Proceedings of the Nutrition Society (2010), **69 (OCE4)**, E329 doi:10.1017/S0029665110001382

Winter Meeting, 15 December 2009, Food supply and quality in a climate-changed world

Effect of feeding frequency and replacing calcium salts of palm oil with crushed rapeseed or coconut oil on methane emissions in lactating dairy cows

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Methane from enteric fermentation is one of the principal greenhouse gases from ruminant agriculture and it also represents an energy loss that reduces feed conversion efficiency. For a broad range of diets, the quantity of methane released is closely related to the amount of dry matter consumed with further variation according to nutrient composition[1]. However, previous research has not established whether factors such as meal frequency affect methane output for a given level of intake. Dietary oil has long been added to dairy cow diets to increase energy density and the ameliorating effect of methane emissions has been known for many years[2]. The aim of this study was to assess methane emissions in lactating dairy cows in response to changes in daily feeding pattern and replacing calcium salts of palm oil with crushed rapeseed or coconut oil.

Four Holstein-Friesian dairy cows in mid-lactation were fed *ad-libitum* a control diet of forage (maize and grass silage) and cereal based concentrate in a 50:50 ratio on a dry matter (DM) basis as a total mixed ration containing 3.5% (DM basis) added oil as calcium salts of palm oil. The calcium salts of palm oil were replaced by either crushed rapeseeds or coconut oil to provide the equivalent additional oil content. The four treatments were: the control diet fed twice daily, the control diet fed once daily, the crushed rapeseed diet fed twice daily and the coconut oil diet fed twice daily. The experiment was conducted as a 4×4 balanced Latin square design with 4-week periods. Measurements of respiratory exchange, including methane production, were obtained over 4 days during the final week of each period, when cows were housed in open-circuit respiration chambers.

	Control-x2	Control-x1	Rapeseed-x2	Coconut oil-x2	SED
DM intake (kg/d)	20.57	20.23	19.54	16.91*	0.67
Milk yield (kg/d)	31.56	32.31	32.42	26.62*	1.01
Methane (litres/d)	610.3	573.9	578.5	480.4*	23.0
Methane (litres/kg DM intake)	29.72	28.64	29.76	28.35	1.62
Methane (litres/kg milk yield)	19.91	18.36	17.83	18.54	1.03

*$P < 0.05$ compared with control-x2, control-x1 and rapeseed-x2.

Coconut oil was effective at reducing methane emissions in dairy cows; however, it also reduced feed intake and milk production and therefore it is not a viable additive for dairy cow rations. Compared to the control-x2 diet, once daily feeding caused a decrease in methane production greater than would be predicted from intake differences alone. Calcium salts of palm oil have been shown to reduce methane production in dairy cows[3] and no additional decrease in methane relative to intake could be attributed to the rapeseed diet. Once daily feeding and crushed rapeseed both showed a numerical decrease in methane emission per kg of milk yield and require further investigation as potential mitigation measures to reduce methane emissions in dairy cows.

The financial support of UK Defra project LS3656 is gratefully acknowledged.

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