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**Assignment Title:** DIABETES, OBESITY AND CANCER
**Course Title:** Medical Biochemistry IV
**Course Code:** BCH 313

**Question**

GROUP 2 CATEGORY (MBBS)

1. Define the following terms

a. ketogenesis

b. ketonaemia

c. ketonuria

d. ketosis

2. What are the consequences of ketosis

3. Write concisely on the management of ketoacidosis.

ANSWERS

1.a). Ketogenesis: Ketogenesis means the formation of ketone bodies. Liver is the only organ that synthesizes ketone bodies. The synthesis of ketone bodies occurs in mitochondrial matrix of hepatic cells. Ketogenesis occurs by the following reactions: • Two molecules of acetyl-CoA condense to form acetoacetyl-CoA. This reaction, catalyzed by thiolase. • Acetoacetyl-CoA then condenses with one more molecule of acetyl-CoA to give β β β β β-hydroxy-β β β β β-methylglutaryl-CoA (HMG-CoA), catalyzed by HMG-CoA synthase. • β-HMG-CoA is then cleaved to acetyl-CoA and acetoacetate by the enzyme HMG-CoA lyase present in the mitochondria. • β β β β β-hydroxy butyrate is formed by the reduction of acetoacetate in the mitochondrial matrix by the enzyme β-Hydroxy butyrate dehydrogenase. • Acetoacetate also undergoes a slow, nonenzymatic spontaneous decarboxylation to acetone. • The concentration of total ketone bodies in the blood of well-fed condition does not normally exceed 0.2 mmol/L.

b). Ketonaemia: High level of ketone bodies in blood are referred to as ketonemia.

c). Ketonuria: If the level of ketone bodies is high in the urine it is known as ketonuria.

d). Ketosis: When the rate of synthesis exceeds the ability of extrahepatic tissues to utilize them, there will be accumulation of ketone bodies in blood, This leads to ketonemia, excretion in urine (ketonuria) and smell of acetone in breath. All these three together constitute the condition known as ketosis.

2. Consequences of ketosis

* Metabolic acidosis. Acetoacetate and beta-hydroxy butyrate are acids. When they accumulate, metabolic acidosis results.
* Reduced buffers. The plasma bicarbonate is used up for buffering of these acids.
* Kussmaul's respiration. Patients will have typical acidotic breathing (see Chapter 24) due to compensatory hyperventilation.
* Smell of acetone in patient's breath.
* Osmotic diuresis induced by ketonuria may lead to dehydration.
* Sodium loss. The ketone bodies are excreted in urine as their sodium salt, leading to loss of cations from the body.
* Dehydration. The sodium loss further aggravates the dehydration.
* Coma. Hypokalemia, dehydration and acidosis are contributing for the lethal effect of ketosis.

3. Management of ketoacidosis

* Treatment is to give insulin and glucose. When glucose and insulin are given intravenously, potassium is trapped within the cells. Hence, the clinician should always monitor the electrolytes.
* Administration of bicarbonate, and maintenance of electrolyte and fluid balance are very important aspects.