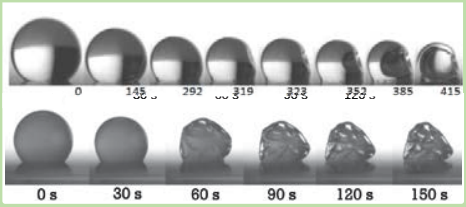
Food Science Cluster

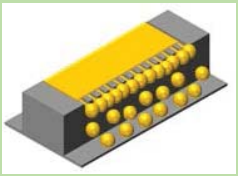
WAGENINGEN
UNIVERSITY & RESEARCH

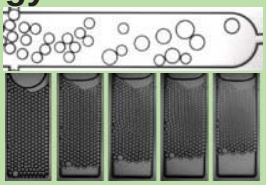
Food Process Engineering

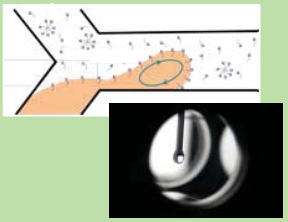
Microtechnology



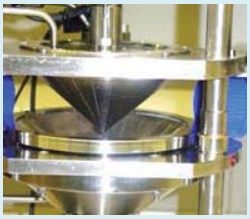
single droplet drying


low energy emulsification


microfluidic toolbox to study emulsions

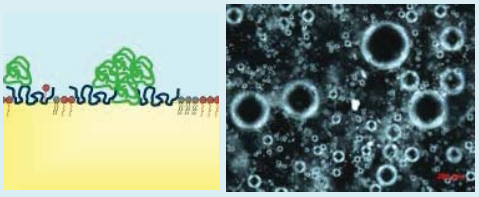

interface characterization

Structure Formation

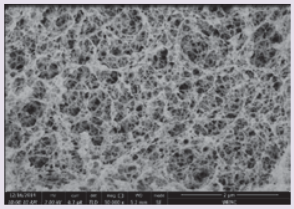

new generation of reactors

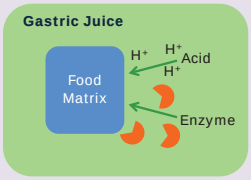

plant-based fibrous structures

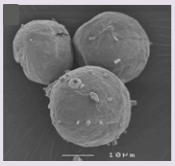

3D-printed food

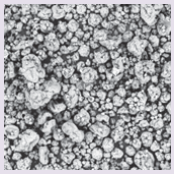

interface nano-engineering in emulsions

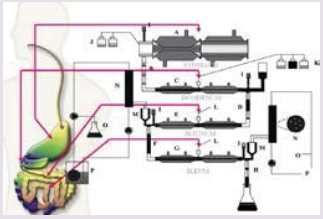
Processing for Health


mechanistic understanding of the process of digestion

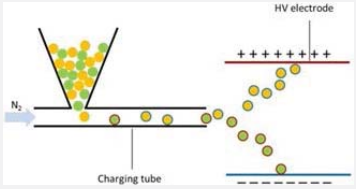





micronutrient encapsulation

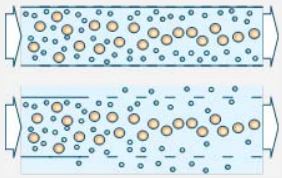

digestion: engineering perspective

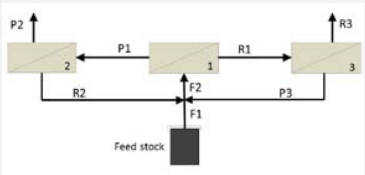
Functional Fractionation



dry fractionation

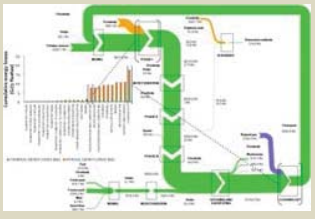
mild separation

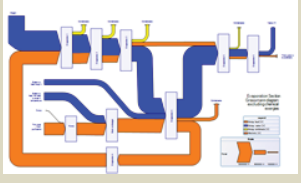

new membrane separation principles

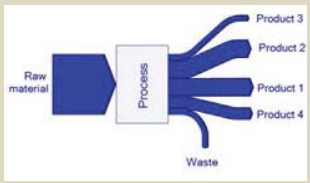


cascade separation

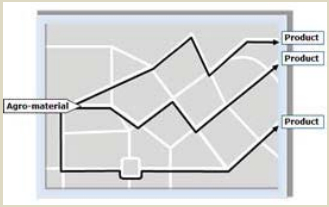
Sustainable Process Chains


thermodynamic analysis of food processes and chains





towards complete utilization of agro-materials



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We investigate phenomena on the micrometre scale, and based on the insights gained, develop new technologies for the production of food and food ingredients.

Contact: karin.schroen@wur.nl
claire.carabin-berton@wur.nl

Foods should be healthy and sustainable, without compromising their sensory attributes. We engineer new food structures, from healthy and sustainable ingredients, with a focus from the nano-scale to the macro-scale.

Contact: atzejan.vandergoot@wur.nl

We design food structures that have a controlled fate upon digestion, and we try to understand the involved phenomena by considering the digestive tract as a bioreactor where transport equations can be applied.

Contact: anja.janssen@wur.nl

Motivated by the need for more efficient food processing technologies, we develop processes for the sustainable production of functional fractions (e.g., protein-rich fractions).

Contact: maarten.schutyser@wur.nl

Did you say ‘food waste’? In our view, this should not exist; instead, new processing routes can be synthesized for an eco-effective production of food.

Contact: remko.boom@wur.nl
albert.vanderpadt@wur.nl

Mission Food Process Engineering

We explore new principles for preparing food structure and food ingredients.
Scientifically, we aim at an improved understanding of the dynamics of dispersed fluids and solids (relevant to food production); and at translating the insights gained towards processes for sustainable production of foods and food ingredients.
Societally, we aim at finding processes that are significantly more sustainable, to produce foods that combine excellent taste with better nutrition.

Education

BSc courses
Food Production Chains
Mathematical Concepts for Food Technology
Food Production and Preservation
Food Engineering

MSc courses
Food Structuring
Transfer Processes
Sustainability in Food Chains
Sustainable Food and Bioprocessing
Food Digestion: Ingestion and Structure Breakdown

Food Process Engineering
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Food Chemistry

Food carbohydrate biochemistry

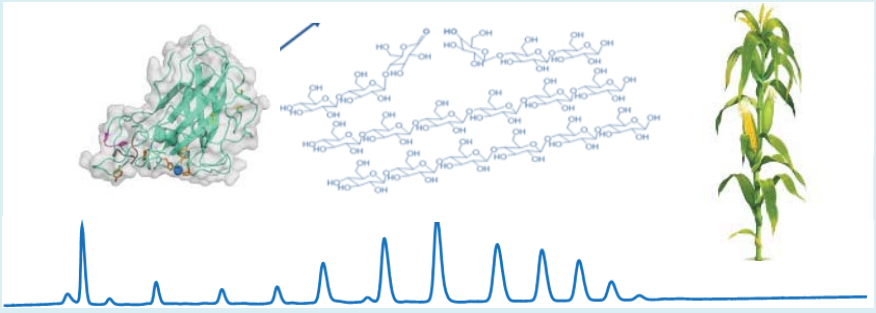
sources of carbohydrates

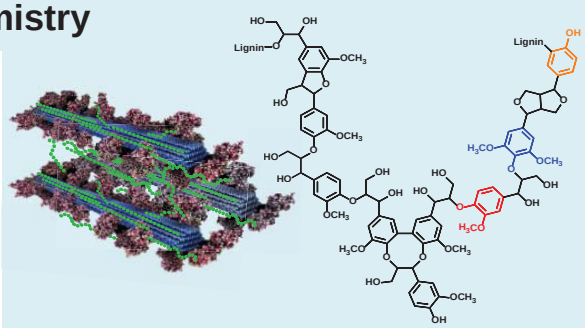
digestion versus fermentation

milk oligosaccharides and prebiotics for baby's health

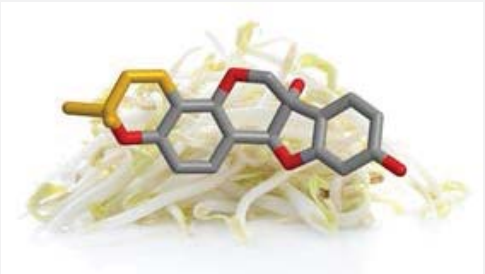
fermentation in the large intestine

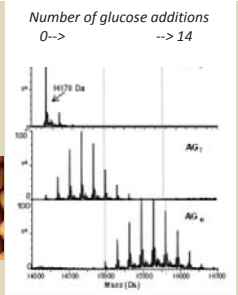
Lignocellulosic biochemistry





Phytochemicals biochemistry

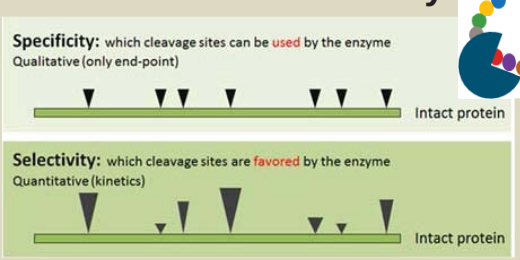


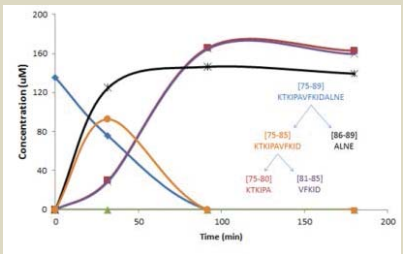


sources

modifications (Maillard)

Protein biochemistry





unravelling the mechanism of enzymatic protein hydrolysis

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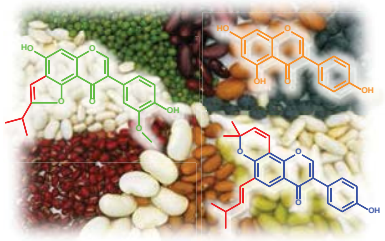

Carbohydrates in foods include small sugars but also oligosaccharides and polysaccharides, added as functional food ingredient or originating from the fruit, vegetable or cereal based raw material. Focus is on the chemical fine structure of these molecules as well on their fate during digestion and fermentation in the gastrointestinal tract.

Contact: henk.schols@wur.nl

Understand at a molecular level degradation of lignocellulosic biomass, in particular fungal or enzymatic conversions. Focus is on lignin structures and use of oxidative enzymes, such as LPMOs and laccases. Conversions of both lignin and carbohydrates are studied, which contributes to resource use efficiency.

Contact: mirjam.kabel@wur.nl

Phytochemicals from various plant materials are characterized. Modifications are done by enzymes, light, fermentation, or germination under stress. The relation between the structure of purified molecules and health, colour, taste, and antimicrobial activity is determined, together with, if possible, their mode of action.

Contact: jean-paul.vincken@wur.nl

The effect of processing on the biochemical and physicochemical properties of proteins is studied in raw materials, ingredients and foods. Topics cover enzymatic hydrolysis and quantitative peptide analysis, Maillard induced modifications, and foam- and emulsifying properties of known and novel proteins.

Contact: peter.wierenga@wur.nl

Mission Laboratory of Food Chemistry

Knowledge of compounds present in agricultural raw materials, food ingredients, and their modifications for application as food/feed or building blocks for biochemical.

Education

BSc courses
Nutritional aspects of foods, Basics in food technology, Food chemistry, Food properties and function

MSc courses
Food related allergies and intolerances, Food ingredient functionality, Advanced food chemistry, Enzymology for food and biorefinery, Advanced biochemical analysis of foods.

PhD courses
Industrial food proteins, Advanced food analysis, Glycosciences, Food and biorefinery enzymology

Endowed Chairs

Cereal protein technology: rob.hamer@wur.nl

Immunomodulation of foods:
harry.wichers@wur.nl

Laboratory of Food Chemistry
Chair: Prof. Harry Gruppen
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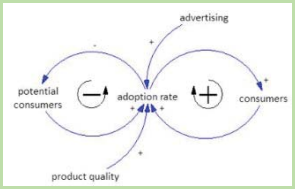
Food Quality and Design

Food Quality and Society

food quality management



system dynamics

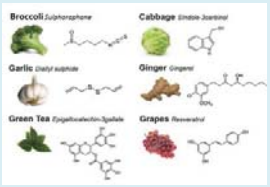

authenticity and fraud


food safety culture

Food Quality and Consumer – 1


consumer practices

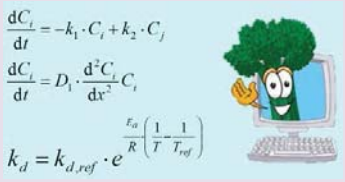

transition countries



phytochemicals


insect foods

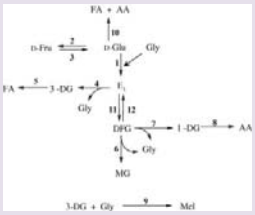
Food Quality and Consumer – 2



food quality modelling


active packaging

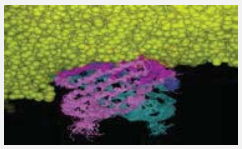

intelligent packaging

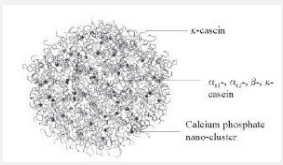


reaction kinetics

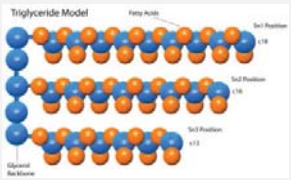
Food Quality and Consumer - 3


quality of infant formula


milk immune proteins

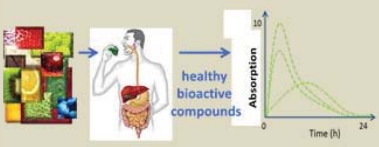


milk variability



fat & cheese quality

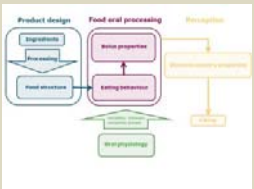
Food Quality and Human Body



design healthy foods


Maillard reaction products


food digestion



oral processing

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FQD studies technical and people related factors on quality management systems, with particular interest in food authenticity, risk-based auditing and food safety culture by innovative methods, like systems dynamics modelling and serious gaming.

Contact: pieternel.luning@wur.nl

FQD's research on Food & Consumer aims to develop food technological solutions to enhance the quality of nutrition. We apply a consumer-oriented approach in which we take the entire food production chain into account to be as effective and efficient as possible.

Contact: ruud.verkerk@wur.nl

Food quality can be efficiently improved by using mathematical modelling tools to study and predict the effects of composition and processing conditions. Studying reaction kinetics in foods is an important part of this. Designing active and intelligent food packaging can enhance shelf life and reduce food waste.
Contact: matthijs.dekker@wur.nl

FQD studies several topics on dairy product quality including: Processing of immune-active proteins for formula, Glycation of milk proteins & cow's milk allergy, Casein composition and casein micelle properties, Structure and physics of milk fat triglycerides

Contact: kasper.hettinga@wur.nl

Foods provide human body macro and micronutrients. We investigate food digestion from the oral cavity through the stomach and the intestine. The aim is to understand the mechanisms of interaction between food components and the gastro intestinal system with a special interest in Maillard reaction products.
Contact: vincenzo.fogliano@wur.nl

Mission Food Quality and Design Group

Our mission is to comprehend food quality from a technological and social perspective.

FQD favours food design and food system management based on interdisciplinary, consumer-oriented research.
Our projects encompass different food production steps, selection of raw material (primary production), transformation (technological aspects), and formulation (bioactive ingredients), and combine them with consumer perception, quality management, and human behaviour.
We apply the latest food science discoveries to industrial product development and to management of food quality. We aim to be catalysts of trans- and interdisciplinary research to ensure societal embedding of results from scientific research.

In all our projects aim at satisfy the emerging need of our three stakeholders: the Society; the Consumers and the Human Body

Education

BSc courses
Business and Consumer Perspectives on Food Quality, Quality Systems Operations, Milk in the Dairy Chain, Food Packaging and Design, Meat Science, Research Topics on Food and Society, a Gamma-Beta Approach, Case Studies Product Quality

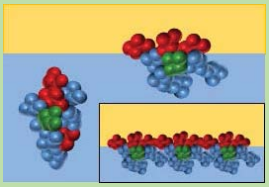
MSc courses
Food Quality Management, Predicting Food Quality, Food Quality Analysis and Judgement, Product Properties and Consumer Wishes, Dairy Science and Technology, Dairy Chemistry and Physics, Food Quality Management Research Principles, Usage Oriented Product Design

PhD courses
Reaction Kinetics in Food Science
Healthy and Sustainable Diets: Synergies and Trade-offs

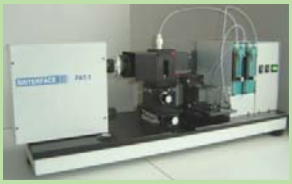
Food Quality and Design Group
Chair: Prof. Vincenzo Fogliano
office.fqd@wur.nl / +31 317 482520
www.wur.eu/fqd

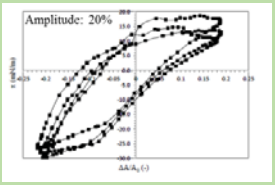
Food Physics

Interface Dominated Materials

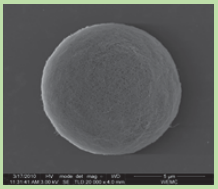


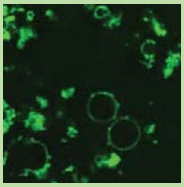
interfacial structure





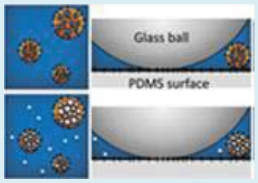
nonlinear Interfacial Rheology



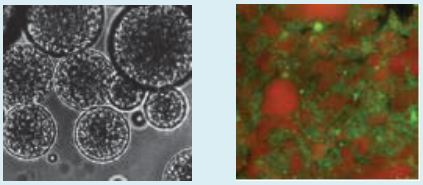


macroscopic stability

Rheology and Texture of Composite Foods



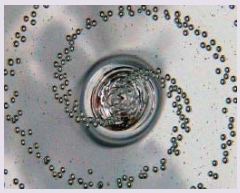
tribology

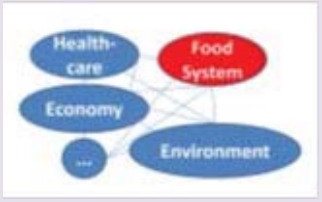


emulsions and emulsion filled gels

fat and oil structuring

Instability and Nonlinear Dynamics in Complex Systems

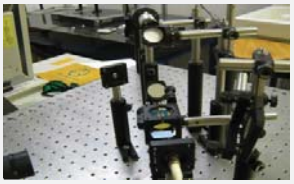




Supramolecular Assembly of Mesoscopic Building Blocks

osmometry

oleogels

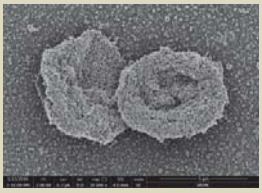


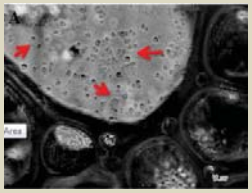
light scattering

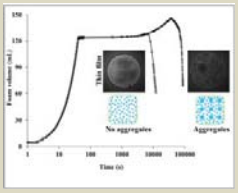
protein fibrils

rheo-optics

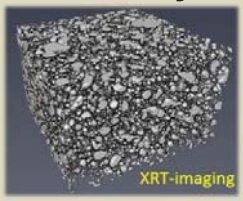
Microstructural and Textural Properties of Dairy Foods

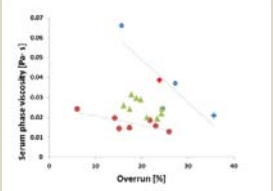






ingredients-microstructure relations in dairy foams





microstructure-functionality relations in ice cream

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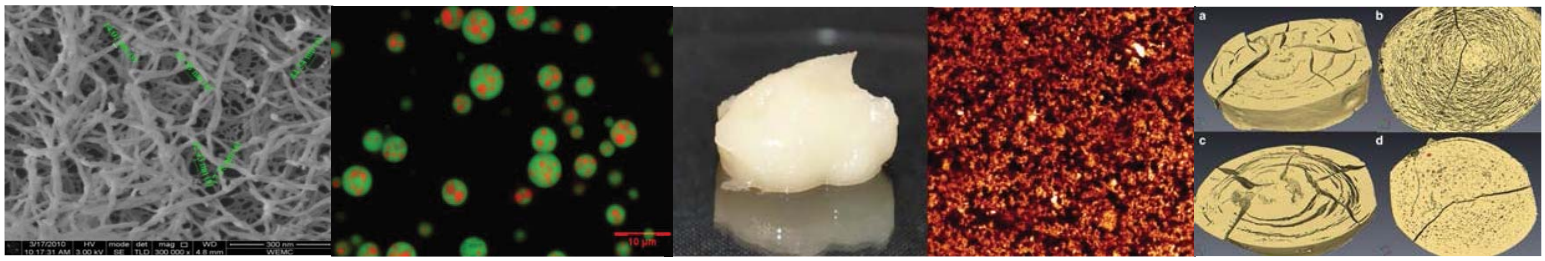


Interface dominated materials, such as highly stable emulsions, foam, and nano- and microencapsulation systems, are developed and characterized with a multidisciplinary approach, combining experiments, theory and simulations.

Contact: leonard.Sagis@wur.nl

Composite foods are engineered at different length scales to alter the rheological, tribological, and sensory properties. Structures are changed by including mechanical contrast, interfacial design, and structured oils with proteins.

Contact: elke.scholten@wur.nl

Using experimental approaches, mathematical models, and statistical physics the instability and dynamics of complex systems, from complex fluids to food systems are studied.

Contact: mehdi.habibi@wur.nl

Mesoscopic building blocks, such as, protein fibrils, protein particles and phytosterol nano-tubules were made and characterized to structure different food products.

Contact: paul.venema@wur.nl,
erik.vanderlinden@wur.nl

Relations between ingredients functionality, microstructure and rheological properties of real foods, particularly of dairy foods, are determined to obtain guidelines to engineer new textures and for reformulation purposes.

Contact: guido.sala@wur.nl

Mission Physics and Physical Chemistry of Foods

We integrate physics, meso-structure design and development, and application-driven research, to enable innovations more effectively.

We aim to:

- deliver fundamental knowledge, new mesostructures, and application concepts, for academic partners, industry and society;
- to educate students to apply such integration in their future careers.

Our focus is on the mesoscale in relation to the molecular and macroscopic scale.

Application areas refer to:

- function (texture, taste, smell, colour, nutrient delivery);
- context (processing, transport, storage, consumption, digestion);
- requirements (sustainability, safety, ingredient availability, reasonable cost).

Education

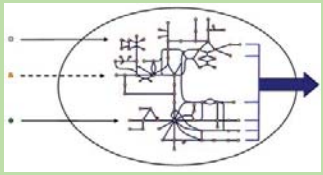
BSc courses
Food Technology I, Physical Chemistry for Food Scientists, Food Physics, Molecular gastronomy, History of Food Production

MSc courses
Advanced Food Physics, Advanced Molecular Gastronomy

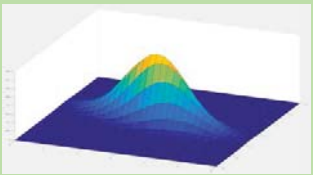
Physics and Physical Chemistry of Foods
Chair: Prof. Erik van der Linden
Els.Jansen@wur.nl / +31 317 485515
www.wur.eu/fph

Food Microbiology

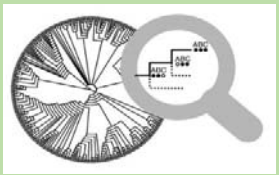
Microbial Systems Biology



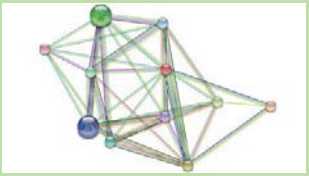
metabolic cell modelling



genotype-phenotype prediction

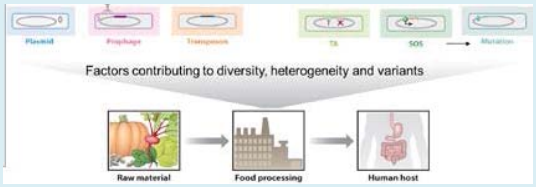


comparative genomics

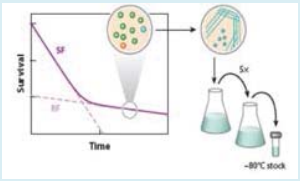


network biology

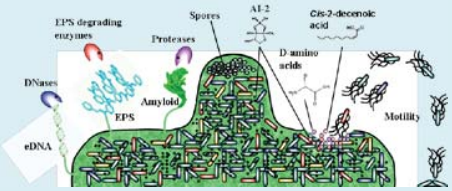
Genomics and Physiology



genotype-phenotype correlations



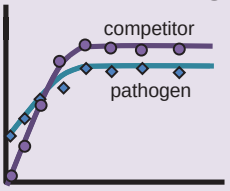
survival and diversity



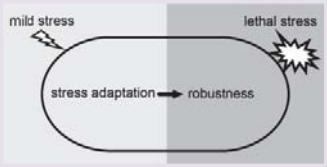
biofilm communities

Pathogen Ecology

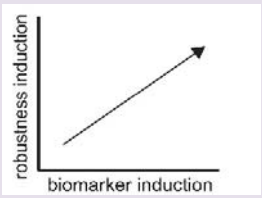
survival and transmission



modelling interaction



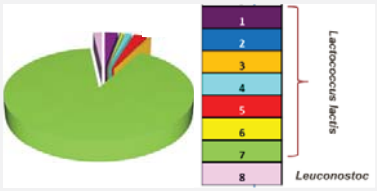
microbe-matrix interaction



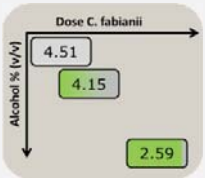
predicting biomarker

Fermentation Ecology

robust and complex starter cultures



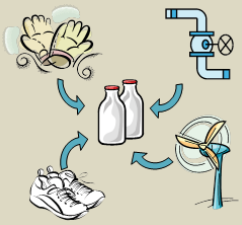
strain diversity analysis



metabolite profiling

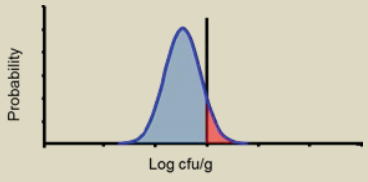
steering functionality

Risk Assessment



contamination

chain wide risk assessment



distributions of risks

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Microbial systems biology aims to predict and understand the molecular mechanisms of cellular physiology and adaptation by integrating metabolic cell modelling, bioinformatics and experiments.

Contact: richard.notebaart@wur.nl

Functional genomics and physiology of food-related micro-organisms aims to characterise microbial stress response and survival strategies including biofilm formation and sporulation using advanced fluorescence single cell techniques.

Contact: tjakko.abee@wur.nl

The ecology of pathogens is studied from single-cell level to ecosystem level and this domain interlinks functional genomics and quantitative microbiology to understand and predict behaviour of pathogens.

Contact: heidy.denbesten@wur.nl

We study the characteristics of fermented food products, delivered by communities of interacting and beneficial microbes through their metabolic activity, survival behaviour and secretion of enzymes in the food matrix

Contact: eddy.smid@wur.nl

Risk of microorganisms in food depends on the prevalence and level of the organism in food and its severity. In our laboratory we study microbial risk assessment throughout the food chain.

Contact: martine.reij@wur.nl,
marcel.zwietering@wur.nl

Mission Laboratory of Food Microbiology

Generate and disseminate genetic and physiological knowledge as well as knowledge of ecology, fermentation and quantitative methods to understand and predict microbial behaviour and to propose intelligent interventions for the assurance of microbiological food safety and quality.

Education

BSc courses
Food Fermentation, Food Microbiology, Food Hazards

MSc courses
Advanced Fermentation Sciences, Advanced Food Microbiology, Food Safety Risk Assessment, Food Safety Management

PhD courses
- Genetics and physiology of food-associated micro-organisms
- Food Fermentation
- Management of microbiological hazards in foods

Massive Open Online Course (MOOC) on Food Safety
https://www.edx.org/course/nutrition-health-part-3-food-safety-wageningenx-nutr103x

Endowed European Chair

Food Safety Microbiology*:* euchair.fhm@wur.nl

Digitals modules on:
- Food Related Hazards
- Good Hygienic Practices
- HACCP
- Hygienic Design
- Food Preservation
- Sampling & Monitoring

www.wageningenur.nl/dl-fsm

Laboratory of Food Microbiology
Chair: Prof. Marcel H. Zwietering
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6708 WG Wageningen

Postal address:
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6700 AA Wageningen

Food Science Cluster

Research groups

Food physics, Food microbiology, Food quality and design, Food chemistry, Food process engineering

Education

Campus based BSc and MSc programs in Food Technology

Online Master in Food Technology: http://www.wur.eu/omft
including campus based laboratory classes

Online modules, also available for professionals:

- Advanced Food Microbiology
- Sustainable Food and Bioprocessing
- Enzymology for Food and Biorefinery
- Advanced Biochemical Analysis of Foods
- Food Toxicology
- Predicting Food Quality
- Product and Process Design
- Advanced Molecular Gastronomy
- Food Ingredient Functionality
- Food Structuring
- Advanced Food Physics

PhD studies

Under VLAG graduate school: https://www.vlaggraduateschool.nl/
Published Theses: http://library.wur.nl/WebQuery/wda?dissertatie/nummer=*\

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