



Increased phytoestrogen content in organic milk and the biological importance

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Interest in phytoestrogens has increased in the past years after a wealth of scientific data have shown that phytoestrogens possess potent and wide-ranging biological activities (**see also box 1**). Phytoestrogens may protect against development of certain diseases including cancer (breast-, prostate-, and colon-cancer), cardiovascular disease and osteoporosis as well as other hormone-dependent conditions like menopausal symptoms (Cornwell et al., 2004).

Epidemiological studies and experimental data from animal studies suggest significant health beneficial effects on these diseases and, e.g., the incidence of breast- and prostate cancer are lower in countries with high amounts of phytoestrogens in the diet. Phytoestrogens as dietary supplements have been on the market in USA and in some European countries for some years.

On this background it is very interesting that organic milk may contain phytoestrogens in higher concentrations than conventional milk.

Phytoestrogens in leguminous plants

Especially leguminous plants such as clover, lupin, and peas, but also cereals, nuts, vegetables and berries contain natural high amounts of phytoestrogens. As the use of leguminous plants has increased in organic milk production, plants like clover and lupin are potential sources of phytoestrogens in milk and therefore also in consumers of milk and milk products.

Higher content of phytoestrogens in organic milk

Milk samples were collected as bulk milk from 7 conventional and 10 organic farms in the period October 22-25, 2002. The content of isoflavonoids was measured by a LC-MS/MS method validated by the use of internal standards. A final validation with isotope-labelled compounds may change the absolute values, but not relative differences.

The results of the preliminary studies show significant differences in the content of phytoestrogens between organic and conventionally produced milk. As examples the mean content of equol (**Figure 1**) was five times higher in organic milk than in conventional milk (948 and 169 nmol per liter, respectively). The mean content of daidzein (**Figure 2**) was more than three times higher in organic milk than in conventional milk (10.2 and 3.1 nmol per liter, respectively).

The content of equol and daidzein varied significantly between the different farms, but it was the same six organic farms that had the highest content of both phytoestrogens. The differences are possibly a result of differences in the diets of the cows.

Equol is of special interest

Equol is a phytoestrogen of special interest because hypotheses suggest that equol itself may directly exert cancer preventive effects (Sathyamoorthy & Wang, 1997). Equol does not exist in plants but is produced from daidzein by bacteria in the human intestine. However, only about one third of the Western populations can produce equol, likely due to the large inter-individual variability in the intestinal flora. On this background one of the hypotheses is that people that can produce equol may have a reduced risk for breast cancer. Therefore, the higher content of equol in organic milk is of special interest in prevention of for instance breast cancer.

Need for further studies

Only a few studies have examined the content of phytoestrogens in milk from cows. Besides our preliminary studies we are only aware of results from conventional farms in Finland, France and Australia. These studies showed varying but generally low concentrations of phytoestrogens in accordance with our studies of conventional milk.

The Australian study, however, showed that conventional milk collected from cows on pasture in the spring had a content of equol at the same level as organic milk from Danish herds. Therefore, there is a need to investigate the content of phytoestrogens in both organic and conventional milk in Denmark and the nutritional factors of importance for the phytoestrogen content.

The preliminary results from the 17 farms are not representative for all organic and conventional farms, as the variation between different farms was significant (**Figure 1** and **Figure 2**). Furthermore, the studies only included some of the many different phytoestrogens.

To understand the importance of the phytoestrogens for the potential health-beneficial effects of organic milk, it is important increase our knowledge about the content and biological effects of phytoestrogens in organic milk. As the phytoestrogens always are found in mixtures, it is important also to focus on biological effects of these mixtures of phytoestrogens. Furthermore, it is important to study the possible interactions between phytoestrogens and other bioactive compounds in the milk when the health-beneficial effect of organic milk is studied.

References

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