

Development of in vitro rumen model to measure by-pass fat

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The goal of this research was to build a model for in vitro assessment of rumen by-pass fat coated/encapsulated products digestibility. Our model is based on 3 steps: 1. Rumen fluid simulation, 2. Gastric fluid simulation and 3. Intestinal fluid simulation. Small amount (0.5 g) of bypass fat product (Ca soap, bypass palm oil, fat coated bypass selenium, fat coated bypass choline chloride) was placed inside nylon bags. Bags were sealed, weighted and incubated. After incubation bags were freeze-dried and weighted again, the difference in weight was used to calculate digestibility. Soxhlet analyses were done to confirm freeze-dry weight from pure fat products.

For the first step rumen fluid from the three cannulated sheep was used. Rumen fluid was diluted with the sheep artificial saliva acting as buffer. Minifors benchtop bioreactor (Infors HT, Switzerland) was used to simulate anaerobic rumen conditions of 39°C and constant pH. Second step lasted for 1 h, and included incubation in 1 g/L pepsin and 0.0125 M HCl at pH 1.9. In third step commercial substitute for bile, which contained some of the bile acids necessary for fat digestion, and dried complete bovine bile (Sigma-Aldrich, Germany) were used in the trial. Higher in vitro intestinal digestion was determined using bovine bile so model was build up using bovine bile. Optimal digestibility was determined when using bovine bile at 10 g/L concentration in comparison to 5 or 15 g/L of bovine bile. Optimal concentration of pancreatin was set to 3.0 g/L, concentrations of 1.5 g/L and 4.5 g/L showed no significant difference. Although better digestibility was determined at pH 7.8 compared to the pH 5, pH was gradually increased from 5.0 to 7.8 to simulate in vivo conditions in ruminants.

Three step in vitro fat digestion method was compared with the in vivo dairy cow trials with rumen bypass products. Good correlation was found both after rumen digestion step and intestine digestion step. In that matter we can conclude that three step in vitro model for digestion of fat works with rumen bypass fat products.

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