

Course Syllabus - NFS 382H1-S (2019)

Vitamin and Mineral Metabolism through the Life-cycle

A. Lectures and Office Hours:

Lectures

Mondays 09:10-10:00 and Wednesdays 09:10-11:00
Room 2170, Medical Sciences Building, University of Toronto

Office Hours

Mondays 10:15-11:15 am or by appointment
Room 5347 Medical Sciences Building, University of Toronto

Note: Questions regarding course material are best addressed after class, during office hours, or by posting the question on Quercus.

B. Instructor:

Mary Cranmer-Byng, MSc., RD, CDE

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Prerequisites: NFS 284 Basic Human Nutrition

Course Description:

Vitamins and minerals are essential for health throughout the life span. This course examines the metabolism of vitamins and minerals in the context of human development from infancy, childhood, adolescence, adulthood, reproduction and through to aging. Some emphasis in the course is placed on understanding the role of vitamins and minerals in disease prevention and pathogenesis.

The specific vitamins and minerals discussed are listed in the weekly course outline (Section “J” below). A few topical issues to be discussed are highlighted.

- Folate and vitamin B12 during reproduction—impact of food fortification in the prevention of birth defects; epigenetic programming.
- Vitamin B12 during reproduction and aging—impact of vegetarian diets on vitamin B12 status; cognition decline during aging.
- Iron, zinc and iodine requirements—impact of changes in Canadian food consumption patterns, mineral interactions, micronutrient deficiencies in developing countries.
- Fluoride—role in oral health and controversies surrounding addition to municipal water supplies.

- Calcium, vitamin D, magnesium and phosphorus—role in bone health with aging and strength of the evidence of non-bone related outcomes of optimal vitamin D status.
- Sodium and potassium —impact on blood pressure and cardiovascular disease
- Vitamins A, C, E and selenium—impact on the development of chronic disease.
- Vitamin K--impact of microbial synthesis of vitamins in the colon on meeting micronutrient requirements.

E. Course Objectives:

To gain knowledge about the metabolism of specific vitamins and minerals and the role that they play in human health.

To understand what the dietary reference intakes (DRIs) are for specific vitamins and minerals and how these values were derived.

To understand the current vitamin and mineral status of Canadians.

To develop critical appraisal skills and attain a basic understanding of the principles of study design so students feel comfortable in assessing new research on vitamin and minerals.

At the end of the course to have a complete set of notes and key citations that can serve as a resource to students in the future.

F. Course Evaluation:

Test #1 (25%): The format will be true/false and short answer questions in which students are required to integrate their knowledge from lectures and readings with findings taken from the scientific literature. This test will be written during our scheduled class time on **Wednesday, February 13th**. Please note the test will be written in Room 2170 of the Medical Sciences Building. The test will be designed for one hour but you may take up to two hours to complete the test.

Test #2 (Take-home test: Journal Article Critique, 25%): This will be a take-home examination. Students will be required to complete a critique of an assigned research article using the strategies reviewed in class and on a vitamin and/or mineral that the instructor has covered during class. Students may work together, but the write-up must be completed independently. The article to be critiqued will be posted online on March 6th. **A hard copy of the article critique must be submitted at the beginning of the class on Wednesday March 13th. In addition, a copy of the assignment needs to be submitted by 8 a.m. on Wednesday March 13th to Turnitin via Quercus** unless other arrangements are made in advance of March 13th. Please note, if a hard copy of the assignment is not received and a copy is not submitted via Quercus on time, the assignment will be considered late and a daily penalty of 10% per day, for two days maximum, will be applied. Assignments will not be accepted past 8 am on Friday March 15th.

Exceptions to this late submission policy will be made only in cases of illness, personal distress, family emergency, or other unforeseen circumstances. These compelling reasons must be supported by documentation or verbal explanation (all discussions are confidential). Please

contact the instructor as soon as possible, preferably before the due date to request an extension. For illness, the illness verification form can be used as documentation:
<http://www.illnessverification.utoronto.ca/index.php>

The university requires the following statement be included in the syllabus regarding the use of Turnitin.com:

"Normally, students will be required to submit their course essays to Turnitin.com for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their essays to be included as source documents in the Turnitin.com reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of the Turnitin.com service are described on the Turnitin.com web site"

For those who do not wish to submit to Turnitin must notify the instructor prior to the due date. As an alternative you may meet with the instructor for a short discussion during which you will be asked questions about the process of writing the assignment and your knowledge of the content of the assignment. Your test mark may be modified based on how well you answer these questions.

Turnitin submissions will be reviewed and students will be emailed if there are any concerns about their writing. Often this will be no more than a discussion of how to properly paraphrase and/or cite references, but the deduction of marks may also result. If a serious case of plagiarism is suspected, the student's assignment will be forwarded to the Office of Academic Integrity for review and possible sanction.

Final Examination (50%): Material from the entire course will be included with emphasis on lectures not previously covered on Test #1. Review sessions before the final exam during regular class hours will help provide direction on key areas of emphasis for the exam. The format of the exam will be true and false and short answer questions. *The date, time and location of the final exam are set by the registrar.*

Important Notes:

Tables containing the Dietary Reference Intake values for Test 1 and the final examination will be provided. You may also bring one letter size sheet of paper with handwritten or typed material to the final examination—you can use both sides of the sheet of paper. This should help students to stay focused during their preparation for the final examination on the “big picture” and integration of the material. You may bring a calculator to Test #1 and the final examination.

If you miss a test due to illness or injury, please use the University of Toronto illness or injury verification form found at: <http://www.illnessverification.utoronto.ca/index.php>

If you miss one of the two term tests for a compelling reason and provide the appropriate documentation, you may choose one of the two following options, which should be declared in writing by March 18th otherwise option #1 will apply.

- 1) Weight your final exam to be worth 75% of your final grade;

- 2) Complete an essay (2000-2500 words) on a topic relevant to the course assigned by the instructor and submitted via Turnitin and hard copy four weeks after the topic was received or the last day of class whichever occurs first.

In the unlikely event you miss both term tests for a compelling reason and provide appropriate documentation, your final examination will be worth either 75% or 100% of your final grade depending on whether you choose the essay option for one of your missed tests.

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A student may request remarking of a term test. This request must be done in writing briefly describing the student's specific concerns within two weeks after the test was returned. Please take the time to look over the answer key before formulating your request. Be aware that your mark may go up, down, or stay the same.

G. Accessibility Needs:

The University of Toronto is committed to accessibility. If you require accommodations for a disability, or have any accessibility concerns about the course, the classroom or course materials, please contact Accessibility Services as soon as possible: <http://www.studentlife.utoronto.ca/as>

H. Course Materials:

Most of the required readings for the course are included in this syllabus and are available to you in electronic format in the "Library Course Reserves". Additional assigned readings will be posted on Quercus in advance of each lecture in designated folders. Lecture slides will be posted on the course website (Quercus) at least the evening before each lecture. If you are looking for a text to support the material presented in class, the recommended text will be of use:

Advanced Nutrition and Human Metabolism, 7th Edition by Sareen S Gropper and Jack L Smith, Wadsworth, CENGAGE Learning.

I. Course Content:

For Test#1 and the final examination you will be examined on lecture material and the "required" assigned readings (e.g. scientific original and review articles), podcasts and videos as outlined in this syllabus and posted on Quercus. It is strongly advised that students attend lectures and complete the "required" assigned reading. These articles have been carefully selected to enhance and reinforce what is taught in the lectures and prepare students for some of the types of questions that will appear on Test#1 and the final examination. Throughout the term, Mary Cranmer-Byng will use some of these articles to provide students with an opportunity to practice interpreting data as reported in scientific journal articles, and to practice integrating their knowledge when reading and interpreting findings from the scientific literature.

J. Course Outline:

Week 1 (January 7):

- Introduction to the Course
- What are Dietary Reference Intakes?

- Prevalence of Vitamin and Mineral Inadequacies in Canada
- General Tips: Timelines for applying to graduate school (funding); securing a summer voluntary/paid research or clinical placement
- ✓ *Barr, S. I. Introduction to Dietary Reference Intakes. Applied Physiology, Nutrition, and Metabolism, 31(1), 61–65 (2006). (required)*
- ✓ *Murphy, S et al. History of Nutrition: The Long Road Leading to the Dietary Reference Intakes for the United States and Canada. Advances in Nutrition, 7(1), 157–168 (2016). (recommended)*
- ✓ *Shakur Y et al. A comparison of the micronutrient inadequacy and risk of high micronutrient intakes among vitamin and mineral supplement users and non-users in Canada. Journal of Nutrition 142(3):534-40, 2012. (required)*
- ✓ *O'Connor DL et al. Canadian Consensus on Female Nutrition: Adolescence, Reproduction, Menopause and Beyond. J Obstet Gynaecol Can 2016 Jun;38(6):508-554.e18. doi: 10.1016/j.jogc.2016.01.001. (Chapter 2 only, required)*

Week 2 (January 14):

- How to Assess the Scientific Literature (Nuts and Bolts)
- ✓ *Young YM and Solomon MJ. How to Critically Appraise an Article. Nature Clinical Practice Gastroenterology and Hepatology 6(2):82-91, 2009. (recommended)*
- ✓ *Review of the Digestion and Absorption of Nutrients. Jackson AD and McLaughlin J. Digestion and absorption. Surgery (Oxford) 27(Issue 6) 231-236, 2009. (recommended)*

Week 3 (January 21):

- Folate, with Emphasis on Women of Reproductive age and Prevention of Birth defects
- ✓ *Colapinto C et al. Folate status of the population in the Canadian Health Measures. Canadian Medical Association Journal 183(2):E100-6, 2011(required)*
- ✓ *Plumptre L et al. High concentrations of folate and unmetabolized folic acid in a cohort of pregnant Canadian women and umbilical cord blood. American Journal of Clinical Nutrition 102:848-857, 2015 (required)*
- ✓ *Cornelia Ulrich. The relationship between micronutrients and nutrigenomics/epigenetics. American Society of Nutrition Meeting 2017 <http://ondemand.nutrition.org/console/player/36138?mediaType=slideVideo> & (required)*

Week 4 (January 28):

- Vitamin B12 with an Emphasis on Early Brain Development and Cognitive Decline in Aging

- In-class journal article critique (Torsvik I et al Am J Clin Nutr 2013)
 - ✓ *MacFarlane AJ et al. Vitamin B12 and homocysteine status in a folate-replete population: results from the Canadian Health Measures Survey. American Journal of Clinical Nutrition 94(4):1079-1087, 2011. (required)*
 - ✓ *Torsvik I et al. Cobalamin supplementation improves motor development and regurgitations in infants: results from a randomized intervention study. American Journal of Clinical Nutrition 98(5):1233-40, 2013. (required)*
- Choline: Should it be included in Prenatal Supplements?
 - ✓ *Masih S et al. Pregnant Canadian women achieve recommended intakes of one-carbon nutrients through prenatal supplementation but the supplement composition, including choline, requires reconsideration. Journal of Nutrition 145:1824-1834, 2015 (recommended)*
 - ✓ *Leermakers ET et al. Effects of choline on health across the life course: a systematic review. Nutrition Reviews 73(8): 500-522. (recommended)*

Week 5 (February 4):

- Iron with Emphasis on the First Year of Life and Pregnancy
 - ✓ *Cooper M et al. Iron sufficiency of Canadians. Health Reports 23(4): 3-10, 2012. (required)*
 - ✓ *Health Canada Prenatal Nutrition Guidelines for Health Professionals - Iron Contributes to a Healthy Pregnancy. https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/fn-an/alt_formats/hpfb-dgpsa/pdf/pubs/iron-fer-eng.pdf (required)*
 - ✓ *Baker RD et al. Diagnosis and Prevention of Iron Deficiency and Iron-Deficiency Anemia in Infants and Young Children (0–3 Years of Age). Pediatrics 126(5): 1040 - 1050, 2010. (required)*
- Zinc with Emphasis on Fortification in Developing Countries and Nutrient Interactions
 - ✓ *Lowe, N. Assessing zinc in humans. Current Opinion in Clinical Nutrition and Metabolic Care, 19(5), 321–327. 2016 (required)*
 - ✓ *Arsenault JE et al. The current high prevalence of dietary zinc inadequacy among children and women in rural Bangladesh could be substantially ameliorated by zinc biofortification of rice. Journal of Nutrition 140:1683-1690, 2010. (recommended)*

Week 6 (February 11):

- Test#1 Short Answer (February 13th)
- Iodine with Emphasis on Development and Fortification of the Canadian Food Supply
 - ✓ *Iodine status of Canadians, 2009 to 2011 <http://www.statcan.gc.ca/pub/82-625->*

x/2012001/article/11733-eng.htm (required)

Week 7 (February 18): READING WEEK

Week 8 (February 25th):

- Fluoride with an Emphasis on Oral Health
 - ✓ *Health Canada: Fluoride in Drinking Water*
<https://www.canada.ca/en/health-canada/services/healthy-living/your-health/environment/fluorides-human-health.html> (required)
- Vitamin D with Emphasis on both Bone Health and Non-Skeletal Effects
- In-class journal article critique #2 (Hollis BW et al Pediatrics 2015)
 - ✓ *Whiting SJ et al The vitamin D status of Canadians relative to the 2011 Dietary Reference Intakes: an examination in children and adults with and without supplement use. American Journal of Clinical Nutrition 94: 128-135, 2011.* (required)
 - ✓ *Lee GJ et al Consumption of non-cow's milk beverages and serum vitamin D levels in early childhood. Canadian Medical Association Journal 186:1287-1293, 2014.* (required)
 - ✓ *Hollis BW, Wagner CL, Howard CR, Ebeling M, Shary JR, Smith PG, et al. Maternal Versus Infant Vitamin D Supplementation During Lactation: A Randomized Controlled Trial. Pediatrics. 2015;136:625-34. (required)*

Week 9 (March 4):

- The article to be critiqued for Test #2 will be handed out in class (March 6th). Test #2 needs to be submitted—on-line via Turnitin and a hard copy at the beginning of class on March 13th
- Calcium, Phosphorus and Magnesium with an Emphasis on Bone Health
 - ✓ *Weaver CM et al. Calcium, dairy products and energy balance in overweight adolescents: a controlled trial. American Journal of Clinical Nutrition 94 (5): 1163-1170, 2011. (required)*
 - ✓ *Calvo M and Lamberg-Alardt C. Phosphorus. Advances in Nutrition. 6: 860-862, 2015. (recommended)*

Week 10 (March 11):

- Test #2 needs to be submitted—on-line via Turnitin and a hard copy at the beginning of class on March 13th
- Vitamins A and C, E and Selenium with Emphasis on their Role as antioxidants and in Prevention of Chronic Disease
 - ✓ *Langlois K et al. Vitamin C status of Canadian adults: Findings from the*

- 2012/2013 Canadian Health Measures Survey. *Health Reports* 2016 27(5):3-10. (required)
- ✓ Bjelakovic G et al. Antioxidant supplements for prevention of mortality in health participants and patients with various diseases. *Cochrane Database of Systematic Reviews* 2012, Issue 3. Art. No.: CD007176 (recommended)
 - ✓ Lykkesfeldt J et al. Vitamin C. *Advances in Nutrition* 5:16-18, 2014. (required)
 - ✓ NPR: In a Grain of Golden Rice, A World of Controversy Over GMO Foods. <http://www.npr.org/sections/thesalt/2013/03/07/173611461/in-a-grain-of-golden-rice-a-world-of-controversy-over-gmo-foods> (required)
 - ✓ Stephenson C. Vitamin A and carotenoids as immunoactive compounds. *American Society of Nutrition Meeting 2017* URL: <http://ondemand.nutrition.org/console/player/36054?mediaType=audio&> (recommended)
 - ✓ Debelo, H., Novotny, J. A., & Ferruzzi, M. G. Vitamin A. *Advances in Nutrition*, 8(6), 992–994, 2017. (recommended)

Week 11 (March 18):

- Vitamin K--impact of microbial synthesis of vitamins in the colon on meeting micronutrient requirements
- Complete Material Listed in Syllabus to Date

Week 12 (March 25):

- Sodium and Potassium with Emphasis on Hypertension
- ✓ Hendriksen MAH et al. Potential effect of salt reduction in processed foods on health. *American Journal of Clinical Nutrition* 99:446-453, 2014. (required)
- ✓ Aburto NJ et al. Effect of lower sodium intake on health: systematic review and meta-analysis. *BMJ* 2013;346:f1326 doi:10.1136/bmj.f1326 (recommended)
- ✓ CBC Market Place (March 2013): The Great Salt Shakedown <http://www.cbc.ca/marketplace/episodes/2012-2013/the-great-salt-shakedown> (required)

Week 13 (April 1):

- Vitamin and Mineral Supplements: Too much of a good thing?
- ✓ Guallar E et al. Stop Wasting Money on Vitamin and Mineral Supplements. *Annals of Internal Medicine* 2013;159:850-851.(required)
- ✓ *Vitamins and Supplements: Magic Pills* (Fifth Estate Broadcast Date: November 20, 2015). <http://www.cbc.ca/fifth/episodes/2015-2016/vitamins-and-supplements-magic-pills> (required)
- ✓ Sesso H. Evidence on positive and null outcomes from RCTs of multivitamin interventions. *American Society of Nutrition Meeting 2017*

<http://ondemand.nutrition.org/console/player/36139?mediaType=audio&> (required)

- ✓ Marra and Bailey. *Position of the Academy of Nutrition and Dietetics: Micronutrient Supplementation. Journal of the Academy of Nutrition and Dietetics* 2018; 118: 2162-2173. (recommended)

- Review For the Final Examination