BBSG-503
Section 8: Integrative and Systems Biology
M-F 9:00 am – 10:00 am
LRC 105 A and B

The section is broken into two parts. Part One will include the Pharmacology and Endocrinology Lectures. Part Two will include the Cardiovascular/Respiratory/Renal Lectures and the Neuroscience Lectures. There will be one, in class exam on Friday, April 8.

Section Director: Willis K. Samson, Ph.D.
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Part One Lecturers
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Part Two Lecturers
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Scott Zahm, Ph.D. zahmds@slu.edu
Doisy Hall-Third Floor, ext. 7-8003
Lecture 1  
Monday, Feb. 28, 2005  9:00 – 10:00 am  
Lecture Title: Drug Absorption  
Lecturer: Dr. Joseph Baldassare  
Suggested Reading: The Pharmacological Basis of Therapeutics- Goodman and Gilman, Chapter 1

Outline:  
I. Absorption Physiochemical Factors in Drug Absorption  
   A. Passive Diffusion:  
      Lipid solubility  
      Effect of pH  
   B. Carrier Mediated Transport  
      Facilitated transport  
      Active transport  
II. Drug Distribution and Storage  
   A. Determination of body water compartments  
   B. Binding to Albumin  
   C. Volume of Distribution

Lecture 2  
Monday, Feb. 28, 2005  10:00 - 11:00 a.m.  
Lecture Title: Molecular Basis for Drug Binding/Pharmacological Antagonism  
Lecturer: Dr. Joseph Baldassare

Suggested Reading: The Pharmacological Basis of Therapeutics- Goodman & Gilman, Chapter 2

Outline:  
Drug Receptor Theory  
   A. Determination of Drug binding  
      Competition binding  
   B. Efficacy and Potency  
   C. Antagonism
Lecture 3
Tuesday, March 1, 2005
Lecture Title: Drug Biotransformation
Lecturer: Dr. Thomas Westfall
Suggested Reading: Goodman and Gilman 10th Edition Chapter 1: p. 11-18 plus Handouts

Outline:
Drug Biotransformation and Excretion
• Consequences of Biotransformation
• Phase 1 Reactions
• Phase 2 Reactions
• Induction and Inhibition
• Factors Influencing Drug Biotransformation
• Excretion of Drugs

Lecture 4
Wednesday, March 2, 2005
Lecture Title: Autonomics I
Lecturer: Dr. Thomas Westfall
Suggested Reading: Goodman and Gilman 10th Edition Chapter 6: p. 115-125 plus Handouts

Outline:
Anatomical and Physiological Considerations
• Anatomy of the Autonomic Nervous System
• Neurochemical Considerations
• Physiological Considerations

Lecture 5
Thursday, March 3, 2005
Lecture Title: Autonomics II
Lecturer: Thomas Westfall

Outline:
Cholinergic Neurotransmission
• Synthesis
• Storage
• Release
• Inactivation
• Receptor Activation
Lecture 6  
Friday, March 4, 2005  
Lecture Title: Autonomics III  
Lecturer: Dr. Thomas Westfall  
Suggested Reading: Goodman and Gilman 10th Edition Chapter 6: p. 129-149 plus Handouts

Outline:  
Adrenergic Neurotransmission  
• Synthesis  
• Storage  
• Release  
• Inactivation  
• Receptor Activation

Lectures 7 and 8  
Monday and Tuesday, March 14 and 15, 2005  
Lecture Title: Anterior and Posterior Pituitary Gland  
Lecturer: Dr. Meghan M. Taylor  
Reading assignment: The lecture handout  

Learning Objectives:  
1. Understand the basic anatomy and functions of the anterior and posterior pituitary.  
2. Identify and understand the regulation of secretion and the major sites and mechanisms of action of GH, PRL, ACTH, TSH, LH and FSH.  
3. Identify the major actions of vasopressin (a.k.a. antidiuretic hormone) and understand what normally controls its release.  
4. Identify the major actions of oxytocin.

Lecture 9  
Wednesday, March 16, 2005  
Lecture Title: Adrenal Physiology  
Lecturer: Dr. Willis K. Samson  
Reading assignment: The lecture handout  

Chapter 59, ACTH; Adrenocortical Steroids and their Synthetic Analogs, pp. 1465-1484
Learning Objectives:
1. Recognize the functional anatomy of the adrenal glands.
2. Identify the regulation of hormone production from the adrenal cortex.
3. Detail the physiology of the glucocorticoids.
4. Recognize the clinical features of cortisol excess or deficiency.
5. Detail the physiology of the mineralocorticoids and adrenal androgens.
6. Identify the consequences of mineralocorticoid excess.
7. Understand adrenal medullary production of catecholamines and their major actions.

Lectures 10 and 11
Thursday and Friday, March 17 and 18, 2005
Lecture Title: Glucose Homeostasis
Lecturer: Dr. Willis K. Samson
Reading assignment: The lecture handout.
Suggested reading in preparation for lecture:
Textbook of Endocrine Physiology, edited by JE Griffin and SR Ojeda, Oxford Press
5th edition, Chapter 16: Glucose, Lipid and Protein Metabolism, pp. 377-406

Learning objectives:
1. Recognize the physiological changes observed in the two stages of fuel metabolism: anabolism and catabolism.
2. Describe the metabolic changes of catabolism.
3. Describe the metabolic changes of anabolism.
4. Review glycogenolysis and gluconeogenesis.
5. Review lipolysis and ketogenesis.
6. Review proteolysis and gluconeogenesis.

Section 2 - SYSTEMS BIOLOGY
CARDIOVASCULAR/RENAL/RESPIRATORY LECTURES
March 21, 2005 – March 30, 2005 (8 Lectures)

Lecture 12
Monday, March 21, 2005
Lecture Title: Introduction to the Circulatory System: Hemodynamics-Derivation of Poiseuille’s Law
Lecturer: Andrew J. Lonigro, M.D.
Required Reading: Berne and Levy, Cardiovascular Physiology, 8th Edition, Mosby, Chapter 1 (pp1-6); chapter 5 (pp 115-134)
Additional Source Material: Guyton and Hall, Medical Physiology, 10th Edition, Saunders, Chapter 14 (pp 144-151; Chapter 17 (pp 175-183; Chapter 19 (pp 195-209).
Lecture 13
Tuesday, March 22, 2005
Lecture Title: *Determinants of Cardiac Output: The Frank-Starling Relationship*
Lecturer: Andrew J. Lonigro, M.D.

Lecture 14
Wednesday, March 23, 2005
Lecture Title: *Overall Control of the Circulation: Cardiovascular Reflexes, hormonal Mechanisms, Local Circulatory Control Mechanisms, The Renal-Body Fluid Mechanism.*
Lecturer: Andrew J. Lonigro, M.D.
Required Reading: Berne and Levy, Cardiovascular Physiology, 8th Edition, Mosby, Chapter 8 (pp 175-197).

Lecture 15
Thursday, March 24, 2005
Lecture: *Introduction to Renal Function: Perfusion and Filtration*
Lecturer: Andrew J. Lonigro, M.D.
Required Reading: Guyton and Hall, Medical Physiology, 10th Edition, Saunders, Chapter 26 (pp279 – 294).

Lecture 16
Monday, March 28, 2005 (First Hour)
Lecture: *Tubular Function: Filtrate Reabsorption, Tubular Secretion, Excretion of Urine*
Lecturer: Andrew J. Lonigro, M.D.
Required Reading: Guyton and Hall, Medical Physiology, 10th Edition, Saunders, Chapter 27 (pp 295 – 312).

Lecture 17
Monday, March 28, 2005 (Second Hour)
Lecture: *The Regulation of pH: Physiologic Buffering Mechanisms*
Lecturer: Randy S. Sprague, M.D.
Required Reading: Guyton and Hall, Medical Physiology, 10th Edition, Saunders, Chapter 30 (pp 346-363).
Lecture 18
Tuesday, March 29, 2005
Lecture: *The Pulmonary Circulation. Regulation of Pressure & The Intrapulmonary Distribution of Flow*
Lecturer: Randy S. Sprague, M.D.
Required Reading: J. B. West, Respiratory Physiology, 6th Edition, Chapter 4, (pp29-44).

Lecture 19
Wednesday, March 30, 2005 (First Hour)
Lecturer: Randy S. Sprague, M.D.

Lecture 20
Wednesday, March 30, 2005 (Second Hour)
Lecture: *Heart Failure-Pathophysiological Mechanisms*
Lecturer: Randy S. Sprague, M.D. & Andrew J. Lonigro, M.D.

Introduction to Nervous Systems
March 31, 2005 - April 6, 2005

Lecture 21
Thursday, March 31, 2005
Lecture Title: Survey of the Nervous System
Lecturer: Scott Zahm, Ph.D.
Objectives - to describe: neurons; supporting cells, i.e., neuroglia - astrocytes, oligodendrocytes, ependyma, microglia; ventricular system and meninges; CNS and PNS; the spinal nerve and autonomies; important structures in the CNS - cortex, thalamus, hypothalamus, basal ganglia, cranial nerve nuclei; blood supply and drainage of CNS

Lecture 22
Friday, Apr 1, 2005
Lecture Title: Development of the Nervous System
Lecturer: Medha Gautam, Ph.D.
Lecture 23
Monday, Apr 4, 2005
Lecture Title: Sensory systems
Lecturer: Michael Ariel, Ph.D.

Lecture 24
Tuesday, Apr 5, 2005
Lecture Title: Motor and Ascending Modulatory Systems
Lecturer: Scott Zahm, Ph.D. Objectives - to describe: minimal CNS substrate for erect posture and movement; descending motor control systems, including cortical and subcortical, that modulate the brainstem/spinal motor substrate; ascending projection systems that modulate activity in cortical and subcortical descending motor control systems - dopamine, acetylcholine, serotonin, etc; possible brain substrates for motivation; the interaction between descending motor control systems and ascending modulatory projections

Lecture 25
Wednesday, Apr 6, 2005
Lecture Title: Neurodegenerative disorders; Parkinson's disease
Lecturer: Scott Zahm, Ph.D.
Objectives - to describe processes underlying degeneration of neurons and discuss some major neurodegenerative disorders that affect humans, with an emphasis on Parkinson's disease.

Thursday, April 7 Study Day

Friday, April 8 Exam, 9:00 am to Noon, LRC 105 a&b and 106 a&b