



NFSC 655: Nutrition and Healthy Aging

Fall 2016

Tuesdays and Thursdays 12:45pm to 2:00pm

KLCT 200

Instructor:

Yuxiang Sun, M.D., Ph.D.

Assistant Professor

<http://nfs.tamu.edu/people/sun-yuxiang/>

Office: 214 D Cater Mattil

Phone: 979-862-9143 (office); 832-818-6763 (cell)

E-mail: yuxiang.sun@tamu.edu

Office Hours: By appointment – Please e-mail Dr. Sun
(Please have “NUTR 689” in the e-mail subject)

Credits:

3 credit hours

Time:

Tuesdays (T) and Thursdays (R), 75 min/class

Course Description: This course is a fusion of biology of aging and geriatric nutrition. It integrates biology of aging, nutritional impacts on longevity and age-associated diseases, and nutritional interventions for healthy aging. Topics will include pathophysiology of aging, nutritional needs of older adults, implications of nutrition on lifespan and healthspan, and nutritional interventions for major aging-related diseases.

Prerequisites: For graduate students, there are no prerequisites for this course.

Teaching objectives of the instructor: The goal of this course is to teach the basic principles of nutrition on aging and age-associated diseases, to advance critical thinking skills in

understanding nutrition and aging literature, and to inspire young scientists to pursue nutrition and aging research.

Learning Outcomes:

By the end of this course, students will gain solid knowledge and understanding in the following areas:

- Theories of aging, physiological and pathological changes related to aging (e.g., energy imbalance, metabolic dysregulation, aging thermodynamics), and major age-associated diseases (e.g., obesity, diabetes, cardiovascular disease, sarcopenia, osteoporosis, cancer, Alzheimer's disease).
- Major biological challenges associated with aging, and aging paradoxes such as over-nutrition vs. malnutrition, cell growth vs. cancer, longevity vs. fertility, etc.
- Nutritional characteristics of aging and age-associated diseases: Nutritional impacts on longevity and vitality, dietary and lifestyle interventions for prevention and treatment of major age-associated diseases.
- Hallmarks of animal models in aging: Principles of basic, translational, and clinical aging research designs.
- Critical thinking in nutrition and aging research, effective oral and written communication of an aging research subject (via journal presentations, grant proposals, and class research symposium etc.).

Textbooks:

Current review papers and original articles will be heavily used in class. No specific textbooks are required. However, the following textbooks are recommended for enrichment reading:

1. *"Biology of Aging"* by Roger B. McDonald
2. *"The Biology of Human Longevity: Inflammation, Nutrition, and Aging in the Evolution of Lifespans"* by Caleb E. Finch
3. *"Molecular Biology of Aging"* Edited by Leonard P. Guarente, Linda Partridge, and Douglas C. Wallace
4. *"Prevention and treatment of Age-related Disease"* edited by Suresh Rattan, and
5. *"Geriatric Nutrition, the professional's handbook"* by Ronni Chernoff

A fun book to read for inspiration on aging research: *"Ageless Quest: One Scientist's Search for the Genes That Prolong Youth"* by Lenny Guarente (can be borrowed from Dr. Yuxiang Sun)

Depending on the knowledge base of students in the class, the following supplemental subjects may be taught:

- *How to search scientific literature*
- *How to critically assess research articles*
- *How to write a scientific paper/review*
- *How to write a research proposal*
- *How to effectively deliver a PowerPoint presentation*

Class policies:

Cell phones: Cell phones and PDA's must be turned off or to vibrate. If it is an emergency and you must take a call, please leave the classroom.

Attendance: Attendance is mandatory. University rules apply governing what constitutes an excused absence. The following link lists what Texas A&M considers excusable absences: <http://student-rules.tamu.edu/rule07>. Absences caused by illness or injury will need to be accompanied by a physician's note. Please be aware that the validity of notes will be confirmed through the physician's office. **Each un-excused absence will result in 5 points being subtracted from your final grade.**

Copyrights: Copyrighted materials include all electronic files generated for this class, including but not limited to syllabus, lecture notes, and material posted in the e-campus. Materials may be downloaded or photocopied for **PERSONAL USE** only, and may not be given or sold to other individuals. **It is prohibited to post lecture notes and related materials on a website without the permission of the instructor.**

University Policies:

1. Academic Integrity:

"An Aggie does not lie, cheat, or steal or tolerate those who do."

Detail Aggie honor code information can be found

at: <http://aggiehonor.tamu.edu/RulesAndProcedures/HonorSystemRules.aspx>.

2. Plagiarism:

As commonly defined, plagiarism consists of passing off as one's own the ideas, words, writings, etc., which belong to another. In accordance with this definition, you are committing plagiarism if you copy the work of another person and turn it in as your own, even if you should have the permission of that person. Plagiarism is one of the worst academic sins, for the plagiarist destroys the trust among colleagues, without which research cannot be safely communicated. **Plagiarism on any assignment will not be tolerated, and it will be recommended that you receive an "F" in this course if evidence of plagiarism is found.**

3. Americans with Disabilities Act (ADA) Policy Statement: The *Americans with Disabilities Act* (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, currently located in the Disability Services Building at the Student Services at White Creek complex on west campus or call 979-845-1637. For additional information, visit <http://disability.tamu.edu>.

Course Schedule:

- *Week 1-11: 2 lectures/week, student will read 1 paper each week*
- *Weeks 12-15: Invited lectures, journal and proposal presentations*
- *Week 16: Final exam*

Week	Topics	Lesson Objectives	Assignments
Week 1 (T 9/1)	Aging Demographics and Theories of Aging	<ul style="list-style-type: none"> • Explain learning outcomes and introduction of syllabus. • Aging demographics in US. • Describe different theories of aging. • Identify nutrition-related challenges of older adults. 	<ul style="list-style-type: none"> • <u>Propose personal goals and objectives for the class</u> (1 page, bullet points), to be emailed to instructor by week #2, "class time".
Week 2 (T 9/6; R 9/8)	Biology of Aging: Pathogenesis, Physiology and Pathology	<ul style="list-style-type: none"> • Describe the key changes that occur during aging: e.g., body composition, hormonal changes, neuroendocrine dysregulation, bone and muscle loss, neuronal impairment, hearing/vision decline, etc.). • The impact of diet on pathogenesis of metabolic, cardiovascular, skeletal, and neurodegenerative diseases, and colon cancer in older adults. • Describe how dietary intervention can slow aging and the progression of age-associated diseases. 	<ul style="list-style-type: none"> • Review class PPT. Key concepts will be quizzed in next class. • <u>Read a current review on biology of aging, and give a 10 min briefing to class</u> (Distribute paper to everyone in class).
Week 3 (T 9/13; R 9/15)	Nutritional Needs of Older Adults	<ul style="list-style-type: none"> • Describe nutritional needs of aging, and the impacts of these changes on health and quality of life. • Describe the different dietary recommendations for older adults for macronutrients, and fluids, vitamins and minerals. • Explain how age-related changes in metabolism and health affect requirements for carbohydrates, fats, proteins, fluids, vitamins and minerals. • Introduce nutritional 	<ul style="list-style-type: none"> • Review class PPT. Key concepts will be quizzed in next class. • To share with class: <u>Outline 10 nutritional characteristics of aging, and 10 major nutritional requirements for aging adults.</u>

		recommendations for older adults based on the <i>Dietary Guidelines for Americans</i> and <i>Healthy People 2020</i>	
Week 4 (T 9/20; R 9/22)	Age-associated Diseases 1/7: Obesity and Inflammation	<ul style="list-style-type: none"> • Discuss the energy imbalance associated with aging: energy intake, energy partition, fuel efficiency, and energy expenditure. • Explain the factors associated with weight gain in the older adult. Summarize the impact of obesity on health of the older adult. • Discuss interventions to attenuate inflammation in the older adult. 	<ul style="list-style-type: none"> • Review class PPT. Key outlines will be quizzed in class the following week (List at least 5 symbolic treats). • <u>Read a paper on obesity or metabolic syndrome in aging</u>. Email instructor the article; write a short paragraph describing what <u>additional information</u> (which was not covered in the lecture) that you have learned from the paper.
Week 5 (T 9/27; R 9/29)	Age-associated Diseases 2/7: Diabetes and Diabetic Complications	<p>Describe the age-related metabolic alterations occurring in the endocrine and neuroendocrine systems.</p> <ul style="list-style-type: none"> • Describe the physiological changes of the endocrine system that occur during aging. • Identify the unique characteristics of insulin resistance, beta-cell impairment, and diabetic complications of older diabetic patients. • Describe the relationship 	<ul style="list-style-type: none"> • Review class PPT. Key concepts will be quizzed in next class (List at least 5 symbolic traits). • <u>Read a paper on type 2 diabetes in aging</u>, and mail instructor.

		between nutritional state and metabolic changes in aging.	
Week 6 (T 10/4; R 10/6)	Age-associated Diseases 3/7: Hypertension, Cardiovascular and Respiratory Diseases	<ul style="list-style-type: none"> • Describe the pathophysiology and etiology of cardiovascular conditions in older adults. • Delineate the risk factors for cardiovascular and respiratory diseases. • Describe the roles of nutrition, physical activity, and lifestyle management in prevention of cardiovascular and respiratory diseases. 	<ul style="list-style-type: none"> • Review class PPT. Key concepts will be quizzed in next class (List at least 5 symbolic traits) • <u>Read a paper on age-associated heart disease</u>, and e-mail it to the instructor.
Week 7 (T 10/11; R 10/13)	Age-associated Diseases 4/7: Neurodegenerative Diseases	<ul style="list-style-type: none"> • Describe age-related neurological problems that affect older adults. • Understand the key pathophysiology and etiology of changes related to Alzheimer's disease and Parkinson's disease. • Develop strategies and interventions to promote healthy nutrition and nutritional therapy for older adults with dementia. 	<p>Review class PPT. Key concepts will be quizzed in next class.</p> <ul style="list-style-type: none"> • <u>Read a paper on Alzheimer's disease</u>, and e-mail it to the instructor.
Week 8 (T 10/18; R 10/20)	Age-associated Diseases 5/7 : Cancer	<ul style="list-style-type: none"> • Understand why aging is a major risk factor for cancer. • Describe the impacts of aging on cancer onset, progression, and survival. • Understand the special nutritional requirements of the 	<ul style="list-style-type: none"> • Review class PPT. Key concepts will be quizzed in next class. • <u>Read a cancer paper</u>, and e-mail it to the instructor.

		elderly cancer patients.	
Week 9 (T 10/25; R 10/27)	Age-associated Diseases 6/7: Bone and Muscle Loss/Impairment	<ul style="list-style-type: none"> • Understand pathophysiology of osteoporosis and sarcopenia. • Identify risk factors for bone and muscle loss in older adults. • Be familiar with nutritional interventions for bone and skeletal health. • Describe nutritional intervention/prevention strategies to promote bone and skeletal health in older adults. • 	<ul style="list-style-type: none"> • Review class PPT. Key concepts will be quizzed in next class. • <u>Read a paper on osteoporosis or sarcopenia</u>, and e-mail it to the instructor.
Week 10 (T 11/1; R 11/3)	Age-associated Diseases 7/7: Oral Health, Vision, Hearing, and Skin	<ul style="list-style-type: none"> • Describe the relationship between fermentable carbohydrates and tooth decay. • Explain risk factors for tooth loss, impaired vision/hearing, and skin aging. • List strategies for the prevention of tooth decay, vision decline, hearing loss, and skin aging. 	<ul style="list-style-type: none"> • Review class PPT. Key concepts will be quizzed in next class. • <u>Review “Supplemental Course Materials”</u>, in order to be ready for journal presentation and aging research proposal.
Week 11 (T 11/8; R 11/10)	Aging Research: Animal Models, and Experimental Design	<ul style="list-style-type: none"> • Animal models for longevity and age-associated diseases. <ol style="list-style-type: none"> 1. Growth hormone and insulin signaling: pros and cons 2. Calorie restriction: when and how much? 3. Sirtuins in longevity • Discussion of aging paradoxes. 	<ul style="list-style-type: none"> • Review class PPT. • <u>Research additional aging animal models, and be aware of challenges associated with aging study</u> – Will be discussed in class.
Week 12 (T 11/15; R 11/17)	Interventions that improve lifespan and healthspan - “Quest to age gracefully”	<p>Dependent on the interest of the class:</p> <ul style="list-style-type: none"> • <u>Option A, by invited speakers:</u> Guest lectures on: (1. Dietetic recommendations for healthy aging; 	<u>Mini-aging research proposal due.</u> The proposal is encouraged to be based on one’s current project. It needs to include:

		<p>(2. Beneficial diets, meal patterns and life style interventions for obesity and diabetes;</p> <p>(3. Chemoprevention of colon cancer by fish oil or mango;</p> <p>(4. Sirtuins (e.g., Resveratrol) for longevity;</p> <p>(5. Effects of antioxidants on improving cognitive and psychological changes;</p> <p>(6. Circadian clock in aging</p> <p>(7. Translational/clinical design of aging study</p> <ul style="list-style-type: none"> • <u>Option B, by Y. Sun</u>: The roles of ghrelin signaling on obesity, diabetes, inflammation, muscle loss and longevity. 	<p>title, significance, innovation, hypothesis, (preliminary data), experimental design, anticipated outcome/caveats).</p>
Week 13 (T 11/22; No class on R 11/24)	Course Summary and Final Exam Tutorial	<ul style="list-style-type: none"> • Outline the most important concepts that have been taught in class, and discuss ‘words of wisdom’ on aging research and healthy aging. 	<ul style="list-style-type: none"> • <u>Prepare for journal presentation.</u> • Prepare for final exam.
Week 14 (T 11/29; R 12/1)	Student journal presentation	<ul style="list-style-type: none"> • Student can choose any of the papers that were previously e-mailed to the instructor. Papers need to be emailed to entire class the week before. 	<ul style="list-style-type: none"> • <u>Prepare for research proposal presentation.</u> • Prepare for final exam.
Week 15 (T 12/6; R 12/8)	Student Mini-proposal presentation		<ul style="list-style-type: none"> • Prepare for final exam.
Week 16 (T 12/13)	Final Exam and Course Evaluation		

Scoring Rubric:

The table below shows the activity types contained within this course, and the assigned points to determine the final course grade.

Criteria
Journal presentation: 25 points Subject knowledge 10 points; Critical thinking/analysis 10 points; Presentation 5 points.
Mini-aging grant proposal: “aging spin of one’s current research project” or an independent aging research proposal : 25 points Proposal 15 points; PPT presentation 10 points (part of class research symposium)
Final Exam: 25 points* Multiple choice questions 15 points; Essay questions related to journal presentation and grant proposal 10 points.
Participation of class quizzes and presentations: 20 points Class quizzes 10 points; Presentation 10 points.
Attendance: 5 points
Bonus 5 points: Attending relevant seminars on campus recommended by the instructor.

** The grade distribution aims to promote meaningful learning with minimal stress. If you are well prepared for class quizzes and journal/proposal presentations throughout the semester, you will do well at the final exam.*

Letter grades for the course will be based on the following grading scale:

Letter Grade	Percentage
A	90 – 100 points
B	80 – 89 points
C	70 – 79 points
D	60 – 69 points
F	<60 points