National Institute of Industrial Technology, INTI.
Dairy Industry Technological Research Centre.
INTI LACTEOS. Buenos Aires. Argentina.

"Persistency of conjugated linoleic and vaccenic acids in Argentine Tybo and Sardo cheeses produced from natural high CLA milk "

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Milk : Functional Foods

Introduction

- Functional foods: foods with additional properties on human health benefits that exceed the classic simple nutrients
- example: amino acids, sugars, fatty acids, etc.

Milk : Functional Foods

Introduction

Which compounds?

For example:

- Omegas 3
- Conjugated Linoleic Acids (CLA) (9cis – 11 trans)

Milk : Functional Foods

Introduction

Omega 3 Fatty Acids

They act in cardiovascular disease prevention.

Milk : Functional Foods

Introduction

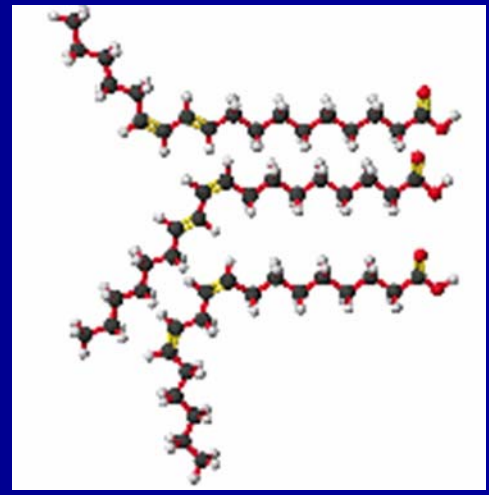
CLA or Conjugated Linoleic Acids

CLA showed cholesterol-lowering, antiatherogenic, antidiabetic and anticarcinogenic effects demonstrated in experimental models

- Conjugated linoleic acid (CLA) is a group of positional and geometric isomers of conjugated dienoic derivatives of linoleic acid.

- The major dietary source of CLA for humans is ruminant fat contained in meats, (beef and lamb), but meanly in dairy products, such as milk, butter and cheese.

- The major isomer of CLA in milk is cis-9, trans-11 (C18:2), also called rumenic acid.

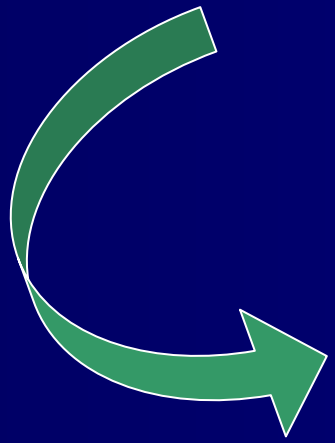


Nutritional intake recommended :

MUFA : 60% TFA

PIFA : 15% TFA

SFA : 25 % TFA



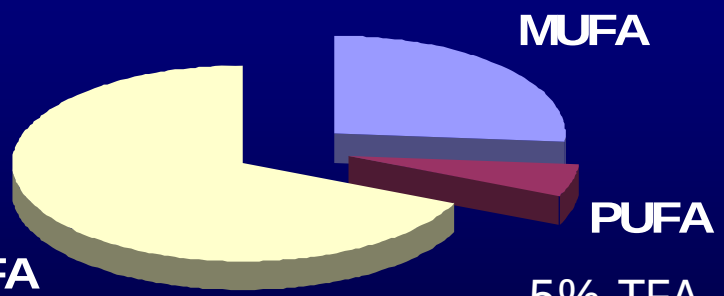
MUFA Monounsaturated fatty acids

PIFA: Polyunsaturated fatty acids

SFA: Saturated fatty acids.

Dairy products

20 – 25 % TFA



C12:0 + C 14:0 + C 16:0 → 40% SFA

The milk fat is a flexible component to transform dairy products into nutraceuticals foods.

Through cows feeding, we can . . .

- Increase the basal concentration of Omega 3 (EPA + DHA).
- Increase the basal concentration of CLA

and…

- Decrease the atherogenicity index (AI) of dairy products (potential clogging of the arteries)

  C12 + C14 + C16 / Sum of UFA.

- The nutrition allows modify, in a natural way, these parameters without requiring the addition of synthetic molecules that deteriorate sensorial properties and natural image of our food.

Background

- 2000. Experimental feeding to obtain “high CLA” milk in INTA-Balcarce.
- 2002. Preliminary results on transfers’ rate of CLA in yoghurt, soft-cream cheese and pasteurized milk production;
- 2009. We focused in hard and semi-hard cheeses to extend other possibilities for inclusion of CLA in the daily intake.

Objective

Determine if transformation of a natural milk containing high CLA and VA contents into Tybo and Sardo cheeses induces significant changes in the concentration of these bioactive molecules in the final product.

Dairy Functional Foods

The Beginning

- INTI – LACTEOS.
  National Institute of Industrial Technology
- INTA – BALCARCE
  National Institute of Agricultural Technology
- PRODEO SRL 2008 award-winning "La Mirada Larga INTI" (looking in a log run) competition.

Ministerio de Economía y Producción
Secretaría de Industria, Comercio
y de la Pequeña y Mediana Empresa

INTI Nacional de Tecnología Industrial

CONCURSO INTI

"LA MIRADA LARGA"

El Instituto Nacional de Tecnología Industrial (INTI) convoca a cátedras o departamentos universitarios; grupos de economía agraria o industrial; empresas; municipalidades u organizaciones sociales de cualquier tipo, con sede en municipios de cualquier Provincia donde se cultive habitualmente soja, maíz o trigo a presentar estudios de prefactibilidad para el aprovechamiento integral de los granos en su lugar propio de producción.

LOS ALCANCES DE LAS PRESENTACIONES DEBEN CONSIDERAR LAS SIGUIENTES REFERENCIAS:

El proyecto debe abarcar todo un Municipio o Departamento o más de uno, de manera completa, con una población total no mayor de 500.000 habitantes. No hay límite mínimo de población.

Para decidir los proyectos ganadores se tendrá en cuenta:
- Que la proporción de bienes cuya industrialización deba continuar fuera del ámbito del Municipio sea mínima; es decir, que esté o tienda a estar maximizada la cadena de valor local.
- Que los subproductos o desechos (suero de queso, plumas de pollo, deyecciones animales, etcétera, para mencionar solo algunos ejemplos) sean valorizados en la zona.
- Los efectos negativos o positivos sobre el medio ambiente y el hábitat urbano.
- La ocupación total generada y la ocupación por unidad de inversión prevista.

Los proyectos deben ser presentados a nivel de estudios de prefactibilidad, lo cual significa:
- Identificar la cadena completa de producción, incluyendo posible producción de bienes de capital para el fin perseguido y los servicios de mantenimiento o similares que se requerirán. Identificar origen y destino de todo insumo y todo producto y subproducto.
- Identificar la disponibilidad actual de algunos eslabones productivos en el ámbito.
- Dar dimensión cuantitativa a superficies a sembrar de cada grano y a todas las etapas de transformación posteriores, señalando cantidades de productos finales a obtener y su destino probable.
- Estimar niveles de inversión nueva necesarios y los niveles de ocupación previstos, con la mayor justificación posible.

En esta instancia, no se requieren estudios de mercado para los bienes a obtener.

PREMIOS
1 Primer premio de $ 50.000
1 Segundo premio de $ 25.000
3 Terceros premios de $ 10.000
Mención para todo otro proyecto que se considere valioso profundizar.
A partir de la decisión del jurado el INTI aportará asistencia a todos los proyectos premiados o mencionados, para convertirlos en estudios de factibilidad y proyectos ejecutivos, hasta definir su posible y efectiva implementación.

JURADO
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Javier Gonzalez | Director de Economía Industrial del INTI
Roberto Castañeda | Director del Centro Lacteos del INTI
Miguel Marcelia | Director del Centro Carnes del INTI
Nadina Cazaux | Directora del Centro Concepción del Uruguay del INTI
Nicolás Apro | Director del Centro Cereales y Oleaginosas del INTI

La inscripción al concurso se extenderá desde el día de la fecha hasta las 16 hs. del 30 de octubre de 2008 en la sede del INTI en Retiro, sito en **Leandro N. Alem 1067 - piso 7 - C1001AAF Capital Federal.**

Email de consultas:
presidencia@inti.gov.ar / napro@inti.gov.ar
Ver bases del concurso en: **www.inti.gov.ar**

High **CLA** and high **VA Milk**

- Transfer of bioactive molecules from high-CLA milk and high VA into cheeses with high CLA and VA

Healthier Cheeses :
with high content in beneficial fats and low AI

How ?

Material and methods.

- The natural high CLA milk was obtained from 8 Holstein cows from middle lactation (109 ± 26 days postpartum), supplemented with sludge soybean oil (SSO), 55.5% of C18:2 n6 and fish oil (FO) as an inhibitor of ruminal biohydrogenation.
- In INTA BALCARCE

Cheese-making : Tybo and Sardo

Material and methods.

An aliquot of milk was used to determine FA profile and the rest of the milk was pasteurized and transformed into Tybo and Sardo cheeses according to industrial processes.

At day 25th after lipid feeding, milk was collected to be processed into cheese.

Tybo: a semi hard argentine cheese.

Sardo: a hard argentine cheese.

Control of bioactive molecules

Material and methods.

Fatty Acid Composition in milk and cheese were analyzed by gas-liquid chromatography using an Agilent GC 6890 Serie Plus fitted with a FID Detector and autosampler.

Results

- After supplementation the milk CLA content increased from a basal value of 1.42 to 3.58 g/100g and Vaccenic Acid from 2.56 to 3.58 g/100g FA

Results

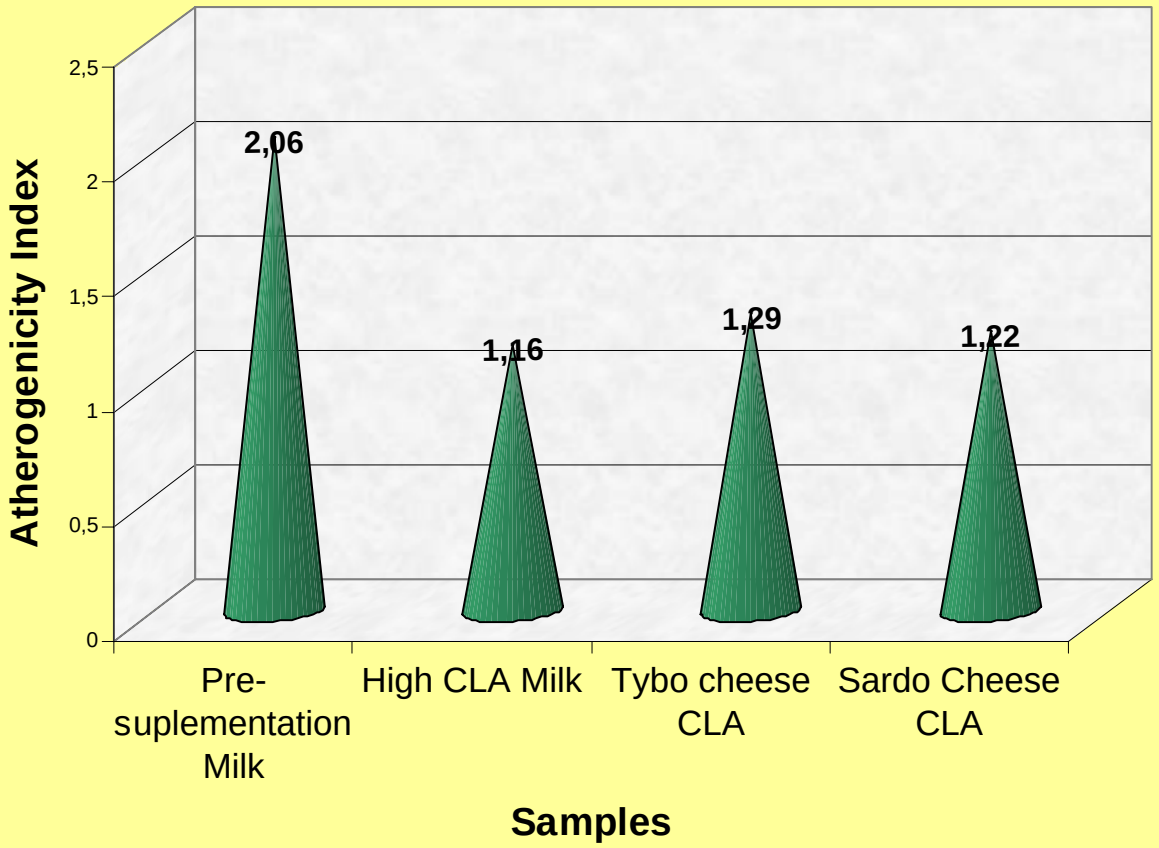
Main fatty acid composition in milk “high CLA” and its transfer to Tybo and Sardo cheese.

Fatty acids (g/100 g total FA)	Milk hCLA	Sardo Cheese hCLA	Transfer %	Milk hCLA	Tybo Cheese hCLA	Transfer %
C12:0	2,38	2,33	98	2,2	2,54	115
C14:0	9,04	9,27	103	8,88	9,73	110
C16:0	24,27	24,95	103	25,87	25,9	100
C18:1t10	4,22	5,95	141	5	3,89	78
C18:1t11 (VA)	5,43	5,89	109	3,55	4,48	126
CLA c9t11	3,58	3,51	98	2,86	2,72	95
CLA c12t10	0,02	0,03	144	0,04	0,05	115
$C_{20:5\ n3}$ (EPA)	0,05	0,04	77	--	--	--
$C_{22:6\ n3}$ (DHA)	0,03	0,03	100	0,04	0,04	100
AI	1,16	1,22		1,16	1,29	

Results

- Atherogenicity Index of milk decrease after supplementation from basal value of 2.06 to 1.16 , decreasing the concentration of atherogenics fatty acids (C12:0 ;C14:0; and C16:0)
- The atherogenicity index of high CLA Sardo and Tybo cheeses were 1.22 and 1.29 respectively.

Fig.1:Atherogenicity Index from hich CLA cheeses



Conclusions

- There are a high transference rate of CLA 9cis 11 trans: 98% for Sardo cheese and 95% for Tybo cheese.

- Assuming that the fat of cheeses are 26.7 and 21.7%, an intake of 90 g/day of Sardo “high CLA” or 143 g/day of Tybo “high CLA”, may allow to achieve cardiovascular protection (800 mg/day) to the consumer of CLA.

Conclusions

- The beneficial effect of functional foods may be effective only within a comprehensive nutrition and healthy lifestyle.
- Successful transfer and support to small farm/cheese-factory to develop more healthy cheeses.

The presence of CLA in milk products would be guaranteed if we start with a natural high CLA milk.

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Remarks

Nowadays, these healthy cheeses are being commercialized in the Argentine market.

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muchas gracias !
than you very much...

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