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Short communication

Effect of oxytetracycline supplementation on nutrient digestibility in veal calves

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Abstract

The hypothesis tested was that the antibiotic oxytetracycline stimulates fat digestion in veal calves fed a milk replacer containing soy protein concentrate. It was reasoned that the carbohydrates in soy protein concentrate stimulate bacterial growth in the small intestine, leading to deconjugation of bile acids, which in turn inhibits fat digestion. From week 19 to 23 of the experiment, the milk replacer either contained oxytetracycline (80 mg/kg in the powder) or not. Bodyweight gain and feed intake were not influenced by oxytetracycline. Moreover, supplemental oxytetracycline affected neither bile acid excretion in feces or apparent fat digestion. Oxytetracycline increased ($P < 0.05$) the apparent absorption of magnesium.

Keywords: Oxytetracycline; Fat digestion; Soy protein concentrate; Fecal bile acid excretion; Minerals

1. Introduction

Substitution of soy for dairy proteins has been shown to reduce fat digestibility and elevate excretion of bile acids in feces of veal calves (Xu et al., 1997; Yuangklang et al., 2004). Soy

Abbreviations: BW, body weight; N, nitrogen; Ca, calcium; Mg, magnesium; NEN, Netherlands Normalisation Institute; IDF, International Dairy Federation; AOAC, Association of Official Analytical Chemists

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protein has a low degree of phosphorylation when compared with casein, the major dairy protein (Van der Meer, 1983; Xu et al., 1997). Feeding soy protein stimulates formation of insoluble calcium phosphate sediments in intestinal digesta. This sediment binds bile acids, making them unavailable for fat digestion, leading to impaired fat digestion and elevated bile acid excretion in feces (Van der Meer and Beynen, 1987). However, an alternative possibility is that fermentable non-digestible carbohydrates in soy protein preparations may be fermented by the microflora in the small intestine causing proliferation of bacteria and enhancement of the deconjugation of bile acids. The result is diminished efficiency of fat digestion because deconjugated bile acids are less effective in micelle formation (Patton, 1981). Supplemental antibiotic agents have been reported to decrease intestinal microbial growth in chickens (Shaddad et al., 1985) and calves (Jenny et al., 1991; Quigley et al., 1997; Donovan et al., 2002).

We hypothesized that supplemental antibiotic, oxytetracycline, would stimulate fat digestion in veal calves through inhibition of bacterial deconjugation of bile acids in the small intestine. Because fat digestion and fecal bile acid excretion are negatively correlated (Xu et al., 1998), it would be expected that oxytetracycline lowers the excretion of bile acids. Veal calves were fed diets containing soybean protein concentrate with or without added oxytetracycline.

2. Materials and methods

2.1. Calves and milk replacers

Thirty-eight Dutch Friesian-Holstein calves were used. The calves, about 1 week of age, were purchased at a local market. Their body weight (BW) was 41.0 ± 3.64 kg. Calves were housed individually in wooden stalls (70 cm × 170 cm) with slatted floors in a ventilated room, and were fed at 6:30 and 16:00 h with a reconstituted milk replacer in plastic buckets. On arrival (week 0), calves were divided into two groups of 19 with similar BW distributions. BW was determined with a calibrated electronic balance. A commercial starter diet was fed for 6 weeks, and calves then received a finisher diet for another 19 weeks. On arrival, calves received 1.7 L containing 125 g air-dry milk replacer per meal, the volume being gradually increased to 6.5 L after 7 weeks. The starter milk replacer was then gradually replaced by the finisher diet (125 g air-dry milk replacer per liter) over a period of 4 days. After replacement was complete, the concentration of the finisher milk replacer was gradually increased to 145 g air-dry milk replacer per liter within 10 weeks and the volume from 5.8 to 8.2 L within 6 weeks. The volume was then kept constant until week 23 (i.e., the end of the trial). Final BW was determined at the slaughterhouse.

The finisher diet contained soy protein concentrate and whey protein as protein sources. Oxytetracycline (80 mg/kg) was added to the diet of one group of calves as a powder twice daily during feeding from week 19. The ingredient and nutrient composition of the experimental finisher diet are shown in Table 1. The milk replacers were reconstituted in 65 °C water and fed at a temperature of 42 ± 2 °C.