

Course Title: Public Health Biology & Physiology
Course Number: ENOH0560JWEB
Course Location: Online / Web based
Course Date & Time: Spring Semester January 17, 2023 - May 9, 2023
Course Instructor: Stephan Schwander MD. PhD
Office Hours: Wednesdays 12:00 noon – 12:45 p.m. via Zoom Link

Zoom link for course participants ONLY!

<https://rutgers.zoom.us/j/7932764964?pwd=ZzNmZ3hWV2hGYnNXemFCS3c0UmlyUT09>

Email: schwansk@sph.rutgers.edu (*enter 'ENOH0560Web' in email subject line*)

Work mobile: 732-713-8959

This course aims at providing you with basic information on the human biology and physiology, building blocks of public health. In considering the competencies of your public health graduate training at RU SPH, this course aims at imbedding and connecting biology and physiology into the social determinants of health. Biology and physiology are part of the equation, but do not explain the entirety of what contributes to health or disease. This course makes the attempt, when possible, to connect the course content to your future practice in the public health arena.

As this course targets a broad group of students in public health, some of the content may appear challenging to some and probably superficial to others. Accompanying reading material can help you to deepen the understanding of processes and mechanisms in the human body and how they connect to our social and physical wellbeing.

The majority of the lectures and weekly discussions will be led by the course director. Some of the lectures and weekly discussions will be led by additional Rutgers faculty, mostly from within the School of Public Health.

Web-based Course

This is an online, asynchronous, web-based course in Canvas. Weekly class sessions are online only; they do not occur in a physical environment or at specific day times! Course participants work at their own pace and from their respective locations during each course week. All assignments, discussions, and quizzes, however, have to be finalized by specific dates, as indicated in the respective weekly modules and assignments to avoid point deductions. I recommend that you develop a weekly rhythm, with self-assigned work times, during which

you address your assignments. Don't underestimate the amount of work that needs to go into weekly assignments, exam preparations and the team project.

Because of this new way of teaching, learning, and interacting, we want to encourage you to interact intentionally and frequently with each other in this course. It is recommendable to know each other as it makes all course participants become part of this course and work more enjoyable. You may eventually also work in small groups. The better and earlier you know each other, the easier to connect for working group projects later.

If this is your first full web-based course, I recommend that you develop a strict routine for your weekly work in this course. In terms of managing the workload, you will need to allocate 6-8 hours weekly, per module, for the lecture watching, reading, and writing. Extra preparation time will be needed for the exam preparations and the teamwork project.

Timeliness of Assignments/Exams and Grading

Due dates of assignments and exams are binding. Changes to these can be permitted only in context with extenuating circumstances and after prior approval by the course Director.

This web-based course has clear rules:

- Weekly assignment due dates and times are always the Mondays following the assignment week, at 9:00 a.m. EST! Late weekly assignments will lose two points (out of 10) per day late. No exceptions.
- Exams need to be taken within the allocated time period (one week). No exceptions.
- Teamwork that is submitted late will receive a 3% reduction from the total possible point number, per day late. No exceptions.
- Teamwork will be graded once and as submitted. No exceptions.

Don't use of jargon, but also do not write as if you were talking to a lay person or younger sibling. Two points will be deducted per day later after the weekly due dates.

Assignments, Writing style, Grading

I pointed out how important the writing is. In the weekly modules, read the course assignment questions carefully and answer them completely to avoid point loss. Format your assignment texts with headers and clear references to what you refer to (the question number or article author).

The writing style in this course should be rather formal and scientific. As this course introduces you to topics that require some specific terminology, try to use some of that terminology in your writing. You will see and hear terms such as 'lymphocytes' or 'cytokines' or 'oxygen pressure'. So, in your writing, use these terms and avoid colloquial language. Do not write in a

style that you would use in a patient information pamphlet or how you would speak to a lay person. Most often, in this course, we will explore factual and experimental findings, but your opinion will be specifically asked for several times. Your opinion about this course and emphasis is always welcome. Let me know.

Your weekly participation will be monitored. Please engage in substantial discussions of your course colleagues' weekly assignments throughout the course. Consistent participation in these weekly discussions can add up to up to two extra credit points (every week once = 1 point, every week 2x or more = 2 points) at the end of the course.

Enjoy this course!

Teaching Assistant: None

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 Textbooks:

These books can be used to complement the course readings:

Essentials of Public Health Biology – Biologic Mechanisms of Disease and Global Perspectives (Essential Public Health) by Loretta DiPietro (Author), Julie Deloia (Author), Victor Barbiero (Author) Publisher: Jones & Bartlett Learning. ISBN: ISBN-10 – 1284077918; ISBN-13 - 978-1284077919. Edition 1st. Copyright 2019.

Essentials of Public Health Biology – A guide for the Study of Pathophysiology (Essential Public Health) by Constance U. Battle. Publisher: Jones & Bartlett Learning. ISBN: ISBN-10 – 0-7637-4464-6 (pbk.); ISBN-13 - 978-0-7637-4464-9 (pbk.). Copyright 2009.

Note: the weekly lectures and readings deviate from these books 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.

Basic understandings of biology and physiology provide a critical foundation for the study of public health. This introductory course offers 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 25%
- Total 100%

Spring 2023 Academic Calendar	
Tuesday, January 17, 2023	Spring Semester Begins
Saturday, March 11, 2023 – Sunday, March 19, 2023	Spring Recess
Monday, May 8, 2023	Classes End
Wednesday, May 10, 2023	GRADES DUE!
Sunday, May 14, 2023	Rutgers University Commencement
Wednesday, May 17, 2023	School of Public Health Convocation

Course Schedule:

Week 1. Week of January 16, 2023

Stephan Schwander MD, PhD.

COURSE STRUCTURE AND INTRODUCTORY CONSIDERATIONS

1. Syllabus and Competencies - Overview of the course and course requirements.
2. History of Science
3. Social determinants of health (SDH). Importance of PH Biol and Physiol for PH workers
4. Our cultures are our source of health. Target group specific diabetes prevention & healthy 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 23, 2023

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

READINGS

Required (as per assignment)

1. Pace, T.W.W. et al. Increased peripheral NF-KB pathway activity in women with childhood abuse-related posttraumatic stress disorder (Brain, Behavior, and Immunity, 2012)
2. Guo, M. et al. Study on serum cytokine levels in posttraumatic stress disorder patients (Asian Pacific Journal of Tropical Medicine, 2012)
3. Pace, T.W.W. et al. A short review on the psychoneuroimmunology of posttraumatic stress disorder: From risk factors to medical comorbidities (Brain, Behavior, and Immunity, 2011)
4. Lange, T. et al. The immune recovery function of sleep – Tracked by neutrophil counts (Brain, Behavior, and Immunity, 2011)

Supplemental

- [Cellular and Molecular Immunology, by Abul K. Abbas, Andrew H. Lichtman and Shivh Pillai. Updated 10th ed.](#) Chapter 1: Properties and Overview of Immune Responses. Chapter 2: Cells and Tissues of the Immune System. Chapter 4: Innate immunity,

WEEK 3. Week of January 30, 2023

Stephan Schwander MD, PhD.

INFLAMMATION

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

READINGS

Required (as per assignment)

1. Burstein, S. Cannabidiol (CBD) and its analogs: a review of their effects on inflammation (Bioorganic & Medicinal Chemistry, 2015)
2. Liu, Y-Z et al. Inflammation: The Common Pathway of Stress-Related Diseases (Front Neuro Sci, 2017)
3. Kaufmann, S.H.E. et al. Inflammation in tuberculosis: interactions, imbalances, and Interventions (Curr Opin Immunol, 2013)
4. Ghio, A.J. et al. Exposure to wood smoke particles produces inflammation in healthy volunteers. (Occup Environ Med, 2012)

Supplemental

- 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)
- [Cellular and Molecular Immunology, by Abul K. Abbas, Andrew H. Lichtman and Shiv Pillai.](#) Updated 10th ed, 2021. Chapter 16. Immunity to Microbes.
- [Maxcy-Rosenau-Last Public Health and Preventive Medicine, 16th Matthew L. Boulton, Robert B. Wallace. 2022.](#) Chapter 88: Tuberculosis.
- 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 6, 2023

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

READINGS

Required (as per assignment)

1. Liu, Y. et al. Short-Term Exposure to Ambient Air Pollution and Asthma Mortality (AJRCCM 2019)
2. Kelly, M.S. et al. The effect of exposure to wood smoke on outcomes of childhood pneumonia in Botswana (IJTLD Feb 2015)
3. Fullerton, D.G et al. Indoor air pollution from biomass fuel smoke is a major health concern in the developing world. (Transactions of the Royal Society of Tropical Medicine and Hygiene (2008))
4. Blount R.J. et al. Residential urban tree canopy is associated with decreased mortality during tuberculosis treatment in California (STOTEN 2020)
5. Rivas-Santiago, C.E. et al. Air Pollution Particulate Matter Alters Antimycobacterial Respiratory Epithelium Innate Immunity (Infect. Immun. 2015)

Supplemental

- [Oxford Handbook of Tropical Medicine, 2nd edition.](#) 2005. Chapter 5 - Pneumonia - see Chapter 2E Acute respiratory infections / pneumonia

- Mason: Murray & Nadel's Textbook of Respiratory Medicine, 4th ed (Rutgers library e-Book):
 - Chapter 14, origin of pulmonary mononuclear and dendritic cells, functions of pulmonary macrophages and dendritic cells
 - Chapter 15, specific immune responses in the lung
 - Chapter 31, common cold, pneumonias, adeno and influenza viruses
 - Chapter, 32 pyogenic bacterial pneumonias; Chapter 34, selected fungal infections
 - Chapter 36, chronic bronchitis and emphysema, chronic obstructive pulmonary disease.

Working Team Project Outline

- Team Sign-Ups and Contract (Feb 27)
- Public Health Expert Statement and Funding Request Outline (Mar 6)

WEEK 5. Week of February 13, 2023

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

READINGS

Supplemental

- [Coronary Heart Disease in Clinical Practice](#). by: Satish Mittal.
- [Maxcy-Rosenau-Last Public Health & Preventive Medicine](#), 16e Matthew L. Boulton, Robert B. Wallace. Section VI, Chapter 52.

WEEK 6. Week of February 20, 2023

MIDTERM EXAM (90 minutes)

WEEK 7. Week of February 27, 2023

Stephan Schwander MD, PhD.

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

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

READINGS

Required (as per assignment)

1. Non, A.L. et al., 2016, Early childhood social disadvantage is associated with poor health behaviours in adulthood (Ann Hum Biol. 2016)
2. Nusslock, R. et al. 2016, Early-Life Adversity and Physical and Emotional Health across the Lifespan: A Neuro-Immune Network Hypothesis (Biol Psychiatry. 2016)
3. Animal Viruses Are Jumping to Humans. Forest Loss Makes It Easier. <https://www.nytimes.com/2020/04/09/climate/animals-humans-virus-covid.html?smid=em-share>
4. Global shifts in mammalian population trends reveal key predictors of virus spillover risk <https://royalsocietypublishing.org/doi/pdf/10.1098/rspb.2019.2736>
5. How Humanity Unleashed a Flood of New Diseases <https://www.nytimes.com/2020/06/17/magazine/animal-disease-covid.html?smid=em-share>

Supplemental

- [Review of Medical Microbiology & Immunology: A Guide to Clinical Infectious Diseases](#), 17th edition. Warren Levinson, Peter Chin-Hong, Elizabeth A. Joyce, Jesse Nussbaum, Brian Schwartz. Part VI, Chapters 51 (Intestinal and Urogenital protozoa) and 52: (Blood & Tissue Protozoa)
- [Oxford Handbook of Tropical Medicine, 2nd edition](#). Chapter 2A, malaria. Chapter 3, Multisystem diseases and Infections (visceral leishmaniasis (kala-azar), African trypanosomiasis. Chapter 7, Gastroenterology: schistosomiasis (bilharzia), Dermatology: onchocerciasis ('river blindness'). Chapter 8: Neurology: Leprosy
- [Cellular and Molecular Immunology by Abul K. Abbas, Andrew H. Lichtman and Shiv Pillai](#). Updated 10th ed. 2022. Chapter 16: Immunity to Microbes. Immunity to parasites.
- [Maxcy-Rosenau-Last Public Health and Preventive Medicine](#), 16th edition. Matthew L. Boulton, Robert B. Wallace. Chapter 81: Agents of Infection and Principles of Transmission. Fungi.

WEEKS 7-14

Working Team Final Project

- Mock Public Health Expert Statement and Funding Request (Apr 24)
- Mock Public Health Expert Statement and Funding Request Video Presentation Submission (Apr 24)
- Team Evaluation for Mock Public Health Expert Statement and Funding Request (May 4)

WEEK 8. Week of March 6, 2023

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

CANCER

1. Molecular Epidemiology
2. Biomarkers

READINGS

Required (as per assignment)

1. Gross A.L. et al. Adipocytokines, Inflammation, and Breast Cancer Risk in Postmenopausal Women: A Prospective Study (American Association for Cancer Research, 2013)

Supplemental

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

SPRING RECESS

Saturday, March 11, 2023 – Sunday, March 19, 2023

WEEK 9. Week of March 20, 2023

Devin English PhD

BIOLOGICAL, PHYSIOLOGICAL, AND PSYCHOLOGICAL EFFECTS OF RACISM

Stephan Schwander MD, PhD.

POVERTY AND HEALTH

GENDER AND HEALTH

READINGS

Required (as per assignment)

1. Guidi J. et al. Allostatic Load and Its Impact on Health: A Systematic Review (Psychother Psychosom, 2021)
2. Schmidt K.L. et al. Society to cell: How child poverty gets “Under the Skin” to influence child development and lifelong health (Developmental Review, 2021)

Course participants submit

OUTLINE PUBLIC HEALTH EXPERT STATEMENT AND FUNDING REQUEST

WEEK 10. Week of March 27, 2023

Stephan Schwander MD, PhD.

EMERGING TOPICS OF PUBLIC HEALTH RELEVANCE

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

READINGS

Required (as per assignment)

1. Defining and combating antibiotic resistance from One Health and Global Health perspectives
2. The Human Microbiome before Birth

WEEK 11. Week of April 03, 2023

Stephan Schwander MD, PhD.

PANDEMICS

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

READINGS

Required (as per assignment)

1. Hopewell P.C. et al. Parallels and Mutual Lessons in Tuberculosis and COVID-19 Transmission, Prevention, and Control. (Emerging Infectious Diseases, 2021)

Supplemental

- [UNAIDS Resources](#)
- [The Global Fund](#)
- [Gates Foundation](#)
- [Cellular and Molecular Immunology, by Abul K. Abbas, Andrew H. Lichtman and Shiv Pillai](#). Updated 10th ed. Chapter 21, Primary and Acquired Immunodeficiencies.
- [Maxcy-Rosenau-Last Public Health and Preventive Medicine](#), 16th edition. Matthew L. Boulton, Robert B. Wallace. Section VIII: Chapter 120 Sexually Transmitted Infections: Syphilis, Chapter 121 Gonorrhoea, Chapter 122 Chlamydia and Other Sexually Transmitted Infections

WEEK 12. Week of April 10, 2023

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

READINGS

Required (as per assignment)

1. Why herd immunity for COVID is probably impossible

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 17, 2023

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

READINGS

Required (as per assignment)

1. Health Disparities, Race, and Alzheimer's
2. Racial and ethnic Disparities in Alzheimer's Disease. A literature review.

WEEK 14. Week of APRIL 24, 2023

Course participants present

MOCK PUBLIC HEALTH EXPERT STATEMENT AND FUNDING REQUEST

WEEK 15. Week of MAY 01, 2023

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.