

Organic milk:

- Differs from conventional milk:
 - Higher proportion of forages in the ration
 - Higher proportion of legumes and other herbs (not so much grass)
 - No mineral fertilizer – crude protein concentration may be lower or higher depending on the proportion of legumes
- Limited knowledge of the chemical and sensory characteristics
- ▼ Organic milk is more and differently affected by forage than conventional milk.

Anne-Maj.Gustavsson@slu.se

CORE organic

PhytoMilk

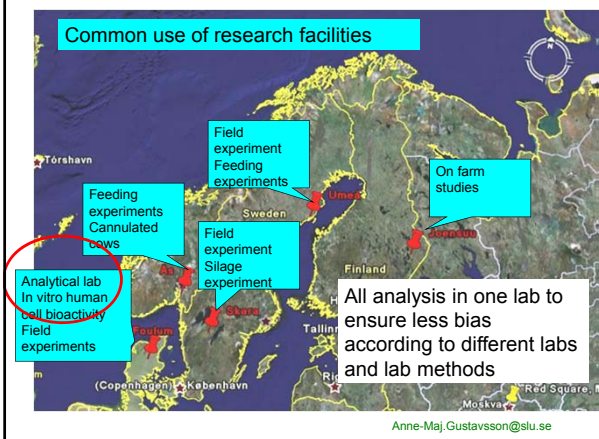
Potential improvement of the salutary effect of organic dairy milk by forage species and by supplementation

Anne-Maj Gustavsson, SLU, Sweden



Anne-Maj.Gustavsson@slu.se

Common use of research facilities



Anne-Maj.Gustavsson@slu.se

We have studied the whole chain

- Forage crop and environmental conditions
- Silage preservation
- Different milk production systems
- Cannulated cows
- Milk properties
 - Shelf stability (oxidation stability)
 - Bioactive components and biological activity
 - Human health

Anne-Maj.Gustavsson@slu.se

“There is a number of ingredients in milk that may be salutary (healthy)”

Bioactive components are for example:

- Fatty acids (omega-3, omega-6, CLA)
- Vitamins
 - Carotenoids (Vitamin A)
 - Tocopherols (Vitamin E)
- Phytoestrogens (e.g lignans; isoflavonoids)
- Endogenous hormones and growth factors (eg. estradiol, IGF-I and TGF- β)
- Se - low content in organic Nordic milk – very little in the soil

Anne-Maj.Gustavsson@slu.se



2-3 main results

Take home messages

Anne-Maj.Gustavsson@slu.se

"There is a number of ingredients in milk that may be salutary (healthy)"

Bioactive components are for example:

- Fatty acids (omega-3, omega-6, CLA)
- Vitamins
 - Carotenoids (Vitamin A)
 - Tocopherols (Vitamin E)
- Phytoestrogens (e.g lignans; isoflavonoids)
- Endogenous hormones and growth factors (eg. estradiol, IGF-I and TGF- β)
- Se - low content in organic Nordic milk – very little in the soil

Anne-Maj.Gustavsson@slu.se

We have not analysed all data yet with full statistical models

PhD students 4 years - We have fundings for three years :

Annika Höjer - have one year left - will have her dissertation in October 2012

Steffen Adler - has become a father – have parental leave for 6 month – will have his dissertation in 2012

Anne-Maj.Gustavsson@slu.se

Phytoestrogens in milk

- Organic milk production
 - More forage
 - Need more legumes for N-fix



Anne-Maj.Gustavsson@slu.se

The farmers possibilities to chose

- 40 % red clover + grass
 - Intake: 70-75 g per day
 - 1.4 mg/kg milk
 - Mostly isoflavonoids - equol
- 16 % birdsfoot trefoil + grass or 31 % white clover + grass
 - Intake: 3-4 g per day
 - 0.4-0.2 mg/kg milk
 - Mostly lignan – enterolactone, enterodiol

Anne-Maj.Gustavsson@slu.se

Phytoestrogens are positive?

- As far as we know now
- If there are some negativ things?
- There is possibilities to chose level in the milk

Anne-Maj.Gustavsson@slu.se

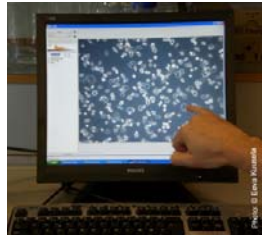
The farmer can chose the concentration of phytoestrogens in organic milk

- Species: Red clover/white clover/birdsfoot trefoil (or other eg. lucerne – not investigated here)
- Cultivars? Do cv. Betty have higher concentration than cv. Bjursele?
- Differences between cows (rumen microflora? Breeds?)
- Harvest time (decrease with development)
- Proportion of legume/grass (need N-fix)

Anne-Maj.Gustavsson@slu.se

Bioactivity of milk

- Choosing relevant cell-based models
- Choosing sample preparation method
- Choosing endpoints



Anne-Maj.Gustavsson@slu.se

Phytoestrogens in the milk

- Have the potential for inhibitory effects (eg. pure equol)
- Have anti-inflammatory effects
- We found no difference in proliferative effects of whey (milk without fat) between the diets
- But additions of milk clearly inhibited proliferation of breast cancer cells
- = milk had antiestrogenic effect independent of dietary treatment

Anne-Maj.Gustavsson@njv.slu.se

Fatty acids

Red clover:

- Had increased levels of PUFA, especially α -linolenic acid

SILAGE with red clover:

- Reduced biohydrogenation of unsaturated fatty acids in the rumen
- Not obtained when GRAZING red clover



Anne-Maj.Gustavsson@njv.slu.se

Selenium

- Se concentration in organic milk is doubled if using Se yeast
- Selenite gave only low concentrations in the milk

Anne-Maj.Gustavsson@njv.slu.se

Main end users

- Other researchers
- Advisors and farmers
- Dairy industry
- Decision makers
- Students

Anne-Maj.Gustavsson@njv.slu.se

Other researchers

- Reviewed scientific papers
 - 3 published
 - 2 accepted
 - 1 submitted
 - 1 manuscript (January 2012)
 - 6 in preparation (Spring 2012)

Anne-Maj.Gustavsson@njv.slu.se



Deliveries
The publication from this project is like a bottle of ketchup

- Everything comes at the same time

Anne-Maj.Gustavsson@slu.se

Other researchers

- Scientific conferences
 - EGF congress – 2 oral; 1 poster; 500 participants
 - NJF (nordic and baltic) – 3 oral; 5 posters; 100 participants
 - EAAP – 1 key note speaker; 2 poster; 500
 - Legum conference in Ireland; 1 oral; 100 participants
 - Final workshop of Phytomilk; 8 oral; 40 part.

Anne-Maj.Gustavsson@slu.se

Decision makers; Advisors; farmers; students

- National conferences and workshops
- Small presentation at meetings with dairy industries and feed companies
- Final seminar of PhytoMilk
- Leaflets (will be done when the results are scientifically confirmed)
- Presentations for students
- New home page. The old was very popular (10-20 hits/day)

Anne-Maj.Gustavsson@slu.se

In which countries can your results be used and how?

- All countries where red clover, white clover and bordfoot trefoil is used (farmers; researchers; dairy industry; advisors; general public; decision makers; students)
- Improved the methods for bioactivity studies in milk – can be used everywhere

Anne-Maj.Gustavsson@slu.se

Many thanks to CORE organic and to the national funding bodies for funding this project!

Many thanks to ICROFT!

Many thanks to all we have collaborated with!




CORE organic

Anne-Maj.Gustavsson@slu.se