Abstract 17111
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Phosphorus excretion in dairy cows is not affected by forage particle size or rumen degradable protein

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Introduction

Inevitable fecal loss **(IL)** of phosphorus **(P)** in dairy cows is estimated to 1 g P / kg DMI.

It was hypothesised that IL of P would be reduced by dietary factors that:

1) reduce saliva secretion
2) reduce rumen microbial production

Objective

To measure the effect of

1) chewing activity and hereby production of saliva
2) rumen degradable protein and hereby microbial production and incorporation of P

on the fecal excretion of P in lactating dairy cows fed below P requirement.

Materials and methods

Design and treatments: 3 dietary treatments during 16 d period. Treatments varied in forage (grass hay) particle size **(FPS)** and rumen degradable protein **(RDP)** content;

- **CONTROL**: FPS 30 mm; RDP optimised by adding urea
- **LOW-N**: FPS 30 mm; RDP below requirements, no urea
- **SHORT**: FPS 3 mm; RDP optimised by adding urea

Animals: 36 Holstein cows 222 ± 102 d in milk, 627 ± 7 kg of BW

Diets: Fed *ad libitum,* 2.5 g P/kg DM, based on the same feeds (% of DM): compound feed (30), corn silage (31), sugar beet molasses (19), grass hay (20)

Fecal excretion and digestibility: 6 grab samples during d 15 and 16, INDF used as marker

Urinary excretion: Semi-quantitative collection by hourly hand-stimulation during 6 h at d 16

Milk: Recorded and sampled at d 15 and 16

Blood sampling: Venopunture in the tail at d 15

Chewing activity: Jaw movements recorded by a data logger on a head halter for 24 h at d 13 and 14

	Treatment			SEM	*P*-value	
	CONTROL	LOW-N	SHORT		LOW-N vs. CONTROL	SHORT vs. CONTROL
Feed intake, kg DM/d	21.6	21.0	23.8	0.6	NS	0.02
Milk Yield, kg ECM/d	27.9	28.0	30.4	1.3	NS	NS
Chewing time, min/kg DM	36.3	-	28.0	1.5	-	0.005
Chewing time, min/d	754	-	653	42	-	0.10
Plasma P_i, mmol/L	0.97	1.02	0.86	0.07	NS	NS
P intake, g/d	53.1	51.9	58.5	0.4	NS	0.02
P in feces, g/d	35.7	37.1	42.0	1.4	NS	0.003
P_i in urine, g/d	0.033	0.034	0.038	0.003	NS	NS
P in milk, g/d	24.6	24.2	26.5	1.3	NS	NS
P balance, g/d	-7.3	-9.5	-10.1	1.3	NS	NS
Digestibility of P, %	32.6	28.3	28.1	2.0	NS	NS
Digestibility of OM, %	70.0	67.2	65.1	0.7	0.01	<0.001

Results and discussion

Negative P balances and low plasma P confirmed that P was fed below requirement, indicating that effects on fecal P excretion mainly originated from variations in IL of P.

Daily chewing time tended to be lower whereas feed and P intake and fecal P excretion was increased with SHORT and none of these were affected by LOW-N, as compared to CONTROL. Digestibility of organic matter was reduced with SHORT and LOW-N as compared to CONTROL.

Milk yield was not affected by treatments.

Conclusion and implications

Reduced forage (grass hay) particle size (FPS) and rumen degradable protein (RDP) content did not reduce fecal P excretion.

The results of the present study do not support the concept that fecal loss of endogenous P is affected by FPS or by rumen degradable protein supply and thus rumen microbial P incorporation.

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