

The effect of mucins on initiating reductive acetogenesis in vitro

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Hindgut fermentation in a number of animal species differs from rumen fermentation by showing a substantially lower methane production and the presence of reductive acetogenesis. Strong competition between methanogenic and acetogenic bacteria for metabolic hydrogen seems to be responsible for the lack of reductive acetogenesis in the rumen. One factor causing a non-methanogenic pathway in the hindgut and acetate as the reduced end product could be the presence of endogenous mucins which are not present in the rumen. The replacement of methane by acetate as a hydrogen sink should increase the energy yield available for the ruminant and decrease methane emissions, and thus be benefit to the animal and the environment. The aim of this experiment was to investigate the influence of mucins on reductive acetogenesis in vitro.

Rumen fluid from a cannulated sheep was incubated with a buffer solution under

anaerobic conditions (incubation gas: CO₂, 24 h, 39°C). Substrates were 500 mg hay, 500 mg mucin or 500 mg hay + 500 mg mucin. To test for reductive acetogenesis, hydrogen gas was added (50/50 v/v) to half of the flasks. After incubation, methane and SCFA production were measured by gas chromatography.

Mucins enhanced methanogenesis from 464 µmol/d to 727 µmol/d. Due to a substantially higher SCFA production the amount of CH₄ produced decreased from 269 to 148 mmol CH₄/mol SCFA. Fermentation stoichiometry was calculated using the net amounts of end products formed from hay in the presence and absence of mucins. Neither the values obtained for hydrogen recovery, nor the effects of head space hydrogen on acetate production suggest enhancement of reductive acetogenesis. We conclude that in our experiments mucins did not stimulate reductive acetogenesis.

	Production (µmol)				CH ₄ (mmol/mol SCFA)	H ₂ -recovery (%)
	Acetate	Propionate	Butyrate	CH ₄		
RF + 500 mg hay	1189 91	391 13	113 8	464 88	266	89
RF + 500 mg mucins	1923 65	674 67	172 16	371 49	126	61
RF + 500 mg hay + 500 mg mucins	3158 205	1186 32	327 26	727 69	148	66