Biology of Aging, NUTR/CMDB 0247
Spring 2023

Who will be leading this course?

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What previous coursework should you have taken?
To succeed in this course, you should have taken Graduate Biochemistry (BCHM-0223) or received permission from one of us. In addition, we recommend that you have taken undergraduate-level classes in Cellular or Molecular Biology and Genetics.

When and where will we meet?
This course will meet for 3 hours/week for 14 weeks.
We will be together in person on Fridays from 9AM – 12noon EST in Jaharis 156. A Zoom option will be offered for students who are not in the Boston area. The Zoom link will be available on Canvas.

What will be discussed in this course?
This course is an in-depth examination of current topics in aging research, with a focus on human aging. Topics to be discussed include theories of aging; physiological, cellular, and epigenetic changes that occur with aging; biochemical and energetic processes that affect healthspan and lifespan; and interventions that may affect the aging process. We will emphasize protein quality control pathways and their roles in homeostasis, aging, and age-related diseases, along with drugs to exploit those capacities. Students will help direct the course by presenting and critiquing papers selected from a curated list of current aging research literature.

What are your learning objectives for the course?
At the conclusion of the course, you should be able to:

1. Describe and compare various theories of aging.
2. Explain how various cellular machineries and genetic programs function to maintain healthspan and analyze how their breakdown can promote aging, including compromises to neurological and cognitive processes and vision.
3. Examine how nutrition, genetics, and the environment interface with the functions of protective machineries.
4. Evaluate empirical evidence related to new dietary and pharmaceutical approaches to prolong healthspan and lifespan.
5. Analyze opportunities for interventions to prolong healthspan and lifespan.
6. Discuss the experimental and conceptual strengths and weaknesses of papers from the primary aging literature.

What texts and materials will you need for the course?
There is no required text for this course. All necessary lecture slides and readings (including a curated list of discussion papers) will be posted on the course Canvas site. Most of the references are from the past few years and are published in high impact journals. Students are expected to have read relevant reviews and the papers selected for presentation before arriving in the session when a specific paper will be presented.

How will your performance be assessed?

You will be assessed and your final grade will be based on: (1) your ability to present research papers to the class; (2) your ability to critique these papers in the context of course material; and (3) your participation in the class discussions. Because we expect that you will gain fluency in the field with each presentation, we will take improvement into account when determining the final grades. Detailed instructions for the research paper presentations and discussions will be provided at the beginning of the semester.

1. **Selecting and presenting a research paper** (at least 2 times during the semester) **30%** of total grade

We seek to make this a lively debate-style class, with all students participating in the debate/discussion. To assure that, each presenter/discussant team will meet 10-14 days before their presentation with one of the instructors to rehearse the presentation and discussion/debate. As a presenter, you will be assessed on your:

- Preparation for the presentation (including a pre-presentation meeting with an instructor and the discussant)
- Rationale for your selection of the paper
- Clarity and completeness of background information. You should use figures from review articles and other sources to give introduction and context to your presentation
- Identification and presentation of important figures in the paper
- Summary of importance of the paper in the field of aging research.

2. **Serving as a discussant** (at least 2 times during the semester) **30%** of total grade

The role of the discussant is to identify significant and/or controversial aspects of the paper and to engage the class in a critical analysis of the research. As a discussant, you will be assessed on your:

- Preparation for the discussion (including a pre-presentation meeting with an instructor and the presenter)
- Evaluation of the methods, results, and authors' conclusions
- Identification of controversial issues in the paper
- Suggestion of new experiments/methodology to extend the research
- Ability to engage other students in the discussion

3. **Attendance and participation in discussions** (throughout the semester) **40%** of total grade

When you are not presenting, you are expected to:

- Attend all classes and arrive on-time, barring exceptional unforeseen circumstances (please inform us if you know you will miss a class ahead of time)
- Come to class having read the assigned reviews and papers
- Contribute to class discussions and participate in small group activities
- Actively listen to others and show respect to your colleagues if your interpretations of the papers differ from theirs

What are the penalties for late or incomplete assignments?
We will work with you to ensure that you can attend class when presenting research papers or serving as discussants. Excessive unexcused absences will negatively impact the participation part of your grade.
Because everyone will have an opportunity to present a paper or act as a discussant within the first month of the class, we will be able to make adjustments early in the semester if you are having trouble.

A passing grade in the course is 'B-'or better. Course grades will be based on the scale below (subject to revision during the course).

A	> 93%	B	83-87%	D	60-70%
A-	90 - 93%	B-	80-83%	F	< 60
B+	87 - 90%	C	70-80%		

Tentative Course Schedule:
Note: This schedule is subject to modifications at the discretion of the course directors

Week 1	Jan 20	Introduction to course (MM and AT)
Week 2	Jan 27	Caloric and dietary restriction, time-restricted feeding (MM and AT) 1 paper discussion Mini-lecture: Ubiquitination (AT)
Week 3	Feb 3	Ubiquitination, autophagic proteolytic pathways (AT) Guest speaker: Luke Wiseman, unfolded protein response Guest speaker: Ana Cuervo, autophagy
Week 4	Feb 10	Proteotoxicity I, diseases of protein aggregation (AT) 2 paper discussions
Week 5	Feb 17	Proteotoxicity II (AT) 2 paper discussions Mini-lecture: Genome stability and aging (MM)
Week 6	Feb 24	Genomic instability, DNA damage and aging (MM) 1 paper discussion Guest speaker: Chris Wiley, cellular senescence
Week 7	Mar 3	Cellular senescence and senolytics (MM) 2 paper discussions
Week 8	Mar 10	Redox regulation and aging, mitochondria (AT) 2 paper discussions
Week 9	Mar 17	Sugar and protein quality control (AT) 2 paper discussions
	Mar 24	**No class - Spring Break**
Week 10	Mar 31	Catch-up / student choice 2 paper discussions
Week 11	Apr 7	The future - Parabiosis and cellular rejuvenation (MM) 1 paper discussion Guest speaker: Irina Conboy, parabiosis
Week 12	Apr 14	The future - Epigenetic reprogramming (MM) 2 paper discussions
	Apr 21	**No class – Tufts Monday**
Week 13	Apr 28	Group presentations / course wrap-up
Week 14	May 5	Group presentations (during final exam period, if needed)

We endeavor to make this class a safe environment where all students feel welcome, respected, and comfortable expressing their opinions. We have adopted the policies below to make this possible.

Diversity, Equity, and Inclusion for all Tufts Community Members:
It is our commitment that students from all diverse backgrounds and perspectives be well served by this course, that students' learning needs be addressed, and that the diversity that students bring to this class be viewed as a resource, strength and benefit. It is our intent to present materials and activities that are respectful of diversity: gender, sex, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture. Please let us know ways to improve the course for you personally or for other students or student groups.

Religious Accommodations
Both university policy and Massachusetts law provides that students unable to attend classes, participate in required course or lab activities, or take a scheduled examination because of religious observance will be provided with reasonable opportunity to make up the course work without adverse effects.
The University's Religious Accommodations Policy is available at https://oeo.tufts.edu/wp-content/uploads/ReligiousAccommodationPolicy.pdf. Students requiring an accommodation should contact the course director prior to the requested dates to work out suitable accommodations.

Decolonization
The course director and lecturers acknowledge the damage done to BIPOC communities by generations of systemic racism within academia. The director also acknowledges that this is a particularly difficult time to be students, and that the political, medical, economic and personal stresses that have been amplified in the past few years disproportionately affect already marginalized students. This course enthusiastically supports the University's stated anti-racist goal (https://gsbs.tufts.edu/news/2021/03/deans-message-february-22-2021) and in pursuit of this, will abide by the following policies.

1. The director and lecturers will seek and use course resources that are inclusive of race, socio-economic standing, gender, sexuality, disability, immigration status, English language learning status, and first-generation status.
2. Microaggressions, along with any other racist remarks, actions or behaviors will not be tolerated.
3. Students experiencing challenges are encouraged to reach out to Dan Volchok (daniel.volchok@tufts.edu) or individuals whom they feel comfortable talking to and discuss solutions.

Students are encouraged to reach out to the course director with any suggestions for adjustments or further course guidelines.

Course Expectations
In addition to the course specific late work and remediation policies detailed above, students, course director and lecturers acknowledge the following:

1. The director accepts responsibility to notify students early if expectations regarding learning, attendance or participation are not being met.
2. The course director will make themselves available by multiple avenues of communication and if needed, will work with students to find mutually convenient times to meet.
3. Opportunities may be available, upon request, to retake missed or late work. If a student falls behind, the director may provide opportunities for that student to catch up. If a student is struggling to understand the material, the course director will work with the student on strategies to better understand the material.
4. Mistakes are expected and respected, and the director will make conscious efforts to prevent them from biasing their opinion of students. The director acknowledges that graduate level biological science material is difficult, and the best way to learn it is by engaging at the limits of your knowledge. If done well, this inevitably will lead to mistakes being made.

University Policies:

- ***Sexual Misconduct Policy:*** Tufts is committed to providing an education and work environment that is free from sexual misconduct. If you or someone you know has been harassed or assaulted, please contact Dan Volchok, the GSBS Sexual Misconduct Reporting Liaison, at 6-6767 or daniel.volchok@tufts.edu. He can help you find appropriate resources and discuss your options. Anonymous reporting is available through the Tufts anonymous Incident Report Form: (https://tuftsuniversity.ethicspointvp.com/custom/tuftsuniversity/oeo/form_data.asp). Students may also obtain free confidential counseling through Talk One2One at 1-800-756-3124. Campus police may be contacted at 6-6911.

- ***Americans with Disabilities Act Policy:*** Tufts University is committed to providing reasonable accommodations for qualified individuals with disabilities. If you are interested in seeking accommodations in courses or in a laboratory setting, please contact Dan Volchok, the GSBS Disability Officer, at 6-6767 or at daniel.volchok@tufts.edu.

- ***Tufts Information Stewardship Policy*** outlines the actions all members of the Tufts community are expected to follow when working with institutional data and systems (https://it.tufts.edu/ispol).

- ***Academic Conduct:*** All students are responsible for compliance with all academic standards and policies, including plagiarism and academic integrity, as outlined in the Graduate School of Biomedical Sciences Student Handbook (https://gsbs.tufts.edu/studentLife/StudentHandbook).

- ***Disclosing Conflicts of Interest***: The course director and lecturers, including guest lecturers, are expected to disclose any significant financial interests or conflicts of interest that might undermine, appear to undermine, or have the potential to undermine the objectivity of their lecture content and assigned reading materials.