ORAL REHYDRATION OF ADULT CATTLE USING ISOTONIC SOLUTION OF SUGAR, SODIUM CHLORIDE AND POTASSIUM CHLORIDE

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SUMMARY

The study was conducted on 10 clinically dehydrated adult cattle. The fluid requirement and clinical parameters were evaluated and treated with electrolyte solution prepared by dissolving electrolytes in 20 liters of water. In all cases with dehydration, the changes in the body temperature remained statistically non-significant. The heart rate, pulse rate decreased after rehydration, however, respiration rate was elevated during treatment and decreased after completion of therapy. The packed cell volume, total erythrocyte count and hemoglobin were reduced significantly after therapy. Due to dehydration, there is increased protein concentration, which significantly decreased after rehydration therapy. The serum sodium values were at lower level before oral rehydration and reached up to normal levels while serum potassium was within normal range. In dehydrated animals, chloride levels were observed at lower side of the normal range. After rehydration therapy, chloride levels were increased and reached near normalcy indicating that this therapy is effective. Glucose levels did not differ significantly in dehydrated animals.

Keywords: Adult Cattle, Isotonic solution, Oral rehydration

Many diseases of animals cause dehydration including ruminal and enteric diseases, acute mastitis, acute metritis, milk fever and ketosis. Fluid therapy is the most important step to save dehydrated animal. However, the fluid requirement for large animal is very high and difficult to achieve at field conditions. Besides, it is very time consuming and expensive. Therefore, it is rarely adopted for large animals under field level. However, it is imperative to give fluid therapy in certain clinical situations and cannot be avoided. Since most dehydrated cattle have a metabolic alkalosis, it is necessary to use a non-alkalinizing oral electrolyte solution that does not contain bicarbonate, acetate or propionate (Smith, 2005). Oral administration can be done by using a full length orogastric tube and pumping in 20 to 50 litre of fluid, depending on rumen capacity and degree of dehydration. Non-chilled water mixed with electrolytes is the preferred fluid of choice and will replace the need for intravenous isotonic fluids. Thus, oral hydration through a pump system is the easiest way to rehydrate the cow under field level to provide important nutrients like water and electrolytes. The present study provides its detailed outcome in dehydrated animals.

This study was conducted to evaluate the effect of oral rehydration therapy on dehydrated adult cattle. For this purpose, 10 cattle with dehydration were selected from Gorakshan Sabha, Dhantoli, Nagpur. Animal's dehydration was monitored through skin tent test, eye position and mucus membrane characteristics as explained by Kopcha (2008) at 0th, 24th and 48th h of therapy.

The other parameters like body temperature, pulse, respiration rate, gait of animal, appetite, biochemical

(serum protein, sodium, potassium, calcium, chloride and glucose) and hematological indices (PCV, Hb and TEC) were also recorded as per the standard methods. Oral electrolyte solution was prepared by dissolving Sugar (100 g), NaCl (140 g) and KCl (25 g) in 20L of water (Jadhav, 2015). The weight of the animal was calculated on the basis of formula described in official gazette of Prevention of cruelty to draught and pack animal rules, Government of India (1965).

Weight of animal (Kg) = $\frac{\text{Length}(\text{cm}) \times \text{Girth}^2(\text{cm})}{10838}$

Fluid deficit in liters was calculating using formula as mentioned below (Kopcha, 2008).

Fluid deficit in liters= Body weight (Kg.) \times Estimated dehydration percentage.

Animals were restrained properly in a travis before oral therapy. Orogastric tube was lubricated with glycerine and held gently over the base of the tongue and passed into the esophagus and finally in the rumen taking necessary precautions. The eructation of gases was indicative of proper placement of tube in the rumen. The electrolyte solution from rehydration unit was placed in rumen by water pump slowly. During the course of therapy, tube was moved forward and backward direction for expulsion of gases from rumen. After drenching electrolyte solution in the rumen, tube was removed slowly.

Dehydrated adult animals were dull, depressed and recumbent. Sticky mucus membrane of eye, sunken eyes and long standing skin ridge was observed in the dehydrated animals. Constable *et al.* (1998) suggested a complete examination of eye position, skin elasticity and eye mucus membrane moistness in dehydrated animals.

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Table 1Skin tent test, % dehydration and fluid given

Animal no.	Body	Skin ter	nt test (s	% of	fluid	
	(kg)	0h	24h	48h	ration	(L)
1	191	6	3	0	10	19.1
2	180	6	2	0	10	18.0
3	247	15	3	3	10	24.7
4	191	7	4	3	10	19.1
5	247	10	5	4	10	24.7
6	255	6	2	0	10	25.5
7	210	9	5	3	10	21.0
8	188	10	6	4	10	18.8
9	195	10	6	4	10	19.5
10	210	8	3	3	10	21.0
	Average	8.7	3.9	2.4		

All experimental animals were recumbent and showing stumbling gait. The appetite was decreased in two animals and three animals were totally anorectic, however, five animals showed normal feeding behavior. Kumar and Mandial (2002) also reported sunken eyes, reduced skin elasticity, depression, dullness and reduced appetite in dehydrated animals.

Skin tent test was done by pinching the skin at neck region of dehydrated animals and time required for the skin fold to disappear was recorded. The readings of skin tent test and per cent dehydration are closely related to each other as the skin elasticity is lost due to loss of fluid from the body. From table 1, skin tent test values shows that skin returned to normal position after 8.70 seconds before oral rehydration therapy in severally dehydrated animals which was further improved and skin came to normal position after 3.9 and 2.4 seconds at 24^{th} and 48^{th} hours after therapy, respectively. This indicated that the oral rehydration therapy is very effective in dehydrated animals. The body temperature in all dehydrated animals remained normal and averaged between 102 to 101.7° F (Table 2). These findings corroborates with findings of Constable et al. (2001) who reported unaltered rectal temperature in

Table 2 Clinical Parameters

Animal No.		1	2	3	4	5	6	7	8	9	10	Average
Mucus membrane	0 hr	DS	DS	DS	DT	DT	DT	DS	DS	DT	DT	
	24hr	DT	DT	DT	М	DT	М	DT	DT	DT	DT	
	48 hr	М	М	DT	М	М	М	DT	DT	DT	DT	
Eyeposition	0 hr	S Res	Ob Sun	Sv Res	Ob Sun	Sv Rs	Ob Sun	Sv Res	Sv Res	Sv Res	Sv Res	
	24hr	S Res	S Res	Ob Sun	S Res	Ob Sun	S Res	Ob Sun	Ob Sun	Ob Sun	S Res	
	48 hr	No Res	No Res	S Res	S Res	S Res	No Res	S Res	S Res	S Res	S Res	
Gait	0 hr	STU	REC	STU	REC	STF	STU	REC	STF	STF	STU	
	24hr	Ν	STF	STU	STF	STU	STU	STF	STU	STU	Ν	
	48 hr	Ν	STU	Ν	STU	Ν	Ν	STU	Ν	Ν	Ν	
Appetite	0 hr	DA	AN	DA	Ν	Ν	AN	Ν	Ν	Ν	DA	
	24hr	Ν	AN	Ν	Ν	Ν	AN	DA	Ν	Ν	Ν	
	48 hr	Ν	DA	Ν	Ν	Ν	DA	Ν	Ν	Ν	Ν	
Body Temperature (°F)	0 hr	100.6	101.2	102.2	103.1	100.3	99.8	101.8	99.4	99.4	104.1	101.2
	24hr	101.0	102.8	101.1	102.2	101.0	100.8	100.9	100.0	100.0	102.5	101.2
	48 hr	101.8	101.9	102.0	102.3	101.7	101.2	101.6	100.8	101.4	102.0	101.7
Pulse rate (per min.) &	0 hr	108	70	68	60	78	48	64	90	90	55	73.1
Heart Rate (per min.)	24hr	82	72	60	64	68	55	58	70	70	59	65.8
	48 hr	75	63	58	66	69	48	62	63	63	57	62.4
Respiration Rate	0 hr	20	24	28	16	24	28	19	16	16	23	21.4
(per min.)	24hr	19	24	22	20	22	22	16	21	23	17	20.6
	48 hr	18	18	24	24	23	18	23	24	25	19	21.6

DS- Dry sticky, DT- Dry tacky, M- Moist, No. Res- No Recession, S Res- Severe Recession, Ob Sun- Obviously Sunken, REC- Recumbent, STU-Stumbling Gait, STF- Stiff Gait N- Normal, AN- Anorexia, DA- Decreased Appetite, N- Normal Appetite dehydrated animals. Average pulse rate and heart rate of these animals was 73.1 per minute at 0th hour, which was reduced to 65.8 and 62.4 per minute at 24th and 48th hour after initiation of oral rehydration therapy (Table 2). Boyd *et al.* (1974) also reported normal temperature and pulse rate in dehydrated animals. However, Tennant *et al.* (1975) observed increased temperature and pulse rate in dehydrated calves. This may be due to variation in the age of the animals. The average respiration rate of animals was 21.4 per minute at 0th hour which reduced to 20.6 and 21.6 per minute at 24th and 48th hours after initiation of oral rehydration therapy. Similar observations were also reported by Boyd *et al.* (1974) who reported normal heart rates and respiration rates in dehydrated animals.

The average packed cell volume was 32.78% at 0th hour which decreased to 25.99% at 24^{th} hour of therapy which was further increased to 23.51 at 48^{th} hour. Similarly trend was also observed for total erythrocyte count at 0th (4.87), 24^{th} (4.72) and 48^{th} (4.605) hour. The average hemoglobin level was 10.96, 8.51 and 7.92 gm% at 0th, 24^{th} and 48^{th} hour, respectively. The reduction in the values of PCV, Hb and TEC at 24^{th} hour after therapy indicated that the oral rehydration is required to be continued at 48^{th} hour also. Similar trend was also reported by Benjamin (1981).

The average serum protein level for dehydrated animals was 6.15 gm/dl at 0th hour which was reduced to 5.66 and 5.22 gm/dl at 24^{th} and 48^{th} hour after therapy. The reduced serum protein value after oral rehydration therapy indicated that this therapy is very effective in correction of dehydration. Similar observations were also reported by Avanza (2004) and Benjamin (1981) who reported similar trend in dehydrated animals. The average value of serum sodium at 0th hour was 139.33 mmol/L which was elevated to 139.69 mmol/L at 24th hour after initiation of therapy. This level was slightly reduced to 138.77 mmol/L at 48th hours which indicated that this therapy should be continued at 24th and 48th hours also. The increase in the values of serum Sodium is indicative of rehydration in the animals. These findings are similar that of Dalton et. al. (1965) who reported increased serum sodium values after rehydration. The average serum chloride value was 102.61, 109.65 and 108.24 mEq/L at 0th, 24th and 48th hour of study period, respectively. However, these values are within normal physiological range. Similar findings were also recorded by Alone et al. (2000). The average value of serum calcium was 9.98, 9.69 and 9.70 mg/dl at 0^{th} , 24th & 48th hours, respectively. The decreased level of serum calcium after oral rehydration was also recorded by Ribeiro et al. (2013) who performed rehydration in

dehydrated cattle with continuous flow system.

Thus, this study showed that oral rehydration should be done in dehydrated animals after assessing skin elasticity and different biochemical and hematological indices.

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