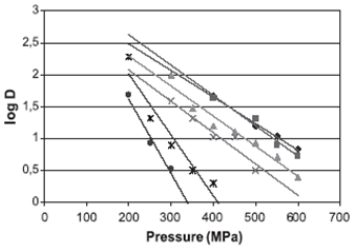
MEET FOOD PRESERVATION INNOVATIONS @ FLANDERS

Report of the 3rd FoodSpot Workshop

Gent, 20th May 2010. **In response to consumers' demands for safe, nutritious, tasteful and high-quality food products, novel preservation technologies and strategies are emerging and starting to find their way to the Food and Drink Industry. However, the novelty of these innovations keeps many companies from directly implementing them into their current practice. The 3rd FoodSpot workshop gave producers of foods and drinks from Flanders, the Netherlands and North Rhine-Westphalia the chance to share their questions and considerations with experts from Flemish public research institutes as well as with cross-border colleagues. The programme encompassed a combination of presentations, practical sessions and networking moments.**

Erwin Lamot, director of Flanders' FOOD and prof. Frank Devlieghere, Head of the Food Safety and Food Quality Department of Ghent University were happy to **welcome** about 45 participants. Erwin Lamot then shortly introduced FoodSpot, the collaborative platform of Food Connection Point, Food-Processing Initiative, Food Valley and Flanders' FOOD aimed at creating a cross-border top innovation food region by stimulating competitiveness and innovation in the food sector. Professor Devlieghere from his site gave a glance at Ghent University and its Interfacultary Centre of Excellence for Food Science, Nutrition and Health (food2know).

The morning seminar started with a talk on '**Microbial inactivation by high hydrostatic pressure (HHP) in foods**' by Chris Michiels, professor in food microbiology at Katholieke Universiteit Leuven. Often, microbial inactivation by HHP pasteurization shows inactivation kinetics comparable to those of thermal processing. However, some bacterial strains (e.g. strains of *E. coli* O157:H7) show deviating inactivation kinetics due to HHP resistance. This can be tackled by combining the sublethal injury effect of HHP with stress factors like for example low pH (e.g. fruit juices) or addition of lactoperoxidase. Further topics that were discussed were HHP-temperature treatment of bacterial spores, use of protective HHP resistant lactic acid bacteria and inactivation of yeasts and moulds by HHP.



A subsequent, complementary, presentation on HHP was given by Marc Hendrickx, professor in food technology at Katholieke Universiteit Leuven. He discussed '**Food quality aspects in relation to thermal and high hydrostatic pressure processing'**. HHP allows to maintain and even generate better structures in processed fruits and vegetables. This is because HHP has a different effect on the activity of different enzymes involved in tissue softening. Pectinase enzymes for example are easily knocked out by HHP, while the texture enhancing methylesterase enzyme is even boosted by HHP. This principle was illustrated for applications in three different temperature/pressure domains: HHP pasteurization of tomato products, (20-50°C/>200 MPa), High pressure shift freezing of carrots (≤ 0°C/<400

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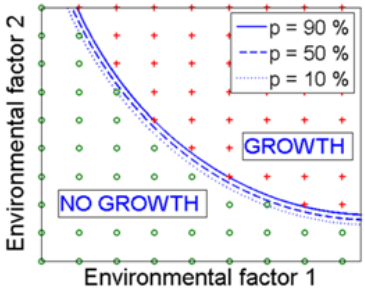
MPa) and High pressure high temperature treatments of carrots (80–100 °C/> 500 MPa). In the latter case HHP showed also to be able to block the chemical depolymerisation (β-elimination) of pectin. Next to structure engineering, HHP also offers opportunities for enhancing the stability and bioavailability of nutrients (e.g. vitamins, lycopene). Within this field, The Laboratory of Food Technology will further focus on intelligent, precision processing approaches for creation of foods and food ingredients with new and improved functional properties.

To round off the section on HHP, an overview was given on the current status of the **implementation of HHP in food industry**. This year a strong rise in installations of HHP industrial machines is seen, with America taking the lead and Europe lagging a bit behind. Most applications are seen in vegetable products (34%), meat products (30%), seafood and fish (14%) and juices and beverages (13%). HHP is used for inactivation of microorganisms and for food quality preservation (colour, flavour, reduction of starch retrogradation) and some particular applications like opening of seafood shells and shellfish meat extraction. Since 2009 pressure-assisted thermal sterilization is approved by FDA. Packaging materials are readily available for HHP ambient temperature treatments. High pressure high temperature and High pressure low temperature (freezing/thawing) processes are currently not exploited at commercial scale.

After a first short coffee break, professor Frank Devlieghere explained that '**Modern preservation is a matter of combining**'. Mild food processing techniques are emerging and starting to find their way to the Food and Drink Industry. This has however consequences for food safety as mild inactivation results into sublethal injury of microbial cells. Furthermore, possible occurrence of microbial resistance against mild treatments can form a problem. These challenges can be tackled by combination technology in which a mild inactivation step is combined with the application of growth inhibiting factors like MAP, pH, aw, … The value of combination technology can be deduced from lab experiments. An example was shown in which treatment of *Campylobacter jejuni* with lactic acid or ClO_2 in combination with O_2-rich atmosphere hampered its surviving and prevented its growth on model systems as well as on real food products. Interestingly, combinations of intrinsic food factors like pH, aw, T and organic acids can be chosen in a way that they act like growth inhibiting factors. To design these combinations, predictive microbiology models are key tools, provided that they are product specific. Finally, it was discussed that challenge test stay necessary but should closely resemble the contamination and the inactivation process in reality.

The last presentation of the seminar session was on '**Predictive modeling for microbial food safety and shelf-life**' by professor Jan Van Impe, head of the division Bioprocess Technology and Control at Katholieke Universiteit Leuven. Predictive modeling is a means for quantifying food safety and spoilage. It is based on the fact that microbial dynamics, which are determined

by environmental factors, can be mathematically described. This allows to predict growth, survival and inactivation of pathogens. The kinetic type of models describe microbial growth/inactivation rate as a function of time and environmental conditions. Another type of models are the probabilistic ones. They describe the chance that a specific microbial event (growth, toxin production, germination) may occur as a function of environmental conditions. Typically, models are developed from experiments with liquid broths. Extrapolation to structured foods has not only to take into account different bacterial behavior (colony growth), but also the effect of food structure as a stress factor and phenomenons like local nutrient depletion. Interestingly, a next generation of predictive models will include growing knowledge on underlying intracellular mechanisms as derived from systems biology.



The lunch break was in a form of talk & eat, and inspired the participants in networking, dialoguing and discussing. Following, Annemarie Nulle introduced the **FOOD2MARKET project** of FoodSpot in which a set of coordinated transnational instruments to guide SMEs from the food sector through their whole innovation process will be established. In the afternoon session '**Hands-on predictive microbiology software packages**', the theory from the morning lecture on modeling became practice. In a computer session, Dr. An Vermeulen and Dr. Eva Van Derlinden (CPMF^2) learned the participants to use a kinetic model to predict and prolong shelf life of a gas packed sliced cooked ham regarding *L. sakei* and *L. monocytogenes*. A probabilistic model enabled participants to determine the chance that *L. monocytogenes* could grow on a chicken curry salad given particular aw, pH, storage temperature and acetic acid contents. Increasing acetic acid concentration and decreasing pH came out as the most efficient ways for avoiding growth of *L. monocytogenes*.

After an afternoon coffee break, three smaller groups were formed, which rotated among three practical workshops. A first one was a lab visit concerning '**Volatile microbial spoilage metabolites**' in which ir. Bert Noseda gave an overview of the infrastructure and research on the isolation and growth of spoilage organisms, the identification and quantification of volatile and non-volatile metabolites and sensory analysis. A second workshop had '**Preservation strategies to inactivate foodborne viruses**' as topic. Via a quiz format, Dr. Leen Baert provided insight into the importance of foodborne viruses (being responsible for 13% of foodborne outbreaks in the EU), their transmission routes and possible reduction strategies. In a third workshop '**A closer look at moulds and mycotoxins**', participants got a short theoretical introduction on the classification of fungi and then prepared microscopic slides from mould-contaminated foods. And yes, some nice hypha and conidiophores appeared, which with some assistance of ir. Nick Deschuyffeleer could be determined as *Penicillium*, *Eurotium* or…

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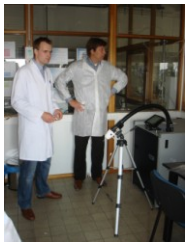
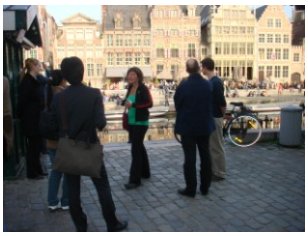


The event was nicely completed with a culinary evening walk in the 'marvelous' old city centre of Gent. Two enthusiastic guides entertained the participants with local stories and brought them to three different restaurants, each serving a different course of the menu. In one word: yummy!






Many thanks to the participants and everyone who contributed to this successful FoodSpot Workshop and looking forward to meet you on one of the following FoodSpot activities.

Steven Van Campenhout

Flanders' FOOD

The workshop was organized jointly with the partners of FoodSpot and research groups from UGent (www.ugent.be/en/), K.U.Leuven (www.kuleuven.be/english/) and University College Ghent (http://english.hogent.be/).

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