ETH zürich

Coop Research Program

Image: Valeria Galetti

Dairy Products as Essential Sources of Iodine in the Swiss Population

Final project fact sheet

Although there has been remarkable progress, iodine deficiency remains a global problem impairing health and development in affected populations. In Switzerland, dairy products represent one of the most important dietary sources. However, many factors potentially affect milk iodine concentrations, with iodine content in fodder and milk processing being the most important determinants. In addition, bioavailability from milk is poorly understood, as no study ever examined the iodine absorption from milk in humans. The project found that iodine concentration in Swiss milk is higher in milk from conventional farming, during the cold season and when an iodine-containing udder disinfectant is used. Iodine concentration in milk strongly depends on iodine concentration in feed, and this was demonstrated at a large range of supplementation concentrations. Comparing different dairy products, the study found higher iodine concentrations in hard cheese compared to fresh dairy products and milk, demonstrating the effects of processing on iodine content in the final product.

Motivation

Iodine deficiency is estimated by WHO to be the leading cause of preventable mental retardation worldwide. Along with iodized salt, milk and dairy products are the main iodine sources in Switzerland. Without this important contribution, the Swiss population would be iodine deficient, especially vulnerable groups such as lactating women and weaning infants. However, dairy products are an unpredictable source, as the concentrations in milk vary widely between seasons, feeding practices and production methods. As milk and dairy products may increasingly gain importance as iodine sources due to the Swiss Salt strategy that aims to reduce salt consumption in an effort to preventing chronic cardiovascular diseases, it is important to characterize the source of iodine variation in milk and dairy.

Objective

The objectives of this project were: 1) to examine milk iodine concentration and its potential determinants in milk from organic and conventional farms; 2) to assess the dose-response relationship between feed and milk iodine, to identify potential iodine losses during the manufacture of cheese and yoghurt as well as cheese ripening, and to investigate the effect of heat treatment and skimming on milk iodine content; and 3) to measure iodine bioavailability from milk. Through the postulation of feeding recommendations for dairy cows and revised guidelines for milking and dairy processing, the project aimed to achieve standardized iodine concentrations in milk and dairy products, in order to ensure an adequate iodine intake for the Swiss population, avoiding both deficiency and excess.

Image 1: Sampling cheeses to measure Iodine content

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Research Highlights

In Swiss farms, the median milk iodine concentration was 87 µg/L with farm type (organic versus conventional), season and udder disinfection with an iodine-containing disinfectant as significant predictors of milk iodine. Milk iodine increased linearly with feed iodine, and this linearity was reached after about 3 weeks of feeding. Heat treatment had no effect on milk iodine, while skimming increased milk iodine by 1-2 µg/L, a difference that is nutritionally irrelevant. Further, during milk processing, about 80% of the iodine present in milk was lost in whey at curd separation. Nevertheless, dairy iodine increased linearly with milk iodine and cellar ripening did not influence the iodine concentration of hard cheeses (Figure 1). The iodine bioavailability from milk was found to be about 90%, making milk iodine highly bioavailable.

Relevance to Stakeholders

Findings highlight the challenges of reducing variations in milk iodine concentration to allow milk to become a more predictable iodine source in the Swiss diet across all seasons by ensuring adequate iodine levels and avoiding iodine excess through milk and dairy products. Controlling the iodine exposure caused by diverse farming practices might be one method to reduce variability. This can be achieved by adding a defined amount of iodine to mineral feed, and by banning the application of iodine-containing teat disinfectants. If milk iodine can be stabilized to about 150-300 µg/L, which is achievable by daily supplementing dairy cows with 1-2 mg iodine per kg dry matter, milk and dairy products could potentially contribute about 25-50 % to the adult iodine recommended daily allowance in Switzerland. Besides optimizing fodder composition, final iodine content in cheese can be improved using iodized salt for addition into curds or brining.

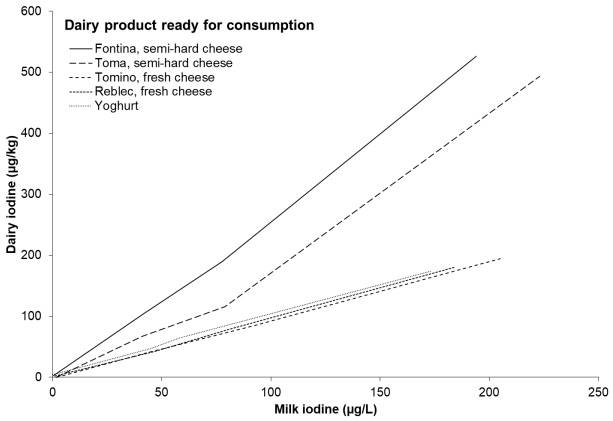

Figure 1: Iodine concentration in dairy products as ready for consumption by iodine concentration in the milk used for the dairy of production (Source: van der Reijden, BJN, 2019)

Selected Publications

van der Reijden, OL.; Galetti, V.; Hulmann, M.; Krzystek, A.; Haldimann, M.; Schlegel, P.; Manzocchi, E.; Berard, J.; Kreuzer, M.; Zimmermann, MB.; Herter-Aeberli, I. The main determinants of iodine in cow's milk in Switzerland are farm type, season and teat dipping. ***Br. J. Nutr.*** **2018**. 119: 559-569.

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Media

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https://worldfoodsystem.ethz.ch/research/research-programs/CRP/miod.html

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