Department of Physiological Science

Physiological Science, SPRING 2009

COURSE TITLE	**MOLECULAR BIOLOGY OF AGING**
COURSE OBJECTIVE	Integration of principles gained through the basic science curriculum with the latest discoveries in the molecular biology of aging. Aging is a complex and fascinating process with great natural diversity. In recent years, the field of aging research has been revolutionized by the implementation of molecular genetic approaches in model organisms. In this course, we will outline the amazing discoveries of the new science of aging biology, which has revealed that aging is a plastic trait modulated by genes and physiological processes. In addition, we will discuss how these new findings integrate with both the nutritional modulation of lifespan and also the complex and profound relationship between the underlying aging process and the diseases of aging. Among the specific topics that will be covered are dietary restriction, mitochondria, insulin/IGF signaling and the link between tumor suppression and organismal aging.
COURSE INSTRUCTOR	David W. Walker, Ph.D. Assistant Professor of Physiological Science 3360 Life Science Building Tel: 310 825 7179 Email: davidwalker@ucla.edu

REQUIRED READINGS	Assigned from textbook chapters and selected reprints of current literature. Textbook: Molecular Biology of Aging (2008). Cold Spring Harbor Monograph Series.
GRADING	Will be based upon two examinations (mid-term 40% and final exam 60% respectively)
COURSE POLICIES	No early or late examinations permitted. If you are unable to take an examination due to illness or other emergency, you must contact the faculty lecturer before the examination. You are required to have written verification regarding the illness or emergency. If you feel that a clerical error was made in the grading of your exam, submit a typed explanation of the issue to the faculty lecturer with a copy of your exam. This written request must be submitted within seven calendar days of receiving your exam; late regrade requests will not be accepted. Exams will not be regarded for content. All exams are closed book. No study aids or materials are permitted. No communication, except with faculty, is permitted.
COURSE PREREQUISITES	Life Science 1, 2, 3, 4 and Chemistry 153A

Lecture	Lecture Topic	Reading
1	**Overview of Course** -Definitions of Aging -Aging as a risk factor for disease -Species-specific lifespans -Overview of Human Aging -The new science of aging biology	Textbook Chapter 5
2	**Evolutionary biology of Aging** -Why do we age? -Is aging programmed? -Evolutionary theories of aging.	Textbook Chapter 4. Kirkwood (2005). *Cell 120: 437-447;* Kirkwood & Austad (2000) *Nature* 408, 233; Kirkwood (2002) Mechanisms of ageing and development 123:737
3	**Biochemistry of Aging I** -What causes aging? -Mechanistic theories of aging -DNA repair and aging -mitochondrial DNA -Testing the DNA damage theory of aging	Textbook Chapter 12.
4	**Biochemistry of Aging II** -Free radical theory of Aging -Free radical biology -Testing the free radical theory of aging	Textbook Chapter 1. Balaban, R. S., Nemoto, S. and Finkel, T. (2005). *Cell* 120, 483-95.
5	**Genetics of Aging I** -*C. elegans* as a model system for aging research -Identification of the insulin/IGF signaling pathway	Textbook Chapter 7.
6	**Genetics of Aging II** -*Drosophila* as a model system for aging research -Studying aging in mice -Insulin/IGF signaling: an evolutionarily conserved determinant of aging	Textbook Chapter 11. Textbook Chapter 13. - Russell & Kahn (2007). Nature Reviews Molecular Cell Biology **8**, 681-691
7	**Genetics of Aging III** -Genome-wide RNAi screens for aging genes -Mitochondrial electron transport chain (ETC) function and aging -Interaction between insulin/IGF signaling and ETC function	Textbook Chapter 1. Textbook Chapter 7.
8	**Genetics of Aging IV** -Mitochondrial function and aging -Humans -Mechanisms	Textbook Chapter 1. Balaban, R. S., Nemoto, S. and Finkel, T. (2005). *Cell* 120, 483-95.

8	**Genetics of Aging IV** -Mitochondrial function and aging -Humans -Mechanisms -Evolutionarily conserved?	Textbook Chapter 1. Balaban, R. S., Nemoto, S. and Finkel, T. (2005). *Cell* 120, 483-95.
9	**Review**	Kenyon (2005) Cell 120, Pages 449-460
10	**Exam**	
11	**Nutrition and Aging I** -Dietary restriction (DR) -History of field -Physiological alterations	Textbook Chapters 2, 3 & 15
12	**Nutrition and Aging II** -DR in genetically tractable model organisms -Towards a mechanistic understanding of DR -The smell of death	Textbook Chapters 2, 3 & 15
13	**Alterations in gene expression associated with normal and altered aging** -age-related changes in gene expression -gene expression changes in response to DR -gene expression changes in response to altered insulin/IGF signaling	Textbook chapter 9
14	**Reproduction and aging** -Sex and death -sex differences in longevity -signals from the germline modulate lifespan	Partridge, Gems & Withers. 2005. *Cell* 120: Pages 461-472
15	**Stress response pathways and aging** -*In vitro* studies -*In vivo* studies	Textbook Chapter 16
16	**Stem cell biology and aging** -Stem cell overview -Stem cell aging in vertebrates -Stem cell aging in invertebrates	Textbook Chapter 10
17	**The relationship between aging and age-related disease I** -Oxidative stress, aging and neurological disease -Protein aggregation, aging and neurological disease	Textbook chapter 1 & 14
18	**The relationship between aging and age-related disease II**	Textbook chapters 6 & 8

20	**Exam**	