Equol as phytoestrogen metabolite in animal products! How and what is the interest for the consumer?

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* Project funded by Moerman funds

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The context

Producer’s point of view
Economic crisis → Farmers need to secure their products in terms of quality, quantity and costs

Industrial’s point of view
Manufacturers are interested by new differentiated quality products which could be checked before being sold

Consumer’s point of view
Environment, health and animal welfare (Agriculture perception improvement)

Why not enrich animal products with phytoestrogens?
**Introduction**

**Phytoestrogens***

- They are polyphenolic compounds present in plants and which contribute to the plants development.
- They are structurally or functionally similar to mammalian estrogens which allows them to have estrogenic activity.
- They are essentially present in Leguminosae (soja, clover, etc.).

Causing infertility in livestock and possible impaired reproductive processes in humans.

Acting as antioxidants and/or anti-inflammatories. Reducing atherosclerosis, osteoporosis, severity and frequency menopausal symptoms, etc.


Introduction

**Equol**: Microbial metabolite produced by specific intestinal bacteria.

**Beneficial effects**:

- Acting as antioxidants,
- Reducing atherosclerosis, osteoporosis, severity and frequency of menopausal symptoms,
- Helping to prevent the onset of prostate cancer and to decrease bone resorption in postmenopausal women.

**Equol-producers** → 1/3 of Western population & 2/3 of Asian population.


**PhytoHealth**: Phytoestrogens-rich plants to improve the biosynthesis of equol

Development of analytical methods

- Optimization
- Validation
- Selection
- Routine use

Phytoestrogens-rich plants improve the biosynthesis of equol through the development of analytical methods. The cycle includes optimization, validation, selection, and routine use.
PhytoHealth:

Development of fast and easy to use analysis methods to detect phytoestrogens and their microbial metabolites in different samples.

For a better understanding of phytoestrogens metabolization in dairy cows in order to create a controlled production where the milk would be naturally enriched in equol.
What is the equol concentration in Belgian milks?

Results of a first screening…
What is the equol concentration in Belgian milks?

- Optimization and validation of Ultra-Performance Liquid Chromatography method with tandem mass spectrometry *

Random sampling & storage at -18°C (max. 2 months)
Enzymatic hydrolysis (β-glucuronidase, 2 h & 37°C)
Double extraction Liq./Liq. (Hexane → remove fat & ethyl acetate → recover interest compounds)
Evaporation & reconstitution in methanol 80%
UPLC®-MS/MS analysis

* Sep2013 : Validation d'une méthode d'analyse quantitative de l’équol dans le lait par UPLC-MSMS. (http://orbi.ulg.ac.be/handle/2268/149435)
What is the equol concentration in Belgian milks?


- UK conventional milk (10 ng.mL⁻¹)
- France conventional milk (36 ng.mL⁻¹)
- Finland conventional milk (62 ng.mL⁻¹)
- Finland organic milk (411 ng.mL⁻¹)
- France organic milk (191 ng.mL⁻¹)

* Journées3R2013: Détermination de la teneur en équol dans les laits commercialisés en Wallonie (Belgique)
What is the impact of skimming and microfiltration process on equol concentration in milk?

* Journées3R2013: Détermination de la teneur en équol dans les laits commercialisés en Wallonie (Belgique)
Conclusion and perspectives

Development of analytical methods for a better understanding of phytoestrogens metabolization in dairy cows in order to naturally enriched milk with beneficial compounds for human health.

- Equol was always present in milk.
- No difference between whole, semi-skimmed and skimmed milks.
- Equol content was higher in organic milks than conventional milks. (? agricultural practice influence ?)
- Variability between countries and between farms.
- Skimming and microfiltration had no impact on equol concentration in milks.
• Development, optimization and validation of analytical methods to quantify equol and its phytoestrogens precursors in several matrices.

• Metabolic and zootechnical trials (*dairy cows*).

• Same approach for laying hens.
Thank you for your attention

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