

Question 1

Using your knowledge on the biosynthesis of fatty acids predict how palmitate will be labelled under the conditions described below and explain the reason for your answers:

- (a) [14-C] acetyl-CoA (uniformly labelled) is added to a soluble (cytosolic) fraction from rat liver.
- (b) A small quantity of [14-C] acetyl-CoA (uniformly labelled) is added to a soluble (cytosolic) fraction from rat liver in presence of an excess of unlabelled malonyl-CoA.
- (c) [14-C] malonyl-CoA (uniformly labelled) is added to a soluble (cytosolic) fraction from rat liver in presence of an excess of acetyl-CoA
- (d) [14-C] malonyl-CoA labelled on C-1 is added to a soluble (cytosolic) fraction from rat liver.
- (e) [14-C] malonyl-CoA labelled on C-2 is added to a soluble (cytosolic) fraction from rat liver.
- (f) [14-C] malonyl-CoA labelled on C-3 is added to a soluble (cytosolic) fraction from rat liver.

Question 2

After a glucose rich meal the excessive glucose that is not used to satisfy energetic needs, is transformed into fatty acids that are then stored into triglycerides. Can you describe the different paths that lead from glucose to triglycerides?

Question 3

In a mixture containing all the enzymes and cofactors required for fatty acid synthesis from acetyl-CoA and malonyl-CoA

- (a) we add acetyl-CoA labelled with deuterium (2-H) in the three positions on its methyl group and an excess of unlabelled malonyl-CoA. How many H atoms will be labelled in palmitate at the end of its synthesis? Explain why.
- (b) we add malonyl-CoA labelled with deuterium (2-H) in the two positions of C-2. How many Deuterium atoms will be incorporated into palmitate and in which positions? Explain why.

Question 4

How many ATP molecules are required to synthesise the triglyceride tripalmiticglycerol starting from glycerol and acetyl-CoA? Explain why.

Question 5

In the reaction catalysed by the Beta-ketoacyl-ACP synthase a 4-carbon-atoms unit is generated by the condensation of a 3-carbon-atoms molecule and a 2-carbon-atoms molecule with release of a CO₂ molecule. Explain what is the advantage of this strategy as compared with one where two 2-carbon-atoms molecules are condensed.

Question 6

A researcher has fed a rat with D-Glucose homogeneously labelled with ^{14}C on all its carbon atoms. After sacrificing the mice and extracting lipids from liver, she finds some radiolabelled diacylglycerol (C16:0/C20:5) has been produced. Assuming that ^{14}C incorporation has been complete can you predict which of the phospholipid carbon atoms are labelled? Explain why.