NAME: NGUE TCHOUMBA EVE JOYCE

MATRIC NUMBER: 19/mhs07/006

DEPARTMENT: PHARMACOLOGY

COURSE CODE: BCH 204

**TOXICITY VALUES OF POTASSIUM**

Potassium chloride and sodium chloride were infused into the reticulorumen of male Holstein calves, approximately 6 mo of age and 260 kg, at .29, .58, 1.15, 1.73, 2.31, or 2.88 g potassium per kilogram body weight or 1.35, 2.12, or 2.16 g sodium per kilogram in equal volumes of water. Paired controls were infused with water. Calves were monitored for physiological changes for 6 h at 15, 30, or 60-min intervals. Potassium and total solids of plasma and packed cell volume were increased at potassium doses greater than .29 g of potassium per kilogram body weight within 1 h after dosing. Clinical toxicity signs, including excess salivation, muscular tremors of legs, and excitability were observed with potassium doses greater than .58 g of potassium per kilogram body weight. Three of five calves given 1.73 g of potassium per kilogram, three of four calves given 2.31 g of potassium per kilogram, and one calf given 2.88 g of potassium per kilogram body weight died.

**Toxic Mechanism:**

Like all metal ingestions they are a direct GI irritant. Once intracellular potassium interferes with electrical conduction in both nerves and muscle resulting in cardiac arrest.

**Toxicokinetics:**

* Rapidly absorbed in the small bowel
* Distributed to the intracellular compartment
* Excreted in the urine (90-95%), faeces and sweat. Once absorption exceeds redistribution and excretion, hyperkalaemia ensues.

DEFICIENCY MECHANISM

**Potassium deficiency**, also called **hypokalemia**, condition in which potassium is insufficient or is not utilized properly. Potassium is a mineral that forms positive Potassium is important for normal muscle and nerve responsiveness, heart rhythm, and, in particular, intracellular fluid pressure and balance. Approximately 8 percent of the potassium that the body takes in through food consumption is retained; the rest is readily excreted.ions (electrically charged particles) in solution and is an essential constituent of cellular fluids. Deficiency problems are not usually a result of poor nutrition but may arise in poor societies where malnutrition is common. Rapid excretion of potassium in severe diarrhea, diabetes, and prolonged administration of cortisone medications are among the causes of nondietary deficiencies. A lack of potassium is known to exaggerate the effects of sodium in decreases and increases of normal metabolic activity. In one form of potassium depletion, which is the loss of adequate potassium in the tissues, including the blood, the potassium has not left the body but has shifted into the body cells from the fluid surrounding them.

**SIGNS AND SYMPTOMS**

Weakness and fatigue

Muscle cramps and spasms

Digestive problems

Heart palpitations

Calcium toxicity is rare, occurring in those with hyperparathyroidism or high calcium supplementation levels. Like vitamin D, toxicity can lead to calcification of soft tissues7. In addition, a very high intake of calcium can lead to kidney stone formation. Clinical signs and symptoms of hypercalcemia may vary depending on the magnitude of the hypercalcemia and the rapidity of its elevation; they often include anorexia, weight loss, polyuria, heart arrhythmias, fatigue, and soft tissue calcifications (Jones, 2008). When serum calcium levels rise above 12 mg/dL, the kidney's ability to reabsorb calcium is often limited; in turn, hypercalciuria can occur, particularly with increased calcium or vitamin D intake. Hypercalciuria is present when urinary excretion of calcium exceeds 250 mg/day in women or 275-300 mg/day in men. Often, urinary calcium excretion is expressed as the ratio of calcium to creatinine excreted in 24 hours (milligrams of calcium per milligram of creatinine). Values above 0.3 mg/mg creatinine are considered to be within the hypercalcuric range.

**DEFICIENCY MANFESTATION**

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.

Complications of hypocalcemia can be life-threatening, and if the condition goes untreated, it could eventually lead to death.

**What are the symptoms?**

The symptoms described below may become worse as the disease progresses.

**1. 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.

**2. Extreme fatigue**

Low levels of calcium can cause insomnia or sleepiness.

People tend to experience:

* extreme fatigue
* lethargy
* an overall feeling of sluggishness
* lack of energy

### 3. Nail and skin symptoms

Chronic calcium deficiency can affect the skin and nails.

The skin may become dry and itchy, and researchers have linked hypocalcemia to eczema and psoriasis. Eczema is a general term for skin inflammation. Symptoms include itchiness, redness, and skin blisters. Eczema is highly treatable, while psoriasis can be managed, but there is no cure.

**4. Osteopenia and osteoporosis**

Calcium deficiency can lead to [osteopenia and osteoporosis](https://ods.od.nih.gov/factsheets/Calcium-HealthProfessional/).

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.

**5. Painful premenstrual syndrome (PMS)**

**6. Dental Problems**

When the body lacks calcium, it pulls it from sources such as the teeth. This can lead to dental problems, including weak roots, irritated gums, brittle teeth, and tooth decay.

**TOXICITY VALUE OF MAGNESIUM**

Magnesium is required for energy production, oxidative phosphorylation, and glycolysis. It contributes to the structural development of bone and is required for the synthesis of DNA, RNA, and the antioxidant glutathione.

An adult body contains approximately 25 g magnesium, with 50% to 60% present in the bones and most of the rest in soft tissues . Less than 1% of total magnesium is in blood serum, and these levels are kept under tight control. Normal serum magnesium concentrations range between 0.75 and 0.95 millimoles (mmol)/L. Hypomagnesemia is defined as a serum magnesium level less than 0.75 mmol/L . Magnesium homeostasis is largely controlled by the kidney, which typically excretes about 120 mg magnesium into the urine each day . Urinary excretion is reduced when magnesium status is low.

**DEFICIENCY MANIFESTATIONS OF MAGNESIUM**

Early symptoms of magnesium deficiency can include nausea and vomiting, loss of appetite, tiredness, and weakness. Although many people are not getting enough magnesium, deficiency is rare, and symptoms usually indicate an underlying health condition.

Magnesium is an essential mineral and electrolyte that plays a role in many bodily processes, including:

* energy production
* bone and teeth structure
* muscle function
* nerve function
* DNA replication
* RNA and protein synthesis

**Long-term magnesium deficiency** may have adverse effects on:

bone density

brain function

nerve and muscle function

digestive system

Loss of bone density can be of particular concern. In younger people, magnesium deficiency may prevent bone growth. It is vital to get enough magnesium during childhood when the bones are still developing.

In older people, magnesium deficiency may increase the risk of osteoporosis and bone fractures.

**Early signs of magnesium deficiency may include**:

nausea

vomiting

loss of appetite

fatigue

weakness

**Osteoporosis**

Osteoporosis is a disorder characterized by weak bones and an increased risk of bone fractures.

The risk of getting osteoporosis is influenced by numerous factors. These include old age, lack of exercise and a poor intake of vitamins D and K.

**Irregular Heartbeat**

Among the most serious symptoms of magnesium deficiency is heart arrhythmia, or irregular heartbeat

The symptoms of arrhythmia are mild in most cases. Often, it has no symptoms at all. However, in some people, it may cause heart palpitations, which are pauses between heartbeats

**TOXICITY VALUE OF CHLORIDE**

The mean chloride concentration in several rivers in the United Kingdom was in the range 11–42 mg/litre during 1974–81 (7). Evidence of a general increase in chloride concentrations in groundwater and drinking-water has been found (8), but exceptions have also been reported (9). In the USA, aquifers prone to seawater intrusion have been found to contain chloride at concentrations ranging from 5 to 460 mg/litre (10), whereas contaminated wells in the Philippines have been reported to have an average chloride concentration of 141 mg/litre (11). Chloride levels in unpolluted waters are often below 10 mg/litre and sometimes below 1 mg/litre (4). Mixing of chlorine bleach (sodium hypochlorite) with ammonia or acidic cleaning agents is a common source of household exposure. As with all poisons, the dose determines the toxicity.

**What Is Hypochloremia**?

**Hypochloremia** is an electrolyte imbalance and is indicated by a low level of chloride in the blood.  The normal adult value for chloride is 97-107 mEq/L.

Chloride in your blood is an important electrolyte and works to ensure that your body's metabolism is working correctly. Your kidneys control the levels of chloride in your blood. Therefore, when there is a disturbance in your blood chloride levels, it is often related to your kidneys.  Chloride helps the acid and base balance in the body.

**Causes of Hypochloremia**:

* Loss of body fluids from prolonged vomiting, diarrhea, sweating or high fevers.
* Drugs such as: bicarbonate, corticosteroids, diuretics, and laxatives.

**Symptoms of Hypochloremia**:

* Many people do not notice any symptoms, unless they are experiencing very high or very low levels of chloride in their blood.
* Dehydration, fluid loss, or high levels of blood sodium may be noted.
* You may be experiencing other forms of fluid loss, such as diarrhea, or vomiting.

**IRON TOXICITY**

**Toxic** dose

**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 terms of blood **values**, **iron** levels above 350–500 μg/dL are considered **toxic**, and levels over 1000 μg/dL indicate severe **iron** poisoning. Iron overdose has been one of the leading causes of poisoning deaths in children younger than 6 years. Iron is used in pediatric or prenatal vitamin and mineral supplements and for treatment of anemia. Iron tablets are particularly tempting to young children because they look like candy. Iron overdose in adults is typically a suicide attempt.

**DEFICIENCY MANIFESTATIONS OF IRON**

**Iron deficiency anemia** is a common type of anemia — a condition in which blood lacks adequate healthy red blood cells. Red blood cells carry oxygen to the body's tissues.

As the name implies, iron deficiency anemia is due to insufficient iron. Without enough iron, your body can't produce enough of a substance in red blood cells that enables them to carry oxygen (hemoglobin). As a result, iron deficiency anemia may leave you tired and short of breath.

Symptoms

Initially, iron deficiency anemia can be so mild that it goes unnoticed. But as the body becomes more deficient in iron and anemia worsens, the signs and symptoms intensify.

Iron deficiency anemia signs and symptoms may include:

* Extreme fatigue
* Weakness
* Pale skin
* Chest pain, fast heartbeat or shortness of breath
* Headache, dizziness or lightheadedness
* Cold hands and feet
* Inflammation or soreness of your tongue
* Brittle nails
* Unusual cravings for non-nutritive substances, such as ice.