

# A Comparison Between Intraperitoneal and Intravenous Fluid Administration in Moderately Dehydrated Calves on a California Calf Ranch

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## Abstract

Several California calf ranches have utilized intraperitoneal (IP) administration of electrolyte solutions to dehydrated calves with favorable clinical response in most patients. Calf ranch records were inadequate, however, to evaluate medium and long term effects of IP treatment, and comparison with IV administration was not made. Objectives of this study were to: 1) compare weight gain to 28 days post-treatment, 2) compare rates of survival to 60 days post-treatment, 3) evaluate pathologic changes to peritoneal surfaces and 4) determine primary cause of death in calves treated with fluids administered by IV or IP routes.

Fifty-five male, Holstein calves, 1 to 16 days of age were used in this trial. Study calves were randomly assigned to treatment with a commercial electrolyte solution by the intravenous route (IV, N=27) or the intraperitoneal (IP, N=28) route of administration. Calves were weighed on day 28 post-treatment and monitored daily for 60 days after treatment. All study calves that died during this period were submitted for a complete post-mortem evaluation.

Weight increase at 28 days post-treatment was .9 kg greater in the IV group, and four more IV treated calves survived to 60 days post-treatment as compared to IP treated calves. Statistical analysis of weight gains and survival rate showed no difference between treatments. Gross and histopathologic changes to the peritoneum at necropsy were similar between IV and IP treated calves. Some differences in the primary cause of death were noted between groups.

In conclusion, this study showed no significant differences in weight gain to 28 days post-treatment, in survival to 60 days post-treatment, and in changes to the peritoneum in calves treated with fluids by either intravenous or intraperitoneal routes.

Oral electrolyte solutions are quite effective at correcting fluid and electrolyte imbalances in mildly dehydrated neonates with diarrhea if given promptly and in proper amounts. Moderately to severely dehydrated neonates often require more intensive fluid therapy such as with parenteral administration. Intravenous (IV) administration is the preferred method of parenteral

administration in critical patients. In spite of the obvious benefits, IV administration is not utilized in most commercial livestock production systems. This is due in part, to economic considerations (materials, time, and equipment) and operator inexperience with proper catheter or needle placement, especially in hypotensive neonates.

Parenteral fluid administration by alternative routes such as subcutaneous, intraosseous, or intraperitoneal (IP) are considered less effective or potentially harmful. Several California calf ranches have utilized IP administration of electrolyte solutions to dehydrated calves with favorable clinical response in most patients. Calf ranch records were inadequate, however, to evaluate medium and long term effects of IP treatment, and comparison with IV administration was not made. Objectives of this study were to: 1) compare weight gain to 28 days post-treatment, 2) compare rates of survival to 60 days post-treatment, 3) evaluate pathologic changes to peritoneal surfaces and 4) determine primary cause of death in calves treated with fluids administered by IV or IP routes.

Fifty-five male, Holstein calves, 1 to 16 days of age were used in this trial. Calves were from a large, commercial calf raising facility in central California. The ranch reported an outbreak of neonatal calf diarrhea in young calves less than 16 days of age. Calves with diarrhea were treated with oral electrolytes and parenteral antibiotics. The majority of calves improved after several treatments but some calves continued to dehydrate until death. Because of the large number of calves on the facility and time constraints on the unskilled labor force, diarrheic calves often did not receive oral electrolyte treatment until dehydration was advanced.

Fifty-five male, Holstein calves, 1 to 16 days of age were used in this trial. Calves were selected based on

refusal or inability to suckle milk or electrolyte solutions at feeding time, and clinical evidence of dehydration. Physical examination findings, body weight (kg), and estimated degree of dehydration were recorded. Dehydration estimate was based on: 1) position of eyeball in the orbit, 2) space between the globe and medial canthus of the eye, 3) eyelid skin pinch, 4) neck skin pinch, 5) corneal moistness, 6) oral mucous membrane character (temperature and moistness), 7) strength of calf and ability to stand, 8) temperature of extremities, and 9) degree of depression, as previously described.<sup>1</sup>

Blood was drawn from the external jugular vein for determination of hematologic values, differential blood count and fibrinogen determinations. Study calves were randomly assigned to treatment with a commercial electrolyte solution by the intravenous route (IV, N=27) or the intraperitoneal (IP, N=28) route of administration. Calves had a 5 cm x 5 cm area shaved over the right jugular groove (IV), or in the center or the right paralumbar fossa (IP), thoroughly cleansed with an organic iodine surgical scrub and sprayed with isopropyl alcohol. Fluids were warmed prior to administration. Volume administered was based on calculated fluid loss in each calf (kg x estimated dehydration %). Calves were weighed on day 28 post-treatment and monitored daily for 60 days post-treatment. All study calves that died during this period were submitted for a complete post-mortem evaluation with special attention paid to the

peritoneum and peritoneal cavity.

Estimated dehydration levels of calves enrolled in this study ranged between 6-8%. Weight increase at 28 days post-treatment was 0.9 kg greater in the IV group, and four more IV treated calves survived to 60 days post-treatment as compared to IP treated calves. Statistical analysis of weight gains and survival rate showed no difference between treatments. Gross and histopathologic changes to the peritoneum at necropsy were similar between IV and LP treated calves. Some differences in the primary cause of death were noted between groups.

In conclusion, this study showed no significant differences in weight gain to 28 days post-treatment, in survival to 60 days post-treatment, and in changes to the peritoneum between treatment groups in calves administered fluids by either IV or IP routes. The significance associated with differences in primary cause of death has yet to be determined.

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## References

1. Hunt E. Field technique for estimating severity of dehydration, volume of fluid necessary for rehydration, and average bicarbonate deficit for a 40-kg neonatal calf with acute diarrhea. *Vet Clin North Am: Food Anim Pract* 1985; 3:655-656.