

**ANAT 541**

**CELLULAR &  
MOLECULAR BIOLOGY  
OF AGING**

**Lecture Outlines  
and  
Selected Readings**

**2024**



## **Departmental Grading Policy**

The Department of Anatomy & Cell Biology will **NOT** revise/upgrade marks except on sound academic grounds. Once computed, the marks in this course will **NOT** be altered/increased arbitrarily. Decimal points will be “rounded off” as follows: if the final aggregate mark is computed to be 79.5%, the mark will be reported as 80% (an A-); a final aggregate mark of 79.4% will be reported as 79% (a B+). These marks are **FINAL and non-negotiable**.

## **Departmental Midterm Exam/In-Course Assessment Deferral Policy**

A midterm exam or other in-course assessment (i.e. quiz, assignment, paper, etc.) in a course administered by the Department of Anatomy & Cell Biology may only be deferred in the case of a **justified absence** due to serious illness or significant extenuating circumstances AND when **valid documentation** is received by the Course Coordinator within FIVE working days of the original midterm exam or due date.

If the deferral request is accepted by the Course Coordinator, students may be offered one or both of the accommodations below, depending on the grading structure of the course:

For ANAT541, In the case of one missed quiz due to a justified absence, the quiz mark for the course will be based on the other 4 quizzes. In the case of a second missed quiz due to a justified absence, a deferred quiz will be scheduled within 10 days of the original quiz date. Note that if you attend class on a quiz day, you must write the quiz.

## **Additional Statements**

- The University Student Assessment Policy exists to ensure fair and equitable academic assessment for all students and to protect students from excessive workloads. All students and instructors are encouraged to review this Policy, which addresses multiple aspects and methods of student assessment, e.g. the timing of evaluation due dates and weighting of final examinations.
- Note that to support academic integrity, your assignments may be submitted to text-matching or other appropriate software (e.g., formula-, equation-, and graph-matching).
- © Instructor-generated course materials (e.g., lectures, handouts, notes, summaries, exam questions) are protected by law and may not be copied or distributed in any form or in any medium without explicit permission of the instructor. Note that infringements of copyright can be subject to follow up by the University under the Code of Student Conduct and Disciplinary Procedures.
- As the instructors of this course we endeavor to provide an inclusive learning environment. However, if you experience barriers to learning in this course, do not hesitate to discuss them with us and the Office for Students with Disabilities, 514-398-6009; [disabilities.students@mcgill.ca](mailto:disabilities.students@mcgill.ca)

- McGill University is on land which has long served as a site of meeting and exchange amongst Indigenous peoples, including the Haudenosaunee and Anishinabeg nations. We acknowledge and thank the diverse Indigenous people whose footsteps have marked this territory on which peoples of the world now gather.

L'Université McGill est sur un emplacement qui a longtemps servi de lieu de rencontre et d'échange entre les peuples autochtones, y compris les nations Haudenosaunee et Anishinabeg. Nous reconnaissons et remercions les divers peuples autochtones dont les pas ont marqué ce territoire sur lequel les peuples du monde entier se réunissent maintenant.

- End

# LECTURERS

LECTURER	ADDRESS
Stephanie LEHOUX	Dept. Medicine, McGill University Lady Davis Institute for Medical Research Jewish General Hospital, Room F-102 <b>Tel.: 514-340-8222, ext 25915</b> <b>E-MAIL:</b>

**COURSE NO: ANAT 541  
DEPARTMENT OF ANATOMY AND CELL BIOLOGY**

**COURSE COORDINATORS: STEPHANIE LEHOUX AND CHANTAL AUTEXIER**

**TIME / PLACE: Mondays 2:35 - 5:25 PM / SADB M/48**

<b>DATE</b>	<b>LECTURER</b>
January 8	Stephanie Lehoux/ Chantal Autexier
January 15	Stephanie Lehoux
January 22	Adelyn Moore, Chantal Autexier and Abigail Gerhold
January 29	Colin Crist <b>Quiz #1</b>
February 5	Colin Crist-student presentations
February 12	François Mercier <b>Quiz #2</b>
February 19	François Mercier-student presentations
February 26	Peter Siegel <b>Quiz #3</b>
February 29 <b>THURSDAY</b>	<b>Grant Proposal #1 Due</b>
March 4	<b>BREAK</b>

# CELLULAR AND MOLECULAR BIOLOGY OF AGING

## ANAT 541

3 Credits

Instructors: Professors S. Lehoux and C. Autexier (coordinators),  
C. Crist, A. Gerhold, L. Haglund, F. Mercier, P. Siegel, M. Vera Ugalde

Teaching assistant/Lecturer: Adelyn Moore

Content: This course focuses on how the complex aging process can be studied by modern cell and molecular approaches. Topics include theories and mechanisms of aging, animal model systems used to study aging, age-dependent diseases, including Alzheimer's, atherosclerosis, muscular dystrophy, osteoporosis, cancer, and age-related diseases, including dyskeratosis congenita.

Method: 1 lecture per week

Readings: References for the readings for the course are in the handout provided on MyCourses. These generally include references for one review article and several primary articles for each topic covered in class. Among the primary articles are those that will be presented in class by the students. **The articles for presentation will be available to the students for sign up the first day of class through MyCourses.**

Evaluation: 5% attendance / 5% participation  
20% quizzes (based on review articles)  
25% oral presentation of a primary research article  
15%: Grant proposal, hypothesis assigned (Due February 29 at 11:59PM)  
30%: Grant proposal based on primary research article of the oral presentation (Due **April 14<sup>th</sup> at 11:59PM**).

The previously untested or unanswered hypothesis for the first grant proposal will be assigned. The second assignment should be related to the topic of your paper presentation. For example, if you present an article on senescence and cancer, you should propose a previously untested or unanswered hypothesis related to senescence and cancer stemming from the article presented.

# ORAL PRESENTATIONS





## First grant proposal due February 29, 2024 11:59 PM

Based on:

Crozier, L. et al. 2023. CDK4/6 inhibitor-mediated cell overgrowth triggers osmotic and replication stress to promote senescence.

Abnormal increases in cell size are associated with senescence and cell cycle exit. The mechanisms by which overgrowth primes cells to withdraw from the cell cycle remain unclear. The authors demonstrate that Cdk2-dependent kinase 4/6 inhibition (CDK4/6i) in HeLa cells overgrows during G0/G1, causing p38/p53/p21-dependent cell cycle withdrawal. Cell cycle withdrawal is triggered by biphasic p21 induction. The first p21 wave is caused by osmotic stress, the second wave results from replication stress. It is e43.8 relmotimotiris, the

## LEARNING OUTCOMES

1. Acquire knowledge of molecular and cellular biology techniques
2. Compare, relate, analyze the different basic theories, mechanisms and diseases of human aging and aging-related diseases
3. Read, understand, interpret, critically analyze, and present a primary research article relating to diseases of human aging or aging related diseases
  - a. identify the hypothesis and assess the validity of this hypothesis in the context of the current literature in the field
  - b. identify and evaluate the molecular and cellular methods used to test the hypothesis
  - c. critically evaluate the data and their significance
  - d. formulate and develop a new hypothesis based on the new data
4. Write a scientific proposal
  - a. Identify, access, and read relevant primary literature on diseases of human aging or aging related diseases
  - b. Formulate an unanswered hypothesis based on the current knowledge in the field
  - c. Design two or three experiments to test this hypothesis and rationalize the use of the methodology
  - d. Predict and interpret the possible results of the experiments
  - e. Formulate a new hypothesis based on the predicted results and identify and justify an appropriate method(s) to test this new hypothesis

## SCHEDULE

1. January 8 Stephanie Lehoux/Chantal Autexier

Introduction to course, format and evaluation

Lecture on theories, mechanisms and models of aging

2. January 15 Stephanie Lehoux

Lecture on age and the vasculature/ Oral presentation of a paper

3. January 22 Adelyn Moore, Chantal Autexier and Abigail Gerhold

Lecture on grant proposal writing/ How to read and critique a journal article/  
Premature Aging and the Telomere Syndrome Dyskeratosis congenita/Modeling  
Aging in the Short Lived C. elegans

4. January 29 Colin Crist

**Quiz 1** on review article

**Lecture on regeneration and stem cell biology**

5. February 5 Colin Crist

**Short oral presentations of primary research articles by students**

6. February 12 François Mercier

**Quiz 2** on review article

**Lecture on aging of the hematopoietic system**

7. February 19 François Mercier

**Short oral presentations of primary research articles by students**

8. February 26 Peter Siegel

**Quiz 3** on review article

**Lecture on cancer progression to metastasis**

**First grant proposal due on February 29th**

## March 4 Reading Week

9. March 11 Peter Siegel

**Short oral presentations of primary research articles by students**

10. March 18 Maria Vera Ugalde

**Quiz 4** on review article

**Lecture on age-related neurodegenerative diseases and the activation of the stress response**

11. March 25 Maria Vera Ugalde

**Short oral presentations of primary research articles by students**

12. April 8 Lisbet Haglund

**Quiz 5** on review article

**Lecture on translational research on the aging spine**

13. April 11 Thursday Lisbet Haglund

**Short oral presentations of primary research articles by students**

**Second grant proposal due on April 14th**