BIOCHEMISTRY OF DISEASE
Biochem 463/Biochem 563
Fall, 2018
M, W 1:00 to 2:15 PM
Room: HEB3 (Health Education Building III) room 3710

Coordinator: **Dr. Meilian Liu**
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Biochemistry of Disease consists of three 4-week topics, one 3-week topic, and one 1-week topic, each designed to develop basic and advanced concepts of biochemistry, cell and molecular biology in the context of health and disease states.

Prerequisite: Biochem 445/446 or Biochem 423

Topic #1: Aug. 20 to Aug. 22 (8/20 and 8/22)

Orientation in Biomedical Research

Dr. Meilian Liu (email: meilianliu@salud.unm.edu; office: BMSB 257)

Dr. Curt Hines (email: WCHines@salud.unm.edu; Office Fitz-255)

Biomedical research enables a better understanding of biochemical and molecular basis of diseases as well as development of novel therapeutic targets for a particular type of disease. This orientation section will introduce this course and discuss the key components of biomedical research, including searching scientific literature, citing reference, and reading scientific articles.

Topic #2: Aug. 27 to Sep. 24 (8/27, 8/29, 9/5, 9/10, 9/12, 9/17, 9/19 and 9/24)

mTOR Signaling and Metabolic Diseases

Dr. Meilian Liu (email: meilianliu@salud.unm.edu; office: BMSB 257)

The mechanistic (or mammalian) target of rapamycin (mTOR) is an intracellular energy sensor, which integrates distinct signals such as hormone, nutrient, and stress, and plays an important role in regulating multiple cellular processes including protein translation, lipid metabolism, cell growth and survival. mTOR exists in two distinct complexes, mTORC1 and mTORC2, which differ in subunit compositions and biological functions. The dysregulation of mTORC1 and mTORC2 are associated with numerous diseases, such as obesity, diabetes, cancer, depression, Alzheimer disease and aging. This section will discuss the composition of mTOR complexes, mTOR signaling transduction, the regulation of mTORC1 and mTORC2, functional role of mTOR signaling, and mTOR-related diseases.

Note: this section will be assessed by quizzes, a group project and a term paper.

Topic #3: Sep. 26 to Oct. 15 (9/26, 10/1, 10/3, 10/8, 10/10, and 10/15)

Biochemistry of cell communication in tissues and tumors

Dr. Curt Hines (email: WCHines@salud.unm.edu; Office Fitz-255)

Tissues are formed and shaped by cells of many different types that organize and operate in harmony. This orchestration requires regulation of distinct—yet highly interdependent—components, not only of the different types of cells present, but of the myriad of molecules they synthesize. The biochemical nature of these interactions is critical to understand if we are to comprehend fundamental processes in disease, especially one as formidable and perplexing as cancer. In this block, we will use the breast as a case in point. We will explore the cellular landscape of the tissue and review the key biochemical signals and pathways that that must be integrated by the different cell types to maintain order and function. We will review and discuss the presence and consequences of influential cell-signaling events, including: Wnt, Hedgehog, Notch, TGF-beta, Cell adhesion, and Jak-stat pathways.

Note: this section will have a sectional examination and a poster presentation.

Topic #4: Oct. 17 to Nov. 12 (10/17, 10/22, 10/24, 10/29, 10/31, 11/5, 11/7, and 11/12)

Proline Metabolism in Health and Disease

Dr. C. Andy Hu (email: AHu@salud.unm.edu; office: FITZ258)

Proline metabolism in mammals involves four other amino acids, glutamate, ornithine, arginine, and glutamine, and 7 enzymatic activities, **Δ**^{1}-pyrroline-5-carboxylate (P5C) reductase (P5CR), proline dehydrogenase/proline oxidase (PRODH/POX), P5C dehydrogenase (P5CDH), P5C synthase (P5CS), ornithine-**δ**-aminotransferase (OAT), glutamine synthetase (GS), and glutaminase (GLS). With the exception of OAT, which catalyzes a reversible reaction, the other 6 enzymes are unidirectional, suggesting that proline-related metabolism is purpose-driven, tightly regulated, and compartmentalized. This five-amino-acid system also links with three other essential metabolic systems, namely the TCA cycle, the urea cycle, and the pentose phosphate pathway. In this section, we will discuss the biochemistry and molecular biology of proline metabolism and its related abnormalities.

Note: this section will be assessed by quizzes, a group project and a term paper.

Topic #5: Nov. 14 to Dec. 10 (11/14, 11/19, 11/21, 11/26, 11/28, 12/3, 12/5, and 12/10)

V-ATPases in Health and Disease

Dr. Karlett Parra (email: Kjparra@salud.unm.edu; office: BMSB 249)

V-ATPase proton pumps are molecular motors that acidify cellular compartments and energize membranes. A broad spectrum of physiological processes relies on V-ATPase activity including endocytic and secretory vesicular transport, zymogen activation, and protein sorting. Cancer, distal renal tubular acidosis, fungal infections, male fertility, and osteopetrosis are malignancies associated with V-ATPase function and dysfunction. This section will discuss scientific literature describing V-ATPase structure, function and regulation in normal physiology and pathophysiology.

Note: this section will have a sectional examination and a poster presentation.

PDFs of Syllabi, slide files, and reading materials will be posted on the "UNM Learn", https://learn.unm.edu

Grading: the final average score of all five sections

97.5% and above, A+; 92.5-97.4%, A; 89.5-92.4%, A-; 87.5%-89.4%, B+; 82.5-87.4%,B; 79.5-82.4%, B-; 77.5%-79.4% , C+; 72.5-77.4%, C; 69.5-72.4%, C-; 59.5-69.4%, D.
Below a C, the students do NOT get credit for the course.
Below a D, the students do NOT get credit for the course.
Fail is below 59.5%.