



HHNS*6440 Nutrition, Gene Expression and Cell Signalling

Winter 2021

Section(s): C01

Department of Human Health and Nutritional Sciences

Credit Weight: 0.50

Version 1.00 - January 04, 2021

1 Course Details

1.1 Calendar Description

This course emphasizes the role nutrients play as modulators of gene expression at the molecular level. The mechanisms by which nutrients modulate gene expression through specific cell signalling cascades are examined. (offered annually)

1.2 Course Description

This course emphasizes the role nutrients play as modulators of gene expression at the molecular level. The mechanisms by which nutrients modulate gene expression through genetic adaptations, epigenetic and signalling cascades are examined. (offered annually)

1.3 Timetable

Thursday, 9:00-11:50, ZOOM

1.4 Final Exam

no exams

2 Instructional Support

Course instructor: Dr. Marica Bakovic

E-mail: mbakovic@uoguelph.ca

Phone: 519-824-4120, Ext. 53764

Course schedule: Thurs 9:00-11:50 Zoom

3 Learning Resources

Lecture materials will be weekly posted on Courselink

4 Learning Outcomes

1. The main objective of this course is to provide graduate students with an understanding of the role of nutrients in the regulation of gene expression and in controlling cell function. As well, students will have a good understanding of the molecular biology methodology used when Nutritional Scientists address these questions. Upon completion of the course, students should be able to evaluate relevant literature in this field as well as design experiments to address questions in this area.

Learning Outcomes

Students will

1. Search literature and learn how to use database information;
2. Read relevant original research papers;
3. Actively participate in preparing specific lecture topics;
4. Discuss concepts and ideas in the class
6. Write a research grant application

5 Teaching and Learning Activities

IV TENTATIVE SCHEDULE

Week/Date	Lecture Topics (Readings are posted on Courselink)
1. Jan 14	Introduction: Stem cells, DNA, Genomics, Characterizing DNA, RNA, and Proteins; PCR, Microarrays, and Bioinformatics
2. Jan 21	Transcriptional Regulation: Purposes, General principles, and techniques; Transcription initiation, RNA Polymerase II, Promoters, Transcription factors
3. Jan 28	Nuclear Receptors, Genetic Mapping of Mutations, Single-nuclear polymorphisms, Allele frequencies
4. Feb 4	Signaling Mechanisms: Synthesis and targeting, Phosphorylation, Glycosylation
5. Feb 18	Regulation by Fatty Acids: Lipids as second-messengers, DAG/PKC and IP-3K/Akt signaling; Fatty acids and PPAR receptors
Feb 11	WINTER BREAK WEEK
6. Feb 25	Regulation by Cholesterol: Cholesterol and SREBP transcription factors
7. March 4	Regulation by Carbohydrates: Glucose/insulin signaling; Receptors, Links between lipid and CHO metabolism.
8. March 11	Regulation by Vitamins: Vitamin D receptor VDR, Retinoic acid receptor RXR, Calcium homeostasis, genomic and nongenomic actions.
9. March 18	Epigenetics and Methyl-group donors (choline, folate, methionine): S-adenosyl methionine (SAM), homocysteine, DNA-methylation
10. March 25	Nutrigenomics I: The genetics of cardiovascular disease

Week/Date	Lecture Topics (Readings are posted on Courselink)
11. April 1	Nutrigenomics II: The genetics of obesity and diabetes
12. April 8	Research Project Presentations and Discussions

Method of presentation: Materials will be presented by **classical-style lectures and students-leading lectures/discussions and seminars**. The first three lectures will focus on a review of basic material and an in-depth examination of the techniques and research approaches that will be discussed in the following lectures. The first part of the course includes general principles and methodologies for gene expression and the second part focus on the role of nutrients in transcriptional, epigenetic, and post-transcriptional regulation. Students will present a 40-minute seminar where their subject is most appropriate to the lecture material. Specific papers to be covered need not take place after the second week of classes. Students will also prepare a 10 pages (single-space) research proposal (see below).

There is no required text for this course however a number of review articles and primary research articles will form the basis for much of the presentation and discussion in the lecture material. These materials will be posted on the course web site a week before the lecture time. Bakovic will periodically update the site with new articles. You should check the site weekly for updates. The lecture material, presentations, and the assigned readings available in electronic format will be held for two weeks at the web course site.

6 Assessments

6.1 Marking Schemes & Distributions

1. Methods of Assessment

Form of Assessment	Weight (%)	Learning Outcome Addressed
Participation	5%	1, 2

Form of Assessment	Weight (%)	Learning Outcome Addressed
Lecture/Seminar	35%	3,4
Grant Review	10%	5
Research Proposal	50%	5

PARTICIPATION: The way for this course to be most effective is if each individual in the class ensures that they are prepared for class by reading relevant course materials well in advance of class and formulating questions that may be helpful to class discussions. It is important for scientists to freely exchange ideas in oral form as well as written formats. This Zoom option would be to provide questions or points for discussion to Dr. Bakovic before or during the class and these points can then be raised by her at the appropriate point in the lecture/seminar. It is also recognized that it is the nature of the contributions that is important- It is quality, not quantity that is important here.

LECTURES/SEMINARS: Students are asked to present a lecture/seminar directly related to the course material on a subject appropriate to the lecture material being covered at the time of their presentation. The lecture should focus on one or two key review papers and on two/three research papers covering the same topic (they all will be provided by Dr. Bakovic and posted on Courselink for download). Students in the class will be asked to read the key paper(s) you will present in advance of your lecture/seminar. You should allow approximately 20 minutes for Zoom discussions, which could occur at the end or throughout your lecture.

GRANT REVIEW: A second way students will participate is in the form of grant (research proposal) reviews. Grants should be completed and distributed for reviewing on March 18. Each student will be asked to review one/two of the grants from the class and write a written evaluation (1 page for each) of the grant, much like we do for real research grants. Reviewers will have two weeks to prepare their reviews. On the last day of classes, each grant will be presented in 10-15 min and a ranking of grants compiled. The review process will be used for experience only. No portion of the grade will be dependent on the success in this mock competition

RESEARCH GRANT PROPOSAL: The style and format for the grant proposal should conform to the guidelines for a research proposal to the Canadian Institutes of Health Research. Dr Bakovic will also provide you with additional instructions when time comes. The parts to be completed are the Scientific Abstract and Detailed Proposal (10 pages –single space) **without Budget** sections of the grant. Students should clear their proposed topics with Dr. Bakovic before materials for the grant are collected. If you are not able to find a suitable

proposal, please discuss this with Dr. Bakovic who should be able to provide you with some helpful guidelines. Grant proposals will be evaluated by Dr. Bakovic for final assessment although proposals will also proceed through "peer review" (see above) for purposes of the Mock Grant Review.

7 Department of Human Health and Nutritional Sciences Statements

7.1 Academic Advisors

If you are concerned about any aspect of your academic program:

- Make an appointment with a program counsellor in your degree program. [B.Sc. Academic Advising](#) or [Program Counsellors](#)

7.2 Academic Support

If you are struggling to succeed academically:

- Learning Commons: There are numerous academic resources offered by the Learning Commons including, Supported Learning Groups for a variety of courses, workshops related to time management, taking multiple choice exams, and general study skills. You can also set up individualized appointments with a learning specialist. <http://www.learningcommons.uoguelph.ca/>
- Science Commons: Located in the library, the Science Commons provides support for physics, mathematic/statistics, and chemistry. Details on their hours of operations can be found at: <http://www.lib.uoguelph.ca/get-assistance/studying/chemistry-physics-help> and <http://www.lib.uoguelph.ca/get-assistance/studying/math-stats-help>

7.3 Wellness

If you are struggling with personal or health issues:

- Counselling services offers individualized appointments to help students work through personal struggles that may be impacting their academic performance. <https://www.uoguelph.ca/counselling/>
- Student Health Services is located on campus and is available to provide medical

attention. <https://www.uoguelph.ca/studenthealthservices/clinic>

- For support related to stress and anxiety, besides Health Services and Counselling Services, Kathy Somers runs training workshops and one-on-one sessions related to stress management and high performance situations. <http://www.selfregulationskills.ca/>

7.4 Personal information

Personal information is collected under the authority of the University of Guelph Act (1964), and in accordance with Ontario's Freedom of Information and Protection of Privacy Act (FIPPA) <http://www.e-laws.gov.on.ca/index.html>. This information is used by University officials in order to carry out their authorized academic and administrative responsibilities and also to establish a relationship for alumni and development purposes.

For more information regarding the Collection, Use and Disclosure of Personal Information policies please see the Undergraduate Calendar. (<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/intro/index.shtml>)

8 University Statements

8.1 Email Communication

As per university regulations, all students are required to check their e-mail account regularly: e-mail is the official route of communication between the University and its students.

8.2 When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. The grounds for Academic Consideration are detailed in the Undergraduate and Graduate Calendars.

Undergraduate Calendar - Academic Consideration and Appeals
<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

Graduate Calendar - Grounds for Academic Consideration
<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

Associate Diploma Calendar - Academic Consideration, Appeals and Petitions
<https://www.uoguelph.ca/registrar/calendars/diploma/current/index.shtml>

8.3 Drop Date

Students will have until the last day of classes to drop courses without academic penalty. The deadline to drop two-semester courses will be the last day of classes in the second semester. This applies to all students (undergraduate, graduate and diploma) except for Doctor of

Veterinary Medicine and Associate Diploma in Veterinary Technology (conventional and alternative delivery) students. The regulations and procedures for course registration are available in their respective Academic Calendars.

Undergraduate Calendar - Dropping Courses

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml>

Graduate Calendar - Registration Changes

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-reg-regchg.shtml>

Associate Diploma Calendar - Dropping Courses

<https://www.uoguelph.ca/registrar/calendars/diploma/current/c08/c08-drop.shtml>

8.4 Copies of Out-of-class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

8.5 Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required; however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to book their exams at least 7 days in advance and not later than the 40th Class Day.

For Guelph students, information can be found on the SAS website

<https://www.uoguelph.ca/sas>

For Ridgetown students, information can be found on the Ridgetown SAS website

<https://www.ridgetownc.com/services/accessibilityservices.cfm>

8.6 Academic Integrity

The University of Guelph is committed to upholding the highest standards of academic integrity, and it is the responsibility of all members of the University community—faculty, staff, and students—to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff, and students have the responsibility of supporting an

environment that encourages academic integrity. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

Undergraduate Calendar - Academic Misconduct

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

Graduate Calendar - Academic Misconduct

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

8.7 Recording of Materials

Presentations that are made in relation to course work - including lectures - cannot be recorded or copied without the permission of the presenter, whether the instructor, a student, or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

8.8 Resources

The Academic Calendars are the source of information about the University of Guelph's procedures, policies, and regulations that apply to undergraduate, graduate, and diploma programs.

Academic Calendars

<https://www.uoguelph.ca/academics/calendars>

8.9 Disclaimer

Please note that the ongoing COVID-19 pandemic may necessitate a revision of the format of course offerings and academic schedules. Any such changes will be announced via CourseLink and/or class email. All University-wide decisions will be posted on the COVID-19 website (<https://news.uoguelph.ca/2019-novel-coronavirus-information/>) and circulated by email.

8.10 Illness

The University will not normally require verification of illness (doctor's notes) for fall 2020 or winter 2021 semester courses. However, requests for Academic Consideration may still require medical documentation as appropriate.
