

# Effect of sodium caseinate on fiber disappearance and fermentation parameters using an equine cecal inoculum

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## Introduction

- Horses can receive up to 70% of their DE requirements from fermentation of forages
- Poor quality forages are low in DE and can lead to impaction colic
- Supplemental protein in ruminants can improve digestibility of poor quality forages through enhanced microbial activity and proliferation ( Köster et al., 1996)
- Due to similarities between the rumen and cecum, we hypothesized that cecal microbial fermentation of poor quality forages can be enhanced via supplemental protein

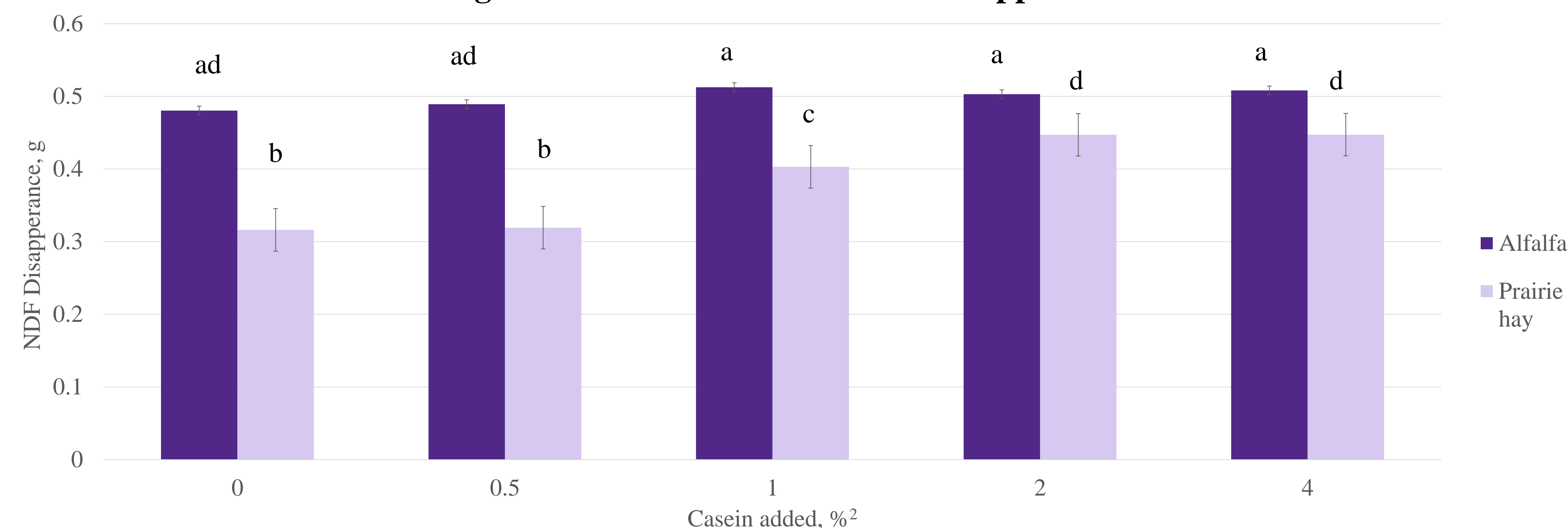
## Objective

Evaluate the effect of varying levels of sodium caseinate on in vitro NDF disappearance and VFA production using a mixed cecal fluid inoculum

## Materials and Methods

- Four cecally-cannulated horses consuming an ab libitum diet of Smooth Bromegrass hay were used as donors of cecal fluid
- Experimental design consisted of a 2 x 5 factorial with 4 replications (horse). Factors consisted of substrate (alfalfa or native prairie hay) and level of supplemental protein supplied as sodium caseinate (0%, 0.5%, 1.0%, 2.0%, and 4.0% additional CP)
- Treatments were applied so that each protein source supplied an additional 2.0% CP. Appropriate levels of cellulose was added to keep treatments ISO-DM.
- Five g (DM) of substrate was added to 250-mL screw top fermentation flasks (#7056; ANKOM Technology, Macedon, NY) containing 140 mL of McDougall's buffer 7 h addition of cecal inoculum to allow for substrate saturation
- Ten mL of strained and stratified cecal fluid was added to each flask along with its respective treatment, sealed, and placed into a shaking incubator (New Brunswick Scientific Inc., New Brunswick, NJ) at 39°C with moderate agitation for 48 h. Bottles were removed from the incubator and exposed to oxygen to halt fermentation
- Terminal pH was recorded and fluid was transferred via pipette in 4 mL aliquots into 2 microcentrifuge tubes containing 1.0 mL of 25% metaphosphoric acid. Acidified samples were centrifuged at 10 x g for 20 min. Supernatant was transferred into gas chromatography vials and VFA were measured using an Agilent 7890 gas chromatograph (Agilent Technologies, Santa Clara, CA) equipped with a DB-WAX capillary column (10 m x 0.10 mm x 0.1 mm film thickness; Agilent and J&W columns, Santa Clara, CA) and flame ionization detector
- The remaining contents of cultures were poured into tins and dried at 55°C for 48 h and then analyzed for NDF in duplicate according to methods described by Goering and Van Soest (1970)
- Data were analyzed using the Glimmix procedure of SAS (Version 9.4). The model included fixed effect of treatment (substrate and sodium caseinate level) and random effect of replicate (horse) to determine the least-squares means (LSMEANS). Significance was declared at  $P < 0.05$ , and a tendency was considered to be present when  $0.05 > P < 0.10$ . Differences among LSMEANS were determined using the PDiff option of SAS

Figure 1. Effect of casein on NDF disappearance<sup>1</sup>

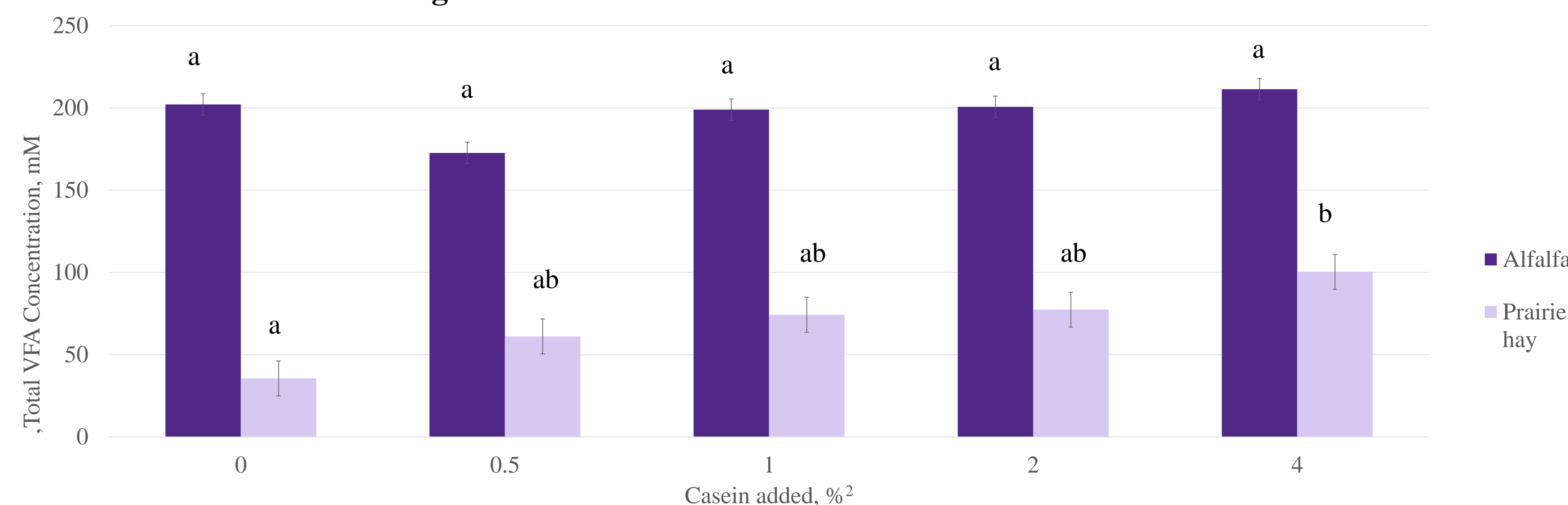


<sup>1</sup> Fermentation bottles containing 10 mL equine cecal fluid, 140 mL McDougall's buffer, and treatments were incubated at 39°C for 48 h

<sup>2</sup> Treatments were 0%, 0.05%, 1.0%, 2.0%, and 4.0% of additional CP provided via sodium caseinate

a,b,c,d Means without a common superscript differ,  $P < 0.05$

Figure 2. Effect of casein on Total VFA Concentration<sup>1</sup>



<sup>1</sup> Fermentation bottles containing 10 mL equine cecal fluid, 140 mL McDougall's buffer, and treatments were incubated at 39°C for 48 h

<sup>2</sup> Treatments were 0%, 0.05%, 1.0%, 2.0%, and 4.0% of additional CP provided via sodium caseinate

a,b Means without a common superscript differ,  $P < 0.05$

## Results

- Prairie hay cultures supplemented with 1.0%, 2.0%, and 4.0% additional CP from sodium caseinate had greater ( $P < 0.05$ ) NDF disappearance when compared to control
- Adding 4.0% additional CP from sodium caseinate increased ( $P < 0.05$ ) VFA production in prairie hay cultures compared to control
- Sodium caseinate had no effect on NDF disappearance nor VFA production in cultures containing alfalfa
- Cultures containing alfalfa had greater NDF disappearance and VFA production when compared to those with prairie hay

## Conclusions

- Alfalfa yields greater fiber digestion and VFA production when compared to prairie hay
- Increasing microbial N supply with prairie hay improves fiber disappearance and VFA production
- Additional protein does not impact fermentation of alfalfa
- In vivo investigation, along with more replications (horse) are needed in order to verify results