READING GUIDE

FATTY ACID AND TRIACYLGLYCEROL METABOLISM

Objectives

1. Describe the structure of fatty acids and how fatty acids are synthesized, stored, and utilized
2. Describe fatty acid liberation from adipose and its importance in energy homeostasis
3. Describe fatty acid oxidation and ketone body production and explain their importance in energy homeostasis
4. Describe the inborn errors of metabolism which result in fatty acid oxidation disorders

Fatty Acid and triacylglycerol Metabolism are covered in Chapter 16

FATTY ACID STRUCTURE

What is the basic structure of a fatty acid? Why are FA amphipathic in nature?

What is meant by the term "saturated" in regards to fatty acids? What about "unsaturated" fatty acids? (Fig. 16.3)

What are the essential fatty acids? Which fatty acid is a precursor for prostaglandins?

Be familiar with the common names of fatty acids and understand the naming system that is utilized. (Fig. 16.4)

FATTY ACID SYNTHESIS

Where does fatty acid synthesis primarily take place? Are there other places it can occur?

Why is acetyl coenzyme A important? How is it produced? Why is cytosolic citrate viewed as a "high-energy" signal? (Fig. 16.7)

What is malonyl CoA? What enzyme is important for malonyl CoA production? Is there a coenzyme involved, if so, what is it? (Fig. 16.7)

Explain Short term regulation and long-term regulation of acetyl CoA carboxylase. When is each used? Why? (Fig. 16.8)

What is fatty acid synthase? Why is it important? How does it relate to palmitate? Be able to describe/understand how the enzyme works. Why is malonyl CoA important to Fatty Acid synthase? Where does NADPH come from for fatty acid synthesis? (Fig. 16.9 and 16.11)

How are fatty acids elongated beyond 16 carbon structures?

What is a "desaturase"? How and where does it perform its function? Why is glycerol phosphate important? (Fig. 16.14)

MOBILIZATION OF STORED FATS AND OXIDATION OF FATTY ACIDS

How are fatty acids stored? What is a triacylglycerol (TAG)? How are TAGs stored? What is the fate of TAGs in the liver? And in adipose tissue? (Fig. 16.15)

How are fatty acids released from TAG? What controls this release? How is this activated? What happens to glycerol? What is the fate of the free fatty acids? (Fig. 16.15)

What is β-oxidation? Why is it important? How does the transport of long-chain fatty acids into the mitochondria occur? What is the carnitine shuttle? How is it controlled? Where does carnitine come from? What happens when carnitine is deficient? How does this occur? (Fig. 16.16)

What are the basic reactions of β-oxidation? What is the energy yield of β-oxidation? (Fig. 16.17 and 16.18)

What is MCAD deficiency?

How does β-oxidation of fatty acids with odd numbers occur? What are the CoAs involved with this process? (Fig. 16.17)

β-oxidation can take place in a peroxisome. Why? How is it different?

What is α-oxidation?

KETONE BODIES

What are ketone bodies? What is, and explain ketogenesis? (Fig. 16.22) How does it occur? What is ketosis? What happens to ketone bodies in diabetes mellitus? (Fig. 16.24)