PLATFORM FOR **FOOD AND NUTRITION**

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THROUGH RESEARCH & DEVELOPMENT

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Successful businesses can tell you from experience: Every euro which goes into research and development pays for itself a thousand times over.

This is because innovations give those businesses a decisive competitive edge, generating revenue and securing jobs in the long-run.

The research location of Upper Austria is in the fast lane, and the University of Applied Sciences Upper Austria (FH Upper Austria) has evolved into a powerful engine. Austria's strongest research University of Applied Sciences offers four schools with around 400 professors and academic staff to innovative businesses.

Currently, over 300 projects in 16 specialist areas are being implemented. The practice-oriented topics range from IT (FH Upper Austria Hagenberg Campus), to Medical Engineering and Applied Social Sciences (FH Upper Austria Linz Campus), as well as Management (FH Upper Austria Steyr Campus), and Engineering (FH Upper Austria Wels Campus).

Perfect networking of the schools ensures that it is possible to achieve an optimal complete solution for each project.

The strategic programme "Innovative Upper Austria 2020 – Research. Business. Future" was accommodated by the Platform for Energy. This Platform's projects provide support in achieving strategic key objectives:

» **Upper Austria in 2020 is a leading region in Europe for the development, sustainable production and marketing** of high-quality foods, adapted to the different needs of people, with special consideration placed on the up- and down-stream processes in the value chain.

Dr. Josef Pühringer
Governor of Upper Austria

Mag. Thomas Stelzer
Vice Governor

Upper Austria has introduced the possibility for joint initiatives in the sectors of education – research – business through the strategic economic and research programme "Innovative Upper Austria 2020", in order to ensure that Upper Austria has a clear competitive edge.

Upper Austria can boast the largest number of businesses and the biggest growth in the sector of food and nutrition when compared to other Austrian states. So that there is an increasing focus on the research behind producing foods, potential businesses have to be inspired to innovate in order to acquire core competences in the area of research behind food and nutrition.

With the FH Upper Austria as a long-term, reliable partner in the sectors of research & development, the State of Upper Austria is provided with support in achieving the implemented, strategic key objectives.

Achieve more:
Cooperation made easy

With its 400 plus researchers, the FH Upper Austria is on hand as a flexible and reliable partner for businesses and institutions from industry and society when it comes to problems in research & development. The possibilities of cooperation are diverse:

» applied R&D projects with business partners

» academic research projects

» international R&D projects

» symposia and workshops

» students' bachelor's papers and master's theses

The project time frame can range from a few months to up to five years.

The FH Upper Austria´s R&D offers are aimed at businesses and institutions from industry and society.

On the one hand, this addresses those businesses which lack personnel resources or have limited financial resources for their own research and development activities (e.g. small and medium-sized companies).

On the other hand, solutions for companies which need support in specialist fields are also developed (e.g. in the form of specific devices). Above all, a joint project is, for the FH Upper Austria's cooperation partners, a financially straightforward and efficient undertaking.

Geared towards the needs of the client, innovative solutions are developed, which can be put directly into practice.

Dr. Gerald Reisinger
University of Applied Sciences Upper Austria
President

Prok. FH-Prof. Priv.Doz. Dipl.-Ing. Dr Johann Kastner
University of Applied Sciences Upper Austria Research & Development
Chief Technology Officer

Achieve more
through innovative food concepts

The ingredients and modification of foods (e.g. biochemical, physiological interaction and effect, analysis of food ingredients, etc.) represent a core issue in the area of food. In addition, different substances in the sector of food are researched, e.g. functional packaging (“smart packaging”), bioplastics, independent decomposition (“green packaging”), “status detection”, etc.

Further issues include quality control (food control) through diverse procedures, such as image-based measurement procedures, sensors, etc., as well as new production technologies.

The Platform for Food and Nutrition’s competences comprise:

- Chemical-analytical characterisation of food ingredients, mainly fruit, vegetables, grains and oilseeds. (Vitamins, minerals, polyphenols, carbohydrates, etc.)
- Chemical-analytical characterisation and stability analyses of oils
- Development of technologies and cell models for the screening of biochemically-physiologically active components (blood-glucose lowering, blood-glucose regulating, cell-growth inhibiting) in raw food materials, their extracts or finished products
- Characterisation of cellular paths which have nutrition-physiological relevance or preventive functions (insulin-signalling, adrenergic receptors, EGF-receptors)
- Bio-availability and cytotoxicity of food ingredients
- Conduct of clinical studies in cooperation with hospitals and university hospitals
- Development of functional foods
- Mechanical description of foods and their structures
- Characterisation of food micro-structures by means of image-based procedures
- Data analysis (statistics, Data Mining and Text Mining)
- Modification of plastics in order to tailor their characteristics portfolio in correspondance with new packaging demands
- Characterisation and processing of plastics for the packaging industry

Current and future specialist areas of work:

Chemical-analytical characterisation of raw food materials and foods

Selected ingredients from types of fruits, vegetables, and grains, as well as oilseeds should be analysed to see if they have positive health effects (e.g. blood-glucose lowering, blood-glucose regulating, caries-reducing, cell-growth inhibiting) and help prevent additives entering the food industry. Examples of these ingredients are minerals, vitamins, secondary plant metabolites (phytamins), proteins (enzymes), or fibres (e.g. beta-glucan).

The focus of this process is on regionally important types of plants and agricultural crops such as apples, tomatoes, turnips, potatoes, grains and berries. The advantages of these agricultural crops are the easy availability of large amounts of raw material, as well as the industrial intermediate projects directly from regional growers and processing plants.

Characterisation of food ingredients regarding their biochemical/ physiological effects in cell models

The analysis of protein-protein interactions plays a central role in the characterisation of molecular effects of phytamins on human cells: to be able to transfer information from the cellular environment into the cell, a complex interaction of proteins in the cell membrane and soluble proteins inside the cell is required. This interaction (signal transduction) leads to corresponding cell processes, e.g. cell proliferation, migration or absorption of necessary substances. The receptors themselves are activated and deactivated via messengers and active substances, such as hormones. Many medically-relevant active substances bind to receptors and thus cause for certain changes in individual cells and, subsequently, in organs and in the entire organism. The specialist areas of study are concerning bio-availability, glucose homeostasis, cytotoxicity and identification of anti-cancerogenic phytamins.

Creation of technological requirements for the production of nutrition-physiologically high-quality foods

» **Optimisation of products regarding the concentration and bio-availability of vitamins, minerals and secondary plant metabolites:** During the manufacture of raw food materials and foods, vitamins, minerals and secondary plant metabolites, etc. are often lost. It should be determined in the industrial manufacture of bread products, pastas, and fruit and vegetable products where in the process these ingredients are lost, and what can be done to improve the concentration of the ingredients. At the same time, sources of raw materials which have a high profile of ingredients and thus contribute to improving the profile of ingredients should be identified.

» **Products with a low glycemic index:** The glycemic index (GI) describes the effect of a food containing carbohydrates on the blood glucose level. The GI is influenced by the composition of foods, the degree of processing, the preparation, the presence of enzyme inhibitors, and the composition of the meal. The DGE (German Nutrition Society) reveals in its carbohydrate guidelines that nutrition sources containing a high GI could increase the risk of obesity, diabetes mellitus type 2, coronary heart diseases and malignant tumors in the intestine. Products which have a low GI should be developed by selecting different raw materials and processing techniques.

» **Products with caries-reducing characteristics based on beetroot:** Caries is still the most widespread lifestyle disease, although prophylactic measures against it have been available for a long time. Around 98% of the European population is affected by caries. Caries incidence develops particularly rapidly amongst children. Products should be developed which prevent the growth of lactic acid bacteria.

Clinical studies which demonstrate the physiological/medicinal effectiveness of foods

Clinical studies should be conducted in cooperation with hospitals and university hospitals:

» Influence of functionalised foods on the prevention of caries
» Influence of functionalised foods on blood pressure
» Influence of functionalised foods on the glycemic index

Achieve more
through pioneering infrastructure

- Laboratories for biochemical, molecular-biological and micro-biological work
- Fermentation laboratory
- Experimental and teaching brewery
- Stability tests
- Oven
- Universal food processor
- Kneading machine
- Plastics Technical Center (compounder, flat and blown film extrusion, injection moulding machine)
- Laboratories for mechanical, thermal and rheological characterisation of plastics
- HPLC, GC and GC-MS including Headspace
- Ion chromatography
- FTIR, TIRF microscopy
- RT-PCR
- FPLC
- FACS
- Texture analyser

Achieving more:
current research projects

- **Combined material and/or energetic use of plant-based raw materials** / ERDF Regio 13

- **Patient-centered integrated network for care of the elderly** / FFG (Austrian Research Promotion Agency) benefit / Partners: Klinikum Wels, X-Tention Informationstechnologie

- **GlucoSTAR** – high-content screening platform for identification and characterisation of insulin-mimetic substances / cooperation project

- **Celmophyt** – bio-availability experiments of plant metabolites by means of in-vitro cell systems / cooperation project

- **PhytoDoc** – biochemical, molecular-biological and chemical-analytical characterisation of secondary plant metabolites / cooperation project

- **Experimental and teaching brewery** at the FH Upper Austria, Wels Campus

- **Cooperation SKD** – Cooperation for competence building: “Valuable Products from Algae” – Screening, Cultivation and Downstreaming / COIN (Cooperation and Innovation) development / partner: MCI Innsbruck

- **StarPATT** – development platform for the screening of raw food materials and food ingredients / FFG cooperation project

Achieve more: Study courses with reference to the topic of food and nutrition

School of Informatics, Communications and Media, Hagenberg Campus

Medical and Bioinformatics ..... B
Biomedical Informatics ..... M

School of Medical Engineering and Applied Social Sciences , Linz Campus

Medical Engineering ..... B
Medical Engineering ..... M

School of Engineering Wels Campus

Food Technology and Nutrition ..... B
Bio and Environmental Technology ..... B M
Automation Engineering ..... B M

B – Bachelor's Degree Programme, M – Master's Degree Programme

At your service: Your contact partners

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