

Department of Nutrition, Gillings School of Global Public Health
University of North Carolina at Chapel Hill

Nutrition 400:

INTRODUCTION TO NUTRITIONAL BIOCHEMISTRY

Spring 2017

I. COURSE DESCRIPTION

This course provides introduction to biochemistry of macro- and micronutrients with a limited focus on medical aspects of nutrient deficiencies and metabolism. The NUTR 400 lectures focus on chemical structures, chemical properties, metabolism, and function of macro- and micronutrients. The main goal of this course is to prepare undergraduate and graduate students for more advanced nutritional biochemistry courses - NUTR 600 and NUTR 620.

NUTR 400 meets on Monday, Wednesday, and Friday from 11:15 am - 12:05 pm in McGavran-Greenberg Room 2301.

Pre-requisites: BIOL 101, CHEM 101, CHEM 102, and NUTR 240.

II. INSTRUCTORS

Course Director: Dr. Mirek Styblo

Professor of Nutrition

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Co-Instructor: Dr. Sergey Krupenko

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Teaching Assistants:

Liyang Zhao, PhD Candidate, liyangz9@email.unc.edu

Viveca Taylor, MPH-RD Candidate, vivecan@live.unc.edu

both Department of Nutrition

III. TEXTBOOK (Required)

Ferrier, D.R., **Lippincott's Illustrated Reviews: Biochemistry, 5th or 6th Edition**, Lippincott Williams & Wilkins, Baltimore, MD 2011 or 2013. (This is also the recommended textbook for NUTR 600.)

Additional Resources (recommended):

Nutrition, 3rd Edition, P. Insel, R. E. Turner, D. Ross (Eds.), Jones & Bartlett Publishers, 2007. (or later editions)

Bowman, Barbara A. & Russell, Robert M., Present Knowledge in Nutrition, 9th Edition, International Life Sciences Inst. Press, Washington, DC 2006.

Robert Murray, Victor Rodwell, David Bender, Kathleen M. Botham, P. Anthony Weil, Peter J. Kennelly, Harper's Illustrated Biochemistry, 28th Edition, LANGE Basic Science, McGraw Hill Companies, Inc. 2009. (or later editions)

Micronutrient Information Center, Linus Pauling Institute at Oregon State University: <http://lpi.oregonstate.edu/infocenter/>

Note: All lectures will be posted on Sakai in PowerPoint format prior to lecture date. All lectures will be recorded and the voice records will be posted on Sakai.

IV. LEARNING OBJECTIVES

By the end of this course, students will have a basic understanding of:

1. Chemical structures and chemical properties of macro- and micronutrients.
2. Processes involved in digestion and absorption of macro- and micronutrients.
3. Major pathways for metabolism of nutrients and key mechanisms regulating these pathways.
4. Essential functions of nutrients in human cells and tissues.
5. Pathologies associated with nutrient deficiencies, nutrient toxicities, and with common metabolic disorders.

V. TESTS, ASSIGNMENTS AND GRADING

You will be evaluated by 3 tests, 3 assignments (critical thinking problems), and a final exam. The final exam will be cumulative, covering the entire content of the course. The tests and final exam will each consist of 2 parts:

1. Multiple choice and true/false questions (30-40 points).
2. More complex, structured questions requiring short answers (60-70 points).

Final grades will be distributed as follows:

Test 1, 2, and 3:	15% each (a total of 45%)
Assignment 1, 2 and 3:	10% each (a total of 30%)
Final Exam:	25%

The grades are distributed as follows:

93-100 points:	H (A)	73-76 points:	L (C)
90-92 points:	H (A-)	70-72 points:	L (C-)
87-89 points:	P (B+)	67-69 points:	F (D+)
83-86 points:	P (B)	63-66 points:	F (D)
80-82 points:	P (B-)	60-62 points:	F (D-)
77-79 points:	L (C+)	<60 points:	F (F)

An additional 1 point can be earned through a short presentation – one presentation per student per course. The topic of this presentation should be in the area of nutrition and/or public health, and must include a strong biochemistry component. Five minutes will be provided for one student's presentation at the beginning of each lecture.

VI. ATTENDANCE POLICY

Students are expected to attend class regularly. Students are responsible for all materials and assignments discussed in class whether they are in attendance or not. Students are expected to be in class on time with cell phones turned off. It is distracting to your fellow students and to the presenter when you come in late.

VII. STUDENTS WITH DISABILITIES

Students with learning and other disabilities are advised to contact the Office of Accessibility Resources & Service (<http://accessibility.unc.edu/students>). This office works with students and the instructors to coordinate accommodations and services in the classroom and during tests and exams. Students must be registered with this office to be eligible for these services.

VIII. HONOR CODE

The Honor Code is in effect in this class and all others at the University. We are committed to treating Honor Code violations seriously and urge all students to become familiar with its terms set out at <https://studentconduct.unc.edu/>. If you have questions, it is your responsibility to ask the Course Instructors about the Code's application. All exams, written work and other projects must be submitted with a statement that you have complied with the requirements of the Honor Code in all aspects of the submitted work.

COURSE OUTLINE

Lecture	Date	Topic	Lecturer	Resources
1.	W 1/11	Introduction to Nutritional Biochemistry	Styblo	Sakai
2.	F 1/13	Amino acids: Chemistry and metabolism	Styblo	Lippincott's Biochem. Ch.1
	M 1/16	No Classes (UNC Holiday)		
3.	W 1/18	Proteins: Structure and function; enzymes	Styblo	Lippincott's Bioch. Ch.2-5 & Sakai
4.	F 1/20	Proteins: Digestion and degradation	Krupenko	Lippincott's Biochem. Ch.19, 20 & Sakai
5.	M 1/23	Disorders of amino acid and protein metabolism	Krupenko	Lippincott's Biochem. Ch. 3, 20, 21 & Sakai
6.	W 1/25	Nucleotide metabolism	Krupenko	Lippincott's Biochem. Ch.22
7.	F 1/27	DNA: Structure, replication and repair	Krupenko	Lippincott's Biochem. Ch.29
8.	M 1/30	Gene expression regulation: transcription factors, epigenetic regulation	Krupenko	Lippincott's Bioch. Ch.32 & Sakai
9.	W 2/1	RNA: Structure, synthesis and processing	Krupenko	Lippincott's Biochem. Ch.30
10.	F 2/3	Proteins: Synthesis and posttranslational modification	Krupenko	Lippincott's Biochem. Ch.31
	F 2/3	Review Session for Test #1	TAs/Styblo/ Krupenko	Time & place TBD
	M 2/6	Test #1	TAs	
	W 2/8	Assignment No. 1 - Review	Styblo/ Krupenko	
11.	F 2/10	Carbohydrates: Chemistry, digestion and absorption (dietary fiber)	Styblo	Lippincott's Biochem. Chapter.7
12.	M 2/13	Carbohydrates: Glycogen structure and metabolism	Styblo	Lippincott's Biochem. Ch.11
13.	W 2/15	Carbohydrates: Glycolysis	Styblo	Lippincott's Biochem. Ch.8
14.	F 2/17	Carbohydrates: TCA cycle and electron transport	Styblo	Lippincott's Biochem. Ch.6 & 9
15.	M 2/20	Carbohydrates: Gluconeogenesis & Cori Cycle	Styblo	Lippincott's Biochem. Ch.10
16.	W 2/22	Carbohydrates: Pentose phosphate pathway. Metabolism of ethanol	Styblo	Lippincott's Bioch. Ch.13 & Sakai
17.	F 2/24	Carbohydrate metabolism: Integration	Styblo	Sakai
18.	M 2/27	Disorders of carbohydrate metabolism; diabetes	Styblo	Lippincott's Bioch. Ch.25 & Sakai
19.	W 3/1	Lipids: Chemistry, digestion and absorption	Styblo	Lippincott's Biochem. Ch.15
20.	F 3/3	Lipids: Fatty acids and triacylglycerol metabolism	Styblo	Lippincott's Biochem. Ch.16
	F 3/3	Review Session for Test #2	TAs/Styblo	Time & place TBD
	M 3/6	Test #2	TAs	
	W 3/8	Assignment No. 2 - Review	Styblo	
21.	F 3/10	Lipids: Phospholipids	Styblo	Lippincott's Biochem. Ch.17
	3/13-3/17	No Classes (Spring Break)		

22.	M 3/20	Lipids: Cholesterol & plasma lipoproteins	Styblo	Lippincott's Biochem. Ch.18
23.	W 3/22	Disorders of lipid metabolism; atherosclerosis & cardiovascular disease	Styblo	Lippincott's Bioch. Ch.15-18 & Sakai
24.	F 3/24	Fat-soluble vitamins: Vitamin A & carotenoids (1)	Styblo	Lippincott's Bioch. Ch.28 & Sakai
25.	M 3/27	Fat-soluble vitamins: Vitamin A & carotenoids (2)	Styblo	Lippincott's Bioch. Ch.28 & Sakai
26.	W 3/29	Fat-soluble vitamins: Vitamin D	Styblo	Lippincott's Bioch. Ch.28 & Sakai
27.	F 3/31	Fat-soluble vitamins: Vitamins E and K	Styblo	Lippincott's Bioch. Ch.28 & Sakai
28.	M 4/3	Water-soluble vitamins: B vitamins (1)	Krupenko	Lippincott's Bioch. Ch.28 & Sakai
29.	W 4/5	Water-soluble vitamins: B vitamins (2)	Krupenko	
30.	F 4/7	Water-soluble vitamins: Vitamin C. Assignment No. 3 – Review	Krupenko Styblo	Lippincott's Bioch. Ch.28 & Sakai
	F 4/7	Review Session for Test #3	TAs/ Styblo	
	M 4/10	Test #3	TAs	
31.	W 4/12	Water and major minerals (Na & K)	Styblo	Lippincott's Bioch. Ch.28 & Sakai
	F 4/14	No Classes (UNC Holiday)		
32.	M 4/17	Major minerals (Ca, Cl)	Styblo	Sakai
33.	W 4/19	Major minerals (P, Mg, S)	Styblo	Sakai
34.	F 4/21	Trace minerals (Fe & Zn)	Styblo	Sakai
35.	M 4/24	Trace minerals (Se, I)	Styblo	Sakai
36.	W 4/26	Trace minerals (Cu, Mn)	Styblo	Sakai
37.	F 4/28	Trace minerals (F, Cr, Mo) ultratrace elements	Styblo	Sakai
	TBD	Review Session for Final Exam	TAs/Styblo/ Krupenko	
	Fri 5/9, 12 pm	Final Exam	TAs/Styblo/ Krupenko	