

Microbiome and Health 16:682:576
Spring 2022; M & Th 12:10-1.30
Ruth Adams Building -- RAB 204 Cook/Douglas

(3 credits)

Offered: This is a lecture /seminar course which is offered each Spring semester.

Prerequisites and Registration Restrictions:

The pre-reqs for the graduate course are 16:375:510 Environmental Microbiology or 16:682:501 Microbial Life.

For Pre-requisite overrides or Special Permission contact the Instructor.

Senior undergraduate students can also take this course.

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

Description: Principles and methodologies for working on human microbiome. An overview on the role of microbiome in human health and disease. Conceptual framework and technologies for understanding how microbiome, particularly gut microbiome impact human health and well-being.

Topics covered: The concept of human superorganism; Ecological principles for understanding human microbiomes; Systems thinking and approaches for working on human microbiome; Bioinformatics and statistics tool kits for human microbiome research; Research strategy and experimental/trial design in microbiome study; From correlation to causality of human microbiome in chronic diseases; Nutrition and gut microbiome; Food processing and gut microbiome; Microbiome in pharmacology; Intergenerational, vertical transmission of human microbiomes; Horizontal transfer of human microbiomes; Microbiome and human adaptation/evolution; Microbiome and human society; Microbiome and Human-Nature relationship.

Course Book:

Reviews and research papers selected from current and classical literatures.

Will give lectures on various topics and hold discussions with the class.

Learning Goals: Students are expected to gain a fundamental understanding of how microbiome may impact human health and the tools and strategies for revealing and understanding such impacts; They are also expected to establish a conceptual framework to evaluate and digest new developments reported in scientific journals and news media.

Examinations: We will have two tests and two essays. One test and one essay will cover the lectures by Dr. Dominguez-Bello, the second test and one essay will cover the lectures by Dr. Liping Zhao. Each test will be 20% and each essay (1000 words at least) will be 30% of the total score of 100.

Additional Information: Instructors Dr. Liping Zhao (Rm. 326, Lipman Hall, phone 848-932-5675, email: liping.zhao@sebs.rutgers.edu), Dr. Maria Gloria Dominguez-bello (Rm.333B, Lipman Hall, phone: 848-932-5648, email: mg.dominguez-bello@rutgers.edu)

Syllabus:

Lecture 1, Introduction: human superorganism	M Gloria Dominguez-Bello	Th Jan20
Lecture 2, Evolution of microbiomes	M Gloria Dominguez-Bello	M Jan24
Lecture 3, Microbiomes other than digestive	M Gloria Dominguez-Bello	Th Jan27
Lecture 4, Microbiome functions	M. Gloria Dominguez-Bello	M Jan31
Lecture 5, Microbiome and Health	Guest: Martin Blaser	Th Febr03
Lecture 6, Microbiota transmission	M. Gloria Dominguez-Bello	M Febr07
Lecture 7, Microbiota development	M. Gloria Dominguez-Bello	Th Febr10
Lecture 8, Microbiota functions in early life	M. Gloria Dominguez-Bello	M Febr14
Lecture 9, Urbanization, microbiome and disease risks: microbial role	M. Gloria Dominguez-Bello	Th Febr17
Lecture 10, Microbiota perturbations: medical practices	M. Gloria Dominguez-Bello	M Febr21
Lecture 11, Microbiota perturbations: hygiene and antibacterials	M. Gloria Dominguez-Bello	Th Febr24
Lecture 12, Human microbiota degradation: evidence consequences	M. Gloria Dominguez-Bello	M Febr28
Lecture 13 Theoretical basis of sequence analyses	M Gloria Dominguez-Bello	Th March03
1st test (one hour)	M. Gloria Dominguez-Bello	M March07
Lecture 14, Systems biology for human microbiome research	Liping Zhao	Th March10
SPRING BREAK		M March14
SPRING BREAK		Th March17
Lecture 15, Causality in human microbiome research: Koch's postulates still apply	Liping Zhao	M March21
Lecture 16, Multi-omics approach and data-mining strategy	Liping Zhao	Th March24
Lecture 17, Nutritional modulation of the gut microbiome for metabolic health: animal models	Liping Zhao	M March28
Lecture 18, Nutritional modulation of the gut microbiome for metabolic health: human obesity	Liping Zhao	Th March31
Lecture 19, Nutritional modulation of the gut microbiome for metabolic health: human type 2 diabetes	Liping Zhao	M Apr 4
Lecture 20, Nutritional modulation of the gut microbiome for healthy longevity: animal models	Liping Zhao	Th Apr7
Lecture 21, Pharmaceutical modulation of the gut microbiome for metabolic health	Liping Zhao	M Apr 11
Lecture 22, The gut microbiome and host immunity: animal models	Liping Zhao	Th Apr14
Lecture 23, Are probiotic bacteria probiotic?	Liping Zhao	M Apr 18
Lecture 24, Can dietary fiber cause liver cancer?	Liping Zhao	Th Apr21

Lecture 25, Human microbiome research in nutrition: what's next?	Liping Zhao	M Apr 25
Guest lecture	TBD	Th Apr 28
2nd test (one hour)	Liping Zhao	M May 2