

**Course Title:** *Biomarkers*

**Course Number:** *ENOH 0653-030*

**Course Location:** *SPH Room 2A*

**Course Website:** *canvas.rutgers.edu*

**Course Date & Time:** *Thursdays, 6 to 8 pm*

*Fall, 2021, September 2 to December 20*

**Course Instructor:** *Jun-Yan Hong, PhD, Professor, Rutgers (SPH-ENOHJ), Room 422, EOHSI Building, 848-445-6146, [hongju@sph.rutgers.edu](mailto:hongju@sph.rutgers.edu); <https://rutgers.webex.com/meet/hongju>*

**Office Hours:** *9 am to 5 pm. Students may schedule individual meetings by phone or WebEx- Appointment is required*

**Required Course Text:** *None. In addition to lectures, readings related to course topics and subtopics will be assigned.*

**Course Description:** *The importance of incorporating biomarkers into environmental/occupational toxicology and epidemiology research is well recognized. This course covers both theoretical concepts and practical issues of biomarkers.*

### **Selected Department Competencies Addressed:**

#### ***For MPH students***

- Describe the major environmental health problems to the general public as well as specific communities within that population;
- Explain the basic mechanism of toxicology and dose-response regarding environmental toxicants;
- Develop a testable model of environmental exposures (one or more agents) and adverse health outcomes (causing injury, disability, other measure of morbidity or mortality); and
- Specify current environmental risk assessment approaches and methods for a particular hazard or risk in a community.

#### ***For PhD students***

- Design a testable hypothesis and execute research activity to investigate the effects of a toxicant, or toxin, or hazard event in a community;
- Explain the importance of differences of susceptibility and vulnerability to environmental toxicant/toxins based upon age, gender, race, ethnicity, genetics and socioeconomic status in different populations;

- Provide an informed expert opinion to government and/or community leaders regarding the extent or level of risk associated with a particular environmental or occupational hazard or condition;
- Be able to teach a course in Environmental and Occupational Health;
- Obtain grant funding from private and/or governmental agencies to initiate an ENOH research program;
- Explain basic principles in environmental and occupational health sciences including toxicology, quantitative risk assessment, epidemiology, and exposure science; and
- Develop and/or apply novel and cutting-edge research methods in the laboratory and/or in the field.

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:

- Describe the role of different biomarkers in human population research, including their advantages and limitations;
- Identify the criteria used to evaluate a potential biomarker, including its selection and validation;
- Understand the biochemistry and molecular biology background of biomarkers as well as the advanced technologies for biomarker detection and analysis;
- Describe the important ethical and social issues involved in using human specimens for biomarker research; and
- Improve the skill of critical literature reading and oral presentation.

### Course Requirements and Grading:

- *In addition to attending the lectures and taking one examination, each student is required to make several presentations on specific topics related to biomarkers research. Every presentation will include a 30- to 40-min oral presentation and 10- to 15-min questions and answers.*

- **Grading**

1. Examination	25 pts.
2. Presentation	60 pts
3. Participation in classroom discussion	15 pts
Total:	100 pts.

• Grading Policy:	94 – 100	A	70 – <77	C
•	90 – <94	A-	<70	F
•	87 – <90	B+		
•	84 – <87	B		
•	80 – <84	B-		
•	77 – <80	C+		

**Course Schedule:** *Include week-by-week listing of each class session (copied below)*

<b><u>Subject</u></b>	<b><u>Date</u></b>
Introduction to Biological Markers*	09/02
Basic Concepts in Molecular and Cell Biology*	09/09
Introduction to Instrumental Analysis(HPLC and MS) and Omics*	09/16
DNA Repair, Mutations and Chromosome Aberrations	09/23
DNA and Protein Adducts	09/30
Genomics and Transcriptomics	10/07
Proteomics and Epigenomics	10/14
Metabolites and Metabolomics	10/21
Application of Biomarkers (I): Exposure Assessment	10/28
Application of Biomarkers (II): Molecular Epidemiology	11/04
Application of Biomarkers (III): Pharmacogenomics	11/11
Biomarkers of Organ Toxicity	11/18
<b>No class (<i>Thanksgiving Day</i>)</b>	<b>11/25</b>
Biomarkers of Metal Toxicity	12/02
<b>Final Exam</b>	12/09
Ethical and Social Issues (All students, each student prepares a 15 to 20-min presentation)	12/16

**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](http://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.

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Acknowledge (Print Name)

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Signature/Date

## **HPLC and Mass spectrometry**

<https://www.youtube.com/watch?v=eCj0cRtJvJg>

High Performance Liquid Chromatography HPLC- UV-VIS Detector Animation

<https://www.youtube.com/watch?v=SQucmCTpdgg>

Mass spectrometry

## **Omics**

<https://www.youtube.com/watch?v=m7X6mugpijQ>

(Video 1 of 8) Introduction to Omics: 360 Degree View of You

<https://www.youtube.com/watch?v=LLac4OlvUeE>

(Video 2 of 8) Genomics: Genome, The Long and Winding Road

<https://www.youtube.com/watch?v=19ef7dl8Yzc>

(Video 3 of 8) Transcriptomics: Releasing the Messengers

<https://www.youtube.com/watch?v=TWIYMvlyPJI>

(Video 4 of 8) Proteomics: Proteins At Work

<https://www.youtube.com/watch?v=Au4llqzxLjA>

(Video 5 of 8) Epigenomics: Your Epigenome and Environment

<https://www.youtube.com/watch?v=kWch9J0EGG8>

(Video 6 of 8) Metabolomics: You Are What You Eat

<https://www.youtube.com/watch?v=QitrG0XXhJo>

(Video 7 of 8) Microbiomics: The Living World In and On You

<https://www.youtube.com/watch?v=eu2BgTBATnQ>

(Video 8 of 8) Omics: Advancing Personalized Medicine from Space to Earth



[NASA Video](#)

766K subscribers

NASA's Human Research Program (HRP) is releasing the video "Omics: Advancing Personalized Medicine from Space to Earth", to highlight its Twins Study, coinciding with National Twins Days. This is the last video in a series of eight which explores space through you by using omics to look more closely at the unique health of an individual. Omics integrates multiple biological disciplines to focus on measurements of a diverse array of biomolecules. It combines genomics, transcriptomics, proteomics, epigenomics, metabolomics and microbiomics to see a larger, more comprehensive picture of the human body at a fundamental, highly granular level.

Related Story: <http://www.nasa.gov/feature/nasa-rele...>

NASA's Human Research Program: <http://www.nasa.gov/hrp>

NASA's Twins Study: <http://www.nasa.gov/twins-study>