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Escola Superior Agrária

CLA e PUFA, factores valorizadores do leite

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Definição de leite

Segundo NP-572 de 1981

"líquido segregado pelas glândulas mamárias da vaca em estado de saúde normal.

Leite para fins alimentares é a secreção láctea obtida de uma ou mais ordenhas completas e ininterruptas, de uma ou mais fêmeas sadias, não fatigadas, mantidas em boas condições alimentares e de higiene, livre de substâncias estranhas, obtido com asseio e isento de colostro".

A designação genérica de leite é aplicada exclusivamente ao leite de vaca, devendo o leite proveniente de outras espécies ser designado pelo nome da fêmea produtora (Luquet, 1990).

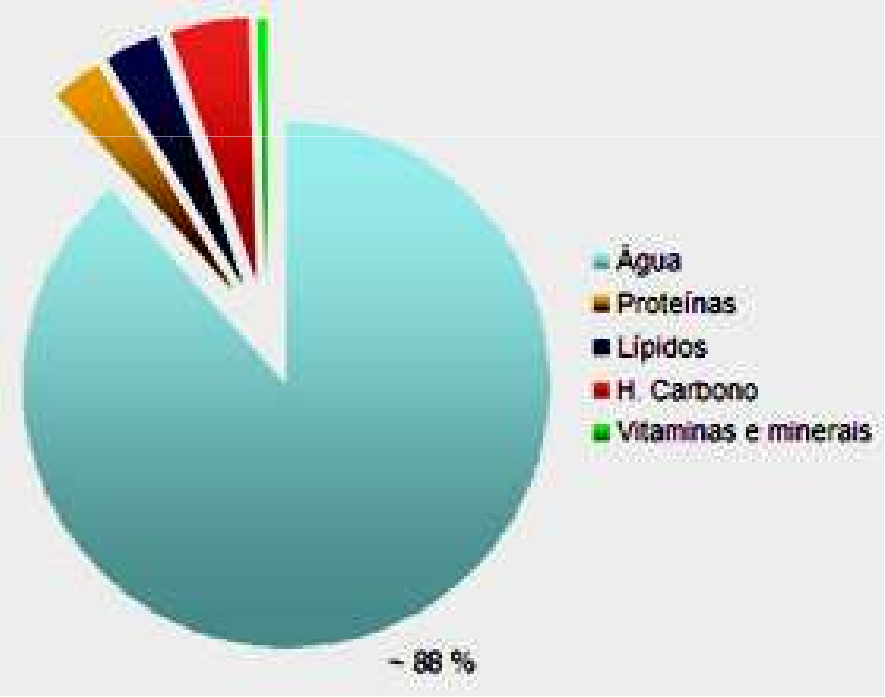
Composição do leite

Composição média do leite de vários mamíferos

Espécie animal	Proteína (%)	Gordura (%)	Sólidos Totais (%)	Lactose (%)	Cinzas (%)
Bovino	3,4	3,7	12,7	4,8	0,7
Ovino	5,5	7,4	19,3	4,8	1,0
Caprino	2,9	4,5	13,2	4,1	0,8
Camelídeo	3,9	5,4	15,6	5,1	0,7

(Kaufmann *et al.* (1987) cit. por Nunes (2004))

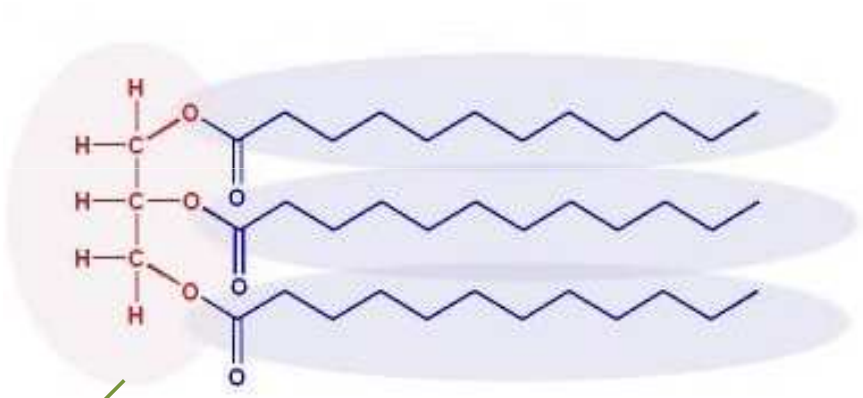
Composição nutricional do Leite UHT Inteiro. Tabela da Composição de Alimentos, INSA



(www.fenalac.pt)

Composição da gordura do leite

A composição da gordura do leite das espécies ruminantes caracteriza-se por uma enorme complexidade (Rego, 2010).



95% triglicéridos

3 ácidos gordos

glicerol

corrente sanguínea

síntese glândula mamária

corrente sanguínea

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Perfil dos ácidos gordos no leite

Fatty acid, %	Treatment			
	Control	9, 11 CLA mix	*t*9, *t*11 CLA	*t*10, *c*12 CLA
4:0	3.43^{c}	3.85^{a}	3.53^{bc}	3.69^{ab}
6:0	1.85^{a}	1.86^{a}	1.85^{a}	1.49^{b}
8:0	0.99^{a}	0.97^{a}	0.98^{a}	0.72^{b}
10:0	2.02^{a}	1.98^{a}	2.01^{a}	1.47^{b}
12:0	2.25^{ab}	2.31^{a}	2.14^{b}	1.90^{c}
14:0	8.63^{b}	9.32^{a}	8.19^{b}	8.22^{b}
14:1	0.79^{a}	0.75^{ab}	0.51^{c}	0.68^{b}
15:0	0.84^{b}	0.90^{a}	0.76^{c}	0.87^{ab}
16:0	26.77^{a}	25.45^{b}	25.79^{b}	23.73^{c}
16:1	1.52^{a}	1.15^{c}	1.28^{bc}	1.32^{b}
17:0	0.57^{b}	0.54^{b}	0.60^{ab}	0.65^{a}
18:0	12.78^{c}	13.98^{bc}	15.64^{a}	15.18^{ab}
18:1 *trans*-6 to 8	0.37	0.38	0.33	0.43
18:1 *trans*-9	0.27	0.29	0.25	0.27
18:1 *trans*-10	0.39	0.42	0.40	0.44
18:1 *trans*-11	1.28^{b}	1.37^{a}	1.39^{a}	1.41^{a}
18:1 *trans*-12	0.41	0.43	0.40	0.43
18:1 *cis*-9	27.50^{b}	25.81^{c}	26.35^{bc}	28.92^{a}
18:2 *cis*-9, *cis*-12	3.28^{bc}	3.16^{c}	3.43^{b}	3.68^{a}
18:2 *cis*-9, *trans*-11[2]	0.51^{b}	0.91^{a}	0.45^{b}	0.50^{b}
18:2 *trans*-9, *cis*-11	<0.01^{b}	0.38^{a}	<0.01^{b}	<0.01^{b}
18:2 *trans*-10, *cis*-12	<0.01^{b}	<0.01^{b}	<0.01^{b}	0.21^{a}
18:2 *cis*-9, *cis*-11	<0.01^{b}	0.09^{a}	<0.01^{b}	<0.01^{b}
18:2 *trans*-9, *trans*-11	<0.01^{c}	0.23^{a}	0.14^{b}	0.01^{c}
18:3	0.46^{c}	0.48^{bc}	0.52^{a}	0.50^{ab}
20:0	0.11^{c}	0.12^{b}	0.13^{a}	0.12^{ab}
Other	2.99^{b}	3.10^{ab}	2.97^{b}	3.17^{a}
Summation[3]				
<C_{16}	19.97^{b}	21.03^{a}	19.22^{b}	18.18^{c}
C_{16} + 16:1	28.29^{a}	26.60^{b}	27.08^{b}	25.05^{c}
>C_{16}	51.18^{c}	52.06^{bc}	53.10^{b}	56.12^{a}
Desaturase index[4]				
14:1/(14:0 + 14:1)	0.082^{a}	0.074^{b}	0.058^{c}	0.077^{ab}
16:1/(16:0 + 16:1)	0.054^{a}	0.044^{b}	0.048^{b}	0.052^{a}
18:1/(18:0 + 18:1)	0.684^{a}	0.649^{bc}	0.626^{c}	0.655^{b}
*c*9,*t*11 CLA/(18:1 *t*11 + *c*9,*t*11 CLA)	0.284^{b}	0.397^{a}	0.246^{c}	0.261^{bc}

(Perfield *et al.*, 2007)

Classificação dos ácidos gordos do leite

Estrutural		Funcional	
Saturados 65%	C4:0 a C10:0		
	C12:0, C14:0 e C16:0	**Hipercolesterémios**	C12:0, C14:0, C16:0
	C18:0		C14:0
	C20:0 e C22:0		
		Neutros	C4:0 a C10:0
			C18:0
Monoinsaturados 30%	C14:1		
	C16:1		
	C18:1	**Hipocolesterémios**	C18:1 cis-9
	C20:1		C18:2 cis-9,12
			C18:3 cis-9,12,15
Poliinsaturados 5%	C18:2		
	C18:3		

(Bessa, 1999)

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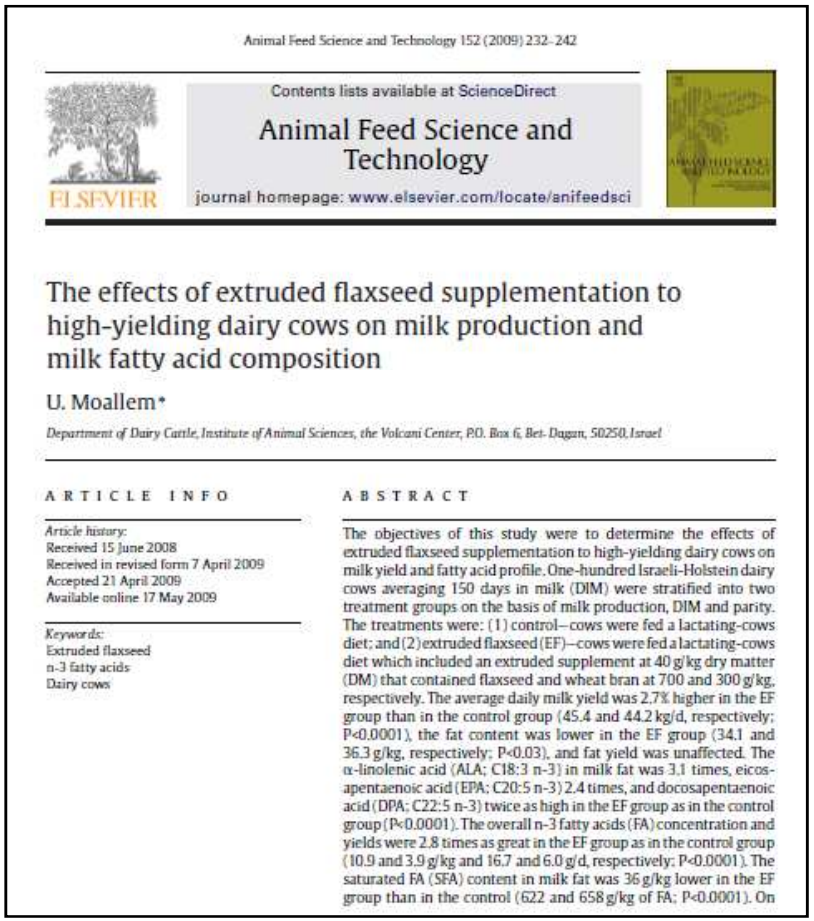
Estudos realizados sobre manipulação da dieta alimentar de bovinos de leite



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The effects of extruded flaxseed supplementation to high-yielding dairy cows on milk production and milk fatty acid composition

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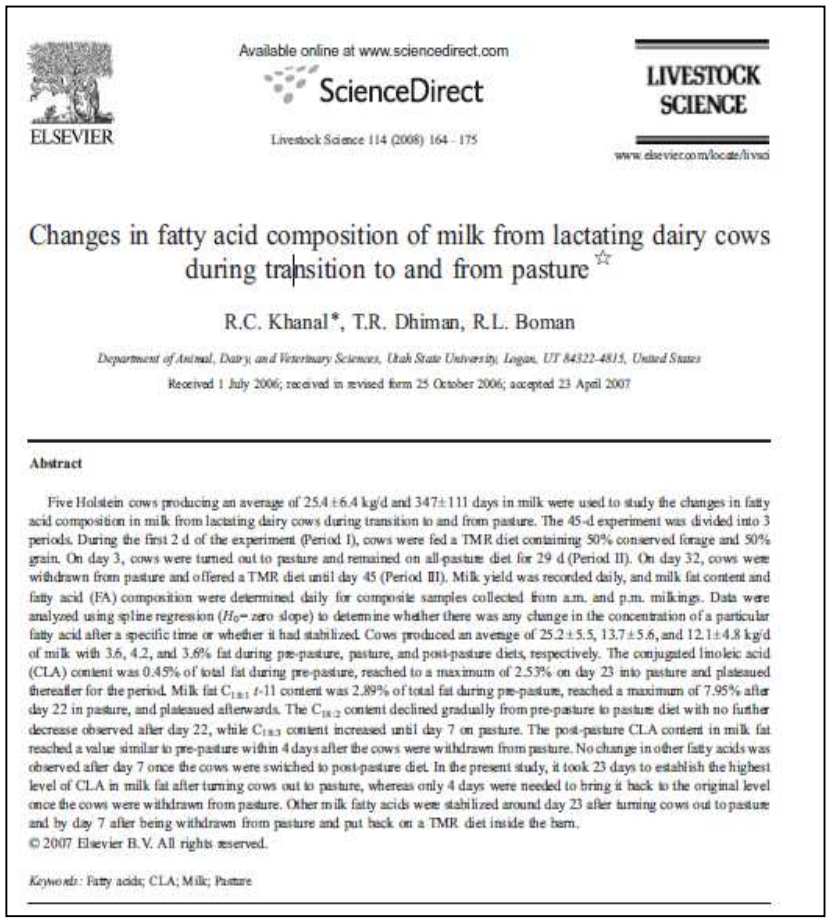
ABSTRACT

The objectives of this study were to determine the effects of extruded flaxseed supplementation to high-yielding dairy cows on milk yield and fatty acid profile. One-hundred Israeli-Holstein dairy cows averaging 150 days in milk (DIM) were stratified into two treatment groups on the basis of milk production, DIM and parity. The treatments were: (1) control—cows were fed a lactating-cows diet; and (2) extruded flaxseed (EF)—cows were fed a lactating-cows diet which included an extruded supplement at 40 g/kg dry matter (DM) that contained flaxseed and wheat bran at 700 and 300 g/kg, respectively. The average daily milk yield was 2.7% higher in the EF group than in the control group (45.4 and 44.2 kg/d, respectively; P<0.0001), the fat content was lower in the EF group (34.1 and 36.3 g/kg, respectively; P<0.03), and fat yield was unaffected. The α-linolenic acid (ALA; C18:3 n-3) in milk fat was 3.1 times, eicos-apentaenoic acid (EPA; C20:5 n-3) 2.4 times, and docosapentaenoic acid (DPA; C22:5 n-3) twice as high in the EF group as in the control group (P<0.0001). The overall n-3 fatty acids (FA) concentration and yields were 2.8 times as great in the EF group as in the control group (10.9 and 3.9 g/kg and 16.7 and 6.0 g/d, respectively; P<0.0001). The saturated FA (SFA) content in milk fat was 36 g/kg lower in the EF group than in the control (622 and 658 g/kg of FA; P<0.0001). On



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Changes in fatty acid composition of milk from lactating dairy cows during transition to and from pasture ☆

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Abstract

Five Holstein cows producing an average of 25.4±6.4 kg/d and 347±111 days in milk were used to study the changes in fatty acid composition in milk from lactating dairy cows during transition to and from pasture. The 45-d experiment was divided into 3 periods. During the first 2 d of the experiment (Period I), cows were fed a TMR diet containing 50% conserved forage and 50% grain. On day 3, cows were turned out to pasture and remained on all-pasture diet for 29 d (Period II). On day 32, cows were withdrawn from pasture and offered a TMR diet until day 45 (Period III). Milk yield was recorded daily, and milk fat content and fatty acid (FA) composition were determined daily for composite samples collected from a.m. and p.m. milkings. Data were analyzed using spline regression (H_0= zero slope) to determine whether there was any change in the concentration of a particular fatty acid after a specific time or whether it had stabilized. Cows produced an average of 25.2±5.5, 13.7±5.6, and 12.1±4.8 kg/d of milk with 3.6, 4.2, and 3.6% fat during pre-pasture, pasture, and post-pasture diets, respectively. The conjugated linoleic acid (CLA) content was 0.45% of total fat during pre-pasture, reached to a maximum of 2.53% on day 23 into pasture and plateaued thereafter for the period. Milk fat $C_{18:1}$ *t*-11 content was 2.89% of total fat during pre-pasture, reached a maximum of 7.95% after day 22 in pasture, and plateaued afterwards. The $C_{18:2}$ content declined gradually from pre-pasture to pasture diet with no further decrease observed after day 22, while $C_{18:3}$ content increased until day 7 on pasture. The post-pasture CLA content in milk fat reached a value similar to pre-pasture within 4 days after the cows were withdrawn from pasture. No change in other fatty acids was observed after day 7 once the cows were switched to post-pasture diet. In the present study, it took 23 days to establish the highest level of CLA in milk fat after turning cows out to pasture, whereas only 4 days were needed to bring it back to the original level once the cows were withdrawn from pasture. Other milk fatty acids were stabilized around day 23 after turning cows out to pasture and by day 7 after being withdrawn from pasture and put back on a TMR diet inside the barn.

Keywords: Fatty acids; CLA; Milk; Pasture

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Trabalho experimental 2005/06

Efeito de diferentes regimes alimentares sobre a qualidade do leite produzido

(Dias, 2007)

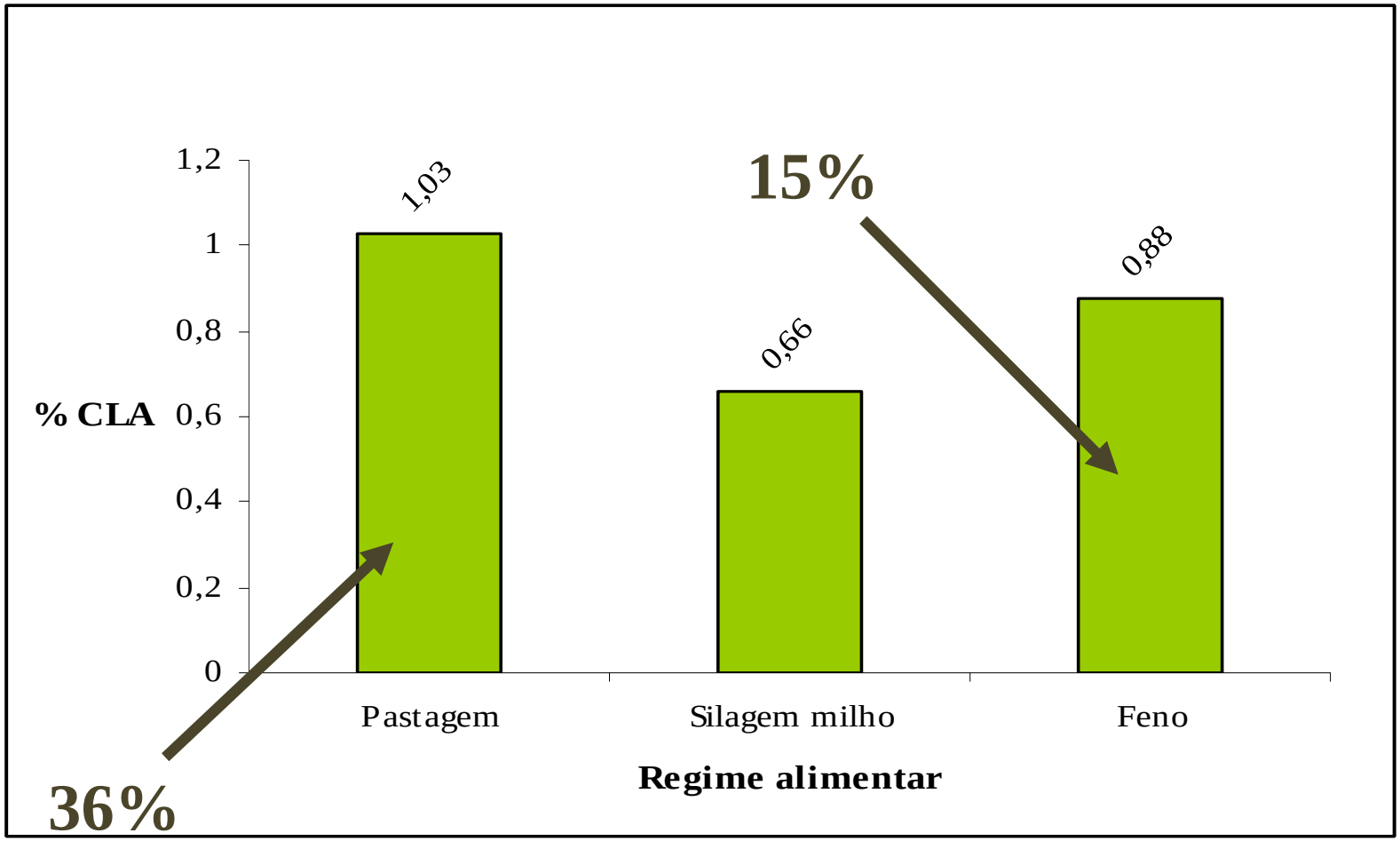
Regime alimentar e a composição em ácidos gordos do leite

	n	Pastagem	Silagem milho	Feno	Sig
C18:0 (%)	24	10,41^{a} (±1,81)	6,86^{b} (±1,38)	8,21^{c} (±1,58)	*
C18:1cis9 (%)	24	20,94^{a} (±4,68)	14,56b (±2,29)	18,22c (±3,35)	*
C18:2(n-6) (%)	24	2,22^{a} (±0,47)	1,73^{b} (±0,39)	2,55^{a} (±0,79)	*
C18:3(n-3) (%)	24	0,44^{a} (±0,23)	0,38^{ab} (±0,10)	0,33^{b} (±0,15)	*
CLA (%)	24	1,03^{a} (±0,33)	0,66^{b} (±0,20)	0,88^{a} (±0,21)	*

a,b,c notações diferentes na mesma linha correspondem a p< 0,05 e são significativamente diferentes; *p< 0,05; n – tamanho amostra; %- percentagem.

(Dias, 2007)

Ácido Linoleico Conjugado (CLA) nos diferentes regimes alimentares



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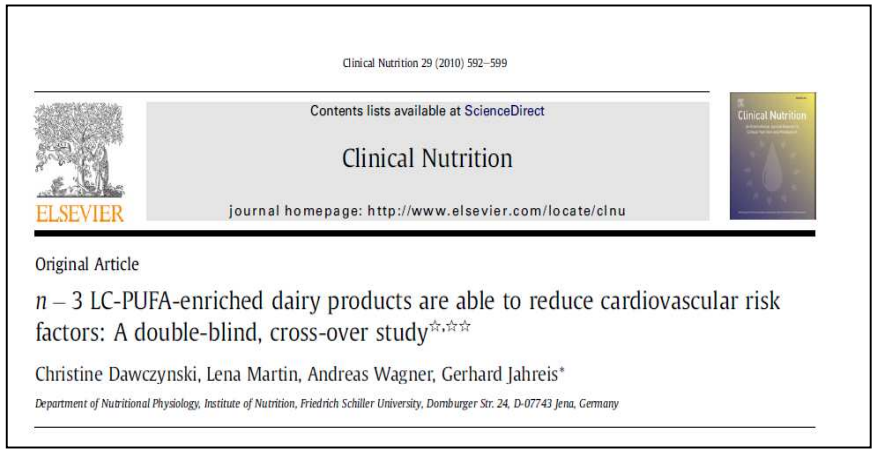
Estudos realizados sobre a importância do consumo de leite na saúde humana



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Original Article

n – 3 LC-PUFA-enriched dairy products are able to reduce cardiovascular risk factors: A double-blind, cross-over study☆,☆☆

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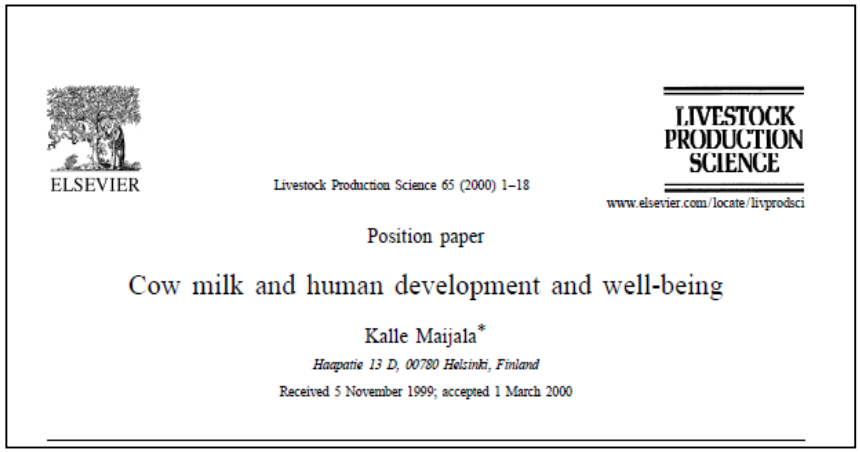

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Position paper

Cow milk and human development and well-being

Kalle Maijala*

Haapatie 13 D, 00780 Helsinki, Finland

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REVIEW

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Beneficial Health Effects of Milk and Fermented Dairy Products – *Review*

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Lipids in Health and Disease

BioMed Central

Review

Open Access

Bovine milk in human nutrition – a review

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Considerações finais

- **O conhecimento da composição e das propriedades funcionais do leite são muito importantes para o produtor, o transformador e o consumidor.**

- **O transformador tem necessidade de cativar o consumidor; a melhor forma é mostrando que o consumo dos seus produtos é benéfico para a sua saúde.**

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Considerações finais

- **Possível valorização futura do leite pela composição da gordura**
  - **CLA (ácido linoleico conjugado);**
  - **PUFA (relação ómega3/ómega6).**

- **O leite produzido com uma alimentação à base de pastagem**
  - **favorece o aumento de CLA;**
  - **redução nos níveis dos ácidos gordos de cadeia curta e o aumento do ácido esteárico (C18:0) e oleico (C18:1cis9).**


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“Os lacticínios produzidos com base no pastoreio possuem um perfil de ácidos gordos com características intrínsecas que os diferenciam positivamente dos mesmos provenientes de sistemas de produção mais intensivos (Rego, 2010).

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Obrigada

JORNADA TÉCNICA
PRODUÇÃO DE RUMINANTES
ESACB, 31 MARÇO 2011