Hyperkalemia (High Potassium) in Cats

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At a glance

About: Hyperkalemia the medical term for an increased level of potassium (K) in the cat's blood.

Causes: It commonly occurs as a result of decreased urinary excretion, which may be due to kidney disease, urinary blockages, ruptured bladder, Addison's disease and reperfusion injury.

Symptoms: Cardiac arrhythmias, twitching, lethargy, muscle weakness, gastrointestinal disturbances, and depression.

Treatment: Manage the underlying condition as well as fluid therapy to increase urinary output to bring down levels.

Hyperkalemia is the medical term for high levels of potassium in the blood. Potassium is an essential electrolyte (body salt) which performs several functions such as:

- Regulating nerve impulse and muscle contractions.
- Maintains intracellular volume.
- Assists in maintaining blood pressure.
- Maintains heart function.
- Maintains the body's electrolyte balance and acid/alkali levels in cells and tissues.
- It also plays a role in heart, skeletal, and smooth muscle contraction, making it an essential nutrient for heart, digestive, and muscular function.

Hyperkalemia occurs due to decreased potassium excretion via the urine. Normal blood values for potassium are 3.5 to 5.4 mmol/L

Causes

Decreased urinary excretion is the most common cause of hyperkalemia in cats due to kidney failure. It is the role of the kidneys to remove excess potassium from the blood via the urine if they are no longer functioning as efficiently potassium levels can build up.

Kidney failure

Acute (sudden onset) or chronic (slow and progressive). Chronic kidney failure is seen more commonly in middle-aged to senior cats. There are several causes of acute kidney failure, such as ingestion of toxins (such as lily or ethylene glycol).

Shift of potassium from the intracellular fluid into the extracellular fluid

98% of the body's potassium is found within the cells), causes of a potassium shift include cell death (lysis) and acid-base abnormalities.

Urinary tract blockages

These occur when crystals or stones lodge in the urethra. Urine is unable to pass the blockage, causing it to build up in the bladder. Once this occurs, the kidneys stop functioning/or become less efficient, and again, blood levels of potassium build up. Males are more prone to developing urinary blockages due to their narrower urethra.

Ruptured bladder

Trauma (such as being hit by a car or a fall from a height) or urinary blockage. Fluid leaks into the abdomen, causing a build-up of toxic wastes, including potassium. Once the bladder is ruptured, urine can no longer be excreted from the body, making the problem worse.

Addison's disease

Also known as primary adrenal insufficiency and hypocortisolism, Addison's disease is an endocrine disorder in which the adrenal glands do not produce enough steroid hormones. One hormone, aldosterone, is responsible for regulating water, salt, and potassium levels in the blood.

Diabetic ketoacidosis

This condition develops when blood glucose can't get into the cells for energy due to lack of insulin. The body breaks down fat as an alternate energy sauce, which causes the blood to become too acidic and hyperglycemia (high blood sugar). Acidosis and hyperglycemia can cause potassium to move from the cells and into the blood circulation.

Reperfusion injury

A serious condition which occurs when blood flow is restored after a blockage has occurred (such as blood clot). During blockage (known as ischemia), cells are deprived of oxygen leading to a cascade of biochemical reactions occur, leading to toxic build-up. Once blood flow is restored, these by-products are released into the circulatory system, and hyperkalemia can occur.

Symptoms

Not all cats will show signs of hyperkalemia, and when they do occur, it is usually when levels have become dangerously high (above 7 mmol/L). Symptoms of hyperkalemia may include:

- Weakness
- Twitching
- Muscle weakness
- Paralysis
- Gastrointestinal disturbances
- Depression

In addition to the symptoms listed above, the underlying cause will also produce symptoms.

Kidney disease

- Increased urination and drinking
- Anorexia (loss of appetite)
- Vomiting
- Bad breath
- Weakness
- Loss of coordination
- Seizures

Urinary blockage

- Frequent trips to the litter tray, your cat may be seen straining, crying, licking his genitals (males are most often affected due to their narrower urethra)
- A small amount of urine may be produced or none at all if he has become completely blocked
- Blood in the urine
- Abdominal pain
- Abdominal swelling
- Vomiting
- Lethargy

Ruptured bladder

- Inability to urinate at all
- Abdominal pain
- Abdominal swelling

Ketoacidosis

- Increased thirst and urination
- Dehydration
- Nausea

- Fruity smelling breath
- Confusion
- Weakness

Addison's disease

- Loss of appetite
- Depression
- Vomiting and diarrhea
- Lethargy
- Shakiness
- Weakness
- Weight loss

Diagnosis

- Biochemical profile – Elevated potassium (mild > 5.5, moderate > 6.5, severe > 9). Elevated BUN and creatinine levels in cats with kidney disease or urinary blockage. Hyperglycemia may occur in cats with diabetes or ketoacidosis.
- Complete blood count – A blood test to measure the cells in a sample of blood, anemia (low blood cell count) can be indicative of chronic kidney disease.
- Urinalysis – A test on the cat's urine to look for blood in the urine, urinary crystals, white blood cells and evaluate kidney function.
- ECG (electrocardiogram) – Electrocardiography is the process of producing an electrocardiogram to evaluate the heart.
- Ultrasound or abdominal x-rays to check the bladder and urinary tract for rupture or blockage.

Treatment

The goal of treatment is to manage the underlying condition as well as fluid therapy to increase urine output and bring down potassium levels.

Emergency care:

- 0.9% sodium chloride (NaCl) – To increase urination to decrease potassium stores through increasing potassium excretion in the urine
- 10% calcium gluconate – Protects the myocardium from toxic effects of calcium
- Sodium bicarbonate (NaHCO3) – Sodium bicarbonate administration to counteract acidosis and to promote movement of potassium from the extracellular space back into the cells.
- Short-acting insulin and dextrose or dextrose alone – Insulin promotes the movement of potassium from the extracellular space to the cells. Dextrose prevents hypoglycemia (low blood sugar) due to insulin therapy

Treating the underlying cause:

- **Kidney failure (chronic)** – Low protein and phosphate diet along with phosphorous binders, which reduce the absorption of phosphate.
- **Kidney failure (acute)** – Find and treat the underlying cause, this may include inducing vomiting, gastric lavage or activated charcoal to reduce absorption of ingested toxins, fluid therapy to help the kidneys flush out toxins and supportive care. If the kidneys have completely stopped urine production, peritoneal dialysis or hemodialysis will be necessary.
- **Ketoacidosis** – Proper management of diabetes.
- **Urinary blockage** – Removing the blockage, usually by catheterisation. If the blockage can't be relieved via the methods listed above, an emergency *perineal urethrostomy* will be necessary. This involves surgery to create a new urethral opening.
- **Removal of urine from the bladder** or **abdomen** if the cat is has a blockage or a ruptured bladder.
- **Ruptured bladder** – Surgery to repair the bladder.
- **Addison's disease** – Lifelong administration of the deficient adrenal hormones.

Aftercare

Follow-up appointments with your veterinarian will be necessary to monitor your cat's heart.

Cats who have had a urinary blockage are at risk of a recurrence. Your veterinarian may recommend a change in diet if your cat is at risk. This may include a switch to wet food (raw or canned) or a prescription diet.