Concentrate intake and milk fatty acid composition in grazing dairy cows

Araujo, L.E., Papolla, P.A. [2], Rodríguez , M.A [2], Antonacci, L.[1], Gagliostro, G.A.[1*].
1.Instituto Nacional de Tecnología Agropecuaria (INTA), Balcarce, Provincia de Buenos Aires, Argentina.
2.Instituto Nacional de Tecnología Industrial (INTI), San Martín, Buenos Aires, Argentina.
*ggagliostro@balcarce.inta.gov.ar

INTRODUCTION

Increased intake of concentrate may shift rumen biohydrogenation of $C_{18:3}$ and $C_{18:2}$ fatty acids (FA) towards *trans*-10 $C_{18:1}$ (atherogenic) reducing the *trans*-11 $C_{18:1}$ (vaccenic acid, VA) and 9-*cis*, 11-*trans* $C_{18:2}$ (rumenic acid, CLA) contents in milk and hence its functional value.

MATERIALS AND METHODS

Twenty-nine Holstein multiparous cows in early lactation were assigned to one of four treatments from days 15 to 71 postpartum. Treatments consisted in four levels of concentrate intake fixed at 3 (C3), 6 (C6), 9 (C9) and 12 (C12) kg/cow/d. Concentrate (96,9% DM) contained corn grain (68%), soybean meal (22%), wheat bran (8%) and a mineral-vitamin premix (2%). On a DM basis, concentrate contained (g/kg) organic matter (920), crude protein (142), starch (362), ether extract (36) and digestible DM (755). Supplements were fully consumed by cows. A pasture based on ryegrass and bromegrass (DM= 26,6 %, CP= 14,2 %, soluble sugars= 16,9 %, NDF= 50,2 %, NDA= 25,8 % and INDMD= 72,2 %) was offered at an herbage allowance of 35 kg DM/cow/ in a daily strip-grazing system. Pasture intake was estimated by the amount offered and refused in individual grazing paddocks over 3 consecutive days in week 5 and 10 postpartum but only data from week 10 are presented in this trial. Samples of milk (100 ml) were collected from each cow at day 71 and frozen (-24°C) until analyzed for milk fatty acid composition by gas liquid chromatography. Data were analyzed using a model that included concentrate level and cow within treatment to estimate the experimental error.

RESULTS

Pasture intake averaged 12,4 kg DM per cow/d without differences between treatments. Milk fat content was not affected when concentrate intake increased (P>0,88) averaging 33,2, 31,1, 32,4 and 33,0 g/kg milk for C3, C6, C9 and C12 respectively. Concentration (g/100g FA) of *de novo* ($C_{4:0}$-$C_{15:1,}$ 24,35), preformed (>17:0, 44,61), saturated (63), unsaturated (35,35) FAs or the saturated/unsaturated ratio (1,83) were not affected (P>0,10) by increased levels of concentrate intake.

Concentration (g/100g FA) of trans-10 $C_{18:1}$ remained low but increased (P<0,001) linearly with concentrate intake from 0,45 (C3), 0,51 (C6), 0,60 (C9) to 0,71 (C12) (Table). The increase was not explained by a concomitant decrease in trans-11 $C_{18:1}$ that averaged 3,45, 3,31, 2,95 and 3,28 g/100g FA for C3 to C12 respectively (P>0,34) (table). Concentration of $C_{18:3}$ *n*-3 remained unchanged averaging 0,60 g/100 g FA. The result was probably explained by the lack of effect of concentrate intake on pasture intake. Milk fat content (g/100g FA) of 9-*cis*, 11-*trans* CLA (1,50; 1,49; 1,35 and 1,50) resulted relatively high in all treatments (C3 to C12) and was not affected by concentrate intake (P>0,61). The atherogenicity index of milk fat averaged 2,13 (±0,11) across treatments (P>0,82).

Table. Fatty acid composition of milk.

Variable	Treatment				SEM	P<
	C3	C6	C9	C12		Treat
C 12:0	3,28	3,12	3,32	3,38	0,35	0,96
C 14:0	10,68	9,96	10,83	11,12	0,77	0,77
C 16:0	26,82	25,68	28,08	26,92	0,90	0,92
IA	2,12	1,97	2,24	2,19	0,21	0,82
10 trans C 18:1	$0,45^{c}$	$0,51^{bc}$	$0,60^{ab}$	$0,71^{a}$	0,04	0,001
11 tras C 18:1	3,45	3,31	2,95	3,28	0,20	0,34
CLA- 9 cis 11 trans	1,50	1,49	1,35	1,50	0,09	0,61

CONCLUSIONS

When pasture represented from 80 to 51% of total DM intake, increasing concentrate intake from 3 to 12 kg/cow/d had only minor effects on *trans*-10 $C_{18:1}$ concentration in milk without depressing vaccenic or rumenic acid (CLA) contents.

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