RUTGERS
School of Environmental and Biological Sciences

COURSE NAME; NUMBER; SEMESTER; MEETING DAYS, TIMES, AND PLACE.

INTRODUCTION TO MICROBIOMES

01:070:297:01 ISS EVOLUT ANTHROPOL (D Anthropology-SAS)
11:680:104:01 MICROBIOMES (DBM-SES)
Spring 2025
Tuesday 10:20 am -1:30 pm
Ruth Adams Building 204

CONTACT INFORMATION:

Instructor(s): **Maria G Dominguez-Bello**
Office Location: Lipman Hall, 333
Email: mg.dominguez-bello@rutgers.edu Office Hours: after class

COURSE WEBSITE, RESOURCES AND MATERIALS:

There is no textbook for this course, but recommended books are:

1. I Contain Multitudes: The Microbes Within Us and a Grander View of Life by Ed Yong
2. Missing Microbes: How the Overuse of Antibiotics Is Fueling Our Modern Plagues by Martin J. Blaser
3. Dirt Is Good by Jack Gilbert and Rob Knight
4. Follow Your Gut: The Enormous Impact of Tiny Microbes (TED Books) by Rob Knight and Brendan Buhler
5. *Press articles:*
6. NPR radio Rob Stein documentary: Exploring The Invisible Universe That Lives On Us — And In Us;
7. https://www.npr.org/sections/health-shots/2013/11/01/242361826/exploring-the-invisible-universe-that-liveson-us-and-in-us
8. Ed Yong's Introduction to the microbiome. National Geographic.
9. https://www.nationalgeographic.com/science/phenomena/2010/08/08/an-introduction-to-the-microbiome/ NYT: Save the Germs
10. NPR: A Frozen Idea to Save Helpful Germs from Disasters
11. Bloomberg: Scientists Urge Doomsday Vault for 'Good' Germs
12. The Guardian: Build a 'Noah's Ark' for beneficial gut microbes, scientists say
13. Inverse: A Doomsday Vault for Seeds Isn't Enough; We'll Also Need One for Our Germs
14. Talks and documentaries:
15. The Invisible Extinction 2022. https://www.theinvisibleextinction.com Theresa Alenghat |
16. TEDxCincinnati - Gut Instinct: How The Microbiome Talk to our Cells, 2021 Erica Angle – TEDxYour Gut Microbiome: The Most Important Organ You've ... Dec 12, 2019
17. Henna-Maria Uusitupa – TEDxPhiladelphia How the gut microbes you're born with …September
18. 2019 Shilpa Ravella - TEDEd How the food you eat affects your gut
19. Rob Knight - | TED Talk How our microbes make us who we are February 23, 2015
20. Jessica Green | TED2013 We're covered in germs. Let's design for that. February 2013 Jack Gilbert | TEDxNaperville. Why getting dirty is the new clean

Scientific articles (Original, Reviews, Perspective):

1- ***Human microbiome variation associated with race and ethnicity emerges as early as 3 months of age***. *E. K. Mallott, A. R. Sitarik, L. D. Leve, C. Cioffi, C. A. Camargo, Jr., K. Hasegawa, et al. PLoS Biol 2023 Vol. 21 Issue 8 Pages e3002230. Accession Number: 37590208 PMCID: PMC10434942 DOI: 10.1371/journal.pbio.3002230*

2- ***Hadza Prevotella Require Diet-derived Microbiota Accessible Carbohydrates to Persist in Mice.*** *R. H. Gellman, M. R. Olm, N. Terrapon, F. Enam, S. K. Higginbottom, J. L. Sonnenburg, et al. bioRxiv 2023. Accession Number: 36945614 PMCID: PMC10028851 DOI: 10.1101/2023.03.08.531063*

3- ***Vulnerability of the industrialized microbiota.*** *J. L. Sonnenburg and E. D. Sonnenburg. Science 2019 Vol. 366 Issue 6464. Accession Number: 31649168 DOI: 10.1126/science.aaw9255*

4- ***Humans and the Microbiome***. *Finlay B. B and CIFAR authors (Blaser MJ, Bosch TCG, DominguezBello 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.*

5- ***Role of the microbiome in human development.*** *Dominguez-Bello MG, Godoy-Vitorino F, Knight R, Blaser MJ.* ***Gut 2019,*** *Jun;68(6):1108-1114. https://doi.org/10.1136/ gutjnl-2018-317503*

6- ***Post-Antibiotic Gut Mucosal Microbiome Reconstitution Is Impaired by Probiotics and Improved by Autologous FMT.*** *J. Suez, N. Zmora, G. Zilberman-Schapira, U. Mor, M. Dori-Bachash, S. Bashiardes, et al. Cell 2018 Vol. 174 Issue 6 Pages 1406-1423 e16. Accession Number: 30193113 DOI: 10.1016/j.cell.2018.08.047*

7- ***Walls talk: Microbial Biogeography of Homes Spanning Urbanization*** *Ruiz-Calderon et al.. Science Advances. 2016: 2(2):e1501061-e1501061.*

8- ***The infant microbiome development: mom matters.*** *Mueller NT, et al. Trends in molecular medicine. 2015:21(2):109-117*

9- ***Microbes as markers for migrations of individuals and human populations.*** *Dominguez-Bello MG and Blaser MJ. Annual review of anthropology. 2011:40:451-474.*

COURSE DESCRIPTION:

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 of 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 as well as a bottom-up 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 and a lay people-level book on the Microbiome, on which students will write a summary as part of their evaluation.
There will be paper readings throughout the semester and book reading assignment, and participation and attendance to class will be considered.

LEARNING GOALS:
Students are expected to gain a understanding of how microbiome impact human health 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.

ASSIGNMENTS/RESPONSIBILITIES, GRADING & ASSESSMENT:
The course will have two tests and 3 essays.

First midterm test	20%
Second final test	20%
2 x 1-page essays reviews	20%
2 page book essay	20%
Participation in class	20%
Total	**100%**

ACCOMODATIONS FOR STUDENTS WITH DISABILITIES
We will follow the procedures outlined at https://ods.rutgers.edu/students/getting-registered. Full policies and procedures are at https://ods.rutgers.edu/

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:

LECTURE	Introduction: human superorganism
Lecture 1,2	Evolution of microbiomes
Lecture 3,4	Microbiomes other than digestive
Lecture 5,6	Microbiome functions
Lecture 7,8	Microbiome and Health
Lecture 9,10	Microbiota transmission
Lecture 11,12	Microbiota development
Lecture 13,14	Microbiota functions in early life
1st test	
SPRING BREAK	
Lecture 15,16	Urbanization, microbiome and disease risks: microbial role
Lecture 17,18	Microbiota perturbations: medical practices

Lecture 19,20	Microbiota perturbations: hygiene and antibacterial compounds
Lecture 21,22	Human microbiota degradation: evidence consequences
Lecture 23,24	Microbiota Restoration
2nd test	

Additional Information: Instructors Dr. Maria Gloria Dominguez-bello (Rm.333B, Lipman Hall, phone: 848932-5648, email: mg.dominguez-bello@rutgers.edu)

Format: Two 1 hour 20 min sessions (lectures/seminars) per week for 14 weeks

ACADEMIC INTEGRITY

The university's policy on Academic Integrity is available at https://academicintegrity.rutgers.edu/sites/default/files/pdfs/current.pdf. 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.

SEBS DEI STATEMENT

Rutgers University is committed to becoming an inclusive learning community that fosters respect, belonging, and value for all with zero tolerance for bias, supporting diversity and striving to provide an inclusive academic environment where all members of our community can thrive and achieve their fullest potential. In the event of an issue, such as the Office of Academic Programs and/or http://inclusion.rutgers.edu/report-bias-incident/

STUDENT WELLNESS SERVICES

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 848-9321181.

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://webapps.rutgers.edu/student-ods/forms/registration.

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.

DoSomething button through Rutgers Dean of Students office: http://health.rutgers.edu/do-something-to-help/

Wellness Coaching through Rutgers HOPE:
http://health.rutgers.edu/education/hope/wellness-coaching/

Self-Help Apps found on the Rutgers Student Health website: http://health.rutgers.edu/education/self-help/self-help-apps/

NJ Hopeline - (1-855-654-6735) | **National Suicide Hotline** - (1-800-273-8255)

BASIC NEEDS RESOURCES

Any student who has difficulty affording groceries or accessing sufficient food, or who lacks a safe and stable place to live, is urged to contact the Rutgers Student Food Pantry and/or the Dean of Students (details below). Furthermore, please notify the professor if you are comfortable doing so, as they may be able to provide additional support.

Rutgers Student Food Pantry
848-932-5500 / College Ave Student Center, Room 115 (126 College Ave) / http://ruoffcampus.rutgers.edu/food/
Check their website for hours and additional locations. The Rutgers Student Food Pantry is dedicated to helping all Rutgers students in need of food, no questions asked. Students will be provided with groceries that typically last about one week.

Dean of Students Office
848-932-2300 / 88 College Avenue, New Brunswick, NJ 08901 / https://deanofstudents.rutgers.edu/ Mon-Fri, 8:30am-5:00pm
The Dean of Students Office at Rutgers University-New Brunswick provides solutions, services, and support to help students navigate Rutgers University. The Office serves as a student support network by providing advocacy, problem resolution, and critical incident intervention for those times when additional assistance is needed. Please call to schedule an appointment to meet with a representative from the Dean's office.