PhD Course
Food Science (Università degli Studi di Napoli Federico II - 33° Ciclo)

Title
LOw LActose products: Healthy and Valuable (LOLAHV)

Potential tutors
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Objectives and multidisciplinary collaborations
The objectives of the project are:
- Define how different processes for low lactose (LL)/lactose free (LF) milk production affect the formation and release of volatile compounds at each production stage and during the shelf-life.
- Investigate the impact of LL or LF ingredients in a model product (e.g ice cream) on perceived sensory quality, particularly on flavour and textural profile.

The project will be carried out using the competencies and facilities of the Sensory Quality group at Foundation Edmund Mach (FEM, San Michele all'Adige), the Food Quality and Design group at Wageningen University (WUR) and the Food & Health Group at University of Naples "Federico II" (UNINA).
The Sensory Quality group at FEM has expertise in both sensory analysis and chemical analysis of the foods and will coordinate the research project.
The Food Quality and Design group at WUR has expertise on new food design and will be in charge of the design and development of a new LL or LF dairy product, i.e. an ice cream model.
The Food & Health group at UNINA has expertise in the development and validation of efficacy of healthy food and will be involved in the assessment of some mediators of the taste perception in samples collected at FEM.
The multidisciplinary project relies on established reference methods (Descriptive analysis for sensory analysis, gas-chromatography for volatile compound detection, LC/MS/MS for biological mediators of taste perception, rheology for texture properties) and innovative and more rapid methods (rapid and dynamic sensory profiling methods, texture analyser and PTR-ToF-MS fingerprinting).

Progress beyond the state of the art
Lactose is present at high concentration in mammals milk and lactase is the enzyme responsible of lactose digestion in the small-intestine.
Although it is always present in the newborns the activity of lactase decreases after weaning leading to lactose intolerance condition in adulthood. In Caucasians a specific mutation allowed the persistence of lactase in adults but around 70% of the world population has non-persistence lactase. In northern Italy, 46% of the population has lactase persistence.
Low Lactose (LL) or Lactose Free (LF) products are the technological solution to this issue. Beside the presence on the market of milk products labelled as "Lactose free and at high digestibility" the development of LL and LF dairy products (such as cheese or ice creams) from local producers needs scientific support to get quality optimization.
Sensory analysis is the only direct method to measure food perceived quality but it is time expensive and not suitable for screening large sample sets. The project proposes a complementary approach based on instrumental analyses of flavour and texture parameters

and on simplified methods of sensory analysis. This plan will allow firstly, to identify key sensory features and, secondly, to define instrumental markers of perceived quality with possible technological relevance.
The activity relies on a multidisciplinary approach which, *in se*, is a novel concept and in particular on the implementation of new approaches (rapid and dynamic sensory profiling, rheological and PTR-MS analysis) with a threefold contribute to the advancements in the field: it will provide i) new insight in the chemistry of LL or LF milk production, ii) new data on enzymes and process implementation for LL or LF products and iii) new data on the perceived quality of LL or LF products.

Research funding

The research project will be conducted with FEM and WUR institutional fundings.

Collaboration with foreign institutions

The project will be carried out with the collaboration of the Food Quality & Design Group at Wageningen University that will host the PhD student for at least 6 months.