Tufts UNIVERSITY | Friedman School of Nutrition Science and Policy

NUTR 0248: Precision Nutrition
Spring 2024

Welcome to NUTR 0248! The profound differences between individuals have driven the precision nutrition approach to improve overall health. This course is designed to introduce fundamental aspects of precision nutrition by providing a broad range of topics. Looking forward to learning together with you this semester!

Diversity of student experiences and perspectives is essential to the deepening of knowledge in this course. At Friedman, we consider it part of our responsibility as instructors to address the learning needs of all of the students in this course. This course will present materials that are respectful of diversity: race, color, ethnicity, gender, age, disability, religious beliefs, political preference, sexual orientation, gender identity, socioeconomic status, citizenship, language, or national origin among other personal characteristics. I am committed to creating a course that is inclusive in its design. If you encounter barriers, please let me know immediately so that we can determine if there is a design adjustment that can be made or if an accommodation might be needed to overcome the limitations of the design. I am always happy to consider creative solutions if they do not compromise the intent of the assessment or learning activity. I welcome feedback that will assist me in improving the usability and experience for all students.

If you feel like your performance in class is being impacted by your experiences outside of class, please don't hesitate to come and talk with me. I want to be a resource for you. Remember that you can also submit anonymous feedback (which will lead to me making a general announcement to the class, if necessary, to address your concerns).

Class Meetings: 13 weeks (two 1.5-hour sections on the same day each week).
The course will in-person on Monday from 3:15PM to 6:15PM. Location: Jaharis 156

Instructor(s): Jiantao Ma, PhD, MBBS
Assistant Professor, Friedman School of Nutrition Science and Policy
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Phone: 617-636-3567

Instructor Office Hours: The weekly office hour is on 2pm to 3pm Wednesday at Jaharis 265. Your questions are appreciated. If you are not available during office hour, you are welcome to email questions to instructors or setup an alternative time to speak. Zoom attending is available for office hour. Please email instructor to obtain Zoom link.

Semester Hour Units: 3 SHUs

Prerequisites: NUTR 202 Principles of Nutrition Science or equivalent course covering the fundamental scientific principles of human nutrition, or instructor permission.

Course Description: This course is designed for graduate students who are interested in understanding, interpreting, and designing studies related to precision nutrition. Precision nutrition includes three levels: (1) dietary recommendations based on guidelines for population subgroups by age, gender, and other social determinants, (2) individualized nutrition recommendations issued from deep and refined phenotyping, and (3) nutrition recommendations based on an individual's genetic background. The profound differences among individuals in disease risk and biological response necessitates adopting multidimensional and dynamic dietary recommendations to achieve optimal effects. We will review the current evidence, uncertainties and controversies, and future directions in precision nutrition. Aspects relating to both scientific research in this area as well as implementation, including healthcare and business models of precision nutrition, will be discussed.

Course Goals: This course will cover a variety of topics to provide introductory level of knowledge to understand current research and industry on precision nutrition. At the conclusion of the course, students should be able to:

1. Appreciate the utility of nutrigenetics in precision nutrition and describe the strength and limitations of statistical methods used in nutrigenetics.
2. Understand the value of various high throughput omics techniques (epigenetics, metabolomics, mitochondrial genomics, and microbiome) in precision nutrition research.
3. Interpret the impact of deep phenotyping (e.g., taste perception and smell acuity and various disease conditions) on nutrition recommendations.
4. Describe the challenges and controversies in studying precision nutrition, including equity, affordability, accessibility, sustainability, adherence in general population.
5. Understand and critically evaluate current applications of precision nutrition, including in research, healthcare, and consumer applications.
6. Critically evaluate precision nutrition research publications.

Texts or Materials: To further understand the material, a selection of classic and contemporary research articles will be assigned. All readings will be posted online at the Canvas course site (https://canvas.tufts.edu).

Academic Conduct: Each student is responsible for upholding the highest standards of academic integrity, as specified in the Friedman School's Policies and Procedures Handbook and Tufts University policies (http://students.tufts.edu/student-affairs/student-life-policies/academic-integrity-policy). It is the responsibility of each student to understand and comply with these standards, as violations will be sanctioned by penalties ranging from failure on an assignment and the course to dismissal from the school.

Online/in-person Discussions: Students will be expected to complete all required readings (reports and research articles) prior to each class. Students are encouraged to ask questions and responding to others' questions or initiating a discussion topic relevant to the required readings by participating in Canvas Discussion. Students are also encouraged to ask questions and comment for lectures. Submission of questions/comments based on readings and lectures will account up to 10% of the final course grade.

Participation: Lectures are intended to teach important concepts. Students are expected to attend all meetings and ask questions and provide comments. A rubric describing desirable types of participation is found in the Class Participation Evaluation. Participation accounts for up to 20% of the final course grade.

Instructions for Submission of Homework: There will be two homework that will focus on concepts needed to complete the final course project. Each assignment will account for up to 20% of the total course grade. Homework will be released at the end of a stated week's class and must be submitted prior to the beginning of the next week's class.

Project: There will be one project to be submitted by the end of the last day of this course. The project attempts to brings together concepts to showcase what the student has learned throughout the course. Students will write a brief critical review of a research paper. Students will need to identify, summarize, and evaluate the selected paper. The instructor will select and assign a paper to each student. Students are required to provide the background of selected research, explain relevant methods, present important findings, and discuss the authors' conclusions. To assist in research paper evaluation, the EQUATOR reporting guidelines (https://www.equator-network.org/reporting-guidelines/consort/) will be used. Students will use the CONSORT checklist for clinical trials and the STROBE checklist for observational studies. Early in the course a paper featuring a randomized controlled trial and a paper featuring an observational study (see required reading 3 and 4 for the first meeting) will be reviewed and the instructor will demonstrate use the CONSORT and STROBE checklists to evaluate the quality of the two selected papers.

Late policies for homework and project: Homework and project report should be submitted on time; however, extenuating circumstances can arise that make this difficult. If you cannot meet a deadline, please ask instructor for an

extension in advance by email prior to the deadline with a brief explanation. If you experience an emergency and are unable to notify me prior to the deadline, please reach out as soon as you are able to discuss a plan. Assignments submitted without an extension or alternative arrangement will not be accepted.

Assessment and Grading: *Grading for the course will be based on the below distribution:*

Grading Range:

Online Discussions	10%
Class Participation (6)	20%
Homework (2)	40%
Project (1)	30%

Class Participation Evaluation		
Desirable (20 points)	Needs Improvement (10 points)	Unsatisfactory (5 points)
Frequently participates in-class discussion (at least once per class) Questions and comments are insightful and relevant to the topic Respectful to others	Occasionally participates in-class discussion (Once per 2-3 classes) Questions and comments are sometimes insightful and/or relevant to the topic	Rarely or never participates in-class discussion Questions and comments lack insight and/or are not relevant to the topic Not respectful to others

Project Evaluation Each of the 5 rows represents a category of evaluation and scores for each category range along a continuous distribution from a maximum of 6 points and a minimum of 2 points. Descriptors are provided to illustrate the continuum.		
Desirable	Needs Improvement	Unsatisfactory
Clearly identify the hypothesis, rationale, and study design of the selected paper	Partially identify the hypothesis, rationale, and study design of the selected paper	Not able to identify the hypothesis, rationale, and study design of the selected paper
Able to justify paper evaluation using the corresponding EQUATOR checklist	Partially justify paper evaluation using the corresponding EQUATOR checklist	Not able to justify paper evaluation using the corresponding EQUATOR checklist
Able to consider common ethical issues in the selected paper	Partially consider common ethical issues in the selected paper	Not able to consider common ethical issues in the selected paper
Able to integrate your observations, opinions, and ideas on the paper to construct an effective critique	Partially integrate your observations, opinions, and ideas on the paper to construct an effective critique	Not able to integrate your observations, opinions, and ideas on the paper to construct an effective critique
Able to write a clear and succinct comments on both strengths and weaknesses of the paper	Partially write a clear and succinct comments on both strengths and weaknesses of the paper	Not able to write a clear and succinct comments on both strengths and weaknesses of the paper

A passing grade in the course is B- or better. Course grades will be based on the below (subject to revision during the course):

Grading Scale	
A	94-100
A-	90-93
B+	87-89
B	84-86
B-	80-83
C+	77-79
C	73 or less

Accommodation of Disabilities: Tufts University is committed to providing equal access and support to all students through the provision of reasonable accommodations so that each student may access their curricula and achieve their personal and academic potential. If you have a disability that requires reasonable accommodations, please contact the Friedman School Assistant Dean of Student Affairs at 617-636-6719 to plan for determination of appropriate accommodations. Please be aware that accommodations cannot be enacted retroactively, making timeliness a critical aspect for their provision.

Tufts Zoom or Tufts Webex: The Friedman School's on-campus courses may be offered by Tufts Zoom (https://access.tufts.edu/zoom) or WebEx (https://it.tufts.edu/webex) on days when the Boston campus is closed due to pandemic, weather or a temporary cancellation issue. Students should expect to be notified by email in the event that class is cancelled and will be provided with the Zoom link for students to attend any remote class sessions during the normally scheduled class period. The Zoom or WebEx meeting video and audio will be recorded and posted on Canvas (https://login.canvas.tufts.edu/). when completed. If an on-campus Examination/Presentation was scheduled on a day when the Boston campus is closed due to weather or a temporary cancellation issue and cannot be conducted by zoom, the exam/presentation will be rescheduled for an alternate on-campus class session date.

Course Website: Lecture slides and other materials are available on the class website at Canvas.

Week	DATE	Section	COURSE TOPIC	LECTURER	Homework /Project Due
1	Jan 22 (Monday)	3:15 – 4:45pm	course overview	Jiantao Ma	
		4:45 – 6:15pm	Evaluation of personalized nutrition literature (clinical trials)	Jiantao Ma	
2	Jan 29 (Monday)	3:15 – 4:45pm	Digital health for personal nutrition (The real world of the precision nutrition industry 1)	Caroline Carney (Good measure)	
		4:45 – 6:15pm	Evaluation of personalized nutrition literature (observational study)	Jiantao Ma	
3	Feb 5 (Monday)	3:15 – 4:45pm	Circadian rhythm and diet	Hassan Dashti (MGH)	
		4:45 – 6:15pm	Evaluation of personalized nutrition literature (write a review)	Jiantao Ma	1st homework
4	Feb 12 (Monday)	3:15 – 4:45pm	Personalized nutrition communication (The real world of the precision nutrition industry 2)	Ashley Koff (Better Nutrition Program)	
		4:45 – 6:15pm	Assessment of dietary intake and nutritional status	Jiantao Ma	
5	Feb 22 (Thursday)	3:15 – 4:45pm	Personalized nutrition: ethical issues	Sara C. Folta	
		4:45 – 6:15pm	Personalized nutrition: regulations and customer protection	Peter Lurie (CSPI)	
6	Feb 26 (Monday)	3:15 – 4:45pm	Gut microbiome and disease diagnosis and prognosis	Naisi Zhao (PHCM)	
		4:45 – 6:15pm	Deep phenotyping in precision nutrition	Jiantao Ma	
7	Mar 4 (Monday)	3:15 – 4:45pm	Molecular Correlates of Diet	Maura Walker (BU)	
		4:45 – 6:15pm	Personal health (The real world of the precision nutrition industry 3)	Gil Blander (Inside Tracker)	
8	Mar 11 (Monday)	3:15 – 4:45pm	Implementation of behavioral science to initiate and sustain healthy eating	Larissa Calancie	
		4:45 – 6:15pm	Biomarkers of diet-microbiome interactions and health	Meng Wang	2nd homework
Spring Recess					
9	Mar 25 (Monday)	3:15 – 4:45pm	Precision public health	Dariush Mozaffarian	
		4:45 – 6:15pm	Epigenetic biomarkers of diet	Jiantao Ma	
10	Apr 1 (Monday)	3:15 – 4:45pm	Diet-gene interaction: current research	Chao-Qiang Lai	
		4:45 – 6:15pm	Nutrition for precision health	Sai Krupa Das	
11	Apr 8 (Monday)	3:15 – 4:45pm	Dietary Patterns and Sustainability	Naglaa El-Abbadi	
		4:45 – 6:15pm	Novel study design: n-of-1 trials	Ju-Sheng Zheng (Westlake)	
12	Apr 22 (Monday)	3:15 – 4:45pm	Microbiome and personalization (human interventions)	Daniel D. Wang (Harvard)	
		4:45 – 6:15pm	Diet-gene interaction: polygenic risk score	Jiantao Ma	
13	Apr 29 (Monday)	3:15 – 4:45pm	Integrated omics data in sugar-sweetened beverages and cardiometabolic risk	Danielle Haslam (Harvard)	
		4:45 – 6:15pm	Integrating metabolites in nutrition research	Jiantao Ma	Final project

- *This schedule is subject to modification at the instructor's discretion.*

Course Topics and Assignment Schedule at a Glance:
Detailed Description of Course Topics, Assignment Schedule, and the Learning Goals for Each Class Session:

Week 1 Date of Class: January 22 (Monday)

Section 1

Course topic:	Course overview
Lecturer:	Jiantao Ma
Learning objectives:	1. To discuss the scope of this course, explain expectations, and summary of course subjects
Required reading:	1. Personalized nutrition and health. DOI: 10.1136/bmj.k2173

Section 2

Course topic:	Evaluation of personalized nutrition literature (clinical trials)
Lecturer:	Jiantao Ma
Learning objectives:	1. Summarize the EQUATOR (Enhancing the QUAlity and Transparency Of health Research) checklist for reporting guidelines
Required reading:	1. CONSORT 2010 explanation and elaboration: updated guidelines for reporting parallel group randomized trials. DOI: 10.1136/bmj.c869 2. Effect of dairy consumption and its fat content on glycemic control and cardiovascular disease risk factors in patients with type 2 diabetes: a randomized controlled study. DOI: 10.1093/ajcn/nqaa138

Week 2 Date of Class: January 29 (Monday)

Section 1

Course topic:	Digital health for personal nutrition (The real world of the precision nutrition industry 1)
Lecturer:	Caroline Carney (Good measure)
Learning objectives:	1. Summarize the current landscape of precision nutrition industry 2. Discuss translational research on precision nutrition and its current and potential future applications 3. Identify policies and regulations regarding precision nutrition 4. Propose important elements of go-to-market strategies
Required reading:	1. Effect of low-fat vs low-carbohydrate diet on 12-month weight loss in overweight adults and the association with genotype pattern or insulin secretion. DOI: 10.1001/jama.2018.0245

Section 2

Course topic:	Evaluation of personalized nutrition literature (observational study)
Lecturer:	Jiantao Ma
Learning objectives:	1. Summarize the EQUATOR (Enhancing the QUAlity and Transparency Of health Research) checklist for reporting guidelines
Required reading:	1. Strengthening the Reporting of Observational Studies in Epidemiology (STROBE): explanation and elaboration. DOI: 10.1371/journal.pmed.0040297 2. Prospective study of a diabetes risk reduction diet and the risk of breast cancer. DOI: 10.1093/ajcn/nqaa268

Week 3 Date of Class: February 5 (Monday)

Section 1

Course topic:	Circadian rhythm and diet
Lecturer:	Hassan Dashti (Massachusetts General Hospital)

Learning objectives: 1. To analyze interaction of diet and circadian rhythm and their relationship with disease development

Required reading: 1. Morning diurnal preference and food intake: a Mendelian randomization study. DOI: 10.1093/ajcn/nqaa219
2. Genetics of Sleep and Insights into Its Relationship with Obesity. DOI: 10.1146/annurev-nutr-082018-124258

Section 2

Course topic: Evaluation of personalized nutrition literature (write a review)

Lecturer: Jiantao Ma

Learning objectives: 1. To summarize the elements of a literature review
2. To describe the process to write a literature review

Required reading: 1. How I review an original scientific article DOI: 10.1164/rccm.200204-324OE
2. How to review a paper. DOI: 10.1152/advan.00057.2002
3. Manuscript peer review: a helpful checklist for students and novice referees. DOI: 10.1152/advances.2000.23.1.S52

Week 4 Date of Class: February 12 (Monday)

Section 1

Course topic: Personalized nutrition communication

Lecturer: Ashley Koff (Better Nutrition Program)

Learning objectives: 1. To describe what is (and is not) personalized nutrition
2. To describe the role of the patient and the practitioner in personalized nutrition
3. To describe the opportunities to develop / amplify personalized nutrition in the marketplace
4. To discuss how do we make personalized nutrition accessible for all

Required reading: 1. Perspective: Guiding Principles for the Implementation of Personalized Nutrition Approaches That Benefit Health and Function. DOI: 10.1093/advances/nmz086

Section 2

Course topic: Assessment of dietary intake and nutritional status

Lecturer: Jiantao Ma

Learning objectives: 1. To identify the limitations of current dietary assessment methods
2. To describe the use of novel dietary assessment tools in estimating diet-disease association and monitoring dietary compliance

Required reading: 1. Quantitative Dietary Fingerprinting (QDF)-A Novel Tool for Comprehensive Dietary Assessment Based on Urinary Nutrimetabolomics. DOI: 10.1038/s41366-020-0628-1
2. A Novel Food Record App for Dietary Assessments Among Older Adults with Type 2 Diabetes: Development and Usability Study. DOI: 10.2196/14760

Week 5 Date of Class: February 22 (Thursday)

Section 1

Course topic: Personalized nutrition: ethical issues

Lecturer: Sara C. Folta

Learning objectives: 1. Describe ethical principles
2. Discuss the equity issues related to precision nutrition

Required reading: 1. An ethical framework for the prevention of overweight and obesity: a tool for thinking through a programme's ethical aspects. DOI: 10.1093/eurpub/cks052
2. Two threats to precision medicine equity. DOI: 10.18865/ed.29.S3.629

Section 2

Course topic:	Personalized nutrition: regulations and customer protection
Lecturer:	Peter Lurie (Center for Science in the Public Interest)
Learning objectives:	1. To describe legal challenges and legislative issues around the precision nutrition 2. To describe current regulations to protect consumers
Required reading:	https://www.cspinet.org/about

Week 6 Date of Class: February 26 (Monday)

Section 1

Course topic:	Gut microbiome and disease diagnosis and prognosis
Lecturer:	Naisi Zhao
Learning objectives:	1. Describe role of the gut microbiome in a variety of diseases 2. Discuss usefulness of gut microbiome in disease diagnosis and prognosis 3. Discuss novel gut microbiome targets for disease treatment
Required reading:	1. Dynamics of the Gut Mycobiome in Patients With Ulcerative Colitis. Sushrut Jangi, Katie Hsia, Naisi Zhao, Carol A Kumamoto, Sonia Friedman, Siddharth Singh, Dominique S Michaud. Clin Gastroenterol Hepatol, 2023 Oct 5:S1542-3565(23)00762-0. doi: 10.1016/j.cgh.2023.09.023 2. Microbial-host isozyme: A novel target in "drug the bug" strategies for diabetes. Guojun Wu, Naisi Zhao, Liping Zhao. Cell Metab, 2023 Oct 3;35(10):1677-1679. doi: 10.1016/j.cmet.2023.09.008

Section 2

Course topic:	Deep phenotyping in precision nutrition (taste perception and preference)
Lecturer:	Jiantao Ma
Learning objectives:	1. Describe five basic taste perceptions 2. Discuss genetic basis of taste perceptions 3. Describe common approaches to measure taste perceptions 4. Discuss the strengths and limitations of quantification measures of taste perceptions 5. Describe relations of food choices and taste perceptions
Required reading:	1. Prevalence and risk factors of taste and smell impairment in a nationwide representative sample of the US population: a cross-sectional study. DOI: 10.1136/bmjopen-2016-013246 2. Association between taste perception and adiposity in overweight or obese older subjects with metabolic syndrome and identification of novel taste-related genes. DOI: 10.1093/ajcn/nqz038

Week 7 Date of Class: March 4 (Monday)

Section 1

Course topic:	Molecular Correlates of Diet
Lecturer:	Maura Walker (Boston University)
Learning objectives:	1. Summarize high throughput approaches to examine proteomics and metabolomics 2. Define proteomics and metabolomics and provide the rationale for how these methods can contribute to nutrition research. 3. Discuss strengths and limitations of current nutrition research utilizing proteomics and metabolomics
Required reading:	1. The Mediterranean diet, plasma metabolome, and cardiovascular disease risk. Li et al. Eur Heart J. DOI: 10.1093/eurheartj/ehaa209 2. Dairy Intake in 2 American Adult Cohorts Associates with Novel and Known Targeted and Nontargeted Circulating Metabolites. DOI: 10.1093/jn/nxaa021

3. Serum untargeted metabolomic profile of the Dietary Approaches to Stop Hypertension (DASH) dietary pattern. Rebholz et al. DOI: 10.1093/ajcn/nqy099

Section 2

Course topic: Personal health (The real world of the precision nutrition industry 3)

Lecturer: Gil Blander (Inside Tracker)

Learning objectives:
1. To explain how scientific knowledge and the concept of precision nutrition is being used in the real world
2. To describe the novel technologies may advance this field
3. To identify key steps to guarantee high industrial standards
4. To discuss expectation from the industry regarding the most needed scientific knowledge

Required reading:
1. Nutrigenomics and personalized nutrition: science and concept. DOI: 10.2217/17410541.5.5.447
2. Personalized Nutrition and Omics. DOI: 10.1016/B978-0-08-100596-5.22880-1

Week 8 Date of Class: March 11 (Monday)

Section 1

Course topic: Implementation of behavioral science to initiate and sustain healthy eating

Lecturer: Larissa Calancie

Learning objectives: 1. To describe systematic analysis and investigation of behavioral factors in initiate and sustain healthy eating

Required reading:
1. A Cluster Randomized Trial of a Community-Based Intervention Among African-American Adults: Effects on Dietary and Physical Activity Outcomes. DOI: 10.1007/s11121-019-01067-5
2. Developing Theory to Guide Building Practitioners' Capacity to Implement Evidence-Based Interventions. DOI: 10.1177/1090198115610572

Section 2

Course topic: Biomarkers of diet-microbiome interactions and health

Lecturer: Meng Wang

Learning objectives:
1. Provide an overview of diet-microbiome interaction and health
2. Summarize current research on selected gut microbiota-generated metabolites and cardiometabolic health
3. Provide an in-depth review on TMAO and cardiometabolic health including measurement of TMAO, biological mechanisms, and population-based studies.

Required reading: 1. The Association of Plasma Trimethylamine N-Oxide with All-Cause and Cardiovascular Mortality: The Multi-Ethnic Study of Atherosclerosis. DOI: 10.1093/cdn/nzab033_063

Week 9 Date of Class: March 25 (Monday)

Section 1

Course topic: Precision public health

Lecturer: Dariush Mozaffarian

Learning objectives: 1. To identify research gap, opportunities, and challenges in precision nutrition and potential impact of precision public health

Required reading:
1. Precision Public Health for the Era of Precision Medicine. DOI: 10.1016/j.amepre.2015.08.031
2. Seeking precision in public health. DOI: 10.1038/s41591-019-0556-6
3. Editorial: Precision Public Health. DOI: 10.3389/fpubh.2018.00121

Section 2

Course topic:	Epigenetic biomarkers of diet
Lecturer:	Jiantao Ma
Learning objectives:	1. Define epigenetics and discuss its role in chronic diseases and aging. 2. Describe common epigenetic modifications of DNA. 3. Provide examples of how dietary exposures that influence epigenetic regulations. 4. Discuss the utility of Mendelian randomization in epigenetic research
Required reading:	1. Epigenetics: A new bridge between nutrition and health. DOI: 10.3945/an.110.1004 2. Diet and the epigenome. DOI: 10.1038/s41467-018-05778-1

Week 10 Date of Class: April 1 (Monday)

Section 1

Course topic:	Diet-gene interaction
Lecturer:	Chao-Qiang Lai
Learning objectives:	1. Define gene-diet interaction and identify relevant examples 2. Provide examples of appropriate statistical models to analyze gene-diet interactions 3. Explain power requirements for gene-diet interaction studies 4. Describe challenges exist when incorporating diet into interaction analyses
Required reading:	1. Gene-diet interaction and precision nutrition in obesity. DOI: 10.3390/ijms18040787 2. Gene-lifestyle interaction on risk of type 2 diabetes: A systematic review. DOI: 10.1111/obr.12921 3. Nutrigenomics, the Microbiome, and Gene-Environment Interactions: New Directions in Cardiovascular Disease Research, Prevention, and Treatment. DOI:10.1161/HCG.0000000000000030

Section 2

Course topic:	Nutrition for precision health
Lecturer:	Sai Krupa Das
Learning objectives:	1. To discuss the scope, quality, and impact of nutrition research supported by the NIH 2. To identify the key issues and challenges in precision nutrition strategies
Required reading:	1. 2020-2030 Strategic Plan for NIH Nutrition Research (https://dpcpsi.nih.gov/onr/strategic-plan) 2. Personalized nutrition and health. DOI: 10.1136/bmj.k2173

Week 11 Date of Class: April 8 (Monday)

Section 1

Course topic:	Dietary Patterns and Sustainability
Lecturer:	Naglaa El-Abbadi
Learning objectives:	1. Describe a systems approach to address the environmental impacts of current food production and consumption patterns. 2. Discuss sustainable dietary patterns as a key strategy for meeting present and future food needs.
Required reading:	1. Systematic Review of Dietary Patterns and Sustainability in the United States. Sarah L Reinhardt, Rebecca Boehm, Nicole Tichenor Blackstone, Naglaa H El-Abbadi, Joy S McNally Brandow, Salima F Taylor, Marcia S DeLonge. Advances in Nutrition, Volume 11, Issue 4, July 2020, Pages 1016–1031, https://doi.org/10.1093/advances/nmaa026

Section 2

Course topic:	Application of n-of-1 study design in precision nutrition
Lecturer:	Ju-Sheng Zheng (Westlake University)

Learning objectives: 1. Summarize the history of n-of-1 trial and basic principle behind this study design
2. Application of n-of-1 design in the precision nutritional research

Required reading: 1. Sedgwick P, What is an "n-of-1" trial? BMJ 2014;348:g2674; DOI: 10.1136/bmj.g2674
2. Potter T, Vieira R, de Roos B. Perspective: Application of N-of-1 Methods in Personalized Nutrition Research. Adv Nutr. 2021;12(3):579-589. DOI:10.1093/advances/nmaa173

Week 12 Date of Class: April 22 (Monday)

Section 1

Course topic: Microbiome and personalization

Lecturer: Dong Wang (Harvard)

Learning objectives: 1. The human microbiome: Definition & current understanding
2. Describe Sequencing-based microbial profiling
3. Discuss challenges and tools regarding incorporating the human microbiome into population-based studies
4. Discuss long-term usual diet vs. short-term interventions regarding diet and gut microbiome

Required reading: 1. Sonnenburg JL, Bäckhed F. Diet-microbiota interactions as moderators of human metabolism. DOI: 10.1038/nature18846

Section 2

Course topic: Diet-gene interaction: polygenic risk score

Lecturer: Jiantao Ma

Learning objectives: 1. Describe a polygenic risk score and the utility of polygenic risk score in the development of various chronic diseases
2. Summarize common methods to develop polygenic risk score
3. Describe strengths and limitations of using genetic risk scores in diet-gene interaction analysis

Required reading: 1. Fried food consumption, genetic risk, and body mass index: gene-diet interaction analysis in three US cohort studies. DOI: 10.1136/bmj.g1610

Week 13 Date of Class: April 29 (Monday)

Section 1

Course topic: Integrated omics data in sugar-sweetened beverages and cardiometabolic risk

Lecturer: Danielle Haslam (Harvard)

Learning objectives: 1. Interactions between sugar-sweetened beverage consumption and genetic variants in the CHREBP pathway on cardiometabolic risk factors
2. Using metabolomics to advance precision nutrition by (1) identifying objective biomarkers of beverage consumption and (2) revealing novel insights into the mechanisms linking beverage consumption and cardiometabolic disease risk

Required reading: 1. Fructose metabolism and metabolic disease. DOI: 10.1172/JCI96702
2. Interactions between Genetics and Sugar-Sweetened Beverage Consumption on Health Outcomes: A Review of Gene-Diet Interaction Studies. DOI: 10.3389/fendo.2017.00368
3. Sugar-Sweetened Beverage Consumption May Modify Associations Between Genetic Variants in the CHREBP (Carbohydrate Responsive Element Binding Protein) Locus and HDL-C (High-Density Lipoprotein Cholesterol) and Triglyceride Concentrations. DOI: 10.1161/CIRCGEN.120.003288

Section 2

Course topic:	Integrating metabolites in nutrition research
Lecturer:	Jiantao Ma
Learning objectives:	1. Describe utilization of metabolomics in nutrition research 2. Discuss study designs integrating metabolomics in nutrition research
Required reading:	1. Li J, Guasch-Ferré M, Chung W, Ruiz-Canela M, Toledo E, Corella D, et al. The Mediterranean diet, plasma metabolome, and cardiovascular disease risk. Eur Heart J. 2020 Jul 21; 41(28): 2645-2656. 2. Dietary metabolic signatures and cardiometabolic risk. Ravi V Shah, Lyn M Steffen, Matthew Nayor, Jared P Reis, David R Jacobs, Norrina B Allen, Donald Lloyd-Jones, Katie Meyer, Joanne Cole, Paolo Piaggi, Ramachandran S Vasan, Clary B Clish, Venkatesh L Murthy. Eur Heart J. 2023 Feb 14;44(7):557-569. doi: 10.1093/eurheartj/ehac446.