

# Fermentation of starch and neutral detergent fibre in the large intestine of dairy cows

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## Introduction

In dairy cattle, between 5 and 20% of the fermentation of neutral-detergent fibre (NDF) may occur in the large intestine (LI) (Südekum et al., 1991, Demeyer and De Graeve, 1991). Fermentation of NDF in the LI increases with decreasing NDF digestibility as in low quality forages (Demeyer and De Graeve, 1991). Rumen fermentation of NDF often decreases on rations with high amounts of easily fermentable starch (De Visser et al., 1998). Rumen-escape starch may reach the LI and here it may also influence NDF fermentation. However, this has not been quantified. Therefore, we studied the effect of rumen-fermentable or rumen-escape starch on fermentation of NDF in the LI in dairy cows.

## Material and methods

Four lactating (29 kg of milk/d) dairy cows were used, prepared with a large rumen cannula and a T-shaped cannula in the ileum. The experiment had a 2 x 2 factorial design. Factors were: supplementation with 0 or 3.5 kg pre-gelatinised maize starch /d; and a continuous infusion of 10 L of water through the ileal cannula with 0 or 500 g maize starch/d. Cows received a totally mixed diet which contained wilted grass silage, pressed and ensiled sugar beet pulp, and a starch-free concentrate mixture at 55, 15 and 30% of DM intake (19 kg/d), respectively.

Ileal digesta flows were estimated by the dual marker technique (Faichney, 1980) using Cr-NDF and Co-EDTA. Over a 24-h period, ileal digesta were collected for an hour (1) every 6 h. Faeces were collected quantitatively for 72 h. Samples of feed, digesta and faeces were freeze-dried, ground over a 1-mm screen and analysed for starch, NDF, Cr and Co.

## Results

Pre-gelatinised maize starch was almost completely digested in the rumen and resulted in decreased rumen fermentation and total tract digestibility of NDF (Table 1). Starch infused in the ileum was completely fermented in the LI and had no effect on NDF fermentation in the LI.

**Table 1** Effect of starch in diet or infused in the ileum on the fermentation of starch and NDF in rumen and large intestine of dairy cows

Starch in diet, kg/d	0		3.5		SED
Starch infused, kg/d	0	0.5	0	0.5	
	% of intake				
Starch fermentation <sup>a</sup>					
In rumen	-	-	95.2	96.1	-
In large intestine	-	121	0	13	5.5
NDF fermentation					
In rumen	78.5	78.3	70.1	72.4	2.0
In large intestine	0.2	0.1	1.9	-2.1	1.3

<sup>a</sup>Including starch infused in ileum

## Discussion and conclusions

This study confirmed the negative effect of rumen-degradable starch on the fermentation of NDF in the rumen. The reduction of total tract digestibility of NDF could be attributed to the reduction in rumen fermentation of NDF.

In this experiment, NDF was not fermented in the LI. The reduction in rumen fermentation of NDF was not compensated for by an increased fermentation of NDF in the LI. From observations of Demeyer and De Graeve (1991) it may be concluded that NDF digestion in the LI occurs when total tract digestibility of NDF is low (51 to 63%). Extrapolating from their results, fermentation in the LI of NDF with a total-tract digestibility of 70% to 80% may be expected to be less than 5%, as confirmed by our data.

## References

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