NUTRITIONAL ASPECTS OF LIPIDS

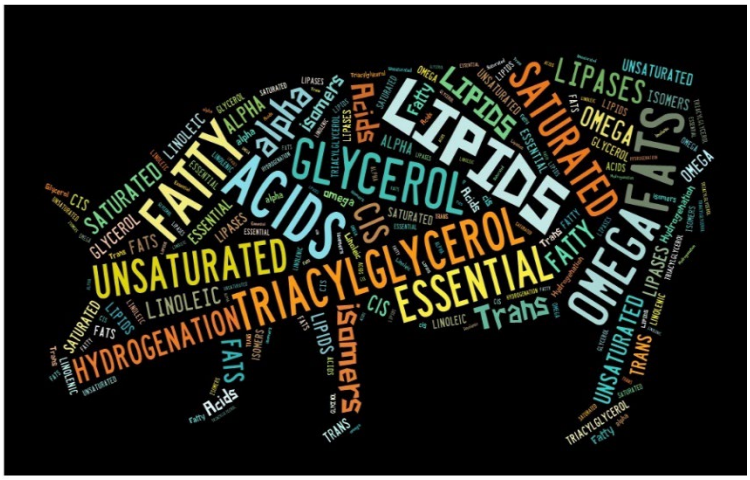
HUN 6301

3 CREDIT HOURS

SPRING 2024

ZOOM
(HTTPS://UFLPHI.ZOOM.US/J/4742141397)

TWO 75 MINUTE PERIODS BEGINNING AT
3:00 PM ON TUESDAY AND FRIDAY



middleearthbiochem.wordpress.com

INSTRUCTOR: Peggy R. Borum, Ph.D.
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OFFICE HOURS: Wednesdays at 3:00 PM and Sundays at 3:00 PM in zoom room https://uflphi.zoom.us/j/4742141397 or by appointment.

COURSE WEBSITE: http://lss.at.ufl.edu

COURSE COMMUNICATIONS: Communication is important to all of us. For email communication, use of the Canvas email is probably the better choice because the instructor's regular email box is often overflowing.

Required Text: INSTEAD OF A REQUIRED TEXT, WE WILL USE ARTICLES PUBLISHED IN THE FOLLOWING JOURNALS:

- Nature
- Eur J Med Res
- Trends Endocrinol Metab
- Front Endocrinol (Lausanne)
- Science
- J Neuropsychiatry Clin Neurosci
- Eur J Nucl Med Mol Imaging
- Diabetes Ther
- Pediatr Diabetes

- Eur J Paediatr Neurol
- Hepatol Commun
- J Clin Med
- Nutrition reviews
- Clin Chem
- Mol Neurobiol

The specific articles and the presenters are listed in the following table.

Presenter	Article #	Citation
	Article 1	91395 **- Identification of an alternative triglyceride biosynthesis pathway** G. L. McLelland, M. Lopez-Osias, C. R. C. Verzijl, B. D. Ellenbroek, R. A. Oliveira, N. J. Boon, et al. Nature 2023 Vol. 621 Issue 7977 Pages 171-178 91394 -**Previously unknown pathway for lipid biosynthesis discovered** J. E. Schaffer Nature 2023 Vol. 621 Issue 7977 Pages 47-48
	Article 2	91403 **- A comprehensive review of the family of very-long-chain fatty acid elongases: structure, function, and implications in physiology and pathology** X. Wang, H. Yu, R. Gao, M. Liu and W. Xie Eur J Med Res 2023 Vol. 28 Issue 1 Pages 532
	Article 3	91370 **- Mechanisms of hepatic fatty acid oxidation and ketogenesis during fasting** P. M. M. Ruppert and S. Kersten Trends Endocrinol Metab 2023
	Article 4	91402 **- ChREBP-Mediated Regulation of Lipid Metabolism: Involvement of the Gut Microbiota, Liver, and Adipose Tissue** K. Iizuka, K. Takao and D. Yabe Front Endocrinol (Lausanne) 2020 Vol. 11 Pages 587189
	Article 5	91388 **- The gut microbiota reprograms intestinal lipid metabolism through long noncoding RNA Snhg9** Y. Wang, M. Wang, J. Chen, Y. Li, Z. Kuang, C. Dende, et al. Science 2023 Vol. 381 Issue 6660 Pages 851-857 91386 - **The gut–Snhg9 interplay as a new path to metabolic health** J. Chen, X. Chen and J. Gao Trends in Endocrinology & Metabolism 2023
	Article 6	91382 **- Ketone Bodies and Brain Metabolism: New Insights and Perspectives for Neurological Diseases** W. Lopez-Ojeda and R. A. Hurley J Neuropsychiatry Clin Neurosci 2023 Vol. 35 Issue 2 Pages 104-109

	Article 7	91381 **- Regional brain glucose metabolism is differentially affected by ketogenic diet: a human semiquantitative positron emission tomography** T. Horowitz, E. Doche, M. Philip, S. Cammilleri, L. Suissa and E. Guedj Eur J Nucl Med Mol Imaging 2023 Vol. 50 Issue 7 Pages 2047-2055
	Article 8	91378 **- Does a Ketogenic Diet Have a Place Within Diabetes Clinical Practice? Review of Current Evidence and Controversies** C. H. Firman, D. D. Mellor, D. Unwin and A. Brown Diabetes Ther 2023 Pages 1-21
	Article 9	91400 **- Medical management of children with type 1 diabetes on low-carbohydrate or ketogenic diets** A. A. Rydin, G. Spiegel, B. I. Frohnert, A. Kaess, L. Oswald, D. Owen and K. M. Simmons Pediatr Diabetes 2021 Vol. 22 Issue 3 Pages 448-454
	Article 10	91375 **- Is ketogenic diet a 'precision medicine'? Recent developments and future challenges** R. Falsaperla, V. Sortino, P. Striano, G. Kluger, G. Ramantani, M. Ruggieri and E. Network for Therapy in Rare Eur J Paediatr Neurol 2023 Vol. 48 Pages 13-16
	Article 11	91405 **- Overview and prospect of NAFLD: Significant roles of nutrients and dietary patterns in its progression or prevention** T. Mao, Y. Sun, X. Xu and K. He Hepatol Commun 2023 Vol. 7 Issue 10
	Article 12	91406 **- Sugar and Dyslipidemia: A Double-Hit, Perfect Storm** A. Gugliucci J Clin Med 2023 Vol. 12 Issue 17 Biochem Pharmacol 2022 Vol. 206 Pages 115346
	Article 13	91393 **- Medium-chain fatty acids for the prevention or treatment of Alzheimer's disease: a systematic review and meta-analysis** C. B. Castro, C. B. Dias, H. Hillebrandt, H. R. Sohrabi, P. Chatterjee, T. M. Shah, et al. Nutrition reviews 2023 Pages nuac104
	Article 14	91411 **- Reevaluating the Role of High-Density Lipoprotein Cholesterol: New Perspectives on Cardiovascular Disease and Alzheimer Disease** E. W. Kjeldsen, J. Luo, L. T. Nordestgaard, N. Sandau and R. Frikke-Schmidt Clin Chem 2023 Vol. 69 Issue 12 Pages 1329-1332
	Article 15	91385 **- Omega-3 Polyunsaturated Fatty Acids Protect Neurological Function After Traumatic Brain Injury by Suppressing Microglial Transformation to the Proinflammatory Phenotype and Activating Exosomal NGF/TrkA Signaling**

		L. Lin, S. Zheng, J. Lai, D. Ye, Q. Huang, Z. Wu, et al. Mol Neurobiol 2023 Vol. 60 Issue 10 Pages 5592-5606

Feel like you may need a little background review and update on the current knowledge concerning the nutritional aspects of lipids? There are PowerPoint files on the course Canvas account about the following topics using mainly material from the book entitled "**The Molecular Nutrition of Fats**" edited by Vinood B. Patel and published in 2018 by Elsevier:

Classes, Nomenclature, and Functions of Lipids and Lipid-Related Molecules and the Dietary Lipids

Lipid Metabolism: An Overview

Fatty Acids, Gut Bacteria, and Immune Cell Function

Omega-3 Fatty Acids and Epilepsy

Docosahexaenoic Acid (DHA): A Dietary Supplement With Promising Anticancer Potential

Strategies to Counter Saturated Fatty Acid (SFA)-Mediated Lipointoxication

You may be interested in reviewing the following textbooks you studied in biochemistry and metabolism courses. You may also want to download the fowling book available through the UF library:

Emerging Role of Lipids in Metabolism and Disease
Pallottini, Valentina; Pallottini, Valentina; Segatto, Marco
2021
https://mdpi-res.com/bookfiles/book/3565/Emerging_Role_of_Lipids_in_Metabolism_and_Disease.pdf?v=1703873491

PURPOSE OF COURSE: The purpose of the course is to provide opportunities for students to increase their knowledge of the nutritional aspects of lipids, to critically read the current literature, to communicate the author's ideas, and to communicate their own ideas using traditional techniques and social media. A project addressing a real-world nutrition problem addressing the Topic "Food is Medicine - The disruptive story of the role of fat in food?" will replace the traditional exams.

COURSE GOALS AND/OR OBJECTIVES: By the end of this course, students will:

- Practice reading and evaluating, in an organized written format, the current literature concerning the nutritional aspects of lipids.
- Demonstrate their skills at leading and participating in oral discussions concerning nutritional aspects of lipids.
- Apply some nutritional aspects of lipids to a current research topic facing the nutritional community.

INSTRUCTIONAL METHODS: This class is designed to increase our knowledge of the nutritional aspects of lipids, to facilitate our critical thinking and application of our knowledge to a real-world nutrition issue, and to provide opportunities for us to communicate our ideas.

Class presentation and participation - You will be assigned 3 recent articles which will be read by all the class before your presentations. Each article addresses a current question about the nutritional aspects of lipids. You will present the information in the article and any relevant information that you choose. You will be graded on your presentation of the information and your ability to lead a discussion among your classmates on the topic.

For the class periods that you are a reader, you will post to the assignment tool in Canvas your review of the article using the following outline:

I. Questions being addressed by authors
II. Why the authors did what they did
III. What the authors did
IV. What the authors found
V. Authors' take-home message
VI. My comments
VII. Contribution to our understanding of the nutritional aspects of lipids

You will also be graded on your verbal participation in the class discussion.

CLASS PROJECT – DISRUPTIVE SCIENTIFIC THINKING –

On January 5, 2023, Nature published the following paper:

Papers and patents are becoming less disruptive over time
M. Park, E. Leahey and R. J. Funk
Nature 2024 Vol. 613 Issue 7942 Pages 138-144
Accession Number: 36600070 DOI: 10.1038/s41586-022-05543-x
https://www.ncbi.nlm.nih.gov/pubmed/36600070

Theories of scientific and technological change view discovery and invention as endogenous processes (1,2), wherein previous accumulated knowledge enables future progress by allowing researchers to, in Newton's words, 'stand on the shoulders of giants'(3-7). Recent decades have witnessed exponential growth in the volume of new scientific and technological knowledge, thereby creating conditions that should be ripe for major advances (8,9). Yet contrary to this view, studies suggest that progress is slowing in several major fields (10,11). Here, we analyse these claims at scale across six decades, using data on 45 million papers and 3.9 million patents from six large-scale datasets, together with a new quantitative metric-the CD index (12)-that characterizes how papers and patents change networks of citations in science and technology. We find that papers and patents are increasingly less likely to break with the past in ways that push science and technology in new directions. This pattern holds universally across fields and is robust across multiple different citation- and text-based metrics (1,13-17). Subsequently, we link this decline in disruptiveness to a narrowing in the use of previous knowledge, allowing us to reconcile the patterns we observe with the 'shoulders of giants' view. We find that the observed declines are unlikely to be driven by changes in the quality of published science, citation practices or field-specific factors. Overall, our results suggest that slowing rates of disruption may reflect a fundamental shift in the nature of science and technology.

Question – What is our disruptive scientific thinking about nutritional aspects of lipids?

In the writing below, the authors' words are in black, and my words are in blue.
Current understanding of how science moves forward:
Theories of scientific and technological change:

- **discovery** and invention = endogenous processes
- previous accumulated **knowledge** = future progress by allowing researchers to, in Newton's words, 'stand on the shoulders of giants' (confirm or somewhat extend previous ways of thinking)

What has been happening:

- Recent decades have witnessed **exponential growth in the volume of new scientific and technological knowledge**, thereby creating conditions that should be ripe for major advances.
- Yet contrary to this view, studies suggest that **progress is slowing in several major fields**.

What the authors did:

- Here, we analyse these claims at scale across six decades, using data on 45 million papers and 3.9 million patents from six large-scale datasets, together with a new quantitative metric—the CD index12—that characterizes how papers and patents change networks of citations in science and technology.

What the authors say they found:
We find that papers and patents are increasingly less likely to break with the past in ways that push science and technology in new directions.

- This pattern holds universally across fields and is robust across multiple different citation- and text-based metrics.
- Subsequently, we **link this decline in disruptiveness to a narrowing in the use of previous knowledge**, allowing us to reconcile the patterns we observe with the 'shoulders of giants' view. We find that the observed declines are **unlikely to be driven by changes in the quality of published science, citation practices or field-specific factors.**

Overall, our results suggest that slowing rates of disruption may reflect a **fundamental shift in the nature of science and technology. (yikes!!!)**

Wonderment -

- Wonder if we read more broadly and listened to more perspectives, our disruptive thinking about the nutritional aspects of lipids would break with the past in ways that push science and technology in new directions.
- Wonder if we focused on the short chain fatty acids and the long chain poly unsaturated fatty acids (instead of palmitate and stearate), our thinking could disrupt current approaches to push science forward.

Action Plan

Let's spend some time this semester finding out and then present our ideas concerning the topic "Food is Medicine - The disruptive story of the role of fat in food" with the following individual presentations posted on the web:

COURSE POLICIES:

ATTENDANCE POLICY*:* You have to be present in class in order to participate in class discussion

COURSE TECHNOLOGY: HUN 6301 is a blended course utilizing both Canvas and face to face lectures.

UF POLICIES:

UNIVERSITY POLICY ON ACCOMMODATING STUDENTS WITH DISABILITIES: Students requesting accommodation for disabilities must first register with the Dean of Students Office (http://www.dso.ufl.edu/drc/). The Dean of Students Office will provide documentation to the student who must then provide this documentation to the instructor when requesting accommodation. You must submit this documentation prior to submitting assignments or taking the quizzes or exams. Accommodations are not retroactive, therefore, students should contact the office as soon as possible in the term for which they are seeking accommodations.

UNIVERSITY POLICY ON ACADEMIC MISCONDUCT: Academic honesty and integrity are fundamental values of the University community. Students should be sure that they understand the UF Student Honor Code at http://www.dso.ufl.edu/students.php.

****NETIQUETTE: COMMUNICATION COURTESY:** All members of the class are expected to follow rules of common courtesy in all email messages, threaded discussions and chats. [Describe what is expected and what will occur as a result of improper behavior] http://teach.ufl.edu/docs/NetiquetteGuideforOnlineCourses.pdf

GETTING HELP:

For issues with technical difficulties for E-learning in Sakai, please contact the UF Help Desk at:

- Learning-support@ufl.edu
- (352) 392-HELP - select option 2
- https://lss.at.ufl.edu/help.shtml

** Any requests for make-ups due to technical issues MUST be accompanied by the ticket number received from LSS when the problem was reported to them. The ticket number will document the time and date of the problem. You MUST e-mail your instructor within 24 hours of the technical difficulty if you wish to request a make-up.

Other resources are available at http://www.distance.ufl.edu/getting-help for:

- Counseling and Wellness resources
- Disability resources
- Resources for handling student concerns and complaints
- Library Help Desk support

Should you have any complaints with your experience in this course please visit http://www.distance.ufl.edu/student-complaints to submit a complaint.

GRADING POLICIES:

Grades will be determined by adding the points obtained for each activity listed in the following table.

Assignment	Points
3 Class Presentations	45

12 journal article notes and class participation	24
Class presentation of disruptive thinking on your assigned topic	15
Disruptive thinking scientific white paper posted on the web concerning "Food is Medicine - The disruptive story of the role of fat in food"	16
Total	100

GRADING SCALE:

Final Grade	**Total Points**
A	93-100
A-	90-92
B+	87-89
B	83-86
B-	80-82
C+	77-79
C	73-76
C-	70-72
D+	67-69
D	63-66
D-	60-62

There will be no curve in this course. Final grades will be simply calculated from the total accumulated points.

COURSE SCHEDULE:

Spring 2024 Course Schedule

Week 1	
Tuesday January 9, 2024	**Course introduction and personalized planning for each student**
Friday –, January 12, 2024	Wonderments / Thinking outside the box / Disruptive thinking – Plan for disruptive thinking - Peggy
Week 2	
Tuesday January 16, 2024	Group discussion of each of the 5 subtopics of Food is Medicine - The disruptive story of the role of fat in food. – Led by Peggy
Friday –, January 19, 2024	Article 1 – 91395 **- Identification of an alternative triglyceride biosynthesis pathway** 91394 -**Previously unknown pathway for lipid biosynthesis discovered**
Week 3	
Tuesday January 23, 2024	Article 2 - 91403 **- A comprehensive review of the family of very-long-chain fatty acid elongases: structure, function, and implications in physiology and pathology**
Friday – January 26, 2024	Article 3 - 91370 **- Mechanisms of hepatic fatty acid oxidation and ketogenesis during fasting**
Week 4	
Tuesday January 30, 2024	Article 4 -91402 **- ChREBP-Mediated Regulation of Lipid Metabolism: Involvement of the Gut Microbiota, Liver, and Adipose Tissue**
Friday – February 02, 2024	Article 5 - 91388 **- The gut microbiota reprograms intestinal lipid metabolism through long noncoding RNA Snhg9** **91386** - The gut–Snhg9 interplay as a new path to metabolic health
Week 5	
Tuesday February 06, 2024	10 minute progress report by each student on development of their section of the class discussion topic

Friday – February 9, 2024	Article 6 - 91382 **- Ketone Bodies and Brain Metabolism: New Insights and Perspectives for Neurological Diseases**
Week 6	
Tuesday February 13, 2024	Article 7 - 91381 **- Regional brain glucose metabolism is differentially affected by ketogenic diet: a human semiquantitative positron emission tomography**
Friday – February 16, 2024	Article 8 - 91378 **- Does a Ketogenic Diet Have a Place Within Diabetes Clinical Practice? Review of Current Evidence and Controversies**
Week 7	
Tuesday February 19, 2024	Article 9 - 91400 **- Medical management of children with type 1 diabetes on low-carbohydrate or ketogenic diets** 91400 **- Medical management of children with type 1 diabetes on low-carbohydrate or ketogenic diets**
Friday – February 23, 2024	Article 10 - 91375 **- Is ketogenic diet a 'precision medicine'? Recent developments and future challenges**
Week 8	
Tuesday February 27, 2024	20 minute progress report by three students on development of their section of the class discussion topic
Friday – March 01, 2024	20 minute progress report by two students on development of their section of the class discussion topic
Week 9	
Tuesday March 5, 2024	Article 11 -91405 **- Overview and prospect of NAFLD: Significant roles of nutrients and dietary patterns in its progression or prevention**
Friday – March 8, 2024	Article 12 -91406 **- Sugar and Dyslipidemia: A Double-Hit, Perfect Storm**
Week 10	
March 11-15, 2024	**Have a great Spring Break!!**
Week 11	

Tuesday March 19, 2024	Article 13 -91393 **- Medium-chain fatty acids for the prevention or treatment of Alzheimer's disease: a systematic review and meta-analysis**
Friday - March 22, 2024	Article 14 -91411 **- Reevaluating the Role of High-Density Lipoprotein Cholesterol: New Perspectives on Cardiovascular Disease and Alzheimer Disease**
	Week 12
Tuesday March 26, 2024	Article 15 -91385 **- Omega-3 Polyunsaturated Fatty Acids Protect Neurological Function After Traumatic Brain Injury by Suppressing Microglial Transformation to the Proinflammatory Phenotype and Activating Exosomal NGF/TrkA Signaling**
Friday – March 28, 2024	Final presentation of scientific perspective article on **Impact of recent investigations into the metabolism of blood parameters of clinical lab "know your numbers."**
	Week 13
Tuesday April 02, 2024	Final presentation of scientific perspective article on **Comparison of the metabolism of individual medium chain fatty acids in different organs including the role of carnitine**
Friday – April 05, 2024	Final presentation of scientific perspective article on **Role of dietary fat in optimizing gut microbiome and role of gut microbiome in metabolism of dietary fat.**
	Week 14
Tuesday April 09, 2024	Final presentation of scientific perspective article on **Comparison of the metabolism of dietary individual omega-3 and omega-6 fatty acids and the effect of the quantities of each in the diet.**
Friday – April 12, 2024	Final presentation of scientific perspective article on **Comparison of different ratios of protein:carbohydrate:fat including the profile of each macronutrient and the total caloric intake relative to physiological need.**
	Week 15
Tuesday April 16, 2024	Reflection on the next steps to be taken in the disruptive story of the role of fat in food.
Friday – April 19, 2024	Discussion of the role of fat in food in our own research.
	Week 16
Tuesday April 23, 2024	**Celebration of Disruptive Thinking**
	Have a fantastic Summer 2024

Disclaimer: This syllabus represents my current plans and objectives. As we go through the semester, those plans may need to change to enhance the class learning opportunity. Such changes, communicated clearly, are not unusual and should be expected.