**ASSIGNMENT.**

**Question.**

GROUP 2 CATEGORY (MBBS)

1. DEFINE THE FOLLOWING TERMS

A. KETOGENESIS

B. KETONAEMIA

C. KETONURIA

D. KETOGENESIS

2. WHAT ARE THE CONSEQUENCES OF KETOSIS

3. WRITE CONCISELY ON THE MANAGEMENT OF KETOACIDOSIS.

**Answer.**

1. A.) Ketogenesis:

Ketogenesis is the [biochemical](https://en.wikipedia.org/wiki/Biochemistry) process through which organisms produce [ketone bodies](https://en.wikipedia.org/wiki/Ketone_bodies) through [breakdown of fatty acids](https://en.wikipedia.org/wiki/Fatty_acid_metabolism) and [ketogenic amino acids](https://en.wikipedia.org/wiki/Ketogenic_amino_acid%22%20%5Co%20%22Ketogenic%20amino%20acid). This process supplies energy under circumstances such as [fasting](https://en.wikipedia.org/wiki/Fasting) or [caloric restriction](https://en.wikipedia.org/wiki/Caloric_restriction) to certain organs, particularly the [brain](https://en.wikipedia.org/wiki/Brain), [heart](https://en.wikipedia.org/wiki/Heart) and [skeletal muscle](https://en.wikipedia.org/wiki/Skeletal_muscle). Insufficient [gluconeogenesis](https://en.wikipedia.org/wiki/Gluconeogenesis) can cause [hypoglycemia](https://en.wikipedia.org/wiki/Hypoglycemia%22%20%5Co%20%22Hypoglycemia) and excessive production of ketone bodies, ultimately leading to a life-threatening condition known as [ketoacidosis](https://en.wikipedia.org/wiki/Ketoacidosis).

B.) Ketoaemia:

The presence of an abnormally high concentration of ketone bodies in the blood.

C.) Ketonuria:

Ketonuria is a medical condition in which [ketone bodies](https://en.wikipedia.org/wiki/Ketone_bodies) are present in the [urine](https://en.wikipedia.org/wiki/Urine).

It is seen in conditions in which the body produces excess ketones as an indication that it is using an alternative source of energy. It is seen during starvation or more commonly in [type 1 diabetes mellitus](https://en.wikipedia.org/wiki/Diabetes_mellitus_type_1). Production of ketone bodies is a normal response to a shortage of [glucose](https://en.wikipedia.org/wiki/Glucose), meant to provide an alternate source of fuel from [fatty acids](https://en.wikipedia.org/wiki/Fatty_acids).

D.) Ketogenesis:

Ketogenesis is the [biochemical](https://en.wikipedia.org/wiki/Biochemistry) process through which organisms produce [ketone bodies](https://en.wikipedia.org/wiki/Ketone_bodies) through [breakdown of fatty acids](https://en.wikipedia.org/wiki/Fatty_acid_metabolism) and [ketogenic amino acids](https://en.wikipedia.org/wiki/Ketogenic_amino_acid%22%20%5Co%20%22Ketogenic%20amino%20acid). This process supplies energy under circumstances such as [fasting](https://en.wikipedia.org/wiki/Fasting) or [caloric restriction](https://en.wikipedia.org/wiki/Caloric_restriction) to certain organs, particularly the [brain](https://en.wikipedia.org/wiki/Brain), [heart](https://en.wikipedia.org/wiki/Heart) and [skeletal muscle](https://en.wikipedia.org/wiki/Skeletal_muscle). Insufficient [gluconeogenesis](https://en.wikipedia.org/wiki/Gluconeogenesis) can cause [hypoglycemia](https://en.wikipedia.org/wiki/Hypoglycemia) and excessive production of ketone bodies, ultimately leading to a life-threatening condition known as [ketoacidosis](https://en.wikipedia.org/wiki/Ketoacidosis).

2.) Ketosis is a metabolic state characterized by elevated levels of [ketone bodies](https://en.wikipedia.org/wiki/Ketone_bodies) in the blood or urine.Physiologic ketosis is a normal response to low [glucose](https://en.wikipedia.org/wiki/Glucose) availability, such as [low-carbohydrate diets](https://en.wikipedia.org/wiki/Ketogenic_diet) or [fasting](https://en.wikipedia.org/wiki/Fasting), that provides an additional energy source for the brain in the form of ketones. In physiologic ketosis, ketones in the blood are elevated above baseline levels, but the body's [acid-base homeostasis](https://en.wikipedia.org/wiki/Acid-base_homeostasis) is maintained.

**Consequences.**

In the beginning of ketosis, you may experience a range of negative symptoms.

They are often referred to as "low-carb flu" or "keto flu" because they resemble symptoms of the flu.

These may include:

* Headache.
* Fatigue.
* Brain fog.
* Increased hunger.
* Poor sleep.
* Nausea.
* Decreased physical performance

3.) Ketoacidosis is a metabolic state caused by uncontrolled production of [ketone bodies](https://en.wikipedia.org/wiki/Ketone_bodies) that cause a [metabolic acidosis](https://en.wikipedia.org/wiki/Metabolic_acidosis). While [ketosis](https://en.wikipedia.org/wiki/Ketosis) refers to any elevation of blood [ketones](https://en.wikipedia.org/wiki/Ketone_bodies), ketoacidosis is a specific pathologic condition that results in changes in [blood pH](https://en.wikipedia.org/wiki/Blood_pH) and requires medical attention. The most common cause of ketoacidosis is [diabetic ketoacidosis](https://en.wikipedia.org/wiki/Diabetic_ketoacidosis) but can also be caused by [alcohol](https://en.wikipedia.org/wiki/Alcoholic_drink), medications, toxins, and rarely starvation.

The symptoms of ketoacidosis are variable depending on the underlying cause. The most common symptoms include nausea, vomiting, abdominal pain, and weakness. Breath may also develop the smell of acetone as it is a volatile ketone that can be exhaled. Rapid deep breathing, or [Kussmaul breathing](https://en.wikipedia.org/wiki/Kussmaul_breathing%22%20%5Co%20%22Kussmaul%20breathing), may be present to compensate for the metabolic acidosis. Altered mental status is more common in diabetic than alcoholic ketoacidosis.

**Management**

The main aims in the treatment of diabetic ketoacidosis are replacing the lost fluids and electrolytes while suppressing the high blood sugars and ketone production with insulin. Admission to an [intensive care unit](https://en.wikipedia.org/wiki/Intensive_care_unit) (ICU) or similar high-dependency area or ward for close observation may be necessary.

**Fluid replacement**

The amount of fluid replaced depends on the estimated degree of dehydration. If dehydration is so severe as to cause [shock](https://en.wikipedia.org/wiki/Shock_%28circulatory%29) (severely decreased [blood pressure](https://en.wikipedia.org/wiki/Blood_pressure) with insufficient blood supply to the body's organs), or a depressed level of consciousness, rapid infusion of [saline](https://en.wikipedia.org/wiki/Saline_%28medicine%29) (1 liter for adults, 10 ml/kg in repeated doses for children) is recommended to restore circulating volume. Slower rehydration based on calculated water and sodium shortage may be possible if the dehydration is moderate, and again saline is the recommended fluid. Very mild ketoacidosis with no associated vomiting and mild dehydration may be treated with oral rehydration and subcutaneous rather than intravenous insulin under observation for signs of deterioration.

[Normal saline](https://en.wikipedia.org/wiki/Normal_saline) (0.9% saline) has generally been the fluid of choice. There have been a few small trials looking at balanced fluids with few differences.

A special but unusual consideration is [cardiogenic shock](https://en.wikipedia.org/wiki/Cardiogenic_shock), where the blood pressure is decreased not due to dehydration but due to inability of the heart to pump blood through the blood vessels. This situation requires ICU admission, monitoring of the [central venous pressure](https://en.wikipedia.org/wiki/Central_venous_pressure) (which requires the insertion of a [central venous catheter](https://en.wikipedia.org/wiki/Central_venous_catheter) in a large upper body vein), and the administration of [medication that increases the heart pumping action](https://en.wikipedia.org/wiki/Inotrope) and blood pressure.

**Insulin**

Some guidelines recommend a bolus (initial large dose) of insulin of 0.1 unit of insulin per kilogram of body weight. This can be administered immediately after the potassium level is known to be higher than 3.3 mmol/l; if the level is any lower, administering insulin could lead to a dangerously low potassium level (see below). Other guidelines recommend delaying the initiation of insulin until fluids have been administered. It is possible to use rapid acting [insulin analogs](https://en.wikipedia.org/wiki/Insulin_analog) [injections under the skin](https://en.wikipedia.org/wiki/Subcutaneous_injection) for mild or moderate cases.

In general, insulin is given at 0.1 unit/kg per hour to reduce the blood sugars and suppress ketone production. Guidelines differ as to which dose to use when blood sugar levels start falling; some recommend reducing the dose of insulin once glucose falls below 16.6 mmol/l (300 mg/dl) but other recommend infusing glucose in addition to saline to allow for ongoing infusion of higher doses of insulin.

**Potassium**

Potassium levels can fluctuate severely during the treatment of DKA, because insulin decreases potassium levels in the blood by redistributing it into [cells](https://en.wikipedia.org/wiki/Cell_%28biology%29) via increased sodium-potassium pump activity. A large part of the shifted extracellular potassium would have been lost in urine because of osmotic diuresis. [Hypokalemia](https://en.wikipedia.org/wiki/Hypokalemia) (low blood potassium concentration) often follows treatment. This increases the risk of [dangerous irregularities in the heart rate](https://en.wikipedia.org/wiki/Cardiac_arrhythmia). Therefore, continuous observation of the heart rate is recommended, as well as repeated measurement of the potassium levels and addition of potassium to the intravenous fluids once levels fall below 5.3 mmol/l. If potassium levels fall below 3.3 mmol/l, insulin administration may need to be interrupted to allow correction of the hypokalemia.

**Sodium bicarbonate**

The administration of [sodium bicarbonate](https://en.wikipedia.org/wiki/Sodium_bicarbonate) solution to rapidly improve the acid levels in the blood is controversial. There is little evidence that it improves outcomes beyond standard therapy, and indeed some evidence that while it may improve the acidity of the blood, it may actually worsen acidity inside the body's cells and increase the risk of certain complications. Its use is therefore discouraged, although some guidelines recommend it for extreme acidosis (pH<6.9), and smaller amounts for severe acidosis (pH 6.9–7.0).

**Cerebral edem**

Cerebral edema, if associated with coma, often necessitates admission to intensive care, [artificial ventilation](https://en.wikipedia.org/wiki/Artificial_ventilation), and close observation. The administration of fluids is slowed. The ideal treatment of cerebral edema in DKA is not established, but intravenous [mannitol](https://en.wikipedia.org/wiki/Mannitol%22%20%5Co%20%22Mannitol) and [hypertonic saline](https://en.wikipedia.org/wiki/Saline_%28medicine%29#Hypertonic_saline) (3%) are used—as in some other forms of cerebral edema—in an attempt to reduce the swelling.

**Resolution**

Resolution of DKA is defined as general improvement in the symptoms, such as the ability to tolerate oral nutrition and fluids, normalization of blood acidity (pH>7.3), and absence of ketones in blood (<1 mmol/l) or urine. Once this has been achieved, insulin may be switched to the usual subcutaneously administered regimen, one hour after which the intravenous administration can be discontinued.

In people with suspected ketosis-prone type 2 diabetes, determination of antibodies against [glutamic acid decarboxylase](https://en.wikipedia.org/wiki/Glutamic_acid_decarboxylase) and [islet cells](https://en.wikipedia.org/wiki/Islets_of_Langerhans) may aid in the decision whether to continue insulin administration long-term (if antibodies are detected), or whether to withdraw insulin and attempt treatment with oral medication as in type 2 diabetes. Generally speaking, routine measurement of [C-peptide](https://en.wikipedia.org/wiki/C-peptide) as a measure of insulin production is not recommended unless there is genuine doubt as to whether someone has type 1 or type 2 diabetes.