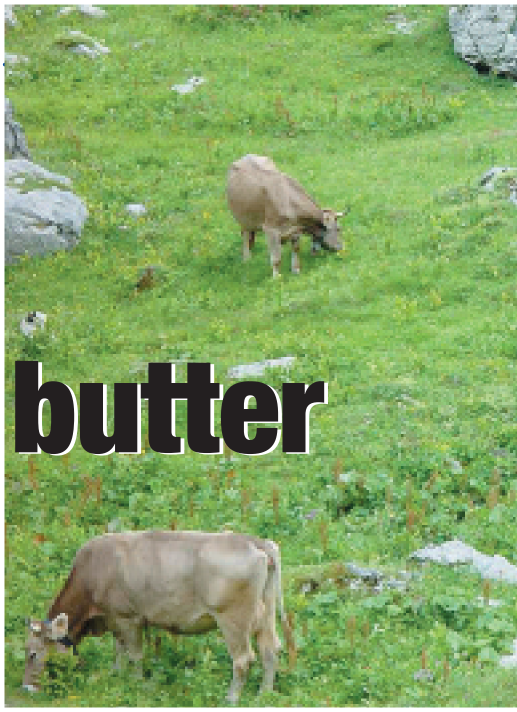
Brita Rehberger[1], Margherita Vass[2], Roger Walliser[3], Dr. Walter Bisig[1,3]

Enrichment of CLA from alpine butter



As part of an EU funded project, Swiss ALP is examining the possible impact of processing on nutritionally valuable milk components, with emphasis on conjugated linoleic acids (CLA). The project will evaluate processes that enable the targeted, low-input enrichment of CLA in milk fat. Among the many benefits ascribed to CLA, it is believed to be an effective agent against cancer.

EU project "Quality low input food"

As part of its research programme into food quality and safety, the European Union is funding the Quality Low Input Food project to the tune of € 18 m. The aim of this project is to improve the quality, safety and productivity of low input foods. This research covers the entire food chain from pasture to plate and aims to improve the competitiveness of the organic sector, and ultimately benefit European consumers and organic farmers. 34 research institutes, universities and industrial partners across Europe are participating in this project.

The subproject in which ALP is involved addresses the topic of processing strategies and examines the potential effects of processing on nutritionally high-value milk components, using conjugated linoleic acids as an example, in order to determine the extent to which processing influences the CLA content of the end products. In a further step the storage stability of CLA enriched butter and conventional butter will be compared, and the changes examined using chemical, sensory-based and so-called holistic methods. The work will also evaluate processes which allow the targeted, low-input use of CLA as an enriching agent in milk fat or dairy products, with a view to making the findings available to the food industry.

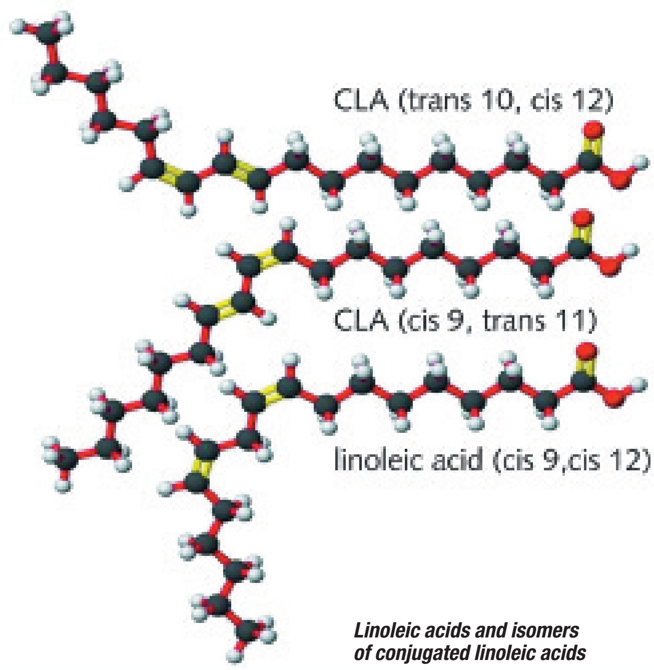
1 Federal Department of Economic Affairs, Agroscope Liebefeld-Posieux Research Station ALP, Schwarzenburgstrasse 161, 3003 Bern, Switzerland, Tel: +41 31 3238403, Fax: +41 31 3238227, e-mail: brita.rehberger@alp.admin.ch
2 Mittelland Molkerei Company Luzern, 6002 Luzern, Switzerland
3 University of Applied Sciences, College of Agriculture, 3052 Zollikofen, Switzerland

In cooperation with the University of Applied Sciences, College of Agriculture, Zollikofen and the industry, a process for low-input CLA enrichment of alpine butter has now been developed as part of a diploma thesis. Since the process selected for the work is a physical enrichment process, it is accepted by international organic farming and food groups. It also permits the use of CLA-rich fractions in organic products.

Physical process for CLA enrichment

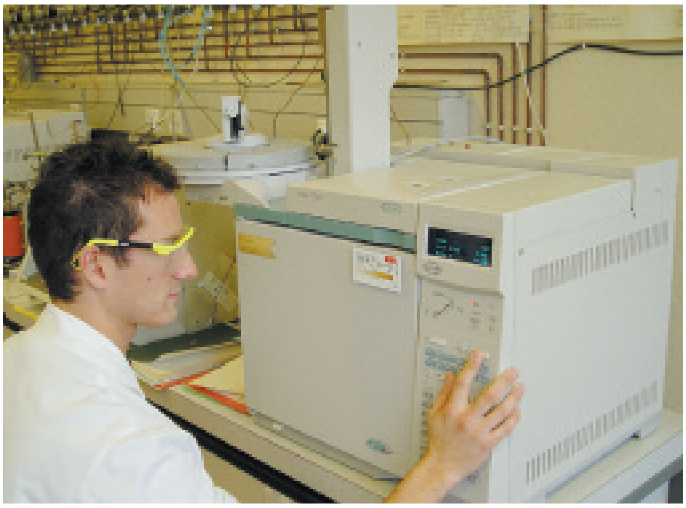
The most commonly used physical process is dry fractionation. Dry fractionation is the only process which does not affect the natural taste of milk fat; in addition, it is fully reversible. This process involves the purely thermal-mechanical separation of triglycerides based on their melting points.

Within the diploma thesis, suitable fractionation conditions were initially evaluated using anhydrous butterfat. Water was extracted from alpine butter prior to fractionation. During the CLA enrichment process, water-free butter was melted at a temperature of 75 °C and then cooled to the requisite crystallisation temperature. Butter crystallisation was influenced by changing time and temperature parameters as well as by means of multiple fractionation, in order to determine the CLA yield in each fraction. The temperature range between 32 °C and 9.5 °C as well as crystallisation times between one and 20 hours were tested. The aim of the physical separation process was to obtain a higher CLA content in a fraction while optimally separating the two fractions, and to achieve a commercially interesting yield of the fraction with the higher CLA content.



Linoleic acids and isomers of conjugated linoleic acids

Alpine butter provides a suitable raw material since it has a significantly higher CLA content than conventional butter. The higher CLA content is probably attributable to the



The concentration of CLA-Isomeres is being tested

difference in feed for cows grazing in natural pastures, species-rich alpine meadows with secondary plant ingredients that affect the rumen microorganisms, and energy deficiencies and metabolism in the cows.

The optimal time and temperature conditions of the selected CLA enrichment process obtained from the various fractionation conditions tested are given in the table.

Conjugated linoleic acids are bound to triglycerides in milk fat and thereby combined with a range of widely differing acids. Hence triglycerides with CLA exhibit different melting and crystallisation points depending on the other two fatty acids. Depending on the composition and the related crystallisation point of the triglyceride, the bound CLA isomer makes its way during fractionation to the stearin or olein fraction, which makes enrichment difficult by purely physical-mechanical methods. One possible reason for the varying enrichment of CLA content in anhydrous butterfat and alpine butter could be the different configuration of triglycerides in both butter types.

Manufacture of functional dairy products

Food production processes are continually being refined and optimised through new technology. This trend increasingly poses new challenges to raw material suppliers as they are obliged to adjust their raw materials to the needs of the food production industry. The same situation is confronting milk fat suppliers. Food manufacturers require different fat fractions depending on the product, and can determine the meltability, taste, smell and colour of the end product.

In Switzerland to date, CLA-enriched milk fat fractions have not been used for any specific application, but various applications for the CLA-enriched or CLA-reduced fraction are conceivable. For instance, the CLA-enriched fraction could be used to obtain CLA-enriched butter fractions as an additive in the production of various foods, such as creams, spreads, CLA-enriched yoghurts or fresh cheese. Due to its technological properties and high melting point, the CLA-reduced fraction could be used for baked goods and chocolate fillings. Up to now, the stearin fraction has been more sought after due to its technological properties. Thanks to an increased CLA-content, interesting new applications would also be emerging for the olein fraction.

Acknowledgement

The authors gratefully acknowledge from the European Community financial participation under the 6th FP for the Integrated Project QUALITYLOWINPUTFOOD (FP6-FOOD-CT-2003- 506358) and co-funding by the Swiss State Secretariat for Education and Research. The results of this publication are the sole responsibility of the authors.

Literature: Available from the author on request

Extract of results of series of experiments

product	crystallisation temperature [ºC]	crystallisation time [h]	CLA content [mg/g fat]
conventional butterfat (reference)	–	–	**7.7**
olein fraction I	20	4	8.6
olein fraction II	16; 12.5	4; 15	10.2
alpine butter (reference)	–	–	**21.6**
olein fraction I A	20	4	22.8
olein fraction I B	20	4	22.7
average increase of CLA content from reference to olein fraction I			1.2
olein fraction II A1	16; 12.5	4; 15	25.1
olein fraction II A2	16; 12.5	4; 15	24.5
olein fraction II B1	16; 12.5	4; 15	25.1
average increase of CLA content from olein fraction I to olein fraction II			2.1
average increase of CLA content from reference to olein fraction II			**3.3**

NEWS

Authentic berry flavours

Quest International has launched a new range of berry fruit flavours in Europe and the Middle East. Basis is the discovery of new flavour components that precisely replicate the flavours of real fruit at various stages of ripeness. Targeted especially at the dairy market – and with primary applications in yoghurt and the rapidly growing dairy drinks sector – the "Berry-sense" range – a product of two years of research and development. The range of flavours can, authentically, reflect the subtlety of fruit taste a consumer requires as well as the exact stage of fruit ripeness, Quest claims. In dairy applications, an extra benefit is guaranteed on-shelf stability of flavour.