**NAME:** AGWU JUANITA CHIDINMA

**DEPARTMENT:** PHARMACOLOGY

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**Assignment Title:** MINERAL METABOLISM
**Course Title:** Medical Biochemistry II
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**Question**

1. OUTLINE THE TOXICITY VALUES AND DEFICIENCY MANIFESTATIONS OF THE FOLLOWING MINERALS

A. POTASSIUM

B. CALCIUM

C. MAGNESIUM

D. CHLORIDE

E. IRON

**ANSWERS**

**1A.)** **POTASSIUM**

**TOXICITY VALUES: High Potassium (hyperkalemia)**

* High potassium can be dangerous; it can cause a heart attack or even death.
* The most common cause of high potassium is kidney disease. Other causes of high potassium include; dehydration, some medicines, uncontrolled diabetes, injuries that cause severe bleeding and some rare diseases. The following are toxicity values of high potassium:
* Decreased Reflexes
* Tingling
* Numbness
* Trouble breathing
* Muscle weakness
* Paralysis
* Abdominal gas and bloating
* Nausea
* Diarrhea
* Vomiting
* Slow heart rate
* Palpitations and cardiac arrhythmia
* Chest pain
* Cardiac arrest

**DEFICIENCY MANIFESTATIONS; Low potassium (Hypokalaemia)**

* Weakness and fatigue: Deficiency in this mineral may affect how the body uses nutrients, resulting in fatigue. Since potassium helps to regulate muscle contractions, deficiency may result in weaker contractions.
* Muscle cramps and Spasms: Potassium helps start and stop muscle contractions. Low blood potassium levels can affect this balance, causing uncontrolled and prolonged contractions known as cramps.
* Digestive Problems: Potassium deficiency may cause problems like bloating and constipation because it can slow the movement of food through the digestive system.
* Heart Palpitations: Potassium helps regulate the heartbeat, and low levels may cause symptoms like heart palpitations.
* Muscle Aches and Stiffness: Muscle aches and stiffness can be another sign of potassium deficiency and are caused by rapid muscle breakdown (rhabdomyolysis).
* Tingling and Numbness: Persistent tingles and numbness may be a sign of impaired nerve function due to potassium deficiency.
* Breathing Difficulties: Potassium helps the lungs expand and contract, so potassium deficiency may result in shortness of breath.
* Mood Changes: Potassium deficiency has been linked to mood changes and disorders.

**Reference:** <https://www.healthline.com/health/high-potassium-hyperkalemia>

<https://www.healthline.com/nutrition/potassium-deficiency-symptoms#section11>

**2B.) CALCIUM**

**TOXICITY VALUES; High Calcium (Hypercalcemia)**

* Hypercalcemia affects various parts of the body causing;
* Headaches
* Fatigue
* Excessive thirst
* Excessive urination
* Pain between the back and upper abdomen on one side due to kidney stones
* Nausea
* Abdominal pain
* Decreased appetite
* Constipation
* Vomiting
* High calcium can affect the electrical system of the heart, causing abnormal heart rhythms.
* Calcium levels can affect the muscles, causing twitches, cramps and weakness.
* High calcium levels can affect the bones, leading to; bone pain, osteoporosis and fractures from diseases.
* Hypercalcemia can also cause neurological symptoms such as depression, memory loss and irritability.

**DEFICIENCY MANIFESTATIONS; Low Calcium (Hypocalcaemia)**

* muscle stiffness
* muscle spasms
* paresthesia’s, or feelings of pins and needles, in the extremities
* changes in mood, such as anxiety, depression, or irritability
* memory issues
* hypotension
* difficulty speaking or swallowing
* fatigue
* parkinsonism
* papilledema, or swelling of the optic disc
* The symptoms of severe hypocalcemia are; seizures, arrhythmias, congestive heart failure, and laryngospasms, or seizures of the voice box.
* The long-term symptoms of hypocalcemia include: dry skin, brittle nails, kidney stones or other calcium deposits in the body, dementia, cataracts and eczema.

**3C.) MAGNESIUM**

**TOXICITY VALUES; High level of magnesium (hypermagnesemia)**

* High doses of magnesium from dietary supplements or medications often result in diarrhea that can be accompanied by nausea and abdominal cramping.
* Abnormal heart rhythms and asystole: they are possible complications of hypermagnesemia related to the heart. Magnesium acts as a physiologic calcium blocker, which results in electrical conduction abnormalities within the heart.
* Symptoms of magnesium toxicity, which usually develops after serum concentrations can include hypotension, vomiting, facial flushing, retention of urine, ileus, depression, and lethargy before proceeding to muscle weakness and cardiac arrest. Others include the following;
* Confusion
* Decreased breathing rate
* Decreased reflexes
* Low blood pressure
* Dizziness

**DEFICIENCY MANIFESTATIONS; Low Magnesium (Hypomagnesemia)**

* Signs of magnesium deficiency include loss of appetite, vomiting, fatigue and weakness.
* As magnesium deficiency worsens, other signs would include; numbness
* Tingling
* Muscle contractions and cramps
* Seizures
* Abnormal heart rhythms and coronary spasms can occur
* Low blood pressure
* Respiratory distress
* Cardiac arrest

**References:** <https://ods.od.nih.gov/factsheets/Magnesium-HealthProfessional/#h5>

**4D.) CHLORIDE**

**TOXICITY VALUES; High Chloride (Hyperchloremia)**

* Congestive heart failure
* Dehydration, fluid loss or high levels of blood sodium may be noticed.
* Excessive thirst
* Dry mucous membrane
* Diarrhea and Vomiting
* Muscle weakness
* Poor control over blood sugar levels

**DEFICIENCY MANIFESTATIONS; Low chloride (Hypochloremia)**

* Fluid loss
* Dehydration
* Weakness or fatigue
* Difficulty breathing
* Diarrhea or vomiting caused by fluid loss

**Reference:** <https://www.healthline.com/search?q1=hypochloremia>

**5E.) IRON**

**TOXICITY VALUES; High Iron (Hemochromatosis)**

* Tiredness or fatigue
* Weakness
* Weight loss
* Abdominal pain
* High blood sugar levels
* Hyperpigmentation or skin turning a bronze color
* Loss of libido or sex drive
* In males; reduction in the size of the testicles
* In females; reduced or absent menstruation
* Arthritis
* Liver diseases or cirrhosis (permanent scarring of the liver)
* Diabetes
* Hypothyroidism
* Heart disease
* Pancreatitis

**DEFICIENCY MANIFESTATIONS; Low Iron (Iron deficiency Anemia)**

* General fatigue
* Weakness
* Pale skin
* Shortness of breath
* Dizziness
* Strange cravings such as cravings to eat dirt, ice, clay etc.
* Tingling or crawling feeling in the legs
* Tongue swelling or soreness
* Cold hands and feet
* Fast or irregular heart beat (palpitation)
* Brittle nails
* Headaches