Ch16

P644 7

Thiamine can be used to synthesis thiamine pyrophosphate, an important coenzyme in pyruvate dehydrogenase. This deficiency of thiamine leads to dysfunction of pyruvate dehydrogenase hence pyruvate cannot be converted to acetyl-CoA. The accumulation of pyruvate increases levels of pyruvate on blood.

P644 9

Oxaloacetate and Malate are important compounds in citric acid cycle. Oxaloacetate can combine with acetyl-CoA to form citric acid to be oxidized in following steps. The lack of Oxaloacetate and malate will cause the inhibition of citric acid cycle and lower the consumption of oxygen, also acetyl-CoA will accumulate. Addition of oxaloacetate and malate stimulate citric acid cycle to increase oxidation of acetyl-CoA hence increase consumption of oxygen. And the amount consumed is much greater than the amount necessary to completely oxidize the added oxaloacetate and malate.

P645 11

ADP (GDP), Pi, Mg2+, NAD+, CoA-SH, TPP

P645 16

(a) We can label glucose by 14C and 18O, then determine CO2 and water released from suspension whether contain 14C and 18O, respectively.

(b) 14C will be located at C-3 or C-2 position of oxaloacetate. The first turn doesn’t release CO2. The second turn release half of 14C from C-3 position. Every following turn release half of 14C. So it requires infinity turns to release all of the 14C.

P646 26

(a) Increase

(b) Decrease

(c) Decrease

**Extra question:**

You and your fellow students find it difficult to believe that the oxidation of a two-carbon acyl compound requires a pathway as complex as the citric acid cycle. In order to verify the metabolic pathways, you have been learning about, you conduct an experiment using a sample of glucose radioactively labeled with 14C at C-1. If the information you have learned is correct, in which glycolytic or citric acid cycle intermediate, and on which carbon, should you find the label:

(a)  if O2 were unavailable?

C-3 of pyruvate.

(b)  in the presence of malonate?

C-2 or C-3 of Succinic Acid.

(c)  after one round of the citric acid cycle?

C-2 or C-3 of oxaloacetate and CO2.

(d)  after three rounds of the citric acid cycle?

C-2 or C-3 of oxaloacetate and CO2.