**LABIP Expert Workshop**

***“Bio-preservation through fermentation, a natural and sustainable process? Opportunities, Risks and Regulation”***

**27 – 28 September 2021**

**Brugge**



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**Welcome and introduction**

Esben Laulund, Chair LABIP

The aim of the LABIP Expert Workshop September 27-28 2021, is to discuss the opportunities, risks and regulation that are involved in using fermentation as a way to a natural production and bio-preservation of foods. The different aspects involved will be presented by invited experts, each of who will shed her/his light on this old traditional technique which have gained a lot of attention in the public space during the recent years.

The presented point of views will be open for discussion during the workshop.

We intent to prepare a consensus document with the outcome of the expert workshop and which is due to be publish in a scientific journal.

We like to thank the speakers for their willingness to travel to Bruges, and LABIP for logistical and financial support.

*The organizing committee.*

**Organising Committee**

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**Holistic introduction –The effect of the LAB fermentation process for the global food production chain and Human well-being:**

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**Regulatory issues in relation to the application of LABs in food production:**

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The EU regulatory framework falls behind the rising interest in the use of micro-organisms in food including but not limited to innovations in fermentation. All foods need to be safe. In some situations evidence of safety must be provided in an authorisation procedure. Microbial cultures may come under this requirement if they ar genetically modified or if they classify as ingredients that do not have a history of safe use in the EU prior to 1997 (i.e. novel foods). There are indications that certain uses of fermentation may even classify as (quasi) food additives and would for this reason be prohibited.

The fermented product may be considered novel in case of a fermentation not used in the EU prior to 1997.

Innovative businesses can consider to apply for authorisation of the culture or product.

Despite the relatively clear wording of the law, the Court of Justice of the EU does not seem to rule out that combinations of conventional fermentation and conventional ingredients may classify as novel when safety may be uncertain.

Consumers need to be informed of the benefits available for them. Food law places strict limits on possible messages.

Key words: food law; regulatory affairs; novel foods; food additives; claims

**What can be learned from traditional fermentation?**

Jeroen Hugenholtz, Wageningen Food & Biobased Research

In this presentation, Jeroen Hugenholtz will describe how microbial fermentation can be employed as the ideal technology to produce many consumer goods such as fuels, plastics, detergents, cosmetics, foods & beverages in a biobased/circular society using only natural and renewable substrates.

Within the food industry, fermentation has been used for ages to produce various fermented foods such as cheese, butter and yoghurt based on milk, beer and wine based on barley, grapes and various other cereals and fruits and soy sauce, tofu and various liquors based on soy fermentation. At WFBR, we now use these existing fermentation processes as inspiration for production of various food and non-food ingredients and as source for our production microorganisms. With these isolated microorganisms we can convert various low-cost AgriFood waste/sidestreams into higher value, resulting in less (food) waste and in more value/income for the primary producers.

**How can fermentation derived products outcompete chemical preservatives in modern food production?**

Michael Callanan, Munster Technology University

Chemically manufactured organic acids, and particularly their salt derivatives, represent cheap and effective food preservatives but do not fit with consumers preferences for foods made without chemical additives. Ingredient suppliers offer a range of fermentation derived ‘fermentates’ as alternative sources of organic acids. These ingredients have consumer friendly labels such as cultured sugar or natural flavour so are competitive in premium markets and products where natural perception and free-from labels have discernible value. However, for fermentation derived preservative ingredients to completely replace chemical preservatives, a number of challenges remain. Firstly, labelling remains ambiguous and subject to regulatory oversight. In addition, issues with cost and efficacy have to be addressed.

**New trends in fermentation: safety and risks of homemade fermentation**

John Leech, TEAGASC, Ireland

Fermentation is ancient form of food preservation, dating back at least 9000 years. Despite decreasing in popularity in Western culture over the last century, during the last decade there has been considerable renewed interest in the popularity of many of these foods, particularly from the perspective of small-scale artisanal production and/or homemade fermentations by non-experts. In particular, fermented foods such as kefir, kombucha, sauerkraut and kimchi are regularly produced at an artisanal scale. High throughput DNA sequencing (HTS) has yet to be exploited extensively for the purpose of monitoring the safety of these products, even for larger scale commercial producers. Here, we discuss the application of HTS to study the microbiota of fermented foods and its potential role in food safety. We show that HTS sequencing can accurately uncover strain level taxonomic resolution, important for pathogen identification, including the presence of pathogenic genes, from various food environments. We also show the utility of HTS for exploring the anti-microbial resistance profile of fermented foods, another major concern for food safety.  Overall, we demonstrate that HTS has the potential to be a useful, cost- and time- effective means of monitoring the safety of fermented foods at any scale of production.

**Potential of bacteriophages or other phage-based means of Bio-preservation**

Beatriz Martinez, Ipla-Csic, Spain

Fermentation is ancient form of food preservation, dating back at least 9000 years. Despite decreasing in popularity in Western culture over the last century, during the last decade there has been considerable renewed interest in the popularity of many of these foods, particularly from the perspective of small-scale artisanal production and/or homemade fermentations by non-experts. In particular, fermented foods such as kefir, kombucha, sauerkraut and kimchi are regularly produced at an artisanal scale. High throughput DNA sequencing (HTS) has yet to be exploited extensively for the purpose of monitoring the safety of these products, even for larger scale commercial producers. Here, we discuss the application of HTS to study the microbiota of fermented foods and its potential role in food safety. We show that HTS sequencing can accurately uncover strain level taxonomic resolution, important for pathogen identification, including the presence of pathogenic genes, from various food environments. We also show the utility of HTS for exploring the anti-microbial resistance profile of fermented foods, another major concern for food safety.  Overall, we demonstrate that HTS has the potential to be a useful, cost- and time- effective means of monitoring the safety of fermented foods at any scale of production.

**A perspective on trends in natural fermentation at restaurants, artisanal producers and for private consumption**

Michael Bom Frost, University of Copenhagen

**Economic benefits – reducing food waste**

Peter Thoeysen, Chr. Hansen

8% of the global greenhouse emissions comes from food waste, and consumers are concerned about it across the globe. Fermentation-enabled bio-protection can play a very relevant role in helping to keep even more food fresh and safe a little longer. Using the dairy food segment and more particular the learnings from resent consumer research and an impact study commissioned by Chr. Hansen in 2016 in the yogurt segment, Peter Thoeysen will in this presentation point to the importance of quality, shelf life and the way we communicate about expiry of food in regards to food waste reduction. And discuss the source of economical benefits for the different stakeholders in the food value chain.

Expiry date is cited as the top reason for throwing away edible yogurt. 17% of all yogurt produced in the EU is wasted, and 80% is due to shelf life related issues. The impact study showed how an additional 7 days shelf life could reduce yogurt waste with 30%, delivering 520,000 tons of CO2 emission reduction and 250 million € savings annually. All members of the value chain can see positive economical benefits from reducing food waste through improving quality and shelf life. The economic value of reducing food waste is often underestimated, a study 700 food companies in 17 countries concluded that on average every $1 invested in food waste prevention yielded $14 economic benefits. In addition to the benefits from the extension of shelf life and food waste savings itself, the actors in the food industry, have an opportunity to achieve economic benefits from utilizing their food waste reducing activities to differentiate their brands from competition and win or defend market share.

**Fermentation of plant proteins: Influence on flavor, texture and bio-preservation**

Herwig Bachmann, NIZO

The replacement of animal derived proteins with plant proteins is an essential step to ensure a globally sustainable and healthy food supply. This transition has been gaining momentum over recent years with an increasing demand for functional plant proteins. While the majority of products aim to replace either dairy or meat there are still numerous technological challenges to achieve similar product properties. These challenges include nutritional parity and the optimization of flavor and texture. However, we also found that many plant based ingredients contain viable, spore forming organisms that impact on food safety and product shelf-life and which need to be controlled. One approach to improve functional properties of plant protein is by fermentation. For this we make use of the biodiversity available in food grade culture collections and screen them for desired properties such as fast acidification, flavor formation and off-flavor removal. Microbial genome information and experimental data of the strains is used to predict strain properties through machine learning. Besides harnessing biodiversity, we also use experimental evolution to adapt microbial strains with desired properties to plant protein-based products and ingredients. This allows to identify cultures which show fast product acidification and thereby increases their bioprotective properties. Examples for adding functionality with fermentation include positive alterations of volatile profiles, texture and the prevention of fungal outgrowth in plant based products. Together this allows us to tailor fermentations to improve the quality of plant protein ingredients and products.

**Wrap – Up session**

**Notes**

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