin.com site. Students who do not agree should contact the course instructor immediately.