

Biomedical Aspects of Aging 2023

Course overview

Dr. Federico Sesti

Professor, Dept. of Neuroscience and Cell Biology federico.sesti@rutgers.edu

Aging is an important aspect of human civilizations especially in light of the pressure that growing elderly populations are putting on modern societies. This course covers an important topic and also fills a gap, since there is no course dedicated to aging in the curriculum, despite the relevance of this process to human societies as whole and to disciplines such as biology and medicine. The new course explores aging at a 360-degree perspective. It goes from a brief introduction of the social and economical aspects of aging, to its biology and etiology and to its associated pathologies (i.e. neurodegenerative disease) including clinical and psychological management.

Course structure

This course will meet two times a week during the spring semester. The course will use a combination of lectures, group discussions and case studies. The course explores 5 major topics (blocks). Each block is reinforced by a case study in which the students, in turn, will prepare and discuss a disease related to the topic. The five broad topics are:

Topic 1: Aging in human culture

Economics of aging
Sociology of aging

Topic 2: Cellular and organismal senescence

Genetics of aging
Metabolism of aging 1: caloric restriction
Metabolism of aging 2: insulin IGF-1-like pathway

Topic 3: Molecular basis for aging

Telomere shortening
Free radical theory
DNA damage
Reproductive cell cycle
Stem cells theory of aging

Topic 4: The aging brain

Changes in the aging brain 1: chemical

Changes in the aging brain 2: neurophysiological

Changes in the aging brain 3: molecular

Topic 5: Neurodegenerative disease

Psychology of aging

Pathology 1: Huntington disease

Pathology 2: Multiple sclerosis

Clinical case 1: Clinical management: Alzheimer

Clinical case 2: Psychological management: Parkinson

Each broad topic will be covered in approximately two weeks. Faculty members will give formal lectures. Studies in some topics, reading and discussing case studies will complement each block. Masters students will be required to lead the discussions. No textbook is required. Students use the PowerPoints of the lectures, as reference material. Suggested textbook for further studies: Shamin Ahmad, "Aging: exploring a complex phenomenon" CRC press, ISBN 9781138196971 - CAT# K31227.

Learning objectives

Upon successful completion of the course, students will be able to:

- Understand the challenges that an aging population poses to the society and the economy.
- Understand the impact of aging on the metabolism. This includes recognizing major effects of starvation and the role that caloric restriction has in prolonging lifespan.
- Understand the major mechanisms of aging including telomere shortening, increased free radicals, DNA methylation etc.
- Understand the role of biomarkers of aging.
- Recognize the most common techniques used in research and clinic to measure anatomical effects of aging with particular emphasis on the brain.
- Recognize changes in cognitive performance and executive function in aging patients.
- Understand the major clinical features of neurodegenerative diseases.
- Describe the role of depression in neurodegenerative disease and its management.