Overview of the Cardiovascular System

- Components of the Cardiovascular System
- Functions of the circulatory system
- Organization of the circuitry
- Relationships between vascular diameter, wall thickness, lumen cross-sectional area, and velocity of flow
- Understanding how Poiseuille’s Law defines the determinants of blood flow

Required Reading: Berne and Levy, Cardiovascular Physiology 7th Edition, Mosby, Chapter 1 (pp 1-6); Chapter 5 (pp 113-131)

Additional Source Material: Guyton and Hall, Medical Physiology, 11th Edition, Saunders, Chapter 14 (pp 161-170)

The Heart and its Function

- The structure of the heart in relation to its function
- The Cardiac Cycle
- The Frank-Starling relationship and how it relates to Cardiac Output
- Determinants of Blood Pressure

Required Reading: Berne and Levy, Cardiovascular Physiology 7th Edition, Mosby, Chapter 3 (pp 73-75); Chapter 6 (pp 140-147)

Additional Source Material: Guyton and Hall, Medical Physiology, 11th Edition, Saunders, Chapter 9 (pp 103-114)

Overall Control of the Circulation: Cardiovascular Reflexes and Hormonal Control

Objectives:
1. Recognize how local factors control acute and long term regional blood flow.
2. Identify the major humoral factors that control blood flow.
3. Identify how the central nervous system controls the circulation and how the neural reflexes are initiated.
4. Recognize the importance of low as well as high pressure baroreceptors.
**Required Reading:** Textbook of Medical Physiology, 10th edition, AC Guyton and JE Hall, W.B. Saunders Co., Philadelphia 2000
Pages: 175-182 and 184-191

March 3 - Barry Chapnick, Ph.D.
M204 977-6465  chapnick@slu.edu

*Introduction to Renal Function: Perfusion and Filtration*
1. Volume and Composition of Body Fluids
   a. body fluid compartments
   b. ionic composition of body fluids
2. Renal Anatomy
   a. gross morphology of the kidney
   b. vascular supply of the kidney
3. Renal circulation
   a. intrarenal distribution of blood flow
   b. control of renal circulation
   c. autoregulation
4. Elements of renal function I
   a. glomerular ultrafiltration
   b. regulation of filtration

**Required Reading:** Guyton and Hall, Medical Physiology, 10th edition, Saunders, Chapter 26 (pp 279-294).

March 6 Barry Chapnick, Ph.D.

*Tubular Function:*
1. Tubular reabsorption/(and secretion)
   a. general considerations
   b. types of reabsorptive/secretory transport
      (active vs. passive)
2. Mechanisms of reabsorption and excretion of ions and water
   a. reabsorption of ions and water in the proximal tubule
   b. ion and water reabsorption in the loop of Henle
      1. Na-K-2Cl symport
      2. counter current mechanism
      3. concentration/dilution mechanisms
   d. ion and water reabsorption in the distal nephron
      1. ion transport in distal tubule and collecting ducts
         Na-K/Na-H exchange
      2. hormonal regulation
         (ADH/aldosterone)

**Required Reading:** Guyton and Hall, Medical Physiology, 10th edition, Saunders, Chapter 26 (pp 295-312).
March 7 Randy Sprague, M.D.
M-210 977-6458 spraguer@slu.edu

The Regulation of pH: Physiologic Buffering Mechanisms

**Required Reading:** Guyton and Hall, Medical Physiology 10th edition, Saunders, Chapter 30 (pp. 346-363)

**Additional source material:** JB West, Respiratory Physiology, 6th edition, Chapter 6 (pp. 63-77)

March 8 Randy Sprague, M.D.

The Pulmonary Circulation: Regulation of Pressure and The Intrapulmonary Distribution of Flow

**Required Reading:** JB West, Respiratory Physiology, 6th edition, Chapter 4 (pp. 29-44)

**Additional source material:** Guyton and Hall, Medical Physiology 10th edition, Saunders, Chapter 38 (pp. 444-451)

March 9 Randy Sprague, M.D.

The Respiratory Function of the Lungs: How Alveolar pO2 is Maintained; How Intrapulmonary Flow and Alveolar Ventilation are Matched

**Required Reading:** JB West, Respiratory Physiology, 6th edition, Chapter 5 (pp. 45-62)

**Additional source material:** Guyton and Hall, Medical Physiology 10th edition, Saunders, Chapter 39 (pp.452-462)

March 10 Progress exam 9:00 – 11:00

March 13-17 Spring Break (No Classes)

March 20 Joe Baldassare, Ph.D.
M-216 977-6468 baldasjj@slu.edu

Drug Absorption

1. Physiochemical Factors in Drug Absorption
   - Passive Diffusion (Lipid solubility and Effect of pH)
   - Carrier Mediated Transport (Facilitated and Active Transport)

2. Drug Distribution and Storage
   - Determination of body water compartments
   - Binding to albumin
   - Volume of distribution

**Required Reading:** Chapter 1, Goodman and Gilman The Pharmacologic Basis of Therapeutics
March 21  Tom Westfall, Ph.D.  
M-362  977-6400  westfatc@slu.edu

**Drug Biotransformation and Excretion**
- Consequences of Biotransformation
- Phase 1 Reactions
- Phase 2 Reactions
- Induction and Inhibition
- Factors Influencing Drug Biotransformation
- Excretion of Drugs

**Required Reading:** Katzung’s Basic and Clinical Pharmacology Chapter4, pp 51-63

March 22  Tom Westfall, Ph.D.

**Autonomics I: Anatomical and Physiological Considerations**
- Anatomy of the Autonomic Nervous System
- Neurochemical Considerations
- Physiological Considerations

**Required Reading:** Goodman and Gilman 11th Edition Chapter 6: p. 137-150

March 23  NO CLASS

March 24  Joe Baldassare, Ph.D.

**Molecular Basis of Drug Binding/Pharmacological Antagonism**
1. Determination of Drug Binding (Competition binding)
2. Efficacy and potency
3. Anagtonism

Required Reading: Chapter 2, Goodman and Gilman The Pharmacologic Basis of Therapeutics

March 27  Tom Westfall, Ph.D.  (9:00 – 10:00)

**Autonomics II: Cholinergic Neurotransmission**
- Synthesis
- Storage
- Release
- Inactivation
- Receptor Activation

**Required Reading:** Goodman and Gilman 11th Edition Chapter 6: p. 150-158

March 27  Tom Westfall, Ph.D.  (10:00 – 11:00)

**Autonomics III: Adrenergic Neurotransmission**
- Synthesis
- Storage
- Release
- Inactivation
- Receptor Activation

**Required Reading:** Goodman and Gilman 11\textsuperscript{th} Edition Chapter 6: p. 158-170

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March 28 Meghan White, Ph.D.  \textbf{(\textit{*N.B. 9:00- 11:00})}

M-471 977-6354  taylormm@slu.edu

\textit{Anterior and Posterior Pituitary}

Objectives:
1. Identify the basic components of the endocrine system.
2. Understand the anatomy of the hypothalamus and pituitary gland.
3. Identify the anterior pituitary hormones and describe their basic regulation.
4. Identify the posterior pituitary hormones and understand their basic function and regulation.

**Required Reading:** Organization of the Endocrine System. In “Textbook of Endocrine Physiology, 5\textsuperscript{th} Edition”. Eds: Griffin & Ojeda, Chapter 1, pages 1-15.

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March 29 and 30 WK Samson, Ph.D.  \textbf{(9:00 – 11:00 both days)}

\textit{Adrenal Physiology}

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.

**Required Reading** in preparation for Adrenal lectures March 29 and 30:

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March 30 WK Samson, Ph.D.  \textbf{(*N.B. 10:00- 11:00)}

\textit{Glucose Homeostasis}

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.

March 31 Scott Zahm, Ph.D.
R-312      977-8003      zahmds@slu.edu

Neuro I: Survey of the Nervous System

Objectives are 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 nerves
- blood supply and drainage of CNS

April 3 Mickey Ariel, Ph.D. (N.B. 9:00 – 10:00)
M-407      977-8050      arielm@slu.edu

Neuro II: Sensory Systems

Objective: To understand general concepts of transduction by sensory receptors and specific physiological mechanism of the Pacinian Corpuscle.

Lecture Outline
1) General overview of basic concepts of sensory systems
   a) sensation versus perception
   b) transduction is specific for energy form and receptor cell type
   c) sensitivity based on transduction mechanism, local density of receptor cells and extent of postsynaptic convergence
2) General overview of sensory transduction
   a) the physics of energy
   b) effect of an increase in sodium membrane conductance (generator potential)
   c) spike activation or synaptic transmitter release
3) Visual transduction: the Rod Photoreceptor
   a) ocular anatomy and rod morphology
   b) rhodopsin, transducin and phosphodiesterase
4) Mechanoreceptor transduction: the Pacinian Corpuscle
   a) non-neural filtering
   b) neural membrane response
   c) frequency response relative to meissner corpuscle
   d) relationship of mechanoreceptor function to perception

Readings: To be announced
April 3 Scott Zahm, Ph.D.  (N.B. 10:00 – 11:00)

*Neuro III: Motor and Ascending Modulatory Systems*

Objectives are 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

April 4 Medha Gautam, Ph.D.
M-470  977-6353  mgautam@slu.edu

*Neuro IV: Development of the Mammalian Nervous System*

Objectives:
1. Describe the basic components of the nervous system and their subdivisions.
2. Describe the developmental origins of the brain, spinal cord and peripheral nervous system.
3. Describe the following events in nervous system development, with knowledge of the principal molecules involved and their basic functions:
   - Neutralization
   - Formation of anterior-posterior and dorsal-ventral axes along the neural tube
   - Neuronal migration and generation of neuronal diversity
   - Neuronal survival and apoptosis
   - Guidance of axons to their targets
   - Synapse formation

**Reading:** Handout distributed before class.

April 5 Scott Zahm, Ph.D.

*Neuro V: Neurodegenerative Disorders; Parkinson’s Disease*

Objectives are to describe:
- processes underlying degeneration of neurons
- some major neurodegenerative disorders that affect humans, with an emphasis on Parkinson's disease.

April 6  

*Study Day*
April 7 Section 8 Exam (only material since March 20\textsuperscript{th} lecture)
9:00 – noon