

MILK-INNO

Milk - new research and R&D innovations

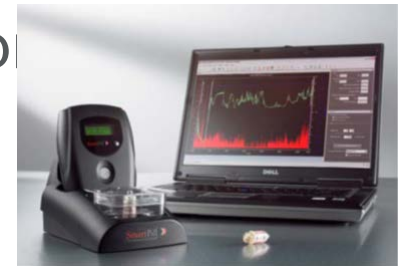
Milk - new research and R&D innovations

aims

- to create knowledge for the development of new milk-based products
- to provide information to identify the optimal production of the final product



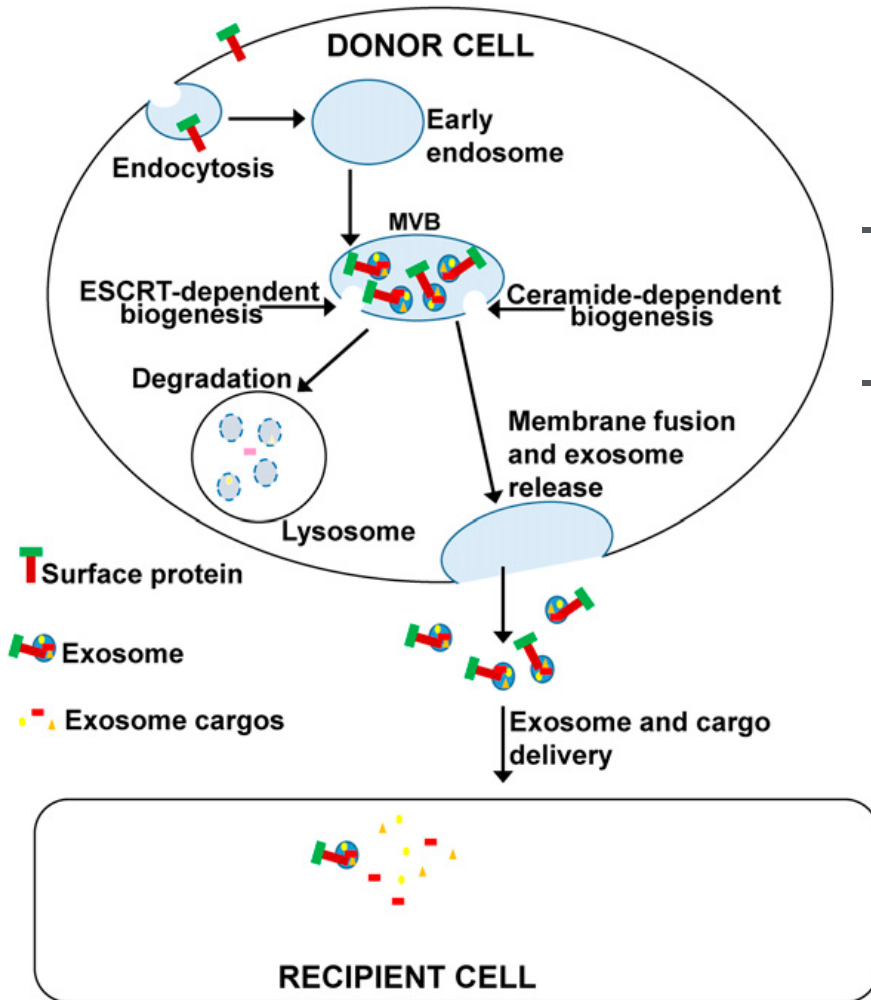
The project covers the entire food chain, from production (feeding, milk production), through processing to the consumer.



Background

- Milk is a good source of several nutrients (gender!)
- Milk contains plenty of bioactive compounds (gender!)
 - Antimicrobial
 - Immuno-enhancing
 - Hormones, growth factors etc.
 - Microbes (contaminants, but also specifically transferred)
 - Genetic material (DNA, nc-RNA etc – part of which packed in exosomes => resistant form for transfer either for neighbour cells or totally other tissues

Exosomes



- Exosomes are specific information packages for the calf
- How does cow information fit to human being?

Figure: Zemleni et al. J Nutr 2017;147:3–10

What shall we study

- How does feed affect exosomes
 - High input
 - Low input
 - Clover (mimicking organic)
- How does processing affect exosomes
 - Separation
 - Homogenization
 - Pasteurization
 - UHT treatment
 - Fermentation
 - Cheesemaking

What have we done so far

- We have collected samples from feeding studies and processed them
- We have tested different extraction methods, and verified that we really got exosomes
 - Particle analysis (NTA NanoSight300, size distribution 50-150 nm), immuno-TEM
 - Protein analyses (just started)
- Next: DNA and RNA extraction and sequencing => Bioinformatics => pathway analyses

Our yield in a test tube

Ultracentrifugation and filtration



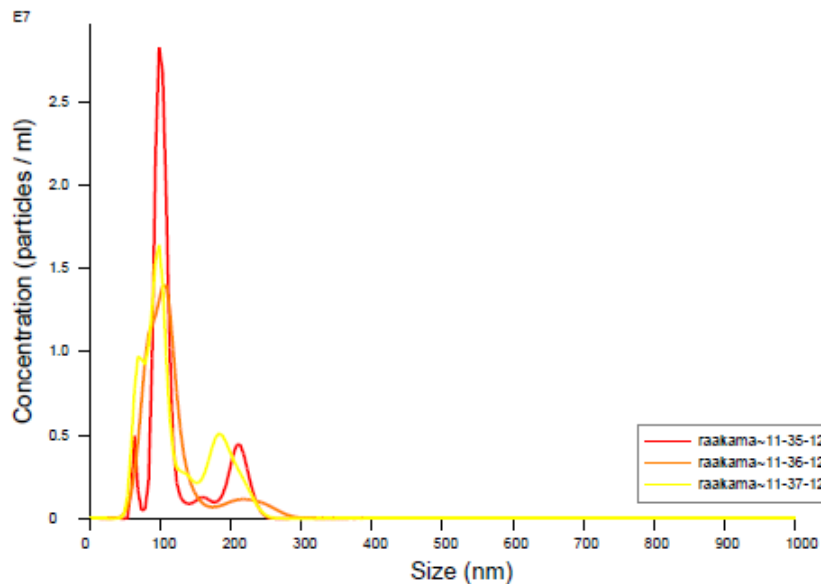
Kuva: Tuija Peltomäki, Luke

Also Commercial kit "Total Exosome Isolation", (Invitrogen) – results not shown

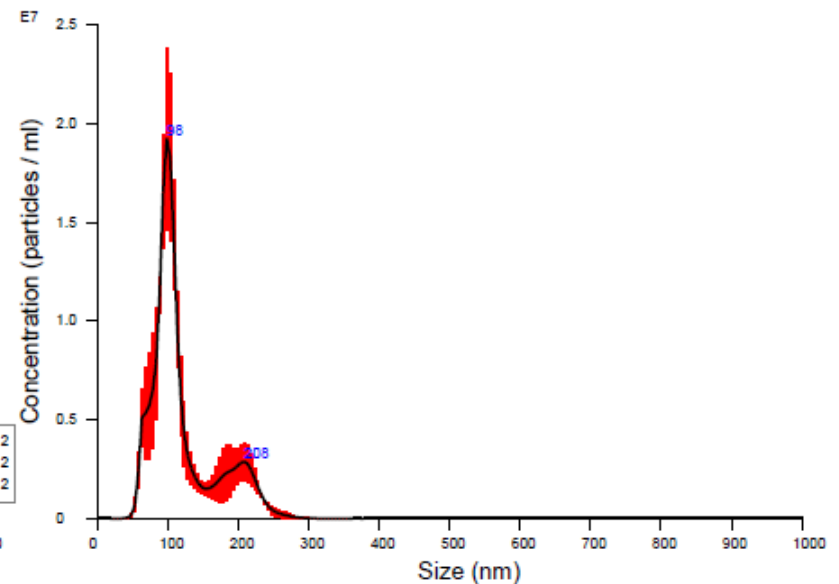
Milk nanoparticles, Ø 50-150 nm

NANOSIGHT

raakamaiyo_kit_10000_fm 2016-11-22 11-34-50



FTLA Concentration / Size graph for Experiment:
raakamaiyo_kit_10000_fm 2016-11-22 11-34-50



Averaged FTLA Concentration / Size for Experiment:
raakamaiyo_kit_10000_fm 2016-11-22 11-34-50
Error bars indicate + / -1 standard error of the mean

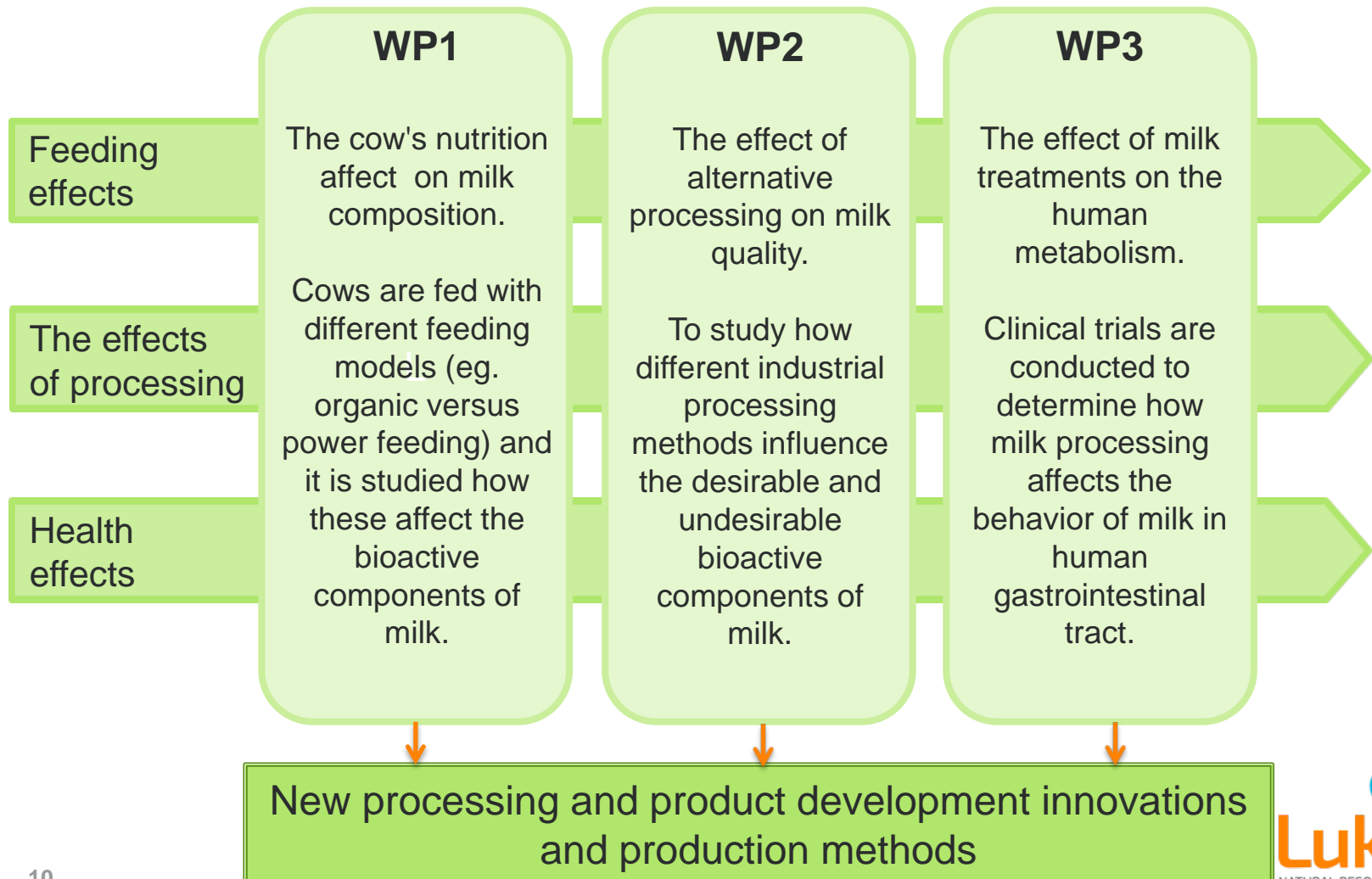
What shall we study in clinical study

- Does processing affect experienced stomach disturbances
 - Pasteurized milk
 - Homogenized pasteurized milk
 - Homogenized UHT milk

Aim: 15 – 20 test persons, single exposure to each milk, blood sample collection for five hours, study diary two days

- 10 persons so far

The main content and connections of the Milk-Inno project work packages, Figure 1.



Project organization and steering group

Project organization

Leader Luke:

Tuomo Tupasela (project leader)

Sirja Viitala

Raija Tahvonen

Johanna Vilkki

+ technical staff

Other partners:

University of Turku

City Hospital of Turku

Project duration: 2016-2019

Steering group

Suvi Rynänen, MMM

Petri Koskela, MMM

Leena Ala-Orvola, MTK

Anu Turpeinen, Valio

Aila Vanhatalo, University of Helsinki

Erkki Vasara, Finnish small cheese makers association & Lukes Customer Manager in Food and Commerce

Connections to other projects

- The research is closely related to the research project funded by the Academy of Finland “*Global network for the development and maintenance of nutrition-related strategies for mitigation of methane and nitrous oxide emissions from ruminant livestock*” (2015-2018), which is involved in the EU Program for Agriculture, Food Security and Climate Change (FACCE JPI) coordinated by MMM and SA and “*Natural Secreted Nano Vesicles as a Source of Novel Biomass Products for Circular Economy*” SA BioFuture 2025 programme