**MATRIC NUMBER : 18/MHS01/160**

**NAME: FASIPE BLESSING**

**COURSE CODE: BCH 204**

**ASSIGNMENT:** Outline the toxicity values and deficiency manifestations of the following minerals

* POTASSIUM
* CALCIUM
* MAGNESIUM
* CHLORIDE
* IRON

**WHAT IS TOXICITY?**

The degree to which a substance (a toxin or poison) can harm humans or animals. Acute toxicity involves harmful effects in an organism through a single or short-term exposure. Subchronic toxicity is the ability of a toxic substance to cause effects for more than one year but less than the lifetime of the exposed organism. Chronic toxicity is the ability of a substance or mixture of substances to cause harmful effects over an extended period, usually upon repeated or continuous exposure, sometimes lasting for the entire life of the exposed organism.

**WHAT ARE DEFICIENCY MANIFESTATIONS?**

A deficiency caused by the lack of a substance, such as an enzyme or a vitamin, that is necessary for normal structure and function of an organism.

1. **POTASSIUM**

Potassium is a mineral found in the foods you eat. It’s also an electrolyte. Electrolytes conduct electrical impulses throughout the body.

Healthy kidneys maintain normal potassium levels in the body because they remove excess amounts through urine.

TOXICITY VALUES

The adequate intake for potassium is 2,600 mg/day for women and 3,400 mg/day for men. A normal range of potassium is between 3.6 and 5.2 millimoles per liter (mmol/L) of blood. A potassium level higher than 5.5 mmol/L is critically high, and a potassium level over 6 mmol/L can be life-threatening. The toxicity value is 5.5-6mg/ddl.

DEFICIENCY MANIFESTATIONS

Low potassium is defined as a potassium level below 3.5 mEq/L.

When potassium levels are deficient/low (hypokalemia), a person can become weak as cellular process are impaired.

Hypokalemia is a metabolic imbalance characterized by extremely low potassium levels in the blood. It is a symptom of another disease or condition, or a side effect of diuretic drugs.

Most often, hypokalemia is asymptomatic, with no obvious signs of the disorder. However, symptoms of hypokalemia may include attacks of severe muscle weakness, eventually leading to paralysis and possibly respiratory failure.

Muscular malfunction may result in paralysis of the bowel, low blood pressure, muscle twitches and mineral deficiencies (tetany). Severe hypokalemia may also lead to disruption of skeletal muscle cells, particularly during exercise. The normal physical response to exercise requires the local release of potassium from muscle. In potassium depleted muscle, the lack of potassium prevents adequate widening of blood vessels, resulting in decreased muscle blood flow, cramps and the destruction of skeletal muscle.

Hypokalemia may also impair the ability of the kidneys to concentrate urine, resulting in excessive urination (polyuria) and excessive thirst (polydipsia). Other symptoms may include loss of appetite, nausea and vomiting. There may also be heart irregularities seen in electrocardiograph changes, confusion, distention of the abdomen, a decrease in mental activity.

1. **CALCIUM**

Calcium is the most abundant mineral in the body. It’s essential for bone health and proper functioning of the cardiovascular, muscular and nervous systems, among many other important roles. Calcium also acts as a coenzyme for many metabolic processes in the body.

The normal range for adults is [8.8–10.4 milligrams per deciliter](https://www.msdmanuals.com/en-gb/professional/endocrine-and-metabolic-disorders/electrolyte-disorders/overview-of-disorders-of-calcium-concentration) (mg/dL).

TOXICITY VALUES

Calcium toxicity is rare, occurring in those with hyperparathyroidism or high calcium supplementation levels. Hypercalcemia occurs when serum calcium levels are 10.5 mg/dL (also expressed as 2.63 mmol/L) or greater depending on normative laboratory values. It can be induced by excess intake of calcium or vitamin D, but it is more commonly caused by conditions such as malignancy and primary hyperparathyroidism.

DEFICIENCY MANIFESTATIONS

Children require more calcium than adults, and any level lower than 8.8 mg/dL constitutes a deficiency.

Hypocalcemia, commonly known as calcium deficiency disease, occurs when calcium levels in the blood are low. A long-term deficiency can lead to dental changes, cataracts, alterations in the brain, and osteoporosis, which causes the bones to become brittle.

The symptoms include:

* Muscle problems: Muscle aches, cramps, and spasms are the earliest signs of a calcium deficiency. People tend to feel pain in the thighs and arms, particularly the underarms, when walking and otherwise moving.

A calcium deficiency can also cause numbness and tingling in the hands, arms, feet, legs, and around the mouth.

* Extreme fatigue
* Dry and Itchy Skin
* Weak and brittle nails
* Osteopenia and Osteoporosis: Osteopenia reduces the mineral density of bones, and it can lead to [osteoporosis](https://www.medicalnewstoday.com/articles/155646.php). Osteoporosis makes bones thinner and more susceptible to [fractures](https://www.medicalnewstoday.com/articles/173312.php). It can cause pain, issues with posture, and eventual disability.
* Painful premenstrual symptoms
* Dental problems
* Depression
1. **MAGNESIUM**

It helps to maintain normal nerve and muscle function, supports a healthy immune system, keeps the heartbeat steady, and helps bones remain strong. It also helps adjust blood glucose levels. It aids in the production of energy and protein. Normal serum magnesium concentrations range between 0.75 and 0.95 millimoles (mmol)/L.

TOXICITY VALUES

Levels that are greater than 2.2 mEq/L (or greater than 1.1 mmol/L) are diagnostic for hypomagnesaemia.

Acute toxicity – 5-10mEq/L

Subchronic toxicity- 10-15mEq/L

Chronic toxicity- 15-20 mEq/L

DEFICIENCY MANIFESTATIONS

Hypomagnesaemia is defined as a serum magnesium level less than 0.75 mmol/L.

Early signs of magnesium toxicity may include:

* Nausea
* Vomiting
* Loss of appetite
* Weakness
* Fatigue
* Constipation
* Depression

As deficiency progresses, people might experience

* Lower calcium levels in the blood which is known as Hypocalcemia
* Lower potassium levels in the blood which is known as hypokalemia
* Numbness and Tingling
* Cramps and muscle contractions.
* Seizures
* Abnormal heart rhymes such as atrial fibrillation.
* Coronary spasms
1. **CHLORIDE**

Chloride is one of the most important electrolyte in the body. It helps keep the amount of fluid inside and outside of your cells in balance. It also helps to maintain proper blood volume, blood pressure and PH of body fluids. The normal adult value for chloride is 97-107mEq/L. Normal serum sodium levels are 135 – 145 mEq/liter (135 – 145 mmol/L

TOXICITY VALUE

 Severe symptoms typically only occur when levels are above 160 mEq/L. **Chloride** is not **toxic to human** health at low levels but does pose taste and odor issues at concentrations exceeding 250 mg/l.

DEFICIENCY MANIFESTATIONS

Hypochloremia occurs when there’s a low level of chloride in the body.

Symptoms include:

* Fluid loss
* Dehydration
* Weakness or fatigue
* Difficulty breathing
* Diarrhea or Vomiting caused by fluid loss.
* Excessive thirst
* High blood pressure
1. **IRON**

**Iron** is a mineral vital to the proper function of hemoglobin, a protein needed to transport oxygen in the blood. **Iron** also has a role in a variety of other important processes in the **body.** Normal value for iron is

TOXICITY VALUE

**Toxic** effects begin to occur at doses above 10–20 mg/kg of elemental **iron**. Ingestions of more than 50 mg/kg of elemental **iron** are associated with severe **toxicity.**

**In blood, iron levels** above 350–500 μg/dL are considered **toxic**, and **levels** over 1000 μg/dL indicate severe **iron poisoning**.

DEFICIENCY MANIFESTATIONS

Iron deficiency causes anemia (Iron- deficiency anemia)

Iron deficiency symptoms include:

* Extreme fatigue
* Weakness
* Pale Skin
* Chest pain, fast heartbeat or shortness of breath.
* Headache, dizziness or light headedness.
* Cold hands and feets.
* Inflammation or soreness of tongues.
* Brittle nails
* Unusual craving for non-nutritive substances.
* Poor appetite.
* Restless legs.