

Individual within-cow and between-cow variation of methane emissions from lactating dairy cows in four separate trials

Van Wesemael Dorien¹, Peiren Nico¹, Vandaele Leen¹, Fievez Veerle², De Campeneere Sam¹

¹ Institute for Agricultural and Fisheries Research (ILVO), Animal Sciences Unit, Scheldeweg 68, 9090 Melle, Belgium

² Laboratory for Animal Nutrition and Animal Product Quality, Ghent University, Proefhoevestraat 10, 9090 Melle, Belgium

Introduction

Methane is a potent greenhouse gas that contributes to global warming. Ruminants are responsible for 4% of the total greenhouse gas emissions in Flanders. To assess the magnitude of between-cow and within-cow variation of methane emissions, data from four (A – D) separate trials (6 or 7 cows each) with potential methane reducing additives were used.

Experimental set-up

Daily methane emissions were measured with a GreenFeed unit during 7 till 11 days. Daily individual feed intake and milk production were monitored. The diets were formulated on an individual cow basis to meet the needs of each cow. The additives were supplemented for at least 7 weeks. The coefficients of variation (CV) were calculated for daily methane production (CH₄), dry matter intake (DMI) and milk production (MP) and for mean daily methane production per kg DMI and per kg MP.



Results and discussion

Trial A shows large ranges for the within-cow CV of all parameters, the mean value however was not very different from those in trial B and D (Table 1). The within-cow CV for DMI and MP were very small in trial C, the broad range for methane yield per kg DMI and per kg MP is therefore the result of a broad range for CH₄. The mean within-cow CV for MP was in all trials the smallest CV and very similar, however the ranges differed.

Although the between-cow CV for CH₄ and DMI varied, the CV for CH₄/kg DMI was very similar in each trial (Table 2).

Table 1: Mean value and range of within-cow CV for the different parameters in each trial

Trial	CH ₄		DMI		MP		CH ₄ /kg DMI		CH ₄ /kg MP	
	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean
A (n=7)	6,9 - 20,0	14,6	5,8 - 21,9	13,5	1,4 - 11,0	5,7	8,7 - 22,9	13,0	6,4 - 18,6	13,0
B (n=6)	5,9 - 14,3	10,1	3,7 - 17,2	9,1	3,5 - 7,1	5,2	9,9 - 16,3	12,1	5,5 - 12,8	9,7
C (n=6)	1,9 - 18,2	8,9	1,0 - 4,3	2,8	1,3 - 3,1	2,2	1,6 - 19,6	9,3	2,2 - 18,1	9,1
D (n=6)	11,5 - 16,0	13,4	6,3 - 14,7	10,8	2,1 - 15,7	7,7	13,8 - 25,4	18,0	12,9 - 31,1	18,5

Table 2: Between-cow CV for the different parameters in each trial

Trial	CH ₄	DMI	MP	CH ₄ /kg DMI	CH ₄ /kg MP
A (n=7)	18,0	11,9	15,3	12,4	17,7
B (n=6)	16,4	8,0	16,4	11,0	20,6
C (n=6)	13,3	12,0	11,6	10,2	11,8
D (n=6)	9,0	6,5	25,1	10,9	24,3