Section Director: Dave Ford, Ph.D.
Office: MS 141: ext. 8129: e-mail: fordda@slu.edu

Lecturers:
Michael Moxley, Ph.D.
Office: MS 1st Floor: ext. 8190: e-mail: moxleyma@slu.edu

Peggy Weidman, Ph.D.
Office: MS 1st Floor: ext. 8179: e-mail: weidmanp@slu.edu

Carmine Coscia, Ph.D.
Office: MS Rm. 121: ext. 8160: e-mail: cosciacc@slu.edu

John Corbett, Ph.D.
Office: MS Rm. 105: ext. 8165: e-mail: corbettj@slu.edu
Dr. Michael Moxley Lectures 1-4 (Basics of pathways are in Zubay handouts will show research examples)

Date: 11/13/03  
Lecturer: Michael Moxley, Ph.D.  
Lecture 1: Hexose Metabolism I  Regulation of Glycolysis and Gluconeogenesis


- Overview of Glycolysis and Gluconeogenesis
- Regulatory Enzymes
- Role of Phosphofructokinase 2
- Tissue Specificity of Regulatory Enzymes

Date: 11/14/03  
Lecturer: Michael Moxley, Ph.D.  
Lecture 2: Hexose Metabolism II Regulation of Glycogenesis and Glycogenolysis


- Overview of Glycogenesis and Glycogenolysis
- Enzymes in the Regulation of Glycogen Metabolism
- Priming of Glycogen Synthesis –Role of Glycogenin
- Tissue Isoforms of Glycogenin?

Date: 11/17/03  
Lecturer: Michael Moxley, Ph.D.  
Lecture 3: TCA Cycle


- Overview of Tricarboxylic Acid Cycle
- Regulation of the TCA Cycle
- Glyoxylate Cycle – Anabolic Variant of the TCA Cycle
- Isocitrate Dehydrogenase –Regulation of Substrate Utilization Differs in Prokaryotes and Eukaryote
Date: 11/18/03                  Lecturer: Michael Moxley, Ph.D.
Lecture 4: Regulation of Intermediary Metabolism in Different Tissues

Resource Material: Class Handouts

- Regulation of Carbohydrate Metabolism in Cardiac and Skeletal Muscle
- Regulation of Carbohydrate Metabolism in Adipose Tissue
- Regulation of Carbohydrate Metabolism in Liver

Dr. Peggy Weidman (lectures 5-10)


DATE: 11/19/03                  Lecturer: Peggy Weidman, Ph.D.
Lecture 5: Oxidative Phosphorylation I

MBC, Chapter 14, pp. 773-775 and pp. 782-791

- Three stages of respiration and overview of oxidative phosphorylation
- Linked redox reactions and respiratory electron transport
- Respiratory electron carrier complex
- Coupling of electron transport to proton pumping

Date: 11/20/03                  Lecturer: Peggy Weidman, Ph.D.
Lecture 6: Oxidative Phosphorylation II

MBC, Chapter 14, pp. 775-781

- The proton electrochemical gradient
- Rotary catalysis mechanism of ATP-synthase
- Coupling proton entry to ATP synthesis
- Coupling of respiratory electron transport and ATP synthesis
- Regulation of Oxidative Phosphorylation
Lecture 7: Profits and Perils of Life in an Oxidizing Environment

• Mitochondrial diseases
• Other enzymes that use molecular oxygen
• Cytochromes P450 and detoxification of Xenobiotics
• Reactive oxygen intermediates and cellular defense mechanisms
• Generation of heat by uncoupler proteins

Lecture 8: Overview of the ER

MBC, Chapter 12, pp 698-710.

• Signal-mediated translocation into the ER
• Addition of core N-linked oligosaccharide
• ER Chaperones and protein folding
• Degradation of misfolded proteins
• The ER unfolded protein response

Lecture 9: Protein Processing, Sorting, and Transport on the Secretory Pathway

MBC Chapter 13, pp 711-738, Chapter 19, pp 1091-1096,

• Processing of core N-linked oligosaccharides in the Golgi
• Synthesis of O-linked carbohydrates, glycolipids, glycosaminoglycans
• Proteolytic processing of prohormones, proenzymes, peptide neurotransmitters
• Protein sorting and vesicular transport on the secretory pathway
• Mechanisms for retention of ER and Golgi resident proteins

Lecture 10: Overview of Endocytosis

MBC Chapter 13, pp739- 765

• Regulated and constitutive secretion
• Sorting of lysosomal enzymes
• Pathways from the cell surface to the lysosome
• Receptor-mediated endocytosis and clathrin-coated vesicles
• Sorting and transcytosis in polarized cells

Lectures 11-15: AMINO ACID AND ISOPRENOID METABOLISM

Dr. C. J. Coscia
Reference Material for Lectures 11-15:
Biochemistry, G. Zubay, 4th Ed.

Lecture 11
DATE: 12/2/03 Lecturer: Carmine Coscia, Ph.D.
Lecture: General Amino Acid Metabolism

**Required reading:** Zubay, pp. 240-243 and pp. 597-602
- Dynamic State of Nitrogen Metabolism
- Role of Transamination in Amino Acid Metabolism

Lecture 12
DATE: 12/3/03 Lecturer: Carmine Coscia, Ph.D.
Lecture: Regulation of Nitrogen Excretion

**Required reading:** Zubay, pp. 602-606
- The Urea Cycle
- Renal NH3 Disposal

Lecture 13
DATE: 12/4/03 Lecturer: Carmine Coscia, Ph.D.
Lecture: Regulation of Aromatic Amino Acid and One-Carbon Metabolism

**Required reading:** Zubay, pp. 251-255 and pp. 710-712
- Regulation of Aromatic Amino Acid Metabolism; Anabolic and Catabolic Pathways
- Folic Acid and One-Carbon Metabolism
- Biological Methylation and its Regulation

Lecture 14
DATE: 12/5/03 Lecturer: Carmine Coscia, Ph.D.
Lecture: Regulation of Nucleotide Metabolism

**Required reading:** Zubay, pp. 631-644, 655, 657
- De novo Synthesis of Purine Nucleotides
- De novo Synthesis of Pyrimidine Nucleotides
- Nucleotide Interconversions
Lecture 15
DATE: 12/8/03 Lecturer: Carmine Coscia, Ph.D.
Lecture: Regulation of Isoprenoid Metabolism (Coscia)

Required reading: Zubay, pp. 532-542, 548-550

Structural and Functional Diversity of Isoprenoids
Mechanisms of Regulation of Cholesterol Biosynthesis

DATE: 12/9/03 Lecturer: John Corbett, Ph.D.
Lecture 16: L-arginine dependent NO synthesis pathway (Corbett)

• eNOS and regulation of vascular tone
• Role of iNOS in inflammation and immune
• Surveillance
• nNOS, role of NO in neuronal signaling

DATE: 12/10/03 Lecturer: Dave Ford, Ph.D.
Lecture 17 Regulation of triglyceride and cholesterol absorption and transport


• Lipids: Definition, Classification and Structures
• Regulation of triglyceride digestion and storage mediated by bile salts, pancreatic lipase, lipoprotein lipase (LPL)
• Regulation of cholesterol and triglyceride transport by lipoproteins
• Regulation of cholesterol uptake by LDL receptors
• Atherosclerosis

DATE: 12/11/03 Lecturer: Dave Ford, Ph.D.
Lecture 18 Regulation of the synthesis, degradation and trafficking of fatty acids


• Hormonal regulation of triglyceride catabolism and synthesis
• Regulation of the transport of fatty acids as acyl CoA and acyl carnitine
• Regulation of fatty acid oxidation by mitochondrial and peroxisomal
• β-oxidation as well as α- and ω-oxidation
• Regulation of fatty acid synthesis by fatty acid synthase and acetyl carboxylase
• Regulation of intracellular fatty acid uptake/utilization

DATE: 12/12/03  
Lecturer: Dave Ford, Ph.D.
Lecture 19 Regulation of phospholipid and sphingolipid synthesis


• Biosynthetic pathways for the phospholipids and sphingolipids.
• Regulation of phospholipid and neutral lipid biosynthesis
• Biosynthesis of plasmalogens, alkyl ethers and platelet activating factor

DATE: 12/15/03  
Lecturer: Dave Ford, Ph.D.
Lecture 20 Regulation of phospholipid and sphingolipid catabolism


• Phospholipases, sphingomyelinase and ceramidase: Enzymic mediators of cell signalling
• Eicosanoids: Lipidic mediators of homeostasis and pathophysiology

DATE: 12/16/03  
Lecturer: Dave Ford, Ph.D.
Lecture 21 Integrative regulation of metabolism

Reading material will be provided
• Transport of body fuels through the body/Liver as central storage depot for fuels (whole body regulation)
• Aerobic and anaerobic myocardial metabolism (regulation at organ level)
• Myocardial metabolism as a mechanism regulating coronary flow and alterations of myocardial metabolism as a source of pathophysiological amphiphiles.

EXAM 12/17/03