

# Oral electrolyte composition and fluid meal type influence the abomasal environment in Holstein calves

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## Introduction

Oral electrolyte solutions (OES) are an important supplemental therapy to reestablish hydration and electrolyte balance in scouring calves. The osmolality and the type of alkalinizing agent in OES must be considered when evaluating commercial products and developing treatment protocols.

Management constraints may restrict OES administration to occur shortly following milk replacer (MR) feeding. Consumption of volumetrically large, nutrient-dense fluid meals may result in prolonged elevations in gastric pH and delayed abomasal emptying rates. Alterations to the functionality and environment of the abomasum may elicit growth of potentially pathogenic bacterial populations, ultimately resulting in clinical abomasal disease (e.g. abomasitis, bloat). The objectives were to determine the effects of OES composition and liquid meal type on the abomasal environment in healthy Holstein calves.

## Materials and Methods

Fifteen bull calves ( $2 \pm 1$  d of age) with adequate passive transfer (serum total protein  $> 5.2$  g/dL) were randomly assigned to 1 of 4 treatments in a 2x2 factorial arrangement; factors being: oral electrolyte alkalinizing agent (acetate [A], bicarbonate [B]) and liquid meal type (MR + OES [MR-A, MR-B], OES only [OE-A, OE-B]). Each OES had similar composition and osmolarity (360 mOsm/L), differing only by alkalinizing agent (e.g. 80 mM of either A or B). Beginning on d 1, all calves were fed 450 g/d of 22% CP – 20% fat MR with ad libitum access to texturized calf starter and fresh water. Each calf had an abomasal cannula surgically placed on d 5. On d

9, calves assigned to MR-A ( $n = 4$ ) or MR-B ( $n = 4$ ) received their morning MR aliquot 0.5 h prior to supplementation of 2 L of OES; the OE-A ( $n = 3$ ) and OE-B ( $n = 4$ ) treatment groups were administered OES only. Acetaminophen (50 mg/kg) was added into the OES to estimate abomasal emptying rate (AER). Peripheral blood samples were collected at 0, 1, 2, 3, 4, 6, and 8 h following OES administration for plasma acetaminophen analysis. Postprandial abomasal fluid samples were collected at 0, 1, 2, 4, 6, and 8 h to measure gastric pH and ex-vivo coliform growth potential following inoculation and incubation for 4 h with  $5 \times 10^4$  coliforms. Data were analyzed using PROC MIXED in SAS.

## Results

Postprandial pH was greater in calves fed MR or B based OES ( $P \leq 0.001$ ). The AER, measured as time to maximal acetaminophen concentration, was slower in calves receiving MR + OES, regardless of the alkalinizing agent ( $P = 0.004$ ). Ex-vivo coliform counts were greater in calves fed both MR and OES or OE-B only ( $P \leq 0.025$ ).

## Significance

Supplementing bicarbonate OES in addition to MR promotes ex-vivo coliform counts in postprandial abomasal fluid as a result of sustained elevations in gastric pH. Timing of OES administration relative to MR feeding may affect abomasal dynamics, thereby affecting clinical treatment outcomes.