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Oral treatment of hypokalemia with potassium chloride and propylene glycol in COWS

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ABSTRACT

Background: Hypokalemia is a fatal metabolic, pathological and induced disorder of Potassium, manifested by low serum levels generally encountered in lactating animals and during thermal-stress. Currently Potassium is given in normal saline intravenously and very slowly. This method is costly, risky and laborious. To study the effect of oral administration of 12 g of elemental Potassium and 200 ml of Propylene glycol orally in hypokalemic cows.

Materials and Methods: After estimating the serum level of potassium with Serum, analyzer, the effect of Nutri-Pot (A) containing 12 g of Potassium in 50-gram pouch and Nutri-Pot (B) containing 200 ml Propylene Glycol in 28 clinically hypokalemic cows was studied. Both A & B were mixed with 200 ml of drinking water and were slowly drenched and the second dose is repeated after 12 hours.

Results: Out of 28 cows, 26 were recovered fully and returned to normal condition and milk production.

Conclusion: Combined drenching of Potassium and Propylene glycol was only the safest, most effective and economical method than administration through a balling gun and gelatin boluses or by ororominal intubation. Or parenteral administration.

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1. Introduction

Hypokalemia, a mineral disorder manifested as too-low serum potassium levels, is life-threatening, in dairy cows. In lactating cattle, 75% of Potassium elimination is via the urine, 13% in faeces (mostly unabsorbed dietary potassium) and 12 % in the milk.¹ Hypokalemic animals show weakness, fasciculation, and muscle wasting. Animals who are severely afflicted are unable to stand or lift their heads off the ground.² The normal physiological potassium concentration in the blood plasma of cows ranges between 3.9 and 5.8 mmol/L.³

With left displaced abomasum, right displaced abomasum, abomasal volvulus, abomasal impaction,

clinical mastitis, retained placenta, and hepatic lipidosis, hypokalemia is frequently seen in lactating dairy cows.⁴

An isotonic solution of potassium chloride (1.15%), which should be provided at 3.2 mL/kg per hour, or a maximum delivery rate of K⁺ at 0.5 mmol/kg per hour, is the most aggressive intravenous therapy strategy. Higher potassium injection rates put cows, at greater risk for hemodynamic arrhythmias, such as early ventricular complexes that can cause ventricular fibrillation and death. Parenteral treatment is expensive, laborious and calls for assistance a veterinarian.

The preferred choice for treating hypokalemia in lactating dairy cattle is oral potassium supplementation via using a balling gun and gelatin boluses oro-ruminal intubation.

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Table 1: Shows the number of hypokalemic cows that attended the veterinary Hospital, Rayachoti from January 2023 to August 2023

Serial Number	Disorder	Number of cows Treated	Serum level in mmol/L		Number of cows cured	Remarks
			Before Treatment	After Treatment		
1	Metabolic	12	<2.5	4.1	12	
2	Pathological-	8	<2.4	3.8	6	Two died ,due to abomasal displacement with less than 1 mmol/L of serumPotassium
3	Induced	8	<3.5	3.9	8	
Total		28	N/A	N/A	26	

In most of the hypokalemic cows, it is noticed that besides loss of appetite, dehydration, and debility, there is a substantial reduction in milk production and further the treatment was given for only the replacement of Potassium but could not provide immediate energy. Hence an attempt is made to reimburse the loss of both potassium and energy with a new formulation of Nutri-Pot(A)&(B).

2. Materials and Methods

Twenty-eight cows with hypokalemic symptoms that were brought to veterinary Hospital, Rayachoti were included in the study. Serum samples were analyzed with Analyzer for Potassium.

The analyzer was made by BA-88A (INDUS). Nutri-Pot, a brand product of Potassium and Propylene glycol, was supplied by Oxenvet Nutraceuticals, Kadapa. The product was supplied as Nu-tri Pot (A) and Nutri-Pot (B). Nutri-Pot (A) contains 12 g of elemental Potassium in a 50-gram Pouch, packed as two sets and Nutri-Pot (B) contains 400 ml of Propylene glycol presented in a 500 ml polythene container.⁵⁻¹⁵ Each 50 grams pouch was first dissolved in 100 ml of drinking water and to 200 ml of propylene glycol was added and then mixed thoroughly. The mixture was drenched slowly and the second dose is repeated after 12 hours, if necessary.

3. Results

The findings suggested that the potassium and propylene glycol-containing Nutri-Pot formulation would be a viable and successful alternative to the bolus or nasogastric tube administration of dissolved potassium by dairy farmers or local practitioners. The restoration of potassium levels to the reference range ($K + 3.5$ /l) was quicker and a significant improvement in milk supply could be seen within 3 days in cows with mild hypokalemia ($K + 2.4$ mmol/l and 3.5 mmol/l). Two cows with serum potassium levels below 1 mmol/L were not able to be rescued.

4. Discussion

The purpose of the current study was to test the hypothesis that giving potassium and propylene glycol to hospitalized hypokalemic dairy cows with various production diseases is not only a safe and practical way to raise plasma potassium levels but also has positive effects on the animals' appetite, milk production, ruminal activity, energy metabolism, and general recovery.

Potassium and propylene glycol enabled the reconstitution of mean plasma potassium within 3 days. In high-yielding cows who exhibit anorexia due to hypokalemia, the Nutri-Pot formulation has demonstrated its usefulness for this purpose. The oral delivery of potassium chloride in solution through the use of a bottle or a drenching gun may irritate the mucous membranes of the oral cavity and the oesophagus as a result of its caustic action. However, under actual field circumstances, recurrent use of a stomach tube or balling gun was not a practical method.

Drenching Nutri-Pot (A) and Nutri-Pot (B), proved to be an easy and safe procedure. Propylene glycol provided immediate energy, acted as a demulcent and lubricant and helped with the quick absorption of the Potassium. Improvement in the clinical condition was associated with an increase in feed uptake and subsequent milk production, as there is a strong correlation between Dry matter intake and milk yield.¹⁶

5. Conclusion

The findings of this study suggested that the administration of dissolved Potassium chloride delivered by nasogastric tube by the dairy farmer or local practitioner may not be a viable and effective alternative to the Nutri-Pot formulation, which contains potassium and propylene glycol. The research animals did not experience any adverse side effects from the potassium Nutri-pot formulation used in this investigation, even when it was administered more than once. There was tremendous recovery from inappetence and in restoration of milk production.

6. Source of Funding

None.

7. Conflict of Interest

None.

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