Week 3

ANATOMY: DIGESTIVE SYSTEM

Digestive System I: Overview
1. Identify the organs of the digestive system.
2. Describe the basic processes performed by the digestive system.
3. Name and describe the abdominopelvic regions.
4. Describe the peritoneum and the peritoneal folds.
5. Discuss peritonitis.
6. Describe the layers that form the wall of gastrointestinal tract.
7. Describe the two nerve plexuses of the gastrointestinal tract.

Digestive System II: Esophagus
1. Describe the location and gross anatomy of the esophagus.
2. Describe the histology and layers that form the wall of esophagus.
3. Explain the functions of the esophagus in the digestive process.
4. Discuss gastroesophageal reflux disease (GERD) and Barrett’s esophagus.

Digestive System III: Stomach
1. Describe the location and gross anatomy of the stomach.
2. Describe the histology and layers that form the wall of stomach.
3. Describe the gastric glands including the cells and secretory products.
4. Explain the functions of the stomach in the digestive process.
5. Discuss peptic ulcer disease (PUD).

Digestive System IV: Small Intestine
1. Describe the location and gross anatomy of the small intestine.
2. Describe the histology and layers that form the wall of small intestine.
3. Describe the intestinal glands including the cells and secretory products.
4. Explain the functions of the small intestine in the digestive process.
5. Describe the special structures of the small intestine that facilitate digestion and absorption.

Digestive System V: Large Intestine
1. Describe the location and gross anatomy of the large intestine.
2. Describe the histology and layers that form the wall of large intestine.
3. Describe the intestinal glands including the cells and secretory products.
4. Explain the functions of the large intestine in the digestive process.
5. Discuss appendicitis and Hirschsprung disease.

Digestive System VI: Liver, Gallbladder & Pancreas
1. Describe the location and gross anatomy of the liver and gallbladder.
2. Explain the functions of the liver and gallbladder in the digestive process.
3. Describe the histology of the liver.
4. Describe the hepatic portal system and blood flow through the liver.
5. Describe the location and gross anatomy of the pancreas.
6. Describe the histology of the pancreas.
7. Explain the functions of the pancreas in the digestive process.
8. Describe the exocrine part of the pancreas, pancreatic juice and the digestive enzymes.
9. Describe the relationship of the pancreas to the liver, gallbladder and duodenum.

BIOCHEMISTRY: DIGESTIVE SYSTEM

Digestive
1. Describe protein digestion in the stomach and small intestine
2. Indicate the digestive enzymes in the stomach (pepsin, trypsin, chymotrypsin)
3. Describe absorption of amino acids in the intestine
4. Indicate the major zymogens released from the pancreas and how they are activated
5. Indicate the molecules found in the portal vein following digestion
6. Describe the primary cellular roles of dietary proteins
7. Indicate the possible fate of dietary amino acids
8. Indicate the major site of protein digestion
9. Describe the transamination reaction: substrates, products, coenzyme.
10. Describe the ALT and the AST reactions, their products and coenzymes
11. Describe the role of glutamate dehydrogenase in producing free ammonia
12. Indicate the allosteric regulators (ATP, ADP, GTP, GDP) of glutamate dehydrogenase and how they affect the direction of the reaction
13. Describe the metabolism of D-amino acids and the enzyme and coenzyme required.

PHYSIOLOGY: DIGESTIVE SYSTEM

Gastrointestinal Motility
1. Describe the functions of chewing.
2. Describe the swallowing sequence and identify voluntary and involuntary components.
3. Compare and contrast primary and secondary esophageal peristalsis.
4. Describe the motor patterns of the stomach following ingestion of a meal.
5. Describe the segmenting and peristaltic patterns of motility seen in the small intestine.
6. Describe the basic electrical rhythm (BER) of each region of the GI tract. Explain the role of Interstitial Cells of Cajal in the origin and propagation of the BER.
7. Describe the sequence of events occurring during reflexive defecation, differentiating those movements under voluntary control and those under intrinsic control.
8. Discuss the role of other GI reflexes including the gastrocolic, gastroileal and ileogastric reflexes.
9. Contrast patterns of motility in the stomach and intestine with that during the fed and fasting states.

Gastric Secretions
1. List the endocrine and exocrine secretions of the stomach, their cells of origin and their functions.
2. Explain how gastric secretion is stimulated during the cephalic, gastric and intestinal phases.
3. Describe the various mechanisms that inhibit secretion of gastric acid.
4. Describe how pepsinogen secretion is controlled and what factors are important for its conversion to pepsin.
5. Explain what is meant by the “gastric mucosal barrier” and indicate the main agents known to disrupt it.

**ANATOMY: CARDIOVASCULAR**

**Heart Mediastinum**
1. Identify the location of the heart.
2. Discuss the boundaries of the mediastinum.
3. List the structures found in the mediastinum.

**Pericardium, and heart wall layers**
1. Explain the location of the pericardium.
2. Discuss the components of the pericardium.
3. Describe the pericardial cavity.

**The Chambers**
1. List the chambers of the heart.
2. Describe the characteristic features of each chamber.

**Arterial Supply of the Heart**
1. Name the coronary vessels that supply the heart.
2. Discuss the regions of the heart supplied by each of the coronary vessels.

**Valves of the Heart**
1. Name the two (2) types of cardiac valves.
2. Identify the location of each type of valve.
3. Describe the characteristic features of each valve.

**Conducting System**
1. Describe the fibers responsible for conducting electrical impulses through the heart.
2. Name the structure in the right atrium responsible for generating impulses.
3. Name the structure between the atria and ventricles responsible for generating impulses.
4. Describe the flow of electrical impulses through the heart and the structures responsible for conducting them.

**Blood Flow through the Heart**
1. Describe the flow of blood as it moves into the heart, through the heart and out of the heart.

**Introduction to structure of blood vessels**
1. Describe the structure of a blood vessel.

**Comparison of Blood Vessels- arteries, veins, capillaries**
1. Contrast the structure and function of the different vessels.

**Systemic circulation: Aorta, Vena cava and upper limb vasculature**
1. Describe the major routes of blood flow in different regions of the body.
BIOCHEMISTRY: CARDIOVASCULAR

Cardiac Biomarkers Part 1
1. Define myocardial infarction
2. Discuss the effects of necrosis and inflammation on serum proteins and enzyme levels
3. Understand the utility of several diagnostic procedures for MI
4. Understand what cardiac biomarkers are

Cardiac Biomarkers Part 2
1. Differentiate the isozymes of creatine kinase (CK) and lactate dehydrogenase (LDH) based on tissue location and subunit composition
2. Understand why the utility of non-specific cardiac biomarkers have been phased out

Cardiac Biomarkers Part 3
1. use of serum troponins I and T as cardiac biomarkers
2. Use of serum CK-MB as cardiac biomarker
3. use of CK/CK-MB ratio for evaluation of myocardial infarction

Cardiac Biomarkers Part 4
1. Understand that the utility of some cardiac biomarkers is still being researched
2. Understand the release kinetics of some cardiac biomarkers.
   a. Time frame of serum cardiac biomarkers (myoglobin, cardiac troponin, CK-MB).
3. Understand the medical use of cardiac biomarkers in MI and non-MI situations.

PHYSIOLOGY: CARDIOVASCULAR

Cardiovascular Overview and Blood Pressure Measurement
1. List the major functions of the cardiovascular system and describe its organization.
2. Define systole and diastole.
3. Define cardiac output and stroke volume. Explain how SV is calculated. Know normal values.
4. Define and be able to calculate, where appropriate, mean arterial pressure, systolic pressure, diastolic pressure and pulse pressure.
5. Understand how increasing stroke volume is likely to increase pulse pressure.

Action Potentials in Heart Myocytes & Electrical Conduct. System
1. Explain the ionic basis of the cardiac action potential recorded from myocytes and from the SA node.
2. Understand the relationship between the electrophysiological and mechanical events in the heart.
3. Explain how the wave of depolarization spreads throughout the heart.
4. Explain the significance of the delay at the AV node.
5. Explain why the SA node is the pacemaker of the heart.
6. Describe how the parasympathetic nervous system decreases heart rate.
7. Describe how the sympathetic nervous system increases heart rate.

Cardiac Cycle and Pressure Volume Relationship
1. Describe the sequence of events that occur during one cardiac cycle. Explain how pressures and volumes within the heart chambers change.
2. Describe the pressure – volume loop.
3. List the approximate values for mean pressures found at various stages of the cardiac cycle.
4. Explain how cardiac valves function in the heart and detail their opening and closing sequence with the cardiac cycle through time, and with the pressure volume relationship.
5. Explain and locate the main phases of the pressure volume relationship: isovolumetric contraction, ejection, isovolumetric relaxation and diastolic filling.
6. Briefly describe Starling’s experiment and state his findings.

**Hemodynamics**
1. Define the Bulk Flow Law and explain it in terms of the cardiovascular system.
2. Understand the relationship between pressure, flow, resistance, velocity and cross sectional area in the cardiovascular system.
3. Calculate velocity of blood flow. Explain which part of the vascular tree has the fastest and slowest blood flow.
4. Discuss the factors that affect the redistribution of blood.

**Regulation of Blood Pressure**
1. Define the features of a negative feedback control system and describes how it relates to the baroreceptor reflex.
2. Describe how the baroreceptor reflex works in the short term control of blood pressure.
3. Define the features of a negative feedback control system and describes how it relates to the baroreceptor reflex.

**Electrocardiogram (ECG)**
1. Define the term dipole, and describe how dipoles generated across the surface of the heart produce the waveforms of the ECG.
2. Describe the various features of a typical bipolar Lead II ECG waveform: the waves, the intervals and the segments, and the electrical state of the heart.