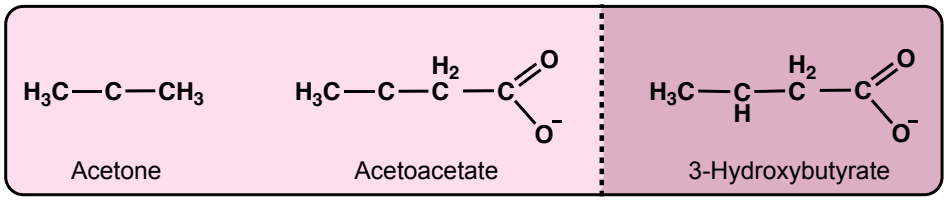
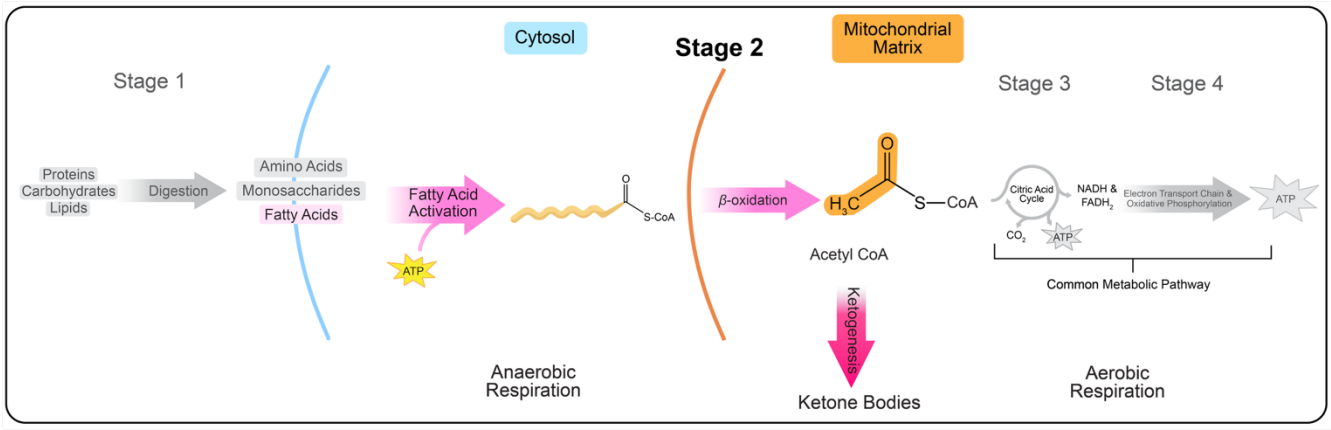
CONCEPT: KETONE BODIES

Intro to Ketone Bodies

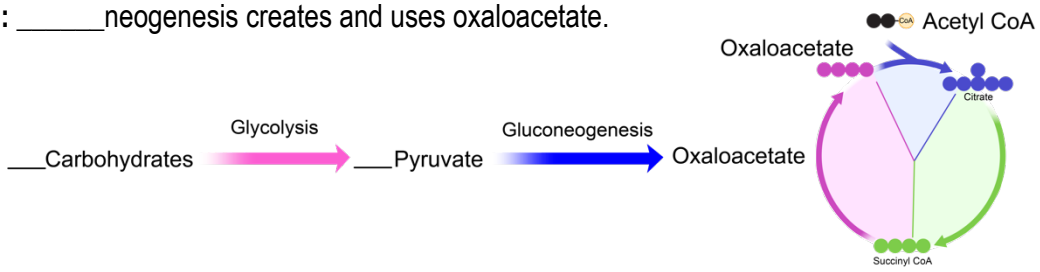
- **Ketone Bodies:** 3 acetyl CoA metabolites produced in the mitochondria of the _____.
  - □ Used as _____ source by the heart, skeletal muscles, and brain when _____ is not available.



- **Ketogenesis:** synthesis of ketone bodies from _____.
  - □ Occurs during _____ carbohydrate diet, starvation or due to diabetes.



- *β*-oxidation of FA produces _____ amounts of acetyl CoA that cannot be processed by the _____ acid cycle.
  - □ Low levels of carbohydrates deplete _____acetate.
  - □ **Recall:** _____neogenesis creates and uses oxaloacetate.



- **Ketosis:** condition where _____ amounts of ketone bodies are present in the blood and urine.
  - □ Two ketone bodies are carboxylic _____ and cause **ketoacidosis**: decrease in blood _____.

EXAMPLE: Which statement best describes the process of ketogenesis?

a) Ketone bodies are synthesized in the mitochondria of adipose cells.

b) Excess glucose leads to formation of ketone bodies from pyruvate.

c) Ketone bodies are synthesized from oxaloacetate, which is a metabolite that is converted from excess acetyl CoA.

d) Ketogenesis occurs as a result of deficiency of glucose and can cause high levels of acetoacetate in the blood.

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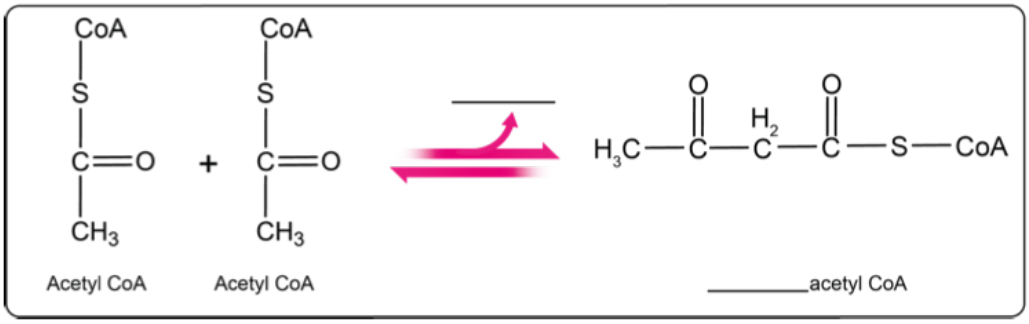
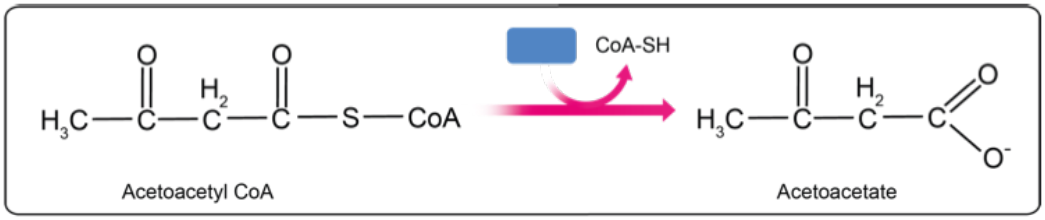
Ketogenesis Reactions

1 **Condensation:** 2 acetyl CoA molecules condense, forming a _____ intermediate.

□ The reverse of the last step of _____.

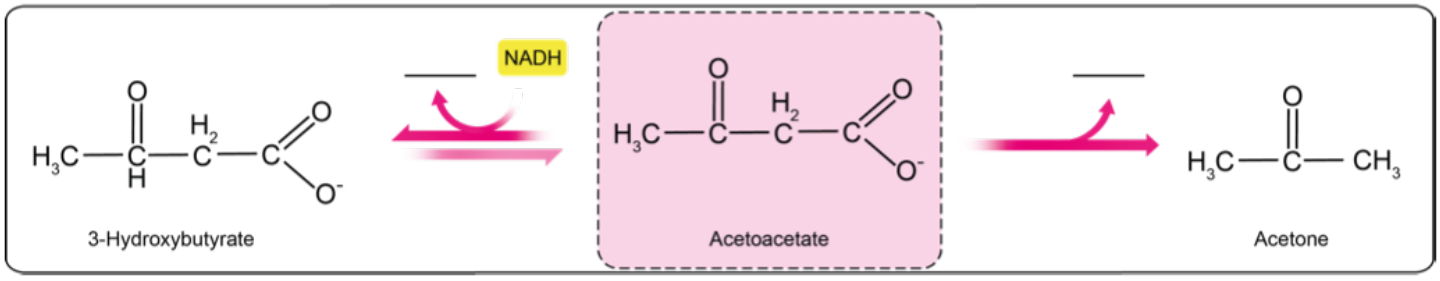


2 **Hydrolysis**: cleavage of acetoacetyl CoA forms first ketone body (_____).



3 **Reduction/Decarboxylation:** acetoacetate is _____ to form second ketone body (3-hydroxybutyrate).

□ In the bloodstream, some acetoacetate is decarboxylated to _____.



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EXAMPLE: Ketone body produced during hydrolysis reaction of ketogenesis is:

a) acetoacetate

b) acetone

c) acetate

d) 3-hydroxybutyrate

PRACTICE: Which reaction produces a ketone body with an alcohol functional group? Draw the ketone body.

a) condensation

b) hydrolysis

c) reduction

d) decarboxylation

PRACTICE: How is oxaloacetate related to ketone bodies formation?

a) High levels of acetyl CoA accumulate and increase the rate of citric acid cycle.

b) Oxaloacetate combines with acetyl CoA to form citrate; this leads to formation of ketone bodies.

c) Citric acid cycle is not dependent on oxaloacetate, and all acetyl CoA is free to be oxidized in the cycle.

d) Ketone bodies are formed when oxaloacetate levels are low.

e) Ketogenesis can speed up gluconeogenesis by producing more oxaloacetate.