

Ruminal hydrolysis of dietary triglycerides in dairy cows fed lipid-supplemented diets

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Introduction — The aim of this work was to study the effects of the nature, the distribution form and the amount of lipid intake on the extent of ruminal lipolysis.

Materials and Methods — Triglyceride (TG) hydrolysis was determined by ruminal balance in 10 dairy cows fitted with proximal duodenal cannulae in 3 trials. The trials, arranged according to a 4 x 4 and two 3 x 3 latin square designs, were performed using basal diets containing one part hay and one part barley-based concentrate (C1, C2, C3 in each trial, respectively) and the same diets containing free oils (rapeseed oil, R5 and R10; tallow, T; soya bean oil, S; palmitostearin, P) or full-fat crushed (CR) or extruded (ER) rapeseed. Representative samples of duodenal digesta were made up of 24 spot samples taken over 3 d. Duodenal dry matter (DM) flow was determined using a dual marker technique and TG in diet and in duodenal contents were analyzed by chromatographic methods.

Results and Discussion — Comparisons between TG duodenal flow and TG intake revealed elevated TG apparent hydrolysis in the rumen (> 85%) which was higher in high-fat diets than in control diets (table I). These differences might be explained by the origins of duodenal TG. In control diets, the fatty acid composition of duodenal TG differed from that of dietary TG but was closely similar to that of rumen solid-adherent bacteria, which seemed to indicate that ruminal lipolysis of dietary TG was nearly complete. In high-fat diets, duodenal TG were probably the result of a mixture of dietary and bacterial TG. Results emphasized the efficient role of the rumen in the lipolysis of dietary TG, mainly in diets containing large amounts of lipids supplied as free oils or full-fat rapeseed.

Table I. Ruminal hydrolysis of triglycerides (mean values and SD).

| Diets | Trial 1 (n = 4) | | | | Trial 2 (n = 3) | | | Trial 3 (n = 3) | | |
|------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| | C1 | R5 | R10 | T | C2 | S | P | C3 | CR | ER |
| TG intake (g/d) | 80 ^b (3) | 627 ^d (20) | 1276 ^g (23) | 1052 ^f (42) | 54 ^a (5) | 1046 ^f (27) | 1057 ^f (36) | 298 ^c (3) | 853 ^e (8) | 875 ^e (16) |
| TG ruminal hydrolysis* | 85.2 ^a (0.9) | 94.3 ^c (1.0) | 97.2 ^d (1.0) | 96.6 ^d (1.0) | 83.3 ^a (2.1) | 96.0 ^d (1.5) | 90.8 ^b (1.3) | 94.1 ^c (0.4) | 96.8 ^d (0.5) | 96.2 ^d (1.8) |

a, b, c, d, e, f, g: $P < 0.05$. * Calculated according to the equation: $1 - D/I \times 100$; I, amount of TG intake (g/d); D = TG duodenal flow (g/d).