Ch17

P671 7

5 acetyl-CoA + Propionyl-CoA + 5 FADH2 + 5 NADH + 5H+ + AMP + 2Pi

P671 9

Activation of fatty acid occurs in cytosol whereas the oxidation of fatty acyl-CoA occurs in mitochondria. To transport fatty acyl-CoA into mitochondria, carnitine acyltransferase I is required, which locates on outer mitochondrial membrane and catalyzes acyl-CoA converting to acyl-carnitine. In this case, initial coenzyme A group labeled with [14C] is removed and remained in cytosol. In addition to this, acyl-carnitine is transported by specific transporter and then converted to acyl-CoA catalyzed by carnitine acyltransferase II located on inner mitochondrial membrane.

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Patients with uncontrolled diabetes is incapacity to transmit glucose into cytosol. Hence, fatty acid becomes the major source of energy that product lots of acetyl-CoA. However, these acetyl-CoA couldn’t be oxidized by citric acid cycle for the substrates in TCA are used to gluconeogenesis. Accumulation of acetyl-CoA consumed most of coenzyme A in mitochondria. So, cell create ketone bodies like acetoacetyl-CoA to release one coenzyme A. Then acetoacetyl-CoA release another coenzyme A group and converts to acetoacetic acid that will be transport to other tissue of body.

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Even-number fatty acid can just be converted to acetyl-CoA in β-oxidation. In mammal’s cell, though acetyl-CoA could provide energy to tissue, it cannot be converted to other important living material in body such us glucose and amino acids. But odd-number fatty acid can generate propionyl-CoA that finally turn to succinyl-CoA, which is a raw material of gluconeogenesis. So, the first group mice can synthesis many other important compounds hence they live better.

**Extra question:**

For each two-carbon increase in the length of a saturated fatty acid chain, how many additional moles of ATP can be formed upon complete oxidation of one mole of the fatty acid to CO2 and H2O? Please explain your answer.

14mol ATP

Each two-carbon increase in the length lead to additional 1 circle of β-oxidation that produce 1 NADH and FADH2 and 1 acetyl-CoA. According to following knowledge, one mol acetyl-CoA can generate 10mol ATP, 1 NADH can generate 2.5mol ATP and 1 FADH2 can generate 1.5 mol ATP. All in all, the sum of additional ATP amount is 14 mol.