



Project: Fatty acid spectrum of hay milk and hay milk products with a focus on CLA and omega-3 fatty acids

Aim of the project

The project aimed to compile evidence-based data on the content of omega-3 fatty acids and conjugated linoleic acids (CLA) in hay milk and hay milk products from Austria's hay milk regions over the course of an entire year.

Project plan

The fatty acid spectrum of hay milk and hay milk cheese from the provinces of Vorarlberg, Tyrol, Salzburg and Upper Austria was determined over the course of a year.

In addition to hay milk, the two most important hay milk products – Emmentaler and mountain cheese – were also analysed.

Samples of pasteurised drinking milk from retail outlets were tested for comparison purposes. According to BISIG and others (2007), neither pasteurisation nor the production conditions for hard cheese alter the fatty acid spectrum.

Project term

January to December 2010

Lead investigator

Dr Wolfgang Ginzinger, former director of the Federal Institute for Alpine Dairy Farming in Rotholz

Analysed samples

108 hay milk cheese: mainly Emmentaler and mountain cheese

24 hay milk: packaged drinking milk

12 standard milk: packaged drinking milk from the retail sector

Performance of the analyses:

University of Natural Resources and Life Sciences, Vienna

Summarised findings for omega-3

fatty acids

	Hay milk	Standard milk
Quantity	132	12
Mean value: % of total fatty acids	1.02%	0.56%
Minimum value:	0.75	0.48
Maximum value:	1.47	0.65

The values for the standard milk correspond to the values indicated in literature (MOLKENTIN, 2009; EHRLICH, 2006). All values for hay milk exceeded the maximum value for standard milk. On average, the values for hay milk were around twice as high (1.84 times).

Conjugated linoleic acids (CLA)

	Hay milk	Standard milk
Quantity	132	12
Mean value: % of total fatty acids	1.12%	0.59%
Minimum value:	0.60	0.52
Maximum value:	1.97	0.77

The values for hay milk and standard milk correspond to the findings reported by SCHREIBER (2002). While there was only a slight seasonal influence – at a low level – on standard milk, the CLA content of hay milk rose sharply from May and peaked in October/November. On average, the values for hay milk were around twice as high (1.89 times).

Not only does hay milk contain almost twice as much linolenic acid as standard milk, but the ratio of omega-3 to omega-6 fatty acids is only about half.

Alpha-linolenic acid

	Hay milk	Standard milk
Quantity	132	12
Mean value: % of total fatty acids	0.87	0.46

Ratio of omega-3: omega-6 fatty acids

	Hay milk	Standard milk
Quantity	132	12
Mean value:	1.55	3.04

It is therefore safe to assume that the conversion rate of linolenic acid into the nutritionally important long-chain omega-3 fatty acids is also greater in hay milk products than in standard milk products.

Literature:

The following authors, among others, have investigated the fatty acid spectrum of milk – hay milk, early hard cheese or silage-free milk, organic milk, conventional milk:

TSCHAGER, E.; ZANGERL, P.; SEBASTIANI, H.; KNEIFEL, W.;

LANG, E.C.; LEGNER, H.:

Organoleptische, technologische und ernährungsphysiologische Eigenschaften von Almmilch
Milchwirtschaftliche Berichte Wolfpassing Rotholz 120 152-157 (1994)

TSCHAGER, E., GINZINGER, W., DILLINGER, K. (2001).

Fettsäurespektrum des Milchfettes in Abhängigkeit von Fütterung und Haltung.

Proceedings ALFA Annual Conference 2001, 29-31 May 2001, Wolfpassing, 163-165

SCHREIBER, M: (2002)

Gehalt an konjugierten Linolsäuren (CLA) in österreichischer Trinkmilch unterschiedlicher Provenienz;
Diplomarbeit an der BAM Rotholz

SCHAEREN, W.; MAUER, J., LUGINBÜHL, W.: Kaum Unterschiede zwischen Silo- und silofreier Milch;
Agrarforschung 12, 34-39, (2005)

SHINGFIELD K.J., SALO-VÄÄNÄEN P., PAHKALA E., TOIVEN V., JAAKKOLA S., PIIRONEN V. &
HUHTANEN P. (2005): Effect of forage conservation method, concentrate level and propylene glycol
on the fatty acid composition and vitamin content of cows' milk.
Journal of Dairy Research 72, 349-361 (2005).

M. EHRlich: Untersuchung von Molkereimilchprodukten aus Deutschland auf gesundheitlich
bedeutsame Fettsäuren (Omega 3, Omega 6, CLA) unter Berücksichtigung des eingesetzten
Maisfutters; Universität Kassel, Witzenhausen, June 2006

B. MARTIN, A. FERLAY, B. GRAULET, P. NOZIERE et Y. CHILLIARD:

Influence de l'alimentation de la vache laitière sur la composition en acides gras et en vitamines du
lait. Conference proceedings: Der besondere Wert graslandbasierter Milch 08/11/2007

Agroscope Liebefeld-Posieux Research Station ALP

WEISS, D.: Milch aus Gras – Milch mit Mehrwert für Verbraucher und Bauern,
conference proceedings: Der besondere Wert graslandbasierter Milch 08.11.2007
Forschungsanstalt Agroscope Liebefeld-Posieux ALP

WEISS, D.; MEISL, I.; KIENBERGER, H.; EICHINGER, H. M. (2005):

Fettsäuremuster im Milchfett in Abhängigkeit der gewählten Fütterungsstrategie.

Conference proceedings, Milchkonferenz 2005, Kiel

WESTERMAYR, T.: Fettsäurezusammensetzung in der Molkereimilch und in Alpmilch
dmz 6, 35-37 (2006)

A. FERLAY, B. MARTIN, PH. PRADEL, J. B. COULON, and Y. CHILLIARD:

Influence of Grass-Based Diets on Milk Fatty Acid Composition and Milk
Lipolytic System in Tarentaise and Montbéliarde Cow Breeds

J. Dairy Sci. 89:4026-4041 (2006)

M. COLLOMB; W. BISIG; U. BÜTIKOFER; R. SIEBER; M. BREGY; L. ETTER:

Influence of supplementing hay with grass silage on the fatty acid composition
of mountain milk ALP science 2008, No. 526

J. MOLKENTIN:

Authentication of organic milk using $\delta^{13}\text{C}$ and the α -linolenic acid content of milk fat
J.Agric.Food Chem. 57, 785-790 (2009)

A decrease in the content of omega-3 fatty acids with the increase in maize silage or concentrated fodder is reported consistently. Grazing has a particularly positive effect on the CLA content.

BISIG, W.; EBERHARD, P.; COLLOMB, M.; REHBERGER, B.:

Influence of processing on the fatty acid composition and the content of conjugated linoleic acid in organic and conventional dairy products – a review
Lait 87 (2007) 1-19