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Clinico-therapeutic management of neonatal diarrhoeic calves by parenteral administration of gentamicin along with intravenous fluid Therapy: case report

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Abstract

A one month old cattle calf was presented at Veterinary Clinical Complex, Apollo College of Veterinary Medicine, Jaipur with the history of watery feces, depression and inappatance since two days. Detailed physical examination revealed dehydrated skin, sunken eye, tachycardia, tachypnea and slight hypothermia. Fecal sample was collected and sent to department of microbiology for bacteriological culture which showed the presence of E. coli. Whole blood and serum sample were also collected for hematological, biochemical and electrolyte evaluation of calf suffering with diarrhea. On the basis of history, clinical symptoms and microbiological examination the case was diagnosed as E. coli induced diarrhea and treated with parental administration of gentamicin (3mg/kg body weight) and intravenous fluid therapy (Ringer's Lactate solution). Unevenfull recovery was observed after four days of continuous treatment.

Keywords: *E. coli*, diarrhea, gentamicin

Introduction

Diarrhea is the most important and common disease in young calves and accounts for approximately 75% of the mortality of dairy calves within the first 3 weeks of age [1]. It is the major constraint in calf rearing followed by respiratory tract disease, disease of the umbilicus, and joints problems. It causes marked economic losses due to the high mortality rate, higher treatment costs, and impaired growth performance. In dairy cattle herds the prevalence and incidence risk for neonatal calf diarrhea has recently been reported to be 19.1 and 21.2%, respectively [2]. Mismanagement of calves affected with diarrhea may result in a fatal outcome. The severity of disease also depends on the environment and management practices. It was reported that in Indian, the incidence rate of clinical cases of diarrhea ranges from 48.68% to 57.68% [3]. Both Infectious and non-infectious factors are responsible for diarrhea in calves. Non-infectious causes of diarrhea include poisoning like molybdenum, stress conditions, imbalanced diet, sudden change of feed, administration of large quantity of laxative, and excess use of non-milk carbohydrates in milk replacer. Among infectious causes of diarrhea, the most common are enterotoxigenic Escherichia coli (ETEC), Clostridium perfringens type C, Cryptosporidium parvum, Bovine rotavirus (BRV) group A, Bovine coronavirus (BCV), Bovine viral diarrhea (BVD) virus, and Salmonella spp. [4]. Although the occurrence of non-infectious diarrhea is much less common as compare to infectious causes they also contribute to great economic loss to farmers. Major changes caused by these intestinal pathogens are intestinal lesions, changes in enzyme activity and mechanism of nutrient transport, or a combination of these effects. In the field conditions still, it is very hard to diagnose the specific cause of calf diarrhea [5]. The pathophysiology of diarrhea is characterized by fluid imbalance, electrolyte disorder, and acid-base status. Dehydration, anorexia, and pyrexia are commonly observed in calves affected with diarrhea. The result of dehydration is decreased plasma volume and extracellular fluid volume, which in turn leads to decreased cardiac output, peripheral perfusion, and oxygen delivery, and ultimately hypovolemic shock. Diarrhea causes hypoglycemia, hypoproteinaemia, hypoalbuminemia, and electrolyte imbalance. Administration of fluid and antibiotics is a prerequisite for the treatment of diarrhea. Previously, numbers of antibiotics like norfloxacin, ampicillin, neomycin, gentamicin, chloramphenicol, etc. were used by different workers and found to be effective in

the management of calf diarrhea.

Case history and clinical observation

A cattle calf with the age of about one month brought to the veterinary clinical complex of Apollo College of Veterinary Medicine, Jaipur. History revealed inappetence, loose feces, and depression since two days (Fig 1). Detailed clinical examination showed dehydrated skin, sunken eye, tachycardia (144/min), tachypnea (58/min), and slight hypothermia (99.6oF) (Table 1). A fecal sample was collected for bacteriological culture. About one ml of whole blood in a vial containing EDTA was collected for hematological evaluation (Table 2) and about five ml of blood was collected in the plane vial without EDTA. Serum was separated from whole blood through centrifuge (3000 RPM for 3-5 minute) method and evaluated for biochemical and electrolyte alteration (Table 2). The bacteriological culture showed the presence of *E. coli* in feces (Fig 2). Whole blood examination revealed increase hemoglobin level (16.8 g/dl), packed cell volume (56.4%), RBC concentration (10.2×10^6/dl) along with leukocytosis (19.6×10^3/dl) with neutrophilia (56.4%) and lymphopenia (32.6%). Serum sample analysis showed increase in total serum protein (11.2g/dl), albumin (4.8g/dl), blood urea nitrogen (32.2mg/dl) and creatinine (2.34mg/dl). Electrolyte analysis revealed hyponatremia (121.4mEq/L), hypochloremia (86.8 mEq/L), and hyperkalemia (5.8 mEq/L).
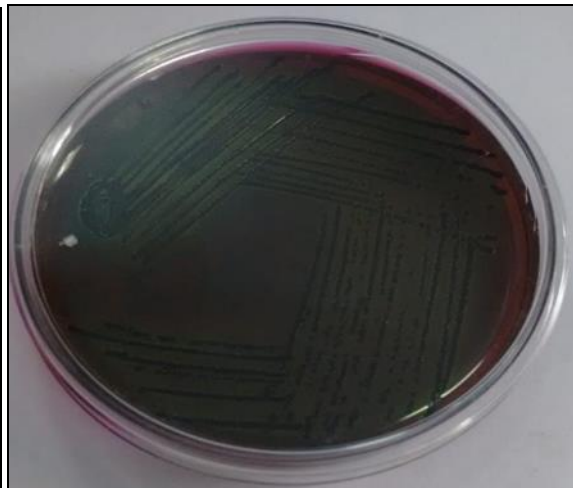

Fig 1: Loose feaces of diarrheic calf

Fig 2: Colony of *E. coli* on EMB media

Table 1: Showing Physiological parameters of diarrhoeic calf (Pre and Post treatment)

S. No.	Parameters	Before Treatment	After Treatment
1	Rectal Temperature (^{0}F)	99.6	102.4
2	Respiration/min	58	24
3	Heart Rate/min	144	94

Table 2: Showing haematobiochemical parameters of diarrhoeic calf (Pre and Post treatment)

S. No.	Parameters	Before Treatment	After Treatment
1	Hb (g/dl)	16.8	12.6
2	TEC (10^6/dl)	10.2	6.8
3	PCV (%)	56.4	36.8
4	TLC ($\times 10^3$/dl)	19.6	12.4
5	Neutrophils (%)	56.4	28
6	Lymphocytes (%)	32.6	58.4
7	Total Protein (g/dl)	11.2	5.8
8	Albumin (g/dl)	4.8	2.8
9	BUN (mg/dl)	32.2	22
10	Creatinine (mg/dl)	2.34	0.92
11	Sodium (mEq/L)	121.4	142.6
12	Potassium (mEq/L)	5.8	3.8
13	Chloride (mEq/L)	86.8	102.8

Treatment and discussion

Treatment was started with intravenous administration of fluid (Ringer's Lactate solution) along with an intramuscular injection of gentamicin @ 3mg/kg body weight bid for five days. Recovery was started on the third day after the start of treatment and animal becomes completely recovered within five days of treatment. In present study increase of hemoglobin (Hb), total erythrocyte (TEC) count and packed cell volume (PCV) in diarrhoeic calve might be due to excessive loss of fluid through feces which finally leads to dehydration which in turn causes a decrease in fluid volume and hemoconcentration leading to the significant increase in hemoglobin values [6] and PCV [7]. Leukocytosis along with neutrophilia and lymphopenia was observed in the present investigation which might be due to the reaction of body defense mechanism against infectious agents [8] and local inflammatory response of the immune system [7]. An increased concentration of total serum protein and albumin might be due to dehydration and hemoconcentration [9, 10]. The increase in serum creatinine and blood urea nitrogen (BUN)

concentration might be due to insufficient perfusion through kidneys because of dehydration and hemoconcentration or might be due to catabolism of protein, fat, and carbohydrate to generate water [11, 12]. Fall in sodium level was recorded which might be due to excessive loss of sodium bicarbonate through intestine [13]. Hyperkalemia, observed in the present study, was explained on the basis of metabolic acidosis which might have stimulated the transfer of potassium ions from intracellular space to extracellular space [14]. In the present study, hypochloremia was found which is in contrast of the finding of Constable *et al*. (1996) [10] who observed increase in serum chloride values in response to the increased chloride resorption by the kidneys possibly because of increased bicarbonate loss in diarrhoeic calves [9]. Intravenous Ringer lactate solution was given to correct metabolic acidosis due to the loss of excess of bicarbonate through the intestine. Lactate, present in the solution, is converted into bicarbonate into the liver and thus compensates the metabolic acidosis. Parental administration of gentamicin was started at a low dose to reduce the chances of nephrotoxicity. Gentamicin has good activity against gram-negative bacteria like *E. coli.*

Conclusion
From above discussion it is concluded that calf diarrhoea is a serious health hazards which may leads to further fatal complications. So it should be diagnosed and treated as early as possible to reduce the economic loss and to increase the farmer's income.

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