

COURSE NAME

Current Issues in Evolutionary Anthropology 01:070:297:01

MICROBIOMES 11:680:104:01

CONTACT INFORMATION:

Instructor(s): **Maria G Dominguez-Bello**

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Office Hours: by appointment

COURSE WEBSITE, RESOURCES AND MATERIALS:

There is no textbook for this course, but lay public books on the microbiome recommended are:

Dirt Is Good

by Jack Gilbert and Rob Knight

Follow Your Gut: The Enormous Impact of Tiny Microbes (TED Books)

by Rob Knight and Brendan Buhler

Missing Microbes: How the Overuse of Antibiotics Is Fueling Our Modern Plagues

by Martin J. Blaser

I Contain Multitudes: The Microbes Within Us and a Grand View of Life

by Ed Yong

Examples of press articles:

NPR radio Rob Stein documentary: Exploring The Invisible Universe That Lives On Us — And In Us; 2013

<https://www.npr.org/sections/health-shots/2013/11/01/242361826/exploring-the-invisible-universe-that-lives-on-us-and-in-us>

Ed Yong's Introduction to the microbiome. National Geographic.

<https://www.nationalgeographic.com/science/phenomena/2010/08/08/an-introduction-to-the-microbiome/>

NYT: [Save the Germs](#)

NPR: [A Frozen Idea to Save Helpful Germs from Disasters](#)

Bloomberg: [Scientists Urge Doomsday Vault for 'Good' Germs](#)

The Guardian: [Build a 'Noah's Ark' for beneficial gut microbes, scientists say](#)

Inverse: [A Doomsday Vault for Seeds Isn't Enough; We'll Also Need One for Our Germs](#)

Examples Scientific articles (Original, Reviews, Perspective):

- Ley, R. E., et al. (2008). "Worlds within worlds: evolution of the vertebrate gut microbiota." *Nat Rev Microbiol* 6(10): 776-788.
- Mueller NT, et al. The infant microbiome development: mom matters. *Trends in molecular medicine*. 2015;21(2):109-117.
- Dominguez-Bello MG and Blaser MJ. Microbes as markers for migrations of individuals and human populations. *Annual review of anthropology*. 2011;40:451-474.
- Lozupone, C. A., et al. (2012). "Diversity, stability and resilience of the human gut microbiota." *Nature* 489(7415): 220-230.
- Ruiz-Calderon et al. Walls talk: Microbial Biogeography of Homes Spanning Urbanization. *Science Advances*. 2016: 2(2):e1501061-e1501061.
- Mueller N, Dominguez-Bello MG, Appel L, Hourigan S. Vaginal seeding' after a caesarean section provides benefits to newborn children." **BJOG: An International Journal of Obstetrics and Gynaecology** 2019 Jan;127(2):301. PMID: 31696621 ; <https://doi.org/10.1111/1471-0528.15979>

- Dominguez-Bello MG, Godoy-Vitorino F, Knight R, Blaser MJ. Role of the microbiome in human development. *Gut* 2019, Jun;68(6):1108-1114. <https://doi.org/10.1136/gutjnl-2018-317503>
- Finlay B. B and CIFAR Humans and the Microbiome authors (Blaser MJ, Bosch TCG, Dominguez-Bello MG, Elinav E, McFall-Ngai M, Melby MK, Muehlmann SR, Sansonetti PJ. Are noncommunicable diseases communicable? *Science* 2020, 367 (6475): 250-251. PMID: 31949069 ; <https://doi.org/10.1126/science.aaz3834>

COURSE DESCRIPTION, SCOPE:

This is a lecture course for students with minimal science background, including undergrads or graduate students from non-biological/health disciplines. There are no prerequisites for the course, which expects to attract students from natural sciences, health sciences, anthropology, sociology, engineering, urban studies, etc.

The course describes principles of host-associated microbes, how do humans acquire them, their functions, the terminology of ecological principles relevant to microbiomes (such as resilience, resistance, diversity and stability). The general content includes principles of evolution of microbial life and hosts, symbioses, ecology, pathogens, degradation of the human microbiota and restoration potential.

There is basic level discussion of press releases and of review papers. The main focus of the course will be on the importance of host-associated microbes to health (mostly to humans) and the consequences of the impact of human activities and lifestyles on the microbiome diversity.

The course will consist on classes with discussion, including in depth discussion of a lay public article and of scientific reviews or original scientific work towards the end of the course.

The course provides a top-down approach to learning about the microbial world and host associated microbes, providing students with a level of understanding on the general trends associated with urbanization, including understanding the many antimicrobial practices of urban societies that are impacting the early transmission, colonization and engraftment of microbes in the body, and their consequences for normal immune development and later disease risks. The subject is of interests to the fields of anthropology, sociology, biology, mathematics, ecology, computational biology, engineering, urban planning, architecture, medicine, nutrition, agriculture, biotechnology and fields of science related to modernization and industrialization.

Reading assignments will include articles and review papers, or book chapters that will be discussed in class, and on which students will write a summary. The class discussion of the papers and the written summary will be part of the student evaluation.

There will be three midterm evaluations, of general knowledge at adequate level of the course.

Course number and level. Course level is 100.

There will likely be some students who have taken Living in the Microbial World (100-level) who will be interested in this course.

To familiarize students with microbial ecosystems living on hosts

To read scientific research papers and critically present their content

LEARNING GOALS:

The course aims to inform students on why and how the microbiome is a new field of study, why is it important and how it is being degraded by an urban lifestyle. The course will familiarize students with the field, and enable them to understand science news about advances that reach mass media, as well as the abstract of scientific papers.

Students in this course will:

1. Understand the basic concepts and functions of host-associated microbiomes.
2. Develop scientific literacy to understand current news on microbiome advances, value of probiotics, of natural birth and natural exposures, and impacts of modern lifestyle.

ASSIGNMENTS/RESPONSIBILITIES, GRADING & ASSESSMENT:

First midterm evaluation	20%
Second midterm evaluation	30%
Essay	50%
Total	100%

ACCOMODATIONS FOR STUDENTS WITH DISABILITIES

Please follow the procedures outlined at <https://ods.rutgers.edu/students/registration-form>. Full policies and procedures are at <https://ods.rutgers.edu/>

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ABSENCE POLICY

Students are expected to attend all classes; if you expect to miss one or two classes, please use the University absence reporting website <https://sims.rutgers.edu/ssra/> to indicate the date and reason for your absence. An email is automatically sent to me.

COURSE SCHEDULE:

<i>Lecture</i>	<i>Date</i>	<i>Topic</i>
1	Tue Jan 19	Introduction to the course
2	Thu Jan 23	Evolution of microbial life on Earth
3	Tue Jan 26	Microbiomes other than digestive
4	Thu Jan 28	Microbiome functions
5	Tue Feb 2	Microbiome and Health
6	Th Feb 4	Microbiota transmission
7	Tue Feb 9	Microbiota development
8	Th Feb 11	Microbiota functions in early life
9	Tue Feb 16	Urbanization, microbiome and disease risks: microbial role
10	Th Feb 18	Microbiota perturbations: medical practices
11	Tue Feb 23	Microbiota perturbations: hygiene and antibacterials
12	Th Feb 25	Human microbiota degradation: evidence consequences
13	Tue Mar 2	How to restore Health
14	Th Mar 4	Theoretical basis of sequence analyses (Jincheng Wang)
15	Tue Mar 9	Discussion

16	Tue Mar 11	Evaluation I
17	Th Mar 14-21	SPRING BREAK
18	Th Mar 23	Discussion Paper 1
19	Tue Mar 25	Discussion Paper 2
20	Th Mar 30	Discussion Paper 3
21	Th Apr 1	Guest: Blaser
22	Th Apr 6	Ed Yong's Introduction to the microbiome
23	Tue Apr 8	Discussion Paper 6
23	Tue Apr 13	Evaluation II
25	Th Apr 15	Discussion Paper 7
26	Tue Apr 20	Discussion Paper 8
27	Th Apr 22	Guest: Zhao
28	Tue Apr 27	Discussion Paper 10
29	Th Apr 29	Discussion Paper 11
30	Tue May 4	Discussion Paper 12
31	Th May 6	Evaluation III (Essay on one of the books)

ACADEMIC INTEGRITY

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The university's policy on Academic Integrity is available at <http://academicintegrity.rutgers.edu/academic-integrity-policy>. The principles of academic integrity require that a student:

- properly acknowledge and cite all use of the ideas, results, or words of others.
- properly acknowledge all contributors to a given piece of work.
- make sure that all work submitted as his or her own in a course or other academic activity is produced without the aid of impermissible materials or impermissible collaboration.
- obtain all data or results by ethical means and report them accurately without suppressing any results inconsistent with his or her interpretation or conclusions.
- treat all other students in an ethical manner, respecting their integrity and right to pursue their educational goals without interference. This requires that a student neither facilitate academic dishonesty by others nor obstruct their academic progress.
- uphold the canons of the ethical or professional code of the profession for which he or she is preparing.

Adherence to these principles is necessary in order to ensure that

- everyone is given proper credit for his or her ideas, words, results, and other scholarly accomplishments.
- all student work is fairly evaluated and no student has an inappropriate advantage over others.
- the academic and ethical development of all students is fostered.
- the reputation of the University for integrity in its teaching, research, and scholarship is maintained and enhanced.

Failure to uphold these principles of academic integrity threatens both the reputation of the University and the value of the degrees awarded to its students. Every member of the University community therefore bears a responsibility for ensuring that the highest standards of academic integrity are upheld.

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deprives you of the educational benefits of preparing these materials appropriately. It is personally dishonest to cheat on a test or to hand in a paper based on unacknowledged words or ideas that someone else originated. It is also unfair, since it gives you an undeserved advantage over your fellow students who are graded on the basis of their own work. In this class we will take cheating very seriously. All suspected cases of cheating and plagiarism will be automatically referred to the Office of Judicial Affairs, and we will recommend penalties appropriate to the gravity of the infraction. To help protect you, and future students, from plagiarism, we require all papers to be submitted through Turnitin.com.

STUDENT WELLNESS SERVICES

The Rutgers University Student Assembly urges that this information be included at the end of every syllabus. Edit or delete as you wish:

Just In Case Web App <http://codu.co/cee05e>

Access helpful mental health information and resources for yourself or a friend in a mental health crisis on your smartphone or tablet and easily contact CAPS or RUPD.

Counseling, ADAP & Psychiatric Services (CAPS)

(848) 932-7884 / 17 Senior Street, New Brunswick, NJ 08901/ www.rhscaps.rutgers.edu/

CAPS is a University mental health support service that includes counseling, alcohol and other drug assistance, and psychiatric services staffed by a team of professional within Rutgers Health services to support students' efforts to succeed at Rutgers University. CAPS offers a variety of services that include: individual therapy, group therapy and workshops, crisis intervention, referral to specialists in the community and consultation and collaboration with campus partners.

Violence Prevention & Victim Assistance (VPVA)

(848) 932-1181 / 3 Bartlett Street, New Brunswick, NJ 08901 / www.vpva.rutgers.edu/

The Office for Violence Prevention and Victim Assistance provides confidential crisis intervention, counseling and advocacy for victims of sexual and relationship violence and stalking to students, staff and faculty. To reach staff during office hours when the university is open or to reach an advocate after hours, call 848-932-1181.

Disability Services

(848) 445-6800 / Lucy Stone Hall, Suite A145, Livingston Campus, 54 Joyce Kilmer Avenue, Piscataway, NJ 08854 / <https://ods.rutgers.edu/>

Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: <https://ods.rutgers.edu/students/documentation-guidelines>. If the documentation supports your request for reasonable accommodations, your campus's disability services office will provide you with a Letter of Accommodations. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. To begin this process, please complete the Registration form on the ODS web site at: <https://ods.rutgers.edu/students/registration-form>.

Scarlet Listeners

(732) 247-5555 / <https://rutgers.campuslabs.com/engage/organization/scarletlisteners>

Free and confidential peer counseling and referral hotline, providing a comforting and supportive safe space.

CATALOG DESCRIPTION

11:680:104 INTRODUCTION TO MICROBIOMES (3)

COURSE SYLLABUS

This introductory course describes principles of host-associated microbiomes (microbial ecosystems living on humans and animals), including their development, functions and roles on health. Students will be required to present recently published works on microbiomes.

Prerequisite: *none*