

DISAPPEARANCE OF LONG CHAIN FATTY ACIDS IN THE HINDGUT OF DAIRY COWS

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Introduction

The absorption of long chain fatty acids (LCFA) in feeds for dairy cows is of special interest in rations containing high amounts of dietary fat as an energy source. The apparent absorption of LCFA in the small intestine usually varies from 60% to 90% depending on the chain length and saturation of the FA. Increasing absorption of LCFA with increasing chain length in the small intestine of ruminants has been found by Møller (1988) as opposed to the absorption of LCFA by monogastrics (Janssen and Steverink, 1988). No absorption of LCFA from the hindgut of ruminants has so far been reported. Experimental results of disappearance of LCFA from the large intestine of dairy cows fed high amounts of FA shall be reported.

Materials and Methods

Two experiments with dairy cows fed high amounts of dietary fat as palm oil or animal fat were carried out. The palm oil was added either as Ca-soaps or as free fatty acids (FFA) and the animal fat as Ca-soaps, traditional fat or saturated fat. Each cow was rumen fistulated and fitted with duodenal and ileal cannula (T-shaped). Samples from duodenum, ileum and faeces were taken at intervals of 6 h over a period of 72 h and analysed for LCFA.

Results

The average disappearance of LCFA (C12-C18:3) from the large intestine, calculated as a percentage of ileal FA for palm oil, was 25.3 and 4.4% for Ca-soaps and FFA, respectively. The disappearance for animal fats was 26.8, 30.2 and 11.7% for Ca-soaps, traditional and saturated fat, respectively. With the exception of the FFA,

TABLE 1. AVERAGE INTAKE, DUODENAL AND ILEAL FLOW AND APPARENT DISAPPEARANCE OF FATTY ACIDS IN THE LARGE INTESTINE OF DAIRY COWS

	Experiment 1 Palm oil		Experiment 2 Animal fat		
	Ca-soaps	FFA	Ca-soaps	Traditional	Saturated fat
Total FA (g/day)					
Intake	862	837	685	907	944
Duodenum	898	1069	860	944	944
'Synthesis'	36	259	175	37	-84
Ileum	208	214	230	400	428
Faeces	155	205	175	280	378
Apparent disappearance of FA in large intestine (% of ileal FA):					
Lauric acid C12	-	16.7	20.0	29.6	12.5
Myristic acid C14	19.6	-	20.8	35.5	12.8
Palmitic acid C16	26.6	10.8	23.2	33.6	8.6
Stearic acid C18	28.8	6.3	31.1	29.1	21.4
Oleic acid C18:1	18.3	-11.6	15.5	31.6	3.7
Linoleic acid C18:2	38.5	-6.9	32.7	38.4	14.6
Linolenic acid C18:3	55.6	2.6	14.5	26.1	20.4
Total FA, Av.	25.3	4.4	26.8	30.2	11.7
Apparent absorption of FA in small intestine (% of duodenal FA):					
In total digestive tract	82.0	75.5	74.5	69.1	60.0
Crude fat, total digested	74.0	64.5	58.9	49.6	52.2

ration of palm oil, which showed an increase (inflow) of C18:1 and C18:2 unsaturated FA, the disappearance of the individual FA ranged from 3.7% for C18:1 (saturated animal fat ration) to 55.6% for C18:3 (Ca-soaps of palm oil). For the other rations, the disappearance of the unsaturated C18:1 and C18:2 FA ranged up to 38.5%, and for the saturated C16:0 and C18:0, FA disappearance values up to 33.6% from the large intestine were found. The differences between rations were not statistically significant.

Discussion

Results indicate either a transcellular absorption of LCFA from the large intestine or an oxidation of FA by bacteria in the hindgut for their energy supply. It must, however, be anticipated that some of the bile secreted to the proximal

duodenum and forming micellar solutions with FA is passing to the large intestine, providing a medium for transport of LCFA across the hindgut epithelia.

(Key Words: Hindgut, Fatty Acids, Absorption)

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