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COMMITTEES

ORGANISING COMMITTEE

CHAIR:
Dr. Josep Maria Monfort, IRTA

CO-CHAIRS:
Dr. Margarita Garriga, IRTA
Dr. Harmen Hofstra, SAFE Office

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Dr. Diana Bánáti, Board, CFRI
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Dr. Cristina Silva, ESB-UCP
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Welcome

The term quality has became a focus point in all discussion regarding the production and provision of food products to market and consumers – quality in the broad sense of serving the consumers’ needs by providing them with the right products at the right time.
Food safety is an inherent element of quality. It receives special attention not only by enterprises but also by policy and legislation because of its key importance for consumers’ health and the responsibility for food safety by enterprises and policy alike.
Increased globalization, industrialization and sophistication of food production and trade increase the need for improved process control, process management, and communication along the vertical food production chain.

The European Association for Food Safety (also known as SAFE consortium) is an organisation of independent scientific institutes and universities whose members combine their expertise in food safety-related sciences in order to promote the discussion on food safety.
The SAFE consortium wants to act as an independent spokesman for food safety research in Europe and Worldwide to the benefit of the public. It deals with ‘food safety’ in its broadest terms and wants to strengthen:
• food safety related research in Europe and Worldwide,
• science-based food safety policy setting and regulations, and
• up-to-date food safety research policies and programming.

The second international congress of the SAFE consortium “Novel Technologies and Food Quality, Safety and Health” covers a broad range of subjects that relate to:
» EMERGING TECHNOLOGIES
» EMERGING RISKS
» TRADITIONAL AND REGIONAL FOODS
» MODERN PHYSICS AND PROLONGING SAFE SHELF LIFE
» MICRO AND NANOTECHNOLOGY
» STATE OF THE ART VIEW ON -OMICS

Keynote and other invited speakers at plenary and parallel sessions include world class experts in food safety sciences. Oral and poster presentations were chosen from a competitive review of abstracts. Junior scientists and students have been particularly encouraged to submit abstracts with great success: more than a third of the submitted contributions for poster as well as oral presentations came in from junior scientists.

On behalf of the SAFE consortium it is my great pleasure to welcome you to our 2009 congress in Girona and to wish you a very fruitful time in the sessions and with the discussions.

Amedeo Conti
Chairman of SAFE consortium
Plenary Lecture 1

Prof. Marc. Hendrickx

Marc Hendrickx is senior professor in food technology at Katholieke Universiteit Leuven. He is chairman of the Centre for Food and Microbial Technology, head of the Laboratory of Food Technology (LFT) and co-director of the InterUniversity Program in Food Technology (IUPFOOD). Prof. M. Hendrickx has been involved in more than 10 multipartner EU funded projects (in the fields of thermal processing, high pressure processing and pulsed electric field processing), currently he is a key scientist and member of the management board of NovelQ, Healthy Structuring and High Tech Europe. He is co-author of over 250 papers in peer review journals and over 200 contributions to international conferences and workshops.

His research activities focus on the effect of food processing and preservation technologies on food functional properties. Technologies refer to structure enabling and preservation technologies including conventional technologies (thermal processing, freezing and frozen storage) and new technologies (high pressure thermal processing, high pressure freezing and high pressure homogenization). Functional properties refer to food structural aspects and the retention, generation and in vitro accessibility of health-related compounds. The research approach focuses on kinetic and mechanistic aspects and scientific approaches for quantitative process impact evaluation. This includes the development of extrinsic indicator systems and the identification of intrinsic indicator systems based on profiling and targeted component analysis.
Plenary Lecture 2

Dr. Marta Hugas

Marta is currently Head of Unit for the panel on Biological Hazards, EFSA. In January 2003 she joined the European Food Safety Authority first in Brussels (Belgium) and then in Parma (Italy) giving support to the Scientific Panel on Biological Hazards. The BIOHAZ panel deals with questions regarding risk assessment of biological hazards relating to food safety and food-borne disease, including food-borne zoonoses and transmissible spongiform encephalopathies, microbiology, food hygiene and associated waste management.

She holds a BSc in Biological Sciences, an MSc in Genetics and Microbial Biotechnology and a PhD in Food Microbiology by the Autonomous University of Barcelona. From 1992 to 2004 she was an Associate professor at the University of Barcelona at the Interuniversity Master of Biotechnology. She’s a Board elected member of the Food Microbiology Group of the Spanish Society for Microbiology, member of the editorial Board of Food Analytical Methods, and a member of the Advisory Panel of the EU Network for prevention and control of zoonoses (MED-VET-NET).

Prior to joining EFSA, she worked for IRTA (Institute for Food and Agricultural Research and Technology) in Catalonia (Spain) where she was Head of Unit on Food Microbiology and Biotechnology and led a research group on applied research on meat and food safety. IRTA’s main activities are scientific research and technology transfer in the area of agriculture, aquaculture and the agrifood industry.

She has extensively published scientific papers, reviews, book chapters and divulgative papers on food safety, particularly the development of starter and bioprotective cultures for meat and meat products, probiotics to improve the safety of poultry, new emerging preservation technologies as well the development of rapid diagnostic methods such as PCR for food pathogens and for starter cultures in meat and meat products and lately on EFSA’s activities on Risk Assessment of Biological Hazards.
Dr. Einar Risvik

Dr. agric., Research Director since 1995.
The position at Nofima Food, The Norwegian Food and Fisheries Research Institute is of a strategic character- that is to position research at the institute towards the needs of the food industry. International collaboration and joint research funding is strategically important for Nofima Food in order to provide a base platform for high quality research.

Dr. Risvik's responsibilities have included strategic direction of the research, utilisation of IPR and support for commercialisation of IPR, networks in international research, links to political organisations including the Department of Agriculture and Food, research councils, Nordic networks and organisations, EU and the Commission.

From 1998 he is a member of the International Advisory Board for LMC, the strategic alliance between the two universities KVL and DTU in Copenhagen, now the University of Copenhagen, Denmark.

From 1997 to 2004 he was Adjunct Professor at the University of Uppsala, Sweden, in Meal Science under the Department of Social Sciences. His role during the first 5 years was related to management of the large MISTRA programme, Food 21, Sweden’s largest multidisciplinary programme for sustainable agricultural, running from 1996.

From January 2007 he has been Chairman of the Steering Committee of New Nordic Food, a programme under the Nordic Council of Ministers, where research activities, visibility projects and a communication platform are coordinated as a whole.

Some original scientific publications (total >40 + editor of 3 textbooks)


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József FARKAS, D.Sc., MHAS, is emeritus professor of food science at the Corvinus University and part-time scientific adviser of the Central Food Research Institute, Budapest, Hungary.

Professor Farkas obtained his B.Sc. and M.Sc. degrees in food technology from the Faculty of Chemical Engineering, University of Polytechnics, Budapest. He received his Ph.D. and D.Sc. in radiation microbiology in 1968 and 1979, respectively, and was elected as a Member of the Hungarian Academy of Sciences in 1990. He joined the Central Food Research Institute, Budapest, in 1957, and served as Head of the Microbiology Department and Deputy Director until 1986, when he was appointed to the Faculty of Food at the present Corvinus University of Budapest. He acted as ordinary professor and department head until his retirement. He worked as a Research Scholar at the Federal Research Institute for Food Preservation, Karlsruhe, Germany, in 1959, at the ARC Meat Research Institute, Langford, Bristol, U.K., in 1968, and at the Biophysics Laboratory, Dept. of Biology, Illinois Institute of Technology, Chicago, USA, in 1972. He was Director of the International Facility for Food Irradiation Technology, Wageningen, The Netherlands, an international project jointly sponsored by the FAO, the IAEA, and the Dutch Government from 1980 to 1985.

Professor Farkas has taught and he is still teaching several graduate and post-graduate courses in food science and technology. He is chairman of the Sub-Committee on Food Safety of the H.A.S., and the Scientific Advisory Board of the Hungarian Food Safety Office. He was an elected member of the International Commission on Microbiological Specifications for Foods (ICMSF) for eight years. He is editor-in-chief of the international journal entitled Acta Alimentaria. His research activities have covered a broad field of research from microbiology and chemistry of food and have also involved various aspects of non-thermal food preservation methods. He is author or co-author of twelve books and several hundred scientific journal articles.

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Plenary Lecture 5

Dr. Carles Cané

Dr. Carles Cané is a Telecommunication Engineer since 1985, and he got his PhD in 1989.

Since 1990 he is a full time senior researcher at the National Microelectronics Centre in Spain, CNM-CSIC, and has been working on the development of CMOS (define CMOS) technologies and also on mechanical and chemical sensors, MEMs (define MEMs) and microsystems. His current expertise is in mechanical and chemical sensors and their integration with CMOS electronics.

Over the years he has been co-ordinator of several R&D projects, both at national and international levels in the Microsystems field. Very recently he finished the project coordination of the GoodFood Integrated Project of the Sixth Framework Programme of the European Commission on Food Safety with Microsystems. He has been head of the Microsystems and Silicon Technologies Department of CNM and deputy-director of the Barcelona site.

He has also been a member of the technical committee of the European EUREKA-EURIMUS-programme on MicroNanosystems and now is a Member of the Governing Board of the ENIAC Joint Technology Initiative and of the Key Technologies of EPoSS European Technological Platform. Dr. Cané is also a member of the Programme Committee of the NMP Theme of the 7th Framework of the European Commission and has also been a member of the Mediterranean Delegation at the Summit of Micro technologies event in the last years.

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Dr. Ben van Ommen

Ben van Ommen is head of the nutrigenomics and nutritional systems biology activities at TNO Quality of Life, one of the largest independent research organisations in the area of nutrition world-wide.

His training was in biochemistry and toxicology. His PhD and early research career were dedicated to molecular and biochemical mechanisms in toxicology and nutrition, including interindividual differences of genetic origin.

His current research group approaches effects of nutrition and nutrition-related bioactive compounds with regards to health promotion and disease prevention on a genome-wide scale. His team is a pioneer in nutritional systems biology, with emphasis on combined transcriptome, metabolome and dynamic modeling approaches. In 2002, he was appointed Senior Research Fellow of the TNO organisation in the area of nutritional systems biology.

Currently, he coordinates the European Nutrigenomics Organisation, an EU-funded partnership of 32 universities and research institutes in the area of nutrigenomics.
Parallel Session 1: Emerging Technologies

Prof. Dietrich Knorr

Dietrich Knorr is Professor, Director of the Institute of Food Technology and Food Chemistry since 2001 and Head of the Department of Food Biotechnology and Food Process Engineering at the Berlin University of Technology since 1987.

He received an Engineering Degree (Dipl.-Ing.) in 1971 and a PhD in Food and Fermentation Technology from the University of Agriculture in Vienna in 1974. He was Research Associate at the Dept. of Food Technology in Vienna, Austria, Visiting Scientist at the Western Regional Research Centre of the US Department of Agriculture, Berkeley, CA, USA; at the Department of Food Science Cornell University, Ithaca, NY, USA and at Reading University, Reading, UK. He was Visiting Professor at the Association of Biotechnological Research, Braunschweig, Germany, Associate Professor, Full Professor and Acting Department Chair at the Department of Food Science, University of Delaware, Newark, DE, USA.

Prof. Knorr is Editor of the Journal of Innovative Food Science and Emerging Technologies (editor of Food Biotechnology until 2000), Research Professor at the University of Delaware, USA, and Adjunct Professor at Cornell University, USA.

In 2004 he got the Marcel Loncin Research Prize of the Institute of Food Technologists (IFT), the Alfred-Mehlitz Award of the German Association of Food Technologists and the EFFoST Outstanding Research Scientist Award.

He has published approx. 400 scientific papers and holds 5 patents.

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Parallel Session 1: Emerging Technologies

Prof. Cristina Silva

Cristina L.M. Silva is an Associate Prof. at Portuguese Catholic University – College of Biotechnology. She is currently responsible for the International Relations and is a member of the Direction Board of the research Center of Biotechnology and Fine Chemistry — INTERFACE A^4 at ESB.

Cristina L.M. Silva is a Chem. Eng., and PhD in Biotechnology and Food Engineering. She is involved in research on quality and safety of foods and the leader of the laboratory LOPA (www.esb.ucp.pt/lopa/).

She has been involved as a responsible partner or coordinator of several national and international projects. Recently, she has been involved in the coordination of LLP, Erasmus Mundus and FP7 projects.

Her research interests are focused on: (i) design and optimization of food process conditions; (ii) predictive microbiology as a tool to optimize food processes; (iii) evaluation of food quality changes due to conventional and novel processing; (iv) evaluation of food quality and safety changes during storage; (v) formulations of new food products and (vi) design and optimization of ethylene oxide sterilization of medical devices.

Cristina L.M. Silva is also coordinator of the networks ISEKI_Food 3 (www.esb.ucp.pt/iseki/) and ISEKI_Mundus 2 (www.esb.ucp.pt/iseki_mundus/), and president of IFA Association (www.iseki-food.net/). She is a member of the Executive Committee of EFFoST (www.effost.org/) and responsible for the TG (task group) on European Cooperation.

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Parallel Session 1: Emerging Technologies

Prof. Jean-Charles Massabuau

Jean-Charles Massabuau was born on the 22nd August 1952 in Paris, France. He obtained his b. Sc. at Paris south university in 1977, his PhD. in 1980 and his Thèse d’Etat in 1984 at the University of Strasbourg, France.

From 1980-1981 he was an instructor at the University of Medical Science Of Strasbourg, from 1981 to 1985 he was a junior scientist in the CNRS, in 1985 he was appointed senior scientist in the CNRS for research in comparative respiratory physiology. In this period he developed the first experimental basis of his theory on basic principles of O$_2$-exchange management in water breathers and he discovered the existence of acidified streams in France. In 2001 he was appointed research director in the CNRS, his research then turned more to physiological ecology and ecotoxicology in aquatic systems.

Jean-Charles Massabuau was married in 1982 to Katherine Matagne, they have a son, Nicolas. He is presently heading a group of 14 permanent persons & 10 PhDs at the Marine Biological Station of Arcachon, France. For more information, have a look at the following websites. The team website, http://www.epoc.u-bordeaux.fr/index.php?lang=fr&page=eq_gema2 and a website devoted to molluscan bivalve ethology and biosensing, the Molluscan Eye: http://www.domino.u-bordeaux.fr/molluscan_eye/.

In a broad sense, today his research interests are concerned with the regulation of respiratory gas exchange in mollusc bivalves inhabiting ecosystems ranging from pristine to contaminated. Therefore, knowledge of both the basic principles of comparative respiratory physiology, ethology and ecology as well as water quality is essential for understanding the formulation of physiological and ecological principles that transcend the particular species and environment being studied. He is presently developing biosensors based on understanding the behavior of bivalves inhabiting European to tropical and arctic ecosystems.

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Parallel Session 1: Emerging Technologies

Prof. Christopher Elliott

Christopher Elliott is Professor of Food Safety and Director of the Institute of Agri-Food and Land Use, Queen’s University Belfast. He gained a Master’s degree at the University of Ulster in Biomedical Sciences and went on to complete a PhD in Veterinary Science at Queen’s in Belfast.

He has published more than 140 scientific papers on the topics of veterinary medicine and chemical contaminant monitoring. His main research interests currently relate to bio-analysis of natural and man-made chemicals and microbiological hazards in food and water supplies.

Chris currently acts as a scientific advisor to a wide number of non-governmental organisations, international food and biotechnology companies on the topic of food safety. He is the co-ordinator of a large EC project entitled ‘Biocop, New Technologies for Chemical Contaminant Monitoring’ (www.Biocop.org) and is a founding member of the International School for Advanced Residue Analysis in Foods (www.saraf-educ.org).

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Dr. Hanna-Leena Alakomi is a food microbiologist and she has been working as a research scientist at VTT Technical Research Centre of Finland for 14 years. She has over 30 peer-reviewed publications related mostly to probiotic technology, viability of microbes and antimicrobial mechanisms of bioactive agents.

She defended her thesis "Weakening of the Gram-negative bacterial outer membrane - A tool for increasing microbiological safety" in the Faculty of Agriculture and Forestry of the University of Helsinki in 2007.

Her current research activities concern control of growth of harmful microbes and beneficial microbes in food applications.

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Parallel Session 2: Emerging Risks

Prof. Colin Hill

Colin Hill has a Ph.D in molecular microbiology and is Professor of Microbial Food Safety and Chair of the Microbiology Department of University College Cork, Ireland. He is also a Principal Investigator in both the Alimentary Pharmabiotic Centre (APC), a multidisciplinary research centre focusing on the role of gut microbiota in health and disease, and the Food for Health Ireland research centre (FHI), a multi-Institutional Centre engaged in identifying bioactive components for use in functional foods. His main interests are in infectious disease, particularly in defining the mechanisms of virulence of foodborne pathogens and in developing strategies to prevent and limit the consequences of microbial infections in the gastrointestinal tract. He has published more than 230 peer-reviewed papers and holds 11 patents in this area. He has also served on the Scientific Committee of the Food Safety Authority of Ireland for many years. In 2005 Prof. Hill was awarded a D.Sc by the National University of Ireland in recognition of his contributions to research.

Some recent publications:


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Prof. Albert Bosch

Albert Bosch is Full Professor in Microbiology at the University of Barcelona, and head of the Enteric Virus Laboratory. Professor Bosch has been involved since 1979 in research on environmental virology, and particularly on the development of procedures for the detection and characterisation of human enteric viruses. His research on hepatitis A virus started in 1986, covering several aspects of clinical, environmental and basic biology of the virus. Current tasks of the laboratory also include studies of viral safety assessment, which comprise standardised determination of hepatitis A virus in blood derivatives. The Enteric Virus Laboratory of the UB was the first university laboratory in Spain to receive the certification of Good Laboratory Practices compliance for validation studies of viral safety.

Professor Bosch has performed research activities at the Albert Einstein College of Medicine and the Universities of North Carolina and Arizona, in the U.S., at the University of Pretoria, South Africa, at the Medical Research Institute in Alexandria, Egypt, and at the Institute of Child Health of the University of London. He has published over one hundred articles in peer-reviewed journals on different topics related to enteric viruses and two complete books on the subject. He is a member of the Royal Academy of Doctors, and the scientific committees of the Spanish Food Safety Agency and Nutrition and the scientific panel “Food and waterborne diseases” of the European Center for Disease Control and Prevention (ECDC). He is the Chairman of the Astrovirus Study Group of the International Committee on Taxonomy of Viruses (ICTV).
Parallel Session 2: Emerging Risks

Dr. Teresa Aymerich

Teresa Aymerich is a senior scientist in the Food Microbiology Unit at IRTA-Food Technology Center. She is responsible for the IRTA-Subprogram of Food Biotic Safety.

She obtained her PhD in Microbiology and Biotechnology in 1996 at the Autonomous University of Barcelona.

She has participated in several EU projects related to validation of PCR molecular techniques to detect food-borne pathogens, microbial characterization and safety of traditional meat fermented products together with the application of natural antimicrobials to increase their safety. She has participated in 16 national research projects with the aim of improving safety of meat products by application of natural antimicrobials in combination with high hydrostatic pressure.

She has a wide knowledge of the microbial ecology of traditional fermented products. Her expertise is mainly devoted to the application of molecular techniques to food microbiology, either to detect pathogens or technological microflora at species and strain levels. She has published up to 50 papers in peer-reviewed journals and book chapters as well as more than 60 communications and posters in different international and national congresses.

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Dr. Brion Duffy

Brion Duffy is Research Leader for Bacteriology at the Swiss Federal Research Station, Agroscope Changins-Wädenswil ACW located near Zürich in Wädenswil, Switzerland. His research program focuses on several plant-bacterial systems. He runs a food safety program studying *Salmonella* and *Listeria* interactions with ready-to-eat vegetables that examines production chain factors (manure/fertilization, cropping system, and genetic/ecological interactions) influencing plant colonization and contamination by human pathogenic bacteria. He also has a research program focused on the genomics/genetics, biology, ecology, plant host resistance and control of bacterial diseases of fruit/nut trees (fire blight, *Xanthomonas*) and vegetables (*Clavibacter*). The ultimate aim of his research programs is to link research and phytosanitary extension activities in order to design sustainable control strategies for food safety and plant quarantine pathogens. His laboratory has sequenced several bacterial genomes (e.g., *Pantoea agglomerans*, *Erwinia amylovora*, *Erwinia pyrifoliae*, *Xanthomonas arboricola*) and a major focus of his current work is on transcriptomics of plant-pathogen interactions.

He received his BS (1988) in tropical plant pathology from the University of Hawai‘i at Hilo; MS (1991) in phytopathology from Washington State University, and PhD (1999) in phytopathology from the Swiss Federal Institute of Technology ETH. He was visiting microbiologist at EMBRAPA in Rio de Janeiro working with *Azospirillum/Acetobacter* on cereal crops (1988-89) and research phytopathologist with the University of Hawai‘i in Volcanoes National Park working on native plant diseases/invasive weed biological control (1992-94). He was research microbiologist at USDA-ARS, California in charge of a ‘food safety in plant production systems’ research program (2000-02) before returning to Switzerland.

A major emphasis of his activities involves building international research networks, promoting young scientists, and communicating science to policy makers. He is partner in several European and international commissions and research projects, has is author/coauthor on over 100 research/extension publications, and serves on several boards of international pathology/microbiology journals and scientific society committees.

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Parallel Session 2: Emerging Risks

Mr. Fred van de Brug is the project leader of the Emerging Risk Identification project. This project is part of the TNO knowledge development & application program on food safety. See www.tno.nl/foodsafety for further information.

In the project he applies knowledge gained from previous experience in information disclosure in the Dutch national research project Virtual Laboratory for E-Science (see www.vl-e.nl). In the Dutch “vl-e” project a consortium of food industries and academic groups developed techniques on information disclosure and ontology development. The consortium members worked on the common problem of how to manage the growing volumes of food science publications by using smart ways of searching for information.

Before working at TNO he worked as a product developer at a leading academic publisher in life sciences on projects on thesauri and annotation, pharma vigilance, electronic production and dissemination.

Working initially as a trained biomedical researcher in the academic hospitals in Leiden and Utrecht on health problems by doing research on animal and child gastrointestinal physiology and motility provided a solid base for working later in the interface between science and information disclosure. His prior academic education in medical biology was completed at the University of Utrecht.

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Parallel Session 3: Traditional and Regional Foods

Prof. Pier Sandro Cocconcelli

Pier Sandro Cocconcelli, is a Professor of Food Microbiology and Biomolecular Techniques, at the Laurea Magistrale level, in Food Safety and Quality at the Agricultural Faculty of the Università Cattolica del Sacro Cuore, in the Piacenza campus.

Since 1984 he has been working at the Istituto di Microbiologia and at the Centro Ricerche Biotecnologiche of the Agricultural Faculty of the Università Cattolica, studying the molecular biology of food-associated bacteria and the industrial application of these microorganisms. Since 1988 he has been involved in several European research projects, studying the molecular biology of lactic acid bacteria and the industrial application of food microorganisms. He is the coordinator of a national project on bacterial biofilms in food production.

Since 2003, he is a scientific member of the Panel FEEDAP of the European Authority of Food Safety (EFSA), he is chairman of the Standing Working Group on Microorganisms of FEEDAP, and a member of the Scientific Committee Working Groups on Qualified Presumption of Safety of Microorganisms and Transparency in risk assessment. He is a member of the WG on the Assessment of the antibiotic resistance effects of biocides, Scientific Committee on Emerging and Newly Identified Health Risks (SCHENIR), DG Health & consumer protection.

His research activities are focused on dairy microbiology, biodiversity in microbial food communities, molecular biology of Firmicutes, risk analysis of food pathogenic bacteria, with particular attention to the expression of virulence factors, and on the gene exchange of antibiotic resistance and virulence determinants in the food chain.

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Parallel Session 3: Traditional and Regional Foods

Mr. Thomas Berger

Mr. Thomas Berger started working as a laboratory technician in the veterinary pharmaceutical industry. In the eighties he studied chemistry at Berne University of Applied Sciences followed by employments in analytical chemistry in private and governmental laboratories (food, water, soil and special waste analysis).

In 1992 he started work at Agroscope Liebefeld Posieux research station ALP of the Federal Department of Economic Affairs in Liebefeld-Berne, Switzerland. In the first years, he was responsible for the development of the quality assurance system at ALP and the accreditation (ISO 17025) of its chemical, microbiological and sensory laboratories. The accreditation was followed by a merger with the ISO 9001 certification system and the certification of the whole research station.

Experiences in proficiency testing, reference material and reference methods brought Thomas into responsibility for organizing and executing the Swiss National Reference Laboratory on Milk and Milk products in the framework of EU regulations in 2000. Since then he is involved in national and international projects and activities, e.g. of the Swiss Veterinary Office (official milk control, national sampling plan on pathogens and hygiene bacteria), chair of the expert group of the Swiss Food Manual on milk and milk products, chair of the former ISO/IDF joint action team on sampling, project leader for the revision of ISO 707 | IDF 50 “Milk and milk products - Guidance on sampling”, co-project leader for ISO 27105 | IDF 216 “Milk and milk products – Determination of lysozyme content by HPLC” and he is actively participating in the network of the national reference laboratories. Since 2008 he is a member of the ALP team on food safety and involved in composing expert opinions and in research issues concerning microbiological and chemical contamination during production and processing of foods of animal origin. He had the leading role in organizing the SAFE/Agroscope Symposium “Safety issues of raw milk cheese“ in December 2008.

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Dr. Paola Lavermicocca

Dr. Lavermicocca is a food microbiologist and senior research scientist at the Institute of Sciences of Food Production, National Research Council, Bari, Italy. She has over 25 years of experience on the application of bacteria and/or their metabolites in the area of food quality (particularly new functional and probiotic products).

She is author or co-author of ca. 130 papers (most in journals quoted by ISI) including patents. She has been and still is coordinator of National and European research projects dealing with food microbiology. She has also acted as Expert for the European Commission and Italian Ministries and as a referee for journals with international editorial boards.

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Dr. József Baranyi

Dr József Baranyi is a mathematician, leading the Computational Microbiology Team (www.ifr.ac.uk/safety/comicro/). His main interest is modelling bacterial responses to food environments and describing microbial complexity.

He has published five book chapters and ca 50 papers with refereed, internationally recognised journals, with a total citation index of ca 1800.

He has been invited to spend collaborative periods at various international research institutions, including CSIRO Food Research, Sydney, Australia; Univ. Bologna, Italy; USDA, Philadelphia, USA; Agricultural University of Athens, Greece.

Dr Baranyi has coordinated national and EU projects, has held several Mathematical Biology courses in various European research establishments and has been keynote/plenary/invited speaker, as well as member or chair of Organising Committees of numerous international conferences. He initiated and developed the first version of the successful ComBase system (www.combase.cc), then conducted many invited ComBase workshops in Europe and all around the world, from South and North America, through Australia and the Far East.

Dr Baranyi is a member of the Editorial Board of Applied and Environmental Microbiology since 1997; Statistical Advisor of the Journal of Applied Microbiology and Fellow of the Institute of Mathematics and its Applications.
Parallel Session 4: Modern Physics and Prolonging Safe Shelf Life

Prof. Andras Fekete

Birth: 08.28.1936, Budapest, Hungary
Occupation: professor


Career history: 1961 to 1978: Research worker/principal research worker/ Head of Control Department/Division at the Hungarian Institute of Agricultural Engineering, Budapest/Gödöllő,

From 1991: Professor in the Department of Physics and Control, Faculty of Food Science, Corvinus University of Budapest, Budapest.


Field of research: physical properties of agricultural materials and foods, nondestructive methods and instrumentation, non-contact measurement methods and instruments for quality assessment, application of electronic tongue for quality assessment of liquid foods, instrumentation and control systems.

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Parallel Session 4: Modern Physics and Prolonging Safe Shelf Life

Dr. Paw Dalgaard

Paw Dalgaard has worked with seafood since 1990 at the Technical University of Denmark. In 1998 he became leader of the research group ‘Seafood & Predictive Microbiology’. His educational background includes a Danish M.Sc. in food science, a French M.Sc. in fermentation technology (Nancy) and a Ph.D. in food preservation (Copenhagen). In 1992 he studied predictive microbiology at the University of Tasmania in Australia. Later, during a sabbatical research visit in 1998, *Photobacterium phosphoreum* was studied at Scripps Institution of Oceanography, University of California, San Diego, USA.

His main research areas today are seafood quality and safety including shelf-life prediction, predictive microbiology, histamine formation, modified atmosphere packaging, ready-to-eat products and psychrotolerant bacteria particularly *Photobacterium phosphoreum*, *Morganella psychrotolerans* and *Listeria monocytogenes*.

Paw Dalgaard has participated in and managed a series of national and international (EU) research projects. Internationally he is probably best known for his research and teaching in predictive microbiology including the development of the Seafood Spoilage and Safety Predictor (SSSP) software. This software is available at [http://sssp.dtuaqua.dk](http://sssp.dtuaqua.dk) and used by more than 3500 people/institutions from more than 100 different countries. Dr. Dalgaard has 45 scientific publications, an h-index of 22 and more than 1450 citations recorded by Web of Science.

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Parallel Session 5: Micro and Nanotechnology

Dr. Qasim Chaudhry

Dr. Qasim Chaudhry is a Principal Research Scientist at the Food and Environment Research Agency of the UK’s Department for Environment, Food and Rural Affairs (Defra). He is also a Visiting Professor at the University of Chester.

Dr. Chaudhry, a Chemist and Biochemical Toxicologist by training, is leading a team of scientists undertaking research into the safety of nanomaterials to human health and the environment in a variety of products and applications, including food and food packaging.

Dr. Chaudhry has published a number of research papers, reviews, and study reports on issues related to nanotechnology safety, and is currently the lead Editor of a book on nanotechnologies in food that will be published later on this year by RSC Publishing.

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Dr. M.-Pilar Marco

Dr. Marco has a degree in Pharmacy from the University of Barcelona (1985); she started her scientific career with a Master Thesis in Organic Chemistry on Synthesis of Analogues of the Alkaloid Ervitsine (1986) at the same university. Her PhD thesis, Synthesis and Regulatory Aspects of the Insect Molting Hormone System (1990), at the Spanish Council for Scientific Research (CSIC) was granted with a fellowship from the Spanish Ministry of Science. For three years (1990-1993), she worked as a postdoctoral researcher at the University of California in Davis in the group of Prof. Bruce D. Hammock on Immunochemical Analytical Methods for Environmental and Biological Monitoring.

In 1993, she started to work as a Junior Scientist at the Environmental and Chemical Research Institute of Barcelona of the CSIC where she obtained her position as Tenured Staff Scientist in 1996, which was the beginning of her professional career as a staff scientist of the CSIC. As head of the Applied Molecular Receptor Group (AMRg), her research has been focused on the production of selective bioreceptors, particularly specific antibodies for non-antigenic molecules, and the development of bioanalytical techniques and biosensors. The immunoanalytical methods developed have found application in the clinical, food safety and environmental fields.

In 2007 she got her position as Professor of Research at the CSIC and nowadays, she is the head of the Chemical and Biomolecular Nanotechnology Department of the Advanced Chemical Research Institute of Catalonia (IQAC) of the CSIC.

Her research interests are focused on the investigation of new transducing principles to develop bioanalytical multiplexed platforms for clinical diagnostics and food safety. She has been principal investigator of an important number of EC and Spanish projects, director of more than 10 PhD theses and co-author on more than 100 publications of international relevance.
Parallel Session 5: Micro and Nanotechnology

Dr. Sabato D’Auria

Sabato D’Auria is a Senior Scientist at CNR and Head of the Laboratory for Molecular Sensing at the Institute of Protein Biochemistry, CNR, Naples, Italy.

Dr. D’Auria was a Faculty Member, Associate Professor, at the Center for Fluorescence Spectroscopy, University of Maryland, Baltimore, USA from 1999 to 2002 and a visiting scientist at the University of Negev, Israel (1997-98).

Dr. D’Auria has authored more than 120 publications in peer-reviewed journals in the field of protein structure, protein function, and advanced biotechnological applications of proteins and enzymes. He is also author of several national and international patents and patent applications in the field of the biosensors. He is a Member of the Editorial Board of the following international Journals: Journal of Fluorescence, Plenum Press, USA; BMC, Chemical Biology, Biomednet, London; Protein Peptide Letters, Bentham Science, USA. He is an official reviewer for the following international Journals: Biochemistry, USA; PROTEINS, Structure, Function, Bioinformatics, USA Biotechnology Progress, USA.

The scientific interests of Dr. D’Auria are focused on the development and application of advanced luminescence methodologies and optical measurements to solve questions of biochemical and medical interest. In particular, Dr. D’Auria’s scientific interests deal with the study at a molecular level of the interactions involving proteins, enzymes, nucleic acids as well as small ligand molecules.

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Parallel Session 5: Micro and Nanotechnology

Dr. Filomena Nazzaro

Filomena Nazzaro, born in Portici (Naples) Italy, is a research scientist at the Istituto di Scienze dell’Alimentazione, ISA, of the CNR Italian Research Council, in Avellino, Italy, since 1995.

Her main areas of research are anti-cancer and antimicrobial components of plants; probiotics and prebiotics, with specific interest in the development of new functional foods and technologies of microbial preservation; vegetal and animal food biochemistry.

Her qualifications include a BSc, PhD in animal biology, and a post doc in biochemistry and enzymology, obtained at University “Federico II” in Naples, Italy.

Dr Nazzaro has been coordinator of the highly relevant bilateral project Italy-China “LABAGRO”, for the building of a food quality and safety laboratory of CNR in the Shandong province of the People’s Republic of China, supported by the Italian Foreign Office. She was also scientific responsible for CNR in the EU Exchange Programme ALFA between the European Union and Latin America “Preparation of a network for sustainable utilisation of natural resources in food biotechnology” (Preparation of Food Biotech BEC-FID). At present, she is task leader in the EU-STREP project “Novel Vegetal-based Extracts Additives for Chemical-Free Food” (NOCHEMFOOD).

Dr Nazzaro is the responsible on the national CNR scientific committee “Traceability, technologies and food safety” CNR-AG P05.004. Dr Nazzaro is also a professor of Food Chemistry at the Parthenope University of Naples (Degree of Food and Industrial Biotechnology).

She is first author or corresponding author of different national or international peer reviewed articles or book chapters, and is reviewer for some international scientific journals, such as Letters of Applied Microbiology, Journal of Agriculture and Food Chemistry, Journal of Food Engineering, the ISME Journal, Food Chemistry, Journal of Food Biochemistry.

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Parallel Session 6: State-of-the-Art View on –omics

**Prof. Chris Michiels**

Professor Chris Michiels is head of the Laboratory of Food Microbiology, Department of Microbial and Molecular Systems, Katholieke Universiteit Leuven, Leuven, Belgium.

His research group is using a microbial ecology approach to study the growth, survival, inactivation and stress adaptation mechanisms of foodborne spoilage and pathogenic bacteria in the food production chain. The focus of this research is on *Enterobacteriaceae*, in particular *E. coli* and *Salmonella*, and on innovative food processing techniques such as high hydrostatic pressure and pulsed electric fields, and in natural antimicrobial enzymes such as lysozymes and the lactoperoxidase system.

The major teaching assignments of Prof. Michiels are General Microbiology, Food Microbiology, HACCP and Quality Assurance, and Dairy Technology. He is also program director of a group of seven Master’s programs offered by the Faculty of Applied Biological Sciences.

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Parallel Session 6: State-of-the-Art View on –omics

Dr. Peter Bron

Peter obtained an MSc in Molecular Sciences at the Wageningen University & Research Centre (WUR) in 1999. His subsequent scientific career has been fully dedicated to the host-microbe interaction and probiotics field.

Peter obtained his PhD-degree in 2003 at the Wageningen Centre for Food Sciences (WCFS, Wageningen, the Netherlands) with a thesis entitled “The molecular response of *Lactobacillus plantarum* to intestinal passage and conditions”. Several strategies aimed at the identification of conditionally expressed genes were implemented and exploited in *L. plantarum*, including in vitro complementation of the essential *alr* gene, resolvase-based in vivo expression technology (R-IVET) and DNA micro-arrays.

Subsequently, Peter worked as a post-doctoral scientist in the Alimentary Pharmabiotic Centre in Cork (Ireland) investigating host-pathogen interactions in the gastrointestinal tract using *Listeria monocytogenes* as a model pathogen. A luciferase-based vector was constructed and exploited to study gene expression using in vivo bioluminescent imaging in *L. monocytogenes* during murine infection. In situ expression profiles were generated for several genes, including regulators, virulence genes and genes involved in isoprenoid synthesis.

Currently, Peter work as a postdoctoral scientist at TI Food & Nutrition (TIFN, former WCFS) in Wageningen (the Netherlands) on a project entitled “Fermentation enhanced probiotic function”. His ten years of research have resulted in 15 publications in scientific journals.

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Ph. D. Miguel Angel Pardo has a Ph.D. in Biochemistry and Molecular Biology from the University of the Basque Country. Nowadays, he is the person in charge of the Molecular Biology Laboratory, part of the Detection Systems Area in the Food Research Division of AZTI-Tecnalia. AZTI-Tecnalia is a non-profit private foundation committed to the social and economical development of the food sector, with a Food Research Division formed by 80 people working in complementary areas of specialization and technological expertise. The Detection Systems Area has been involved in several RTD projects for food control administrations and private companies in the field of food authenticity and safety.

Dr. Pardo is also Project Leader for several National and European projects concerning the developing of genetic authentication techniques for seafood products based on DNA analysis by PCR-RFLP, FINS, microsatellites, SNPs, DNA probes etc...

During the last 7 years, he has been involved in several European (i.e. “Health promoting, safe seafood of high quality in a consumer driven fork-to-farm concept” – SEAFOODPLUS and “Food safety and quality monitoring with microsystems” – GOODFOOD) and National Projects concerning to the developing of genetic authentication techniques of food products based on DNA analysis by PCR-RFLP, FINS, microsatellites, SNPs, DNA probes etc...

He has published 18 articles in several international journals (i.e Journal of Agricultural Food Chemistry and Biochimica et Biophysica Acta) and more that 40 communications to international and national congresses and workshops. He has also obtained two patents regarding methods for species identification by real time PCR technology (PCT/ES2006/000725 and P200601988).

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Parallel Session 6: State-of-the-Art View on –omics

Dr. Alessandra Cereti

Dr. Alessandra Cereti was born on 16/03/73. She is currently a PhD Student in Biochemistry at the University of Turin working on the project entitled, 'Mass spectrometry (LC-MS/MS) hidden allergen detection in food - peanuts' at the CNR-ISPA Proteomics Laboratory, Bioindustry Park del Canavese. Some of the results have already been published (Anal.Bioanal.Chem., 2007).

Her specialty is the study and applications of proteomical techniques to foods, including techniques such as: 2D-Electrophoresis, SDS-PAGE and mainly Mass Spectrometry techniques. She also does identifications with MALDI-TOF (PMF) and LC-MS/MS (HPLC-ESI-IT) applied to different foods and samples. Sample preparation, instrument management and data analysis by Bioinformatics and Mass Spectrometry data analysis software are among her specialities.

She has taken the following courses in addition to her PhD training: Basics and applications of Mass Spectrometry techniques Course (University of Siena). Mass Spectrometry applied to Proteomics Course (University of Viterbo). Bioinformatics (first and second level) applied to biochemical data analysis Courses (University of Torino).

She has a Specialist Degree in Chemistry (5 years) from the University of Rome 'La Sapienza', where she studied 'Acidic component and Antioxidant properties in red Piedmont Wines', applying different analytical techniques on wine, mainly RP-HPLC, Electrochemistry, AAS and ICP-AES.
THE IMPACT OF HIGH HYDROSTATIC PRESSURE ON QUALITY AND SAFETY ASPECTS OF FOODS

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Over the past two decades, high pressure food processing at ambient temperature has become a mature technology and has successfully been introduced at an industrial scale for a large range of food products. The technology offers the food industry an alternative to conventional methods of thermal processing because in a number of cases it allows the avoidance of the production of undesirable changes in foods that hamper the balance between high quality (color, flavour and functionality) and safety. At the same time the technology offers an additional processing variable that allows creating new (combinations of) functional properties of foods, better addressing consumer preference, acceptance and needs.

This presentation will discuss current scientific know-how as well as industrial implementation of the technology. The part on the scientific state-of-the-art will focus on (i) basic principles of high pressure processing identifying high pressure-low temperature processes, high pressure pasteurization processes and high pressure-high temperature processes, (ii) effects of high pressure thermal processes on microbial inactivation, (iii) effects of high pressure thermal processing on enzyme inactivation and activity, (iv) effects of high pressure thermal processes on food allergens, (v) effects of high pressure thermal processes on texture characteristics of plant-based foods, (vi) effects of high pressure thermal processes on plant-based food-related chemical reactions, (vii) effects of high pressure thermal processes on color and flavor characteristics of plant-based foods, (viii) effects of high pressure thermal processes on nutrients and (ix) process impact evaluation approaches for high pressure thermal processes based on integrated mathematical models and/or extrinsic indicator systems.

The presentation will include both mechanistic and kinetic aspects. The part on industrial implementation will consider different product applications introduced in the market.

Part of the data that will be presented have recently been obtained in the context of NovelQ. NovelQ builds on the existing know-how and brings together acknowledged European expertise in science and technology to address incremental innovation in novel food processing and packaging. High pressure, pulsed electric field, cold plasma and advanced heating technologies together with optimal packaging schemes are determining its research agenda. NovelQ represents an integrated interdisciplinary research, demonstration and dissemination project designed to overcome bottlenecks inhibiting the introduction of novel technologies in the European food industry. To achieve this goal, two interacting approaches are used: (i) the development of a comprehensive knowledge base offering mechanistic and kinetic insight into the effect of novel processing technologies and packaging materials on safety and quality of complex food products of plant origin; and (ii) an integrated product process development and demonstration approach on a wide range of food products including consumer perception of novel processing technologies and pan-European activities of innovation, demonstration, dissemination and training.
NEW AND EMERGING CHALLENGES IN FOOD SAFETY FROM A RISK ASSESSMENT PERSPECTIVE

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EFSA was established in order to provide scientific advice and technical support for legislation and policies in all fields which have a direct or indirect impact on food and feed safety. EFSA has the pivotal role in food safety risk assessment, and risk communication in the European Union. The Scientific Panel on Biological Hazards (BIOHAZ) addresses issues on hazards of a biological nature related to food safety, food-borne diseases (FBD) including transmissible spongiform encephalopathies, food microbiology and waste management.

Identifying emerging risks is a key task assigned to EFSA by its founding Regulation (General Food Law). EFSA has a specific unit responsible for establishing procedures to systematically collect up-to-date information and data in order to identify and analyse emerging risks in the field of food and feed safety, particularly: defining priority indicators for the identification of emerging risks, developing procedures for collecting and evaluating data to identify emerging risks, identifying key sources and best practices in Member States and internationally to collect and update relevant data. This work is done in close collaboration with the risk assessment panels to ultimately support risk managers in taking effective and timely decisions in the field of food and feed safety.

EFSA receives most of its questions from the EU risks managers (The European commission, the European Parliament and the Member States), however EFSA also has the possibility to issue self mandates to address issues on food safety that it considers to be of interest for public health. In this context, the BIOHAZ Panel has adopted an opinion on Food-associated MRSA, which was identified as an emerging concern.

In a wider perspective on the area of biological food safety, the BIOHAZ Panel has recognized that the context in which works is changing over time and it has identified a list of concerns reflecting the fact of globalisation. The issues of specific concern for the BIOHAZ Panel include: Food-borne viruses, changing consumption patterns, demographic change, changes in pre-harvest technologies, new post-harvest processing technologies, improved diagnostic tools, control of BSE. In the context of increasing scarcity of resources, a major challenge for the risk manager will be to balance food safety and the costs thereof, against food security and the increasing cost of food production.

Emerging of resistance to important antimicrobials (AMR) [such as quinolones, extended-spectrum cephalosporins, and meticillin] amongst zoonotic and/or human pathogens is also a public health concern, the foodborne aspects of which have also been recently evaluated in a BIOHAZ opinion.
ABSTRACTS - PLENARY

CONSUMER PERCEPTION OF TRADITIONAL AND REGIONAL FOODS

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Traditional and regional foods are already a substantial segment in the European food market. In the southern part of Europe this has been established for a long time, and in the northern parts this is currently being established. The market size, nature and definitions of what traditional and regional foods are is still in formation. Several initiatives from Framework programme projects like TrueFood, the Nordic networks like IDnorfood and the more political Nordic Ministers Council programme New Nordic Food are examples of ongoing coordination and research efforts. In TrueFood, definitions of traditional food have been established, IDnorfood has focused on food perception by chefs, and New Nordic Food is an initiative to stimulate production, distribution and consumption of foods from a Nordic cuisine.

The potential for economic growth is large, but growth must still include knowledge in order to be successful. In TrueFood, data show clear perceptual differences between regions of Europe when it comes to what is considered traditional, although the expectations of quality have a lot in common. In IDnorfood, the chefs of star restaurants emphasised sensory attributes, origin of the raw material and preparation methods as the most important perspectives for traditional and regional foods. In New Nordic Food the chefs have formulated a manifesto with common values for Nordic food and the politicians have supported this with a political declaration with ambitions for regional development, tourism, value creation and potential export. The backdrop for this is the understanding of food culture as an important ingredient in globalisation and as a marker for pride and identity in a local culture.

It all comes together as a branding strategy for food where tradition and local production are very important elements in image building.
NEAR-INFRARED AND FLUORESCENCE SPECTROSCOPIC METHODS AND ELECTRONIC NOSE TECHNOLOGY FOR MONITORING FOODS

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There is a clear need for application of proper methods for measuring food quality and safety in the globalized food-webs. Numerous instrumental methods have been established in the course of the 20th century and are developing further, together with data analysis techniques, for such purposes. Among them, near-infrared and fluorescence spectroscopic methods and chemical sensor arrays called electronic noses show particular promises for rapid, non-destructive, non-invasive and cost-effective ways for assessing changes and enhancing control during processing and storage of foods. Their key advantages as analytical tools are 1) their relative high speed of analysis, 2) the lack of a need to carry out complex sample preparation or processing, 3) their relative low cost, and 4) their suitability for on-line monitoring or quality control.

The present survey attempts to demonstrate examples from the above areas, limiting itself mainly to monitoring some quality indices which contribute to the functionality or acceptability of foods as affected by alternative processing technologies, or loss of freshness/microbial safety, or developing spoilage during storage and marketing. These instrumental methods are correlative techniques: they must be calibrated first against (traditional) reference properties, and the instrumental data are evaluated with the help of chemometric methods. Near-infrared spectroscopy (NIR) can be used in either the reflectance or the transmittance mode. NIR spectra transformed to mathematical derivatives allows subtle spectrum changes to be resolved. Selected examples from the extensive NIRS literature relate to assessment of the quality of frozen fish, predicting cooking loss of chicken patties, detecting complex physico-chemical changes of minced meat as a function of the intensity of high hydrostatic pressure treatment, comparing changes of NIR spectrometric „fingerprints” caused by gamma radiation or high-pressure pasteurization of liquid egg white. Changes of NIR spectra reflect several parameters which suit the evaluation of loss of freshness, and onset of spoilage of various foods. NIR spectroscopy shows an application potential for rapid detection of bacterial or mould contamination. It may serve as a tool for detecting initial stages of mobilization processes during germination of cereal grains, or, even for GMO screening. Spectrofluorimetric measurements have shown potential e.g. to monitor lipid oxidation and development of meat rancidity, to differentiate between raw and processed milks, and to monitor fish and egg freshness. Electronic noses containing chemical sensor arrays offer a rapid method for evaluation of head-space volatiles of food samples, important for characterizing quality and safety. Such gas sensors may be able to classify storage time, and determine spoilage, either earlier or at the same time as the human senses, or „sniffing out” bacterial pathogens or (toxigenic) fungal growth on certain foods. Electronic nose sensing is also a promising method for detecting quality changes of fruit- and vegetable products non-destructively. In relation to some examples to be presented in the paper, certain software developments as qualitative classification tools made by Hungarian scientists will be pointed out.
FOOD SAFETY AND QUALITY MONITORING WITH MICROSYSTEMS

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Food safety and quality assurance play an important role in the improvement of the quality of life of all citizens. Thus, the agrofood industry is quite interested in finding new test solutions for the different stages of the complete food chain. Nowadays, the agrofood industry relies mainly on tests performed with laboratory-based systems, which are well accepted due to their good accuracy, but lack in flexibility and tend to be time consuming and expensive. Due to this, tests are usually performed randomly in different food samples; this means that the tests are not universal. Thus, there is a real interest in looking for new solutions based on novel technologies that may help in the massive testing of samples. Immunosensors, DNA chips, electrochemical devices, portable multisensing systems, optical and magneto based assays, etc…, may be of high importance in the future if they benefit from the introduction of Micro technologies and systems. The combination of microfabrication, nano and bio technologies, computer sciences and advanced communication strategies will lead to a novel series of instrumentation fully adapted to the requirements of the agrofood field, as they will bring well appreciated advantages in:

- **Miniaturisation**, that will allow new markets as portable instrumentation, and minimally invasive systems for field and at-line tests.
- **Fast response**, that will allow reduction of time of the assays and thus on-line food screening applications.
- **Cost reduction** of the sensing devices and of the reagents required, that will allow massive and extensive tests of the full agrofood chain.
- **Electronics reading**, that will allow the implementation of smart communication strategies and local decision taking nodes which are the basis of autonomous systems.
- **New functionalities** coming from the combination of sensor, actuator and electronics integration and data processing, that will allow new functionalities implemented with single devices.

In conclusion, Microsystems may be very adequate for food screening applications because of a reduction of time for tests and of reagents required. Also, Microsystems can improve the capabilities of communication that enable setting a smart information loop useful for decision taking and risk management at all stages of the food chain. Microsystems solutions may be also easily applied to the improvement of food production when combined with smart decision taking systems.

The objectives and results of GoodFood (FP6-IST-1-508774-IP), an Integrated Project from the European Commission dealing with Microsystems Technologies for the agrofood area will be presented.
METABOLIC EFFECTS OF MICRONUTRENTS INCLUDING NUTRIGENOMICS AND RISK-BENEFIT EVALUATION

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Vitamins and many minerals are essential micronutrients, and adequate intake is a major public health concern. This led to the establishment of recommended daily intakes, including subgroup differentiation based on variability and vulnerability. “Western” dietary habits promoted a shift from a balanced diet to supplementation and we are now facing negative “side effects” of chronic overexposure to dietary supplements. How can we refine our recommendations?

Micronutrients impact health in a concerted manner: most of them have overlapping or interacting biological activities. For example, the “antioxidant vitamins” collaborate by covering a wide spectrum of oxidative challenges. Niacin, B12, Folate, and others are essential to core metabolic processes, and also interact with antioxidant processes. Thus, hardly any micronutrient should be assessed in biological isolation, i.e. their status parameters and efficacy are interdependent.

Inter-individual variation and vulnerability for each micronutrient is caused by a series of genotypic and phenotypic drivers. Apart from a discrete number of monogenic disorders, we do not really know how to quantify their importance. The HTMFR polymorphism is a good example. The current methodology, mostly population/cohort and statistics-based, is simply inadequate, and this results in many assumptions and “weight of eminence” recommendations.

How to proceed? Maybe it is time to completely change track: from a population based recommendation to an individual based recommendation? Does the individual phenotype reveal micronutrient status and needs? Does the individual genotype really matter? Which approaches might work? Which tools are needed? Is all relevant information on genetic variation available? Can modeling help? What phenotyping technologies are available for the researcher and dietician? What about bioinformatics? Which business models will drive a possible change? I’ll address these issues in a proposal promoting a systems biology approach, combining toxicogenomics combined with extensive phenotyping and launching the “micronutrient genomics project”, a community based effort to construct a new foundation for assessment of the micronutrient and health relationship.
Parallel Session 1: Emerging Technologies

ASSESSMENT OF THE IMPACT OF EMERGING TECHNOLOGIES ON FOOD SAFETY

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High pressure is a mature “emerging” technology with approx 130 industrial installations worldwide. Inactivation of vegetative microorganisms, spores, prions and viruses will be presented and inactivation mechanisms discussed.

Pulsed electric fields application is on the verge of industrial use with key applications for cell membrane permeabilization. Examples of process designs for pasteurization purposes as well as strategies for equipment optimization will be given.

Pulsed light and cold plasma offer a potential for surface decontamination of packaging and food materials. Inactivation effectiveness as well as impact on food quality will be shown.

The use of ozone for decontamination of liquids as well as surfaces of food materials will be shown and the limitations regarding microbial inactivation discussed.

Ultrasound as well as high pressure homogenization have been used for cell destruction. An evaluation of these technologies also in combination with thermal processing will be provided.
MATHEMATICAL MODELLING ON NON-THERMAL INNOVATIVE FOOD PRESERVATION PROCESSES

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Innovative non-thermal food preservation methods have been emerging as attractive alternatives to conventional thermal methods. There are several new non-thermal technologies of potential interest to the industry, such as ozone, UV-C irradiation, ultrasound, high pressure, and electrical pulses. The application of non-thermal technologies to food processing and preservation may yield processed foods with minor losses of colour, flavour, texture and nutrients, while retaining the desired shelf-life and safety.

Ozone, UV-C irradiation, and ultrasound treatments, especially when combined with mild heat treatments, are promising techniques for the fruits and vegetables industry, because in many situations synergetic effects have been observed. However, in order to optimize processing conditions, assuring the required shelf-life and safety, and maximizing quality retention, it is necessary to mathematically model the processes and their impact on product safety and quality.

The food processing models should be able to describe the system behaviour, and can be based on physical and chemical relations, be of empirical nature (data-driven), or a combination of both. In the case of processes involving ozone, UV-C irradiation and/or ultrasound treatments the available models are mostly empirical. However, it is already possible to optimize these processes.

Some cases studies will be presented, in particular the optimization of thermosonication treatments for watercress (*Nasturtium officinale*).
REAL TIME VALVOMETRY TO MONITOR SAFETY IN OYSTER FARMING

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Growing quality seafood through innovation is fundamental. The aquaculture industry must incorporate principles of innovation and science in its production methods to enhance competitiveness and maintain environmental sustainability. In oyster farming, a major problem is the change in local and global environmental factors that are major regulators of oyster metabolism, production and ultimately seafood quality. In this view, toxic algae blooms are today a major problem in terms of aquatic ecosystem risks, human health and economy. Specifically, toxin accumulation in marine bivalves can lead to human exposure through the diet and to closures of shellfish harvest for human production. Thus any fundamental findings which could help to develop early warning protocols revealing the presence of these algae would be welcome. We will present how we redeveloped an old idea, dating initially from around 1900, to use changes in bivalve behaviour as an early detection system. Today we are working on the possibility of using the ability of oysters, or other mollusk bivalves, to ‘taste’ their environment as a possible way to monitor the arrival of toxic algae in oyster farming areas.

With the extraordinary technological advances in electronic, internet and mobile telephone networks in recent years, we sit at our desks and continuously survey and record the behaviour of animals. A multidisciplinary team of biologists, electronics specialists and mathematicians from the Marine Station of Arcachon (France) developed this system. It was initially for use in basic research but it is now also applied as an aid in the on-line monitoring of water quality for the oyster farmers in the Bay of Arcachon. The system is, at the same time, both simple and complicated. We glue light electrodes to the 2 shells of the bivalves so that we can measure all valve movements, including the amount of shell opening and closing and valve shaking. The electrodes weigh less than 1 g each and have been designed to minimise animal disturbance. In order to have a representative number of animals, we work with groups of 16, we sample data every 0.1 s and... we handle 1 720 000 data points per day every day. This is a tremendous amount of information that is processed daily to maintain a near online surveillance (daily update). When the raw data arrive in the laboratory, they are modelled and analysed in about 30 minutes. The idea is to produce a single mathematical equation for each animal for each day, then to exploit these equations so that the maximum possible amount of ‘digested’ data can be obtained and statistically analysed for daily, weekly, monthly and/or yearly patterns. The data are shown graphically for easy reading. To model the variety of bivalve behaviours we have developed non-parametric and robust regression analysis. Less than 1 hour after data arrives in the lab, a 1st output is available, in an analysed form, on the web. We have created a site which is available both in English and in French, ‘The Molluscan Eye’ (l’Oeil du Mollusque: http://www.domino.u-bordeaux.fr/molluscan_eye), where the public, and the oyster farmers, can find recordings of the detailed behaviour of oysters … from just yesterday. We also have private access for professionals. This new technology offers a way to continuously monitor water quality and thus the health of the farmed seafood which is more and more in demand by the public.
Parallel Session 1: Emerging Technologies

BIOSENSORS AND BIOMARKERS IN FOOD SAFETY ANALYSIS

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Food is one of the commodities that can be truly referred to as ‘globalised’. We now regularly consume food which has been grown and processed in many regions of the world. In relation to the safety of this food there are enormous efforts at the European level to ensure that what we eat is indeed safe and wholesome. The main risks that are being tackled can be divided into microbiological and chemical.

In a large Integrated Project funded by the European Commission entitled Biocop, the development of a number of biosensor technologies, both optical and electrochemical based, have been undertaken to produce fast, rapid and reliable screening assays for a wide range of chemical contaminants in foods such as mycotoxins, phycotoxins, pesticides and antimicrobials. This work has been supported by the development of a wide range of unique analyte-specific binding proteins. The results of this biosensor research will be presented to show how new and improved methods to deliver bioanalyses of a wide range of chemical contaminants in foods has been achieved.

In an even more ambitious research goal of Biocop, the ability to develop ‘effect based bioanalysis’ has been explored. Through the use of advanced proteomics and metabolomics, panels of biomarkers were sought which could produce ‘molecular fingerprints’ which could be used to determine if farm animals have received illegal anabolic steroid treatments. This research has yielded the identification of many such biomarkers and, when combined with bioinformatic modelling, can provide highly accurate means of detecting hormone misuse in cattle. The development of the techniques and how they could be applied to routine food safety monitoring programmes will be presented.

Biocop research is being presented at a wide range of international workshops and meetings throughout 2009 and 2010. For more information about the topics and registration details visit the website www.Biocop.org.
NOVEL TECHNOLOGIES IN BIOFILM ERADICATION AND IN ENHANCEMENT OF ACTIVITY OF ANTIMICROBIAL AGENTS

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Growth of harmful microbes in food processes causes severe problems in the food industry. Harmful microbes may cause food spoilage and they also are a potential food safety risk as potential pathogens. Ability of microbes to attach to surfaces and produce biofilms makes control of their growth challenging. Therefore several methods have been developed for the prevention of microbial growth on surfaces and for the improvement of process hygiene.

This presentation aims at giving an overview of the current and novel techniques used to prevent biofouling and eradication of biofilm from process surfaces. Recent studies have been focusing on the development of functional surfaces – like silver-containing antimicrobial steels, photocatalytic TiO$_2$ coatings and modification of surface hydrophobicity - with new or improved function. Developed functional surface materials have been reported to reduce the attachment of microbes and dirt as well as facilitate the removal of these materials during cleaning operations.

Practical examples will be given from studies made in the brewing industry e.g. with hydrophobic and photocatalytic TiO$_2$ coatings. In addition, several brewery biofilm microbes have recently been shown to produce acyl homoserine lactones, which act as quorum sensing signalling molecules. Other studies with quorum sensing have indicated that it may play an important role in biofilm development on surfaces.

As target sites for several biocides and disinfectants are within microbial cells, they must traverse the outer cell layer(s) of microbes in order to reach their target sites. Alternative methods for increasing activity of biocides and disinfectants are agents which disintegrate and weaken microbial membranes. Permeabilizers are agents which have been applied for the weakening of Gram-negative outer membrane. Hence, permeabilizers can enhance the activity of biocides and other antimicrobial agents, thus enabling the application of a reduced amount of biocide. Examples will be given about the activity of selected permeabilizers, like polyethylenimine (PEI) and weak organic acids. Studies have shown that PEI is capable of permeabilizing Gram-negative environmental strains, for example 

References:
TOOLS FOR FUNCTIONAL POST-GENOMIC ANALYSIS OF *LISTERIA MONOCYTIOGENES*

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*Listeria* is one of the most sequenced genera of bacteria, including members of all known species and many complete and draft genomes of the human pathogen *Listeria monocytogenes*. This provides a wealth of opportunity for fundamental, industrial and clinically relevant research, given the diverse lifestyle and habitats of this saprophytic and parasitic organism combined with a growing set of genetic tools. We have begun to modify existing and develop some additional genetic tools for this organism to facilitate this post-genomic era of *Listeria* research. Along the way we have gained some insights into aspects of *Listeria* biology, a number of which will be shared in this presentation.

**Lighting up *Listeria***. We have used the *lux* genes to develop a convenient marker for strain tagging, or for gene expression studies \(^{[1,2]}\). In both instances individual strains or gene expression can be followed in real-time in complex matrices, including living animals. **Knocking out genes – including essential genes.** Gene knockouts form an essential stage in any analysis, and a number of options are available. We favour a rapid, non-polar SOEing system based on a non-replicating plasmid which results in a clean deletion. We have extended this to allow allelic exchange or site specific mutations in genes of interest \(^{[3]}\). **Expressing heterologous proteins.** The corollary to knocking out genes is to control their expression precisely within the cell. We have developed a set of vectors which allows fine control over the level of gene expression over a wide dynamic range \(^{[3]}\). **Competitive indices.** Animal to animal variation can be a significant problem when investigating subtle alterations in virulence potential. This issue can be alleviated, and the number of animals required significantly reduced, by using individually tagged parent, mutant and complemented strains within the same mouse \(^{[4]}\).

Taken together with improved electroporation protocols \(^{[3]}\), this set of genetic tools offers the researcher greater control over the genome(s) of *Listeria monocytogenes*, which has allowed us to identify a novel virulence gene cluster associated with epidemic strains of lineage 1 \(^{[5]}\). We hope they will also prove useful to other *Listeria* researchers.

ABSTRACTS - PARALLEL

Parallel Session 2: Emerging Risks

FOOD-BORNE VIRUS TRANSMISSION: PROGRESS AND CHALLENGES

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Viruses are a major cause of food-borne disease. It is now well recognised that the most common viral gastrointestinal illnesses are rotavirus and norovirus (NoV) diarrhoea in the infantile and adult population, respectively. However most well documented outbreaks of viral gastroenteritis are related to noroviruses. Other gastroenteric viruses, such as rotaviruses and astroviruses have also occasionally been implicated in outbreaks. Another major food and waterborne disease is hepatitis which can be a serious debilitating disease progressing from a non-specific illness with fever, headache, nausea and malaise to vomiting, diarrhoea, abdominal pain and jaundice. Hepatitis A represents worldwide around 50% of the total hepatitis cases and, although it is self-limiting and rarely causes death, it may incapacitate patients for several months. The causative agent is the hepatitis A virus (HAV) which has been linked to several outbreaks. Hepatitis E, although less frequent than hepatitis A, has a higher mortality rate, particularly in pregnant women. It is the most important or the second most important cause of acute clinical hepatitis in adults throughout Asia, the Middle East and Africa. In contrast, hepatitis E is rare in industrialized countries, but antibody (anti-HEV) is found worldwide. Hepatitis E is principally the result of a water-borne infection in developing countries and is thought to be spread zoonotically (principally from swine) in industrialized countries. Altogether the actual number of outbreaks reported to be caused through water or food consumption is very low. It is plausible that in a majority of outbreaks, when the mode of transmission is unknown or where no data exist, are most likely attributed to water but remain unresolved because the detection methods may not be sufficiently developed, thus leading to an underestimation of foodborne and waterborne outbreaks.

The inclusion of viral analysis in regulatory standards for viruses in food samples must overcome several shortcomings, among others, the technical difficulties and high costs of virus monitoring, the lack of harmonised and standardised assays and the challenge posed by the ever changing nature of the principal target viruses.

Methods cited in the literature for the detection of enteric viruses in food and water matrices are diverse, complex, poorly standardised and restricted to a few specialist laboratories. It is obvious that quality control and quality assurance (QA/QC) issues must be solved, as well as simplification and automation of molecular procedures before they could be adopted by routine monitoring laboratories and considered by regulatory agencies when formulating guidelines for virus standards.

Nevertheless, once these standardized virological assays are available, the formulation of guidelines to ensure the virological quality of selected commodities in specific scenarios will certainly contribute to reduce the incidence of foodborne viral infections.
NEW STRATEGIES TO DETECT AND COMBAT MEAT-BORNE PATHOGENS

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Consumers’ dietary habits have changed, and demands for high quality, ready-to-eat, safe products with an extended shelf-life and natural flavour and taste have increased. Meat is a rich nutrient matrix that provides a suitable environment for proliferation of spoilage and meat-borne pathogenic microorganisms. Zoonoses cases in humans are still a health concern around the world. To cope with consumer and food safety authorities’ demands and concerns, the food industry has been forced to implement the HACCP technology as well as to innovate and implement alternative mild technologies together with the classical ones within the so called ‘hurdle concept’.

The application and efficiency of the alternative mild technologies such as high hydrostatic pressure, natural antimicrobials and active packaging on meat products will be discussed. Results of challenge tests throughout the shelf life of different meat products will be presented as a usefulness tool to obtain raw data for microbiological risk evaluation, according to the present EU regulation. Moreover, applicability of Real time PCR as an ideal complement of classical microbiology procedures for food-borne pathogen detection will be considered. Quickness, specificity and the number of samples that can be analysed could be considered as strong pillars for efficient control techniques in food microbiology.
FOODBORNE PATHOGENIC BACTERIA IN FRESH VEGETABLE PRODUCTION CHAINS


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Food safety outbreaks of human pathogenic bacteria (e.g., Campylobacter, E. coli O157:H7, Listeria, Staphylococcus, Salmonella) are an emerging threat in fresh vegetable production chains. A greater understanding of the plant-pathogen interaction is essential for identifying critical points in the production chain that can be improved and exploited for effective intervention strategies in order to improve food safety. This is particularly relevant for organic agricultural systems that rely on application of animal waste products for fertilization (a major risk factor for introduction of pathogens) and preservation of a ‘healthy’ image to maintain consumer confidence. Prevalence of pathogens in production chains was assessed in Austria, Germany, Switzerland, Denmark and Sweden within the EU FP7 CORE-Organic ERA-Net Pilot Project ‘PathOrganic’. Samples from over 7000 vegetable plants and applied manures (chicken, swine, cattle) from 14 production fields were analyzed using ISO and PCR-detection methods. Prevalence data will be presented. Results of critical points in production chains studies will be presented. The effects of host plants at the cultivar level on human pathogen contamination risk in the rhizosphere, and evidence suggesting a link to the quality of root exudated, will be presented. The influence of compromised plant health (e.g., plant diseases caused by fungal phytopathogens) on increased risk of human pathogen colonization and proliferation will be discussed.
Parallel Session 2: Emerging Risks

FOOD SAFETY ONTOLOGY AND TEXT MINING STRATEGIES AS A TOOL IN (RE)EMERGING RISK IDENTIFICATION

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Industry and government are held responsible for the safety of food and feed products. Therefore actual and relevant information concerning emerging safety risks is crucial. But how is it possible to filter relevant information from the fast growing volumes of information produced by science and the media?

In recent history several incidents with contaminated food have occurred. For example, the surprising detection of dioxin in the milk of cows fed with potato peelings in 2004 in the Netherlands, resulted in high costs and loss of confidence in the food production chain. The origin of this contamination turned out to be the kaolinitic clay that was used in the new sorting process of the potatoes in the plant (2004). However, in 1997 it had already been published on the internet that kaolinitic clay can be naturally contaminated with dioxin.

This example illustrates that information is crucial for preventive risk management. In order to enable filtering of relevant information from large volumes of information TNO developed a smart information system. This system combines the TNO Food Safety Ontology with text mining techniques. This information system supports the filtering of large volumes of electronic information produced by science and the media. By means of this dedicated system, documents from websites and databases are processed, which results in an overview of information on potential risks.

The system can be customized in such a way that the resulting filtered information can be matched with specific needs for government and industry.
QUALITY AND SAFETY OF REGIONAL AND TRADITIONAL FERMENTED FOODS IN EUROPE

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Fermentation of raw materials (milk, meat and vegetables) is one of the ancients’ ways to preserve food. It is a desirable process resulting from the modification of different substrates by the activity of microorganisms. The quality and safety of traditional and regional fermented foods is strictly related to the quality of raw materials, the fermentation microbiota and the technological process. Several fermented foods are based on adventitious fermentation due to the growth of the microbiota naturally present in the raw materials, other use natural or selected starter cultures to drive the fermentation processes.

Although the traditional fermentation processes has evolved to produce safe and high quality food, new threats to safety and quality may arise. These include those relating to the quality of raw materials (e.g. emergence of zoonotic pathogens and antimicrobial resistant bacteria) and to modifications in the traditional processing technology (e.g. shortening of ripening time and extension of shelf-life).

The study and comprehension of the microbial ecology of fermented food is now facilitated by recent achievements in the research on fermentation and pathogenic bacteria. Culture-independent molecular techniques (e.g. DGGE and qPCR) allow the study of populations dynamics during food fermentation, which can influence safety and quality of traditional foods. Moreover, post-genomic approaches provide innovative methods for the study of microorganisms in food matrixes offering new tools for quality and safety. Examples of the use DGGE in complex microbial analysis and genome wide microarrays for the study of bacterial pathogens in food will be presented.
SAFETY ISSUES OF TRADITIONAL RAW MILK CHEESES

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In December 2008 the SAFE/Agroscope Symposium on “Safety issues of raw milk cheese” took place in Brussels. The aim of the symposium was to identify gaps in food safety of these products, to outline measures to be taken for further amelioration of the food safety situation and to find common research topics.

In the beginning T Berger (Agroscope Liebefeld Posieux, CH) pointed out the agricultural and cultural importance of raw milk cheese for many European countries. Beside the existing knowledge and data the concerned sector has to invest additional forces to improve the situation and to give answers on a sound scientific basis. Looking at prevalence data A Pirisi from AGRIS Sardegna, IT presented effects of ripening on pathogenic bacteria in Pecorino Romano Cheese and showed that theses cheeses were free of pathogens when ripened for 90 days under typical conditions. Experiences in the production of short ripened Canarien traditional raw milk cheeses and the implementation of HACCP by small producers was presented by S Alvarez (Canarien Agronomic Research Institute, ES). M Nicolaescu from the University of Agronomic Sciences and Veterinary Medicine, RO presented an actual hygiene status of traditional Romanian raw milk cheese. Applying a ripening time of 90 days the cheeses mainly fulfil the criteria especially when respecting good raw milk quality. C Heggum (Danish Dairy Board, DK) presented the use of risk-based metrics for hazard analysis. Using these tools the dairy sector is able to take advantage of the newest developments in food safety and taking its responsibility for sufficient safety at the time of consumption. In her presentation S Menendez (Federal Veterinary Office, CH) described a Swiss example of a qualitative approach for risk assessment and discussed the chances and limitations of the qualitative method. A risk assessment in raw milk Camembert cheese was the topic of M Saana (National Veterinary School, FR). He used *L. monocytogenes* to illustrate how to establish Performance Objectives and Performance Criteria. In his presentation on transparency in risk analysis M Mühlemann (Agroscope Liebefeld Posieux) advocated for fully accessible information in order to understand for whom and why an assessment was made and in which manner, by what means, for what purposes, under what limitations and in which environment it was done. Experiences from the advisory service and emergency team for businesses producing traditional raw milk cheeses was the topic presented by E Jakob and R Imhof (both Agroscope Liebefeld-Posieux). A highly lasting impact in cases of *L. monocytogenes* contamination can be reached when the team is called early and measures are entirely implemented. Finally L Moreau (European Commission, DG RTD) outlined what was already done and what is planned in the framework of EUs DG research programs FP6 and FP7 concerning the issue milk.

The second part of the symposium was dedicated to group works. For more information on this, please visit the SAFE website, www.safeconsortium.org.
PROBIOTIC VEGETABLE GASTRONOMY: OLIVES AND ARTICHOKES MAY SUCCESSFULLY DELIVER BENEFICIAL BACTERIA TO HUMANS

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Current information on the benefits deriving from good eating habits is motivating consumers to become more aware of their diet without sacrificing taste. The latest trends seem to move towards natural and traditional foods supplemented with nutritional benefits. An innovative line of probiotic vegetable products that will allow regular consumption of beneficial micro-organisms from traditional vegetable preparations is under development by Italian research institutions in collaboration with food companies. There is currently no functional product division in the fresh gastronomy sector, therefore vegetable products provide a concrete opportunity to convey the probiotic benefits already appreciated by consumers in other market sectors such as yoghurt and dairy. Daily intake of probiotic micro-organisms can prevent gastrointestinal disturbances and improve the well-being of the organism by reinforcing its natural defences. To exert their beneficial effect after human consumption, probiotic bacteria need to survive first the manufacturing process of the carrier food and then the gastrointestinal ecosystem. The performance of probiotic strains is influenced by the protective action of the carrier food and improvement can be obtained by food technology. Artichokes and olives can work as valid biological vehicles for the transport and release of adequate amounts - no less than one billion live cells/portion - of live probiotic strains. A protective action is performed by the micro-architecture of olives or artichokes which allows bacteria to survive by adhering to the olive skin or artichoke surface, thus improving survival in the gastrointestinal tract. Bacterial strains have survived in the gut of volunteers fed daily with probiotic vegetables and a modulatory effect on gut microflora has been observed after artichoke and olive intake.

References
MATHEMATICAL MODELS TO PREDICT MICROBIAL KINETICS IN FOOD

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Since the 80’s, predictive microbiology (with a more apt name, the quantitative microbial ecology of food) has been focusing on the mathematical models describing microbial responses to food environments. Responses include growth / no growth, probability of growth, time to spoilage, time to visibility (in broth: turbidity); time to the moment when a specific metabolite or gene-product reaches a certain level (such as detection level), etc. However, the most important of all these responses is the specific growth/death rate of the population, if it exists at all.

A basic assumption in modelling the kinetics of food-borne microorganisms is that, in a growth-supporting environment, the cells divide at a specific rate that is characteristic of the species and the environment. This idealistic scenario is “disturbed” by the points below:

1. For single cells, the concept of specific rate is not a good quantity; it exists as an expected value only. In fact it can only be inferred from the distribution of individual division times, and frequently it is not even easy to calculate. As a consequence, deterministic kinetic models refer to a population as a whole, where the size is big enough to mitigate the effect of random differences between individuals. However, the variability between (even genetically homogeneous) cells cannot be ignored at small population levels.

2. The initial physiological state of the cells is not necessarily suitable to the environment. However, the cells’ regulatory mechanism can conduct an adaptation period, during which the cells adjust to their new environment, marked by the above-mentioned specific rate.

3. The environment is not necessarily homogeneous (in time or/and space). Temporal inhomogeneity makes it necessary to introduce dynamic models, where the environment can change during the investigated time course (such as storage time). The most common case is when the temperature is dynamic, but other environmental factors can also change with time: the water activity gradually decreases when the product is getting dry; or pH can be affected by the metabolites of indigenous bacteria. Note that this way, the question of microbial interactions can be embedded in the broader issue of dynamic models, since bacteria affect each other via changing their environment.

4. The microbial population is not necessarily homogeneous; therefore microbial interactions can play a major role in the responses. Spatial and temporal inhomogeneity are inherently interwoven with the issue of microbial interactions.

In this talk, we show that different mathematical techniques are necessary to study the above questions at (i) population; (ii) single cell and (iii) molecular levels.
METHODS AND INSTRUMENTATION FOR MONITORING PHYSICAL PROPERTIES OF HORTICULTURAL PRODUCE

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The objective of the work reported here was to evaluate up-to-date measurement methods and instruments for monitoring physical properties of horticultural produce and to determine relationships between produce quality and physical properties.

Ripeness is a principal quality characteristic that is determined by a classical compressive firmness measurement method. However, dynamic methods - the acoustical resonance measurement and impact test methods - and sensing systems have been developed for in-line firmness sensing of produce. Therefore, unripe, ripe and overripe produce can be distinguished during storage and before processing or marketing. Furthermore, internal defects are detectable by the acoustical resonance method, which is of high accuracy. Therefore, texture changes which are the result of core browning, softening, water core and hollow heart, can be detected.

“Electronic produce” is used to determine the impacts and forces acting on produce during transportation, sorting, etc. Stress sensors and micro data loggers are implanted into the “electronic produce” or the package to record the effects acting on the produce and to determine the hazardous points on the processing line.

Optical methods with respect to VIS and NIR spectra and color attributes were found to be suitable for monitoring quality changes during storage. Relationships were determined for moisture content and apple surface irregularities, and carrot firmness and NIR spectra. Imaging procedures were applied for detecting scars and bruises on the fruit surface and peel browning by black and white thresholding. Special contaminants were detected on the produce surface, such as fecal contaminants, by in-line multispectral and hyperspectral imaging.

Sensing taste attributes of fruits and vegetables can be performed when measuring the potential properties of the fruit and vegetable juices by an “electronic tongue”. Relationships were determined to distinguish different fruit cultivars and storage conditions.

Consequently, several up-to-date methods and instruments are available for accelerating and improving quality monitoring of horticultural produce during postharvest processes.
PREDICTIONS OF SHELF-LIFE AND SAFETY IN FISH AND SHELLFISH

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Growth of micro-organisms in fish and shellfish is common due to the properties of the raw materials. Prediction of microbial spoilage and safety is therefore important to assure that products are safe and of good sensory quality when they reach the consumers. Predictions contribute to reduce the risk of product rejections and recalls. However, to be useful, predictive tools must be accurate and simple. This is a challenge because microbial responses related to spoilage and safety can be complex. A solution is to incorporate several different types of predictive models in a flexible software. The Seafood Spoilage and Safety Predictor (SSSP) software relies on this approach. With more >3500 users from >100 different countries, SSSP has been well adapted by the global seafood sector. SSSP v.3.0 from December 2008 is available free of charge at http://sssp.dtuaqua.dk. This presentation provides examples of how the SSSP software can be used in the assessment and management of safety and quality for fish and shellfish. Use of product and storage data is explained, particularly the use of product temperature profiles for time/temperature integration.

Shelf-life of fresh fish can be predicted by models for growth and activity of specific spoilage organisms (SSO). These microbial spoilage models can take into account the effect of storage temperature, storage atmosphere and the initial concentration of SSO in products. The SSSP software includes models for growth of *Photobacterium phosphoreum*, *H₂S*-producing *Shewanella* and lactic acid bacteria. These models allow the effect of changing storage temperature on product shelf-life to be predicted and this is of considerable practical importance.

Related to safety, histamine formation and growth of *Listeria monocytogenes* can be predicted by SSSP. Histamine is responsible for more incidents of seafood-borne disease than any other hazard. Toxic concentrations of histamine in marine finfish products can be formed both by psychrotolerant bacteria at chill storage conditions (0-5°C) and by mesophilic bacteria at storage temperatures above 7-10°C. To predict the effect of large temperature variations, as observed e.g. during delayed chilling of finfish, the SSSP software includes kinetic models for growth, interaction and histamine formation by *Morganella psychrotolerans* and *M. morganii*.

*L. monocytogenes* remains a major concern to the global seafood sector (EC 1441/2007, Codex/ALINORM 09/32/13). Therefore, SSSP includes an extensive and thoroughly validated mathematical model to predict both growth boundary and growth of *L. monocytogenes*. Prediction of the growth boundary is important when developing or reformulating products where *L. monocytogenes* will be unable to grow. The growth model is important when establishing the safe shelf-life of various ready-to-eat fish and shellfish products. The *L. monocytogenes* model in SSSP includes the effect of temperature, atmosphere, NaCl/a_water, pH, smoke components (phenol), nitrite, organic acids (lactate and diacetate), interactions among all these environmental parameters and the inhibiting effect of lactic acid bacteria on growth of the pathogen (the Jameson Effect). This makes SSSP a flexible predictive tool that the global seafood sector can use in the management of fish and shellfish safety.
ABSTRACTS - PARALLEL

Parallel Session 5: Micro and Nanotechnology

NANOTECHNOLOGY IN THE FOOD SECTOR

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Like other sectors, recent advances in nanotechnology are promising to revolutionise the food and related sectors. Although the current nanotechnology applications in the EU’s food sector are only marginal, an increasing number of products is available worldwide. Nanotechnology applications in the food and healthfood sector are also anticipated to grow rapidly in the coming years. The new technological developments have, however, also raised certain concerns over the safety of nanomaterials to consumers’ health.

This presentation will highlight the current state of nanotechnology developments in this area, and will discuss the potential risks of nanotechnology-derived (health)food products.
Parallel Session 5: Micro and Nanotechnology

ADVANCES AND IMPROVEMENTS IN RESIDUE ANALYSIS USING ANTIBODIES AND MICRO (NANO)SYSTEMS

Prof. M.-Pilar Marco


The combination of micro(nano)technological and biotechnological advances have given rise to novel diagnostic approaches to improve efficiency and/or to refine and extend the limit of detection. Materials and nanoparticles with defined physical properties may be used to develop functional hybrid biomaterials then used to develop biosensors with improved features and capabilities for residue analysis. At the moment, research is moving in the direction of exploiting the novel and unique properties of materials at the nanolevel to investigate the influence that biorecognition phenomena may produce on the optical and/or electrical properties of these systems, pointing to the possibility to develop more sensitive and flexible biosensing systems. Thus, subtle changes in properties, such as the dielectric field or the refractive index produced after biomolecular recognition events can be detected if they are taking place at the surface of these novel materials and devices.

On the other hand, antibodies as biorecognition elements have fascinating features such as the possibility to respond selectively to biological or bioactive substances and the capability to respond in a physiological manner. Antibodies are natural molecules with inherent capabilities to specifically react with their counter antigen. Moreover, they can be produced in principle against all kinds of substances and their features can be tailored according to the requirements of each application. In this presentation, some examples on the recent research performed in our group to develop improved bioanalytical devices for residue analysis in the food safety field will be presented. Examples will be given of recent achievements to detect pesticides, antibiotic residues and androgenic anabolic steroids with biosensing devices based on electrochemical\(^1\) \(^2\) and optical\(^3\) transducer principles.

(2) Bratov, A.; Ramón-Azcón, J.; Abramova, N.; Merlos, A.; Adrian, J.; Sánchez-Baeza, F.; Marco, M.-P.; Domínguez, C. Biosensors and Bioelectronics 2008, 24, 729-735.
ABSTRACTS - PARALLEL

Parallel Session 5: Micro and Nanotechnology

ADVANCED NANO-BIOSENSORS FOR FOOD SAFETY AND A BETTER QUALITY OF LIFE

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For many decades, scientists have recognized the power of incorporating biological principles and molecules into the design of artificial devices. Biosensors, an amalgamation of signal transducers and biocomponents, play a prominent role in medicine, food and processing-technologies. Compactness, portability, high specificity and sensitivity represent some reasons why biosensors are considered a high potential promise to replace current analytical practices.

Fluorescence detection is the dominant analytical approach in medical testing, biotechnology and drug discovery. Starting in the 1980s the first chemically synthesized fluorescence probes for specific analytes became available. These early probes were designed so as to include in the same molecule both the specific affinity for the ligand and the ability (capability) to change some intrinsic fluorescent property upon binding of the ligand. The development, via chemical synthesis, of specific sensors for relevant analytes is more challenging. In order to circumvent these difficulties modern biotechnology has resorted to the idea of using proteins and enzymes as components of sensors for biochemical analytes. The idea is to exploit the extremely wide range of selective affinities sculpted into the various proteins by biological evolution. The number of potential ligands specifically recognized by different proteins is very large and ranges from small molecules to macromolecules (including proteins themselves).

The use of proteins as components of biosensors has many advantages: a) relatively low costs in design and synthesis; b) the fact that proteins are, at least in general, soluble in water and c) finally, thanks to the progresses of molecular genetics, the possibility of improving/changing some of the properties of proteins by genetic manipulation.

However, the use of enzymes as probes for biosensors poses an additional problem: substrate consumption. One adopted solution has been the use of coenzyme-depleted enzymes which are still able to bind the substrate, but not to transform it.

We report recent advanced applications of fluorescence sensors to monitor analytes of high interest for food safety and, more generally, for a better quality of life.
Parallel Session 5: Micro and Nanotechnology

MICROCAPILLARY ELECTROPHORESIS AS AN INNOVATIVE APPROACH FOR FOOD ANALYSIS

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The development and the use of new analytical techniques in food science has recently seen massive growth as result of the increased apprehension of consumers about food quality and safety. As a consequence, cheaper, more powerful, sensitive and rapid analytical techniques are required, at international levels, by regulatory agencies as well as by food chemists, biochemists, microbiologists and quality control laboratories to meet this requirement.

In recent years, micro-capillary electrophoresis (mCE) techniques have seen a significant increase in their applications in food analysis. The combined use of molecular techniques and capillary electrophoresis can be considered a remarkable analytical procedure that combines the selectivity and the sensitivity provided by the molecular technique with the speed of analysis, resolving power and low sample requirements of mCE techniques. Thus mCE, combined or not with PCR-based techniques, can become a powerful analytical alternative for (a) detection of food-borne pathogens; (b) identification of new bacteria of agro-food interest; (c) species identification; and (d) detection of genetically modified organisms (GMOs). In the food quality and safety field, the use of mCE is increasing mainly in the evaluation of the correct proteolytic events taking place during ripening and aging of fermented foods. Finally mCE, combined with MS or immunochemical techniques, can be a relevant, faster and sensitive support to identify the presence and the nature of bioactive peptides in milk and dairy products.
SOS RESPONSE AFTER HIGH PRESSURE STRESS IN E. COLI

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The development of high pressure (HP) processing for food preservation is creating a need for a better understanding of the effects of pressure on microbial physiology. While the effects of stresses like heat, cold, acid, oxidants and low water activity have been extensively studied in Escherichia coli as a model organism, little is known about HP stress, although pressure is also an important environmental parameter that varies over at least three orders of magnitude throughout the biosphere.

Moderate pressures up to 150 MPa do not kill E. coli but induce a specific stress response which includes a number of well-known stress proteins like the chaperones DnaK and GroEL, and the entire SOS regulon. The induction of this stress response may lead to cross resistance of the bacteria to stresses that are relevant to food preservation. Interestingly, this stress response is shifted to higher pressures (up to 400 MPa) in E. coli strains that have acquired HP resistance.

While the induction of chaperones is most likely a direct consequence of HP mediated protein damage, triggering of the SOS regulon requires the prior generation of DNA damage and was quite unexpected. In fact, HP itself is unable to induce direct DNA damage, and further investigation of this phenomenon revealed the endogenous restriction endonuclease Mrr of E. coli as the actual molecular trigger of this response. Interestingly, HP is thus far the only stress that is capable of activating Mrr, and we are currently investigating the underlying cellular mechanism. As DNA damage and the subsequent induction of the SOS response is mutagenic, we believe that Mrr can contribute to the generation of genetic variability and thus to the adaptive potential of E. coli populations.
POST-GENOMIC APPROACHES TO ELUCIDATE PROBIOTIC MODE OF ACTION

Peter Bron\textsuperscript{1,2}, Michiel Wels\textsuperscript{1,2}, Roger Bongers\textsuperscript{1,2}, Anne Wiersma\textsuperscript{1,2}, Maria Marco\textsuperscript{1,2} and Michiel Kleerebezem\textsuperscript{1,2,3}

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Probiotics constitute an important growth market for the food industry. However, advanced development of specific probiotic products is presently constrained by a lack of knowledge of bacterial cellular components important for the health-promoting effects observed in the consumer. In the last decade, we have employed the model bacterium \textit{Lactobacillus plantarum} WCFS1 to study the reciprocal bacterial and mucosal responses upon their encounter in the intestinal tract. Initially, a R-IVET screening approach revealed more than 70 genes of \textit{L. plantarum} that are specifically induced in the gastrointestinal tract of mice, which was confirmed by specific in situ detection of the corresponding transcripts using qRT-PCR, while the importance of the identified genes in intestinal persistence could be shown by mutational analysis. More recently, whole genome transcriptional profiling was used to identify the diet-dependent transcriptome of \textit{L. plantarum} during colonization of germ-free mice fed a standard rodent chow diet or a prototypic western diet. The subsequent elucidation of the in situ bacterial transcriptome in the human host enabled us to compare the bacterial responses to the intestinal conditions encountered in different host organisms. Host intestinal mucosa responses following the encounter with \textit{L. plantarum} have also been studied in a variety of model systems, including in vivo analysis in healthy human volunteers. These studies have included a randomised double-blind placebo-controlled cross-over study in which healthy adults were provided preparations of \textit{L. plantarum} harvested at different growth phases. Following consumption of these bacterial preparations, biopsies were taken from the intestinal mucosa and altered transcriptional profiles were analysed. Transcriptional profiles of human epithelia displayed striking differences upon exposure to the different \textit{L. plantarum} preparations. Modulation of NF-kB-dependent pathways was central among the major differentiating cellular responses, providing insight into the cellular pathways associated with the induction of immune tolerance towards this lactic acid bacterium. The observation that host responses are dramatically influenced by bacterial fermentation conditions triggered us to develop a functional-genomics fermentation platform that allows the identification and optimisation of expression of probiotic functionality parameters. \textit{L. plantarum} WCFS1 was grown according to a combinatorial fermentation scheme that included variations in NaCl concentration, pH, and oxygen and amino acid availability. Samples harvested from these fermentations were assessed for their respective transcriptome, proteome and glycome profiles. In parallel, these samples were analysed for specific probiotic functionality parameters, including immunomodulatory and gastrointestinal stress-tolerance phenotypes. The data obtained were stored in a correlation database that was used to identify molecular features conferring probiotic properties and enhancing survival capacity. Overall, these studies illustrate the potential of genomics technologies for the elucidation and optimisation of health-impact cultures based on knowledge of host-microbe interactions at the molecular level.
GENOMICS TRENDS IN SEAFOOD TRACEABILITY

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Genomics is a relatively brand new term which defines the study of genes and their functions, including the understanding of genome structure by sequencing and mapping. This new discipline was actually born from a marriage of molecular and cell biology with classical genetics being fostered by computational science (1). Moreover, genomics encloses several disciplines such as functional and structural genomics, pharmacogenomics, epigenomics and comparative genomics. The later actually consists of the study of evolutionary relationships between the genes and proteins of different species, strains, populations and even individuals.

On the other hand, the authentication of seafood products is currently an important concern within the context of seafood product labelling to ensure traceability through the whole chain. Seafood traceability will eventually increase the confidence of the final consumers of seafood products. To achieve this aim, a number of analytical tools are required to verify: i) geographical origin and ii) fish species identification. Furthermore, the protection of traditional and regional seafood products from the fraudulent introduction of foreign species should be addressed.

In this context, there is a growing trend towards applying modern genomics tools to resolve traceability deficits in order to authenticate seafood products. As a matter of fact, a variety of different genomics tools are currently available (2) and some attempts to authenticate seafood products have already been addressed.

Thus, the final aim of this lecture is to give some hints to establish a beneficial link between the last genomics tools and seafood authentication issues.

References

Food allergies represent an important health problem in industrialized countries. Undeclared allergens as contaminants in food products pose a major risk for sensitized people. By the Directive 2003/89/EC of the European Commission, it is mandatory for producers to label all ingredients and derived substances.

A number of assays to detect traces of allergens in different kind of foods have been developed and some of these are commercially available. The most commonly used techniques are ELISA and PCR or Real-time-PCR. There is not much known about mass spectrometry applied in an analytical manner to detect traces of allergens or traces of allergenic components in food. A method based on tandem mass spectrometry (MS/MS) for the detection of traces of allergens in processed foods is in study. High abundance proteins are selected as potential targets for a sensitive detection. Peptides are obtained after tryptic digestion from natural or recombinant commercial proteins and sequenced on a LC-MS/MS system. Molecules that are found to be specific are then included in the subsequent assay development.
EMERGING TECHNOLOGIES

Oral 1: 14.30-14.45

NEUTRAL ELECTROLYSED WATER AS SANITIZER OF FRESH-CUT VEGETABLES

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Disinfection is one of the most important processing steps affecting the quality and safety and the shelf-life of fresh-cut, ready-to-eat fruits and vegetables. Chlorine is the most widely disinfectant used but recent outbreaks associated with pathogen contamination in fresh-cut vegetables raised the concerns about its efficacy in assuring their safety. Moreover, due to the environmental and health risks posed by the use of chlorine, there is a trend in eliminating chlorine from the disinfection process. Neutral Electrolyzed Water (NEW), which is produced by the electrolysis of a diluted NaCl solution passing through the anode of a membrane electrolyser, could be an alternative.

The aim of the study was to determine whether NEW could replace sodium hypochlorite (SH) in the fresh-cut produce industry. The effects of NEW, applied at different concentrations and times, in the reduction of some foodborne pathogens and indigenous microbiota in fresh-cut produce was investigated and compared with a standard SH treatment and deionized water.

The bactericidal activity of diluted NEW (containing approximately 50 ppm of free chlorine, pH 8.60) against foodborne pathogens on lettuce was similar to that of SH (120 ppm of free chlorine) with reductions of 1–2 log units. Treating fresh-cut lettuce, carrot, endive, corn salad and ‘Four seasons’ salad with NEW 1:5 (containing about 50 ppm of free chlorine) was equally effective as applying SH. Microbial reduction depended on the vegetable tested and treatments were more effective on carrot and endive than on the other products tested. The reductions of indigenous microbiota were smaller than those obtained with the artificially inoculated bacteria tested (0.5–1.2 log reduction). NEW seems to be a promising disinfection method as it would allow to reduce the amount of free chlorine used for the disinfection of fresh-cut produce by the food industry, is safer, produced ‘in situ’ and easier to handle. However, as chlorine, total microbial elimination is not ensured.

Oral 2: 14.45-15.00

PULSED LIGHT FOR FOOD DECONTAMINATION: PRESENT AND FUTURE PERSPECTIVES FOR FOOD SAFETY

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Pulsed light appears as a promising novel decontamination technology to obtain safer products with extended shelf life and improved quality. This technology involves the use of intense and short duration pulses of broad spectrum light. Its high efficacy can be attributed to its rich broad-spectrum UV content, short duration and high peak power. Pulsed light has been successfully tested for the inactivation of microorganisms on differences surfaces, air, water and foods (vegetables, baked foods, seafood, dairy products, …). Although pulsed light has been focused on pathogen decontamination, reduction of contaminants of chemical origin appears as a novel approach for this technology. Studies performed for chemical decontamination could open up new applications for food industry, e.g. in solving problems like diminution of mycotoxins, pesticide residues, …. Furthermore, reduction of allergenic proteins after pulsed light treatment of peanuts show this technology as a promising process in this field for food industry.

Present and future perspectives concerning pulsed light technology and its application for food safety are overviewed in this work.

Oral 3: 15.00-15.15

NATURAL ANTIMICROBIALS FROM EXTRACTS OBTAINED USING THE SUPERCRITICAL FLUID EXTRACTION TECHNOLOGY

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Natural extracts are been introduced as a valid alternative within the food industry for reducing food spoilage bacteria and pathogens. Extracts from rosemary (Rosmarinus officinalis), garlic (Allium sativum), oregano (Origanum vulgare) and sage (Salvia officinalis) obtained by supercritical fluid extraction were evaluated for their antimicrobial activity against four microbial species, including gram-positive bacteria (Staphylococcus warneri and Lactobacillus plantarum) and gram-negative bacteria (Shewanella putrefaciens and Aeromona caviae).

The antimicrobial activity was investigated by the disc diffusion method and the MIC and MBC (Minimum Inhibitory and Bactericidal Concentration, respectively) were determined. All of the extracts, excepted the one coming from oregano, showed antimicrobial activity against most of the microorganisms tested, with inhibition areas ranged from 15 to 25 mm and minimum inhibitory and bactericidal concentrations values ranged from 3.25 to 0.003 g/ml. Lactobacillus plantarum showed sensitivity to the three extracts and on the other hand Staphylococcus warneri showed sensitivity just to one of the aforementioned extracts. The results support previous researches which show that extracts obtained by SFE can be considered and used as preservatives in food products.

Oral 4: 15.15-15.30

INACTIVATION AND RECOVERY OF FOODBORNE PATHOGENS AFTER HIGH PRESSURE TREATMENTS UP TO 900 MPa IN DIFFERENT MEAT HOMOGENATES
High pressure (HP) has been shown to enhance safety and shelf life of many foods. However, it has also been shown that sublethally injured cells can recover during storage under favourable conditions. The aim of the present study was to evaluate the effect of different meat homogenates with different composition, $a_w$ and pH on both the inactivation and recovery of microorganisms after HP. Overnight cultures of *L. monocytogenes*, *S. enterica* and *S. aureus* in both BHI and different meat homogenates simulating cooked ham, dry cured ham and fermented sausage were treated from 300 to 900 MPa. After HP, viability reduction and level of sublethally injured cells were determined together with the ability of the pressurized cultures to recover under different physicochemical conditions. *S. aureus* was the most HP resistant bacteria and some cultures in BHI were able to recover even after treatment at 900 MPa. In contrast, *S. enterica* and *L. monocytogenes* were more drastically inactivated and only a few cultures recovered after treatments at both 600 and 900 MPa. However, when NaCl, lactate, nitrite and acid were added separately during recovery, viability of all the cultures was highly reduced. When the three pathogens were grown in meat homogenates, the lowest reductions after HP were observed for dry cured ham homogenate while control (BHI) allowed the highest rates of recovery. Accordingly, the food matrix and the added compounds have an important effect on both the immediate decrease of viability due to pressurization and on the ability of the resulting sublethally injured cells to recover. Thus, the combination of HP with other treatments (the hurdle technology) improves the food safety.

Oral 5: 15.30-15.45

THE USE OF PROTECTIVE CULTURES AS A NATURAL MEANS OF FOOD PRESERVATION.

**Delves-Broughton , J.**
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Bacterial cultures, particularly lactic acid bacteria, are widely used to preserve fermented foods (e.g. fermented meats, dairy products and vegetables). The success of these fermentation processes depends, amongst other factors, on the competitiveness of the used starter cultures. Many lactic acid bacteria produce many different antimicrobial metabolites which enable them to counteract a wide range of competitors that would otherwise cause problems in the fermentation process.

In recent years research has been carried out into the use of lactic acid bacteria in food-processing applications where the outgrowth of specific problem microorganisms is to be controlled. These so called “protective cultures” should inhibit undesirable organisms without any negative impact on the organoleptic qualities of the treated food product. Advantages of the use of protective cultures as biopreservatives are their increased acceptance by consumers, regulatory agencies, and the food industry. Furthermore protective cultures allow the use of consumer friendly labeling.

Examples of the use of Danisco protective cultures (the Holdbac® range) will be presented for the preservation of ham, yoghurt, and feta cheese.
ANTIMICROBIAL ACTIVITIES OF ACTIVATED LACTOFERRIN AND ROSEMARY EXTRACT AGAINST L. MONOCYTOGENES ON MEAT

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Listeria monocytogenes, a ubiquitous pathogen, can multiply on meat and meat products at the refrigeration temperature. Interest in the usage of natural antimicrobials instead of synthetic ones has been increasing to inhibit the pathogens and to extend the shelf life of meats. Rosemary is a plant commonly growing in Mediterranean Region. ALF, activated form of lactoferrin naturally present in mammalian secretions such as milk and saliva, is a promising antimicrobial.

In this study, inhibitory effects of ALF and rosemary extract (RE) were tested against L. monocytogenes by using microtiter plate assay. Dipping applications of the same agents were also evaluated for antimicrobial activities on beef tenderloin inoculated with L. monocytogenes. Meat samples were inoculated with L. monocytogenes by dipping into 1x10^5 cfu/ml bacterial solutions before the treatment with 0.1%, 0.3% and 0.5% ALF or 15%, 30% and 45% RE. Samples were stored at 4°C in sterile zipper bags. The microbiological analysis was conducted to these samples at the days of 0, 3, 6 and 9 on L. monocytogenes selective medium.

The MIC values were found as 0.1% for ALF and 15% for RE after 24 hours incubation at 37°C. The application data of day 9 showed that 0.3% and 0.5% ALF reduced the number of L. monocytogenes on meat samples by nearly 1 and 1.5 log, respectively. Similarly, 30% RE and 45% RE application resulted in nearly 1 and 2 log reduction of the L. monocytogenes on meat samples, respectively. The MIC values of both antimicrobials didn’t result any log reduction on meat samples. Synergistic activity of ALF and RE against L. monocytogenes has been also under investigation. These results indicate that ALF and RE have antilisterial activity in vitro and on meat applications. Their use in food industry especially for treatment of meat and carcass is promising.

PREVENTION AND CONTROL OF P. EXPANSUM PATULIN PRODUCER BY BIOCONTROL AGENTS

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Penicillium expansum is the causal agent of blue mould, the most common post-harvest rot of pomaceae fruits worldwide that causes considerable economic losses and produces patulin, a mycotoxin known to cause immunological, neurological and gastrointestinal toxic effects in animal models and in humans. Use of mouldy fruits contaminated with P. expansum greatly increases the risk of patulin contamination in fruit juices, especially apple juice, that are commonly consumed by infants and children.
The control of post-harvest fungal diseases is usually based on the use of chemical treatments, cold storage or modified atmosphere. Nevertheless an effective control of the presence of patulin in pomaceae fruits and their products has not been achieved. In this study Cryptococcus laurentii, a yeast isolated from microbial community growing on the surface of apples and the lyophilised culture filtrates of Lentinula edodes (LF23), an edible mushroom with many pharmacological proprieties, have been used.

Both the biocontrol agents have shown an inhibitory effects on the germination of P. expansum conidia and on the synthesis of patulin with the stimulation of fungal and yeast antioxidant enzymes both in vitro and in vivo experiments.

The biocontrol system “LS28+LF23” has shown its effectiveness on development of P. expansum and on patulin biosynthesis in apple incubated at 25°C and also on apple stored for 6 weeks at 4°C and then incubated at 25°C for few days. The control effect is due to several components of the system apple- biocontrol yeast-biocontrol mushroom, in particular some β-glucans and glycoproteins produced by L. edodes have shown a significant effect, probably by the stimulation of the antioxidant system of toxigenic fungus

This study contributes to develop a biological control of fruit decay using microbial antagonists as alternative method or to assist the conventional control of post-harvest pomaceae rot.

STATE-OF-THE-ART VIEW ON -OMICS

Oral 1: 16.15-16.30

PROTEOMICS AS A TOOL FOR DETECTING AMINE-PRODUCING STRAINS OF LACTIC ACID BACTERIA

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Enterococcus faecalis DISAV1022 is a food-contaminant bacterial strain, isolated from a sample of Robiola of Roccaverano, a goat Piedmont cheese. Its ability to produce biogenic amines was determined by HPLC that revealed the production of high amounts of tyramine and of traces of β-phenylethylamine. Kinetics of these amine accumulation suggest that the same enzyme, the TDC, catalyzes both tyrosine and phenylalanine decarboxylation: tyrosine was recognized as the first substrate and completely converted into tyramine (100% yield) while phenylalanine was decarboxylated to β-phenylethylamine (10% yield) only when tyrosine was completely depleted. Comparative proteomic investigations, by means of two-dimensional electrophoresis followed by MALDI-TOF/TOF mass spectrometry, were performed on bacteria grown in conditions stimulating biogenic amine production (CDM fortified with high amounts of tyrosine and phenylalanine) and in control condition (CDM medium). These analysis were carried out on both cytosolic and membrane cell districts, revealing the presence of 49 differentially expressed proteins: among these 11 were down-regulated and 39 up-
regulated in stimulated conditions. Most of these proteins can be divided in 8 main functional groups. Except for aromatic amino acid biosynthetic enzymes, no significant down-regulation of the central metabolic pathways was observed in stimulated conditions suggesting that tyrosine decarboxylation does not compete with the other energy supplying routes. The most interesting finding of proteomic investigations is the presence of a membrane-bound TDC highly overexpressed during amine production. This is the first evidence of a true membrane-bound TDC, longly suspected in bacteria on the basis of the gene sequence, able to catalyze the decarboxylation of both tyrosine and phenylalanine.
EMERGING RISKS

Oral 1: 14.30-14.45

FOOD SAFETY IN RELATION TO ENVIRONMENTAL HAZARDS AFFECTING SHELLFISH: EMERGING RISKS.

IRTA Sant Carles de la Ràpita, C. Poble Nou, Km 5,5 , 43540 Sant Carles de la Ràpita, Spain.

Shellfish products are derived from wild populations or cultured shellfish in coastal areas and monitoring of the quality of marine waters is a first priority when considering safety hazard evaluation. The three main environmental hazards that can affect the quality of such products are related to microbiological contamination, marine biotoxins and pollutants.

Current European legislation sets admissible levels for factors related to these hazards but it only addresses some of the issues. As a result, there is a need for further studies, especially the risk assessment of emerging problems.

For microbiological agents, most legislation to classify shellfish growing areas is still based on bacterial standards, using faecal coliforms or E. coli as indicators. However, they have limited value for predicting levels of human viral contamination (such as norovirus or hepatitis A virus). In addition, some Vibrio species (e.g. V. parahaemolyticus) have been identified as emerging potential threats in certain areas. Consequently, epidemiological studies are required to assess the relevance of these problems.

The transfer of marine toxins through food webs is a well-known issue but the identification of new toxins and their derivatives raises new threats. Emerging toxins, such as azaspiracids and cyclic imines, represent a concern that requires improved understanding. Toxicological issues, such as the potency of spirolids and yessotoxins, are also under discussion. Additionally, the latitudinal distribution of toxin-producing marine microalgae is changing, since the temperature dependent geographical distribution of species may fluctuate according to climate change.

For chemical pollutants, analytical procedures and the EU legislation are quite well developed, and efforts are being made towards the development of rapid screening kits to lower costs. Related risk assessments should focus on the dietary habits of populations and quantification tools for better risk evaluation.

In order to focus on all these emerging risks, the implementation of sanitary surveys, in conjunction with risk assessment approaches, is being increasingly used as a solution for optimizing effort.

Oral 2: 14.45-15.00

UNDESIRABLE EFFECTS OF ROASTING PROCESS AND NEO-FORMED COMPOUNDS: NOVEL EMERGING RISKS?

M. Arlorio¹, J.D. Coisson¹, F. Travaglia¹, A. Caligiani², V. Fogliano³ and A. Martelli¹
The roasting process allows the formation of colour/aroma via Maillard reactions in hazelnuts and cocoa. Colour, as sensorial parameter, is a charming characteristic of roasted foods. Time, temperature, moisture and ripening degree of seeds dramatically influence the roasting impact on the seeds. Despite of their fundamental role in organoleptic properties, the roasting potentially allows accumulating of toxic contaminants (acrylamide, furan, D-amino acids and biogenic amines, by Strecker reaction). The RGB Computer Vision and Image Analysis (CVIA) coupled with Artificial Intelligence (AI) is a powerful tool useful to correlate colour development with toxic substances appearance.

Aims of this work were i) to evaluate some potentially toxic compounds in roasted hazelnut/cocoa samples (D-aa, biogenic amines, acrylamide, HMF, furan) and ii) the development of a CVIA/AI-based method useful to correlate colour with toxic markers. Concerning cocoa, the content of total biogenic amines ranged from 13.03 (Arriba) to 60.97 mg/Kg (not-roasted Ghana beans), showing a significant change in roasted samples, depending on the single amine. D-amino acids were mainly D-alanine, D-aspartic and D-glutamic acid. Free D-alanine predominated in not-roasted samples (4.0%, D/L ratio, Ivory Coast); D-aspartic was the major protein-bound D-aa in roasted samples (5.7%, D/L ratio, Ghana). Concerning roasted hazelnuts, we stated that thermal impact should allow the formation of HMF (up to 120 mg/Kg) and acrylamide (up to 200 ug/Kg), confirming the need of the roasting process optimization. The HS-SPME/GCxGC/TOF-MS analysis confirmed the presence of furan and other substituted furans in volatiles flavour. Using CVIA/AI, we set-up a useful approach useful i) to correlate colour with some toxic/thermal parameters (particularly D-aa and HMF), and ii) to predict the roasting degree in hazelnuts. Our results clearly showed that the decrease of Red colour component is strictly correlated to the increase of HMF and D-amino acids.

Oral 3: 15.00-15.15

SAFETY EVALUATION OF NANOPARTICLES AS EMERGING FOOD INGREDIENTS: THE CASE OF SILVER

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Silver is a well known antimicrobial compound and for this reason it is of interest for the Food Industry. As a matter of fact, it is currently admitted as an additive in certain foods where it is known as E174. The properties of silver are more effective when the molecule is reduced to the nanosize scale. Nanosilver is currently included in certain food containers and its addition to food as a stabilizer has also been proposed. However, no specific testing to assess the safety of nanosilver in food and no legal requirements to identify this ingredient as such, are currently available.

The aim of our work was to determine the general effects of the exposure to silver and nanosilver in a model vertebrate. To this end, we chose the zebrafish animal model.
Acute and chronic toxicity was tested on zebrafish embryos and larvae, respectively. Embryos and larvae were suspended in different concentrations of silver (ranging from 0.001 to 5 ppm) as silver nitrate and colloidal nanosilver. The following toxicological endpoints were analysed at three different timings (1, 2 and 21 days post fecundation): mortality, malformations, differential expression of selected toxicity biomarker genes. Silver nitrate showed a toxicity that followed a dose-response scheme. The mortality rate resulted evident only at the highest concentrations tested and no deformations were detected. Nanosilver caused a mortality rate that was not necessarily following a dose response scheme and lower concentrations gave in some cases higher mortality. Gene expression analysis confirmed these results and some of the toxicity biomarker genes proved particularly suitable to detect the effect of nanosilver.

Our study indicates that the toxic effect of nanosilver should be further investigated and in the meantime its use as food ingredients should be questioned. An appropriate legislation should urgently be proposed.

Oral 4: 15.15-15.30

DETECTION METHODOLOGY AND SURVIVAL OF MYCOBACTERIUM AVIUM SUBSP PARATUBERCULOSIS (MAP) IN DAIRY PRODUCTS

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*Mycobacterium avium subsp. paratuberculosis (MAP) causes chronic inflammation of the intestines in cattle known as Johne’s disease. A very similar disease, Crohn’s disease (CD), characterized by chronic bowel inflammation is known in humans. In patients suffering from CD, MAP is more often isolated, suggesting a link between both. However a causal link between MAP and CD has not yet been proven scientifically. MAP bacteria can be present in raw milk but their survival of pasteurisation and their presence in retail milk has also been demonstrated (Grant et al., 1996; 2002). Whether live MAP can also be present in dairy products at the time of consumption was the aim of our study. Detection methodology to isolate MAP from cheeses and yoghurt was optimised and further applied to check the survival of MAP in yoghurt and cheese. Two strains of MAP (ATCC19851 and Niebuell) were inoculated on various cheese varieties (Gouda, Munster, Danish Blue, Emmental, Cheddar) as well as on yoghurt and subsequently plated onto four different culture media, typical for MAP isolation (HEYM+VAN; HEYM+PANTA, Middlebrook+VAN; Middlebrook+PANTA). Sample preparation was done according to Donaghy et al (2004). The survival of MAP bacteria inoculated in natural yoghurt and stored in refrigerator was followed during 5 weeks by plating samples on HEYM+PANTA every week.

The bacterial background flora in cheese was not sufficiently inhibited to allow a good quantitative estimate of MAP on all of the evaluated media. Additional antimicrobials were necessary. Isolation of MAP from yoghurt on the other hand was feasible. Inoculated MAP bacteria survived at least 5 weeks during refrigerated storage of yoghurt. In conclusion: the isolation of MAP is often hampered by shortcomings in the methodology while the survival of MAP in retail yoghurt was demonstrated.
Penetration of Salmonella enteritidis through the vitelline membrane of hen’s eggs as affected by its strength during the laying period

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Eggs have been implicated as leading sources of human salmonellosis caused by Salmonella enterica serovar Enteritidis (SE). Although SE is not often deposited directly inside the yolks of naturally contaminated eggs, penetration through the vitelline membrane to reach the yolk contents could result in rapid bacterial multiplication. This study was conducted to determine whether the penetration of SE through the vitelline membrane is affected by the vitelline membrane strength (VMS). The VMS and penetration were determined for successive eggs. At the beginning, middle and end of lay, five series of successive eggs were collected of 24 hens from one laying flock. For the penetration study, an in vitro egg contamination model was used enabling sampling of the yolk contents as a function of egg storage (up to three weeks). The VMS decreased from the beginning to the middle of lay, but subsequently stayed constant until the end of lay. The proportion of vitelline membrane samples that were penetrated, was not affected by the laying period. The time of penetration varied strongly within the groups of hens and within one hen. Combining all results, only a slight but significant correlation (R=0.1692 ; p=0.011) was found between the VMS and the moment of penetration.

Comparative study of mature biofilms formed by different Listeria monocytogenes strains by biocide resistance and microscopic analysis.

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Biofilms are widely considered to be a prevailing bacterial lifestyle in most environments. Resistance to stress stimuli is much higher in biofilms than in liquid
culture, i.e. planktonic state. Biofilms thus enhance bacterial persistence in food processing environments. In the case of pathogens such as *Listeria monocytogenes*, this can be a source of serious food safety problems.

A comparative study of mature biofilms formed by different strains of *L. monocytogenes*: CECT 5873, CECT 911 and CECT 4032 was carried out with the aim of examining structure and antimicrobial resistance. Biofilms formed after 4 and 11 days at 25°C were thus evaluated for resistance to benzalkonium chloride, peracetic acid and nisin. Dose-response kinetics were determined and both lethal dose 50 (LD50) and lethal dose 90 (LD90) were calculated by fitting experimental data to a modified logistic equation. Lethal doses values obtained for biofilms and planktonic cells were also compared. Statistical differences were tested using Student´s t-test (α=0.05). Additionally, biofilm structure was analyzed by scanning electron microscopy.

Lethal doses of benzalkonium chloride and nisin were higher against biofilms than against planktonic cells, but resistance to peracetic acid was higher for free-living cells. The latter could be related to a lower peracetic acid effectiveness in liquid culture. Biocide resistance of biofilms increased with age except for CECT 5873. This increase was highest for CECT 4032, with LD values increasing two or three-fold. Microscopic studies revealed that only mature biofilms formed by strain CECT 4032 developed a structure with cloud-like masses, whereas a monolayer biofilm was observed for other strains.

It is concluded that biofilm resistance is inherent to each strain and that biofilm microstructure correlates with antimicrobial resistance.

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**MICRO- AND NANOTECHNOLOGIES**

Oral 1: 16.00-16.15

**SILVER NANOTECHNOLOGY AS TOOL TO RAISE SAFETY IN ABSORBENT PADS**


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A potential use of cellulose-derived materials as holder of silver nanoparticles has been explored, and their capability to deliver antimicrobial activity in absorbent pads has been investigated during meat storage. The proposed silver based antibacterial hybrid materials have been developed after in-situ reduction of silver nitrate adsorbed on cellulose fibres. Nanoparticles generated by physical methods were regular in shape and efficiently dispersed, while the chemical reduction produced highly aggregated nanoparticles. Nanoparticle size was found relevant to guarantee high antimicrobial activity, and indeed a satisfactory correlation between silver ion release and the antimicrobial efficiency against *E. coli* and *S. aureus* could be confirmed; furthermore, the highest concentrations tested were efficient to reduce the microbial load in meat exudates during MAP storage. Consequently, silver based absorbent materials could be especially designed to preserve aseptic conditions during manipulation, leading
therefore to feasible applications of a silver based nanotechnology in food technology.

Oral 2: 16.15-16.30

A MULTI-TRANSUDUCER BIOSENSOR IN MONITORING LARGE CLASSES OF POLLUTANTS FOR FOOD QUALITY AND SAFETY

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Nowadays, there is an increasing demand worldwide for low cost, fast and reliable methods for monitoring chemical species. Biosensors offer all these advantages since they can be easily used both in laboratory and in field applications (1,2). This rapidly expanding field has an annual growth rate of 60%, with major impetus from the healthcare industry (30% of the world’s total analytical market) supported with other analytical areas of food & environmental monitoring and security. The world total analytical market is approx 12 billion/year and less than 0.1% of this market is currently using biosensors. One main reason of this reduced growth is that each biomediator requires a specific device and a lot of effort for a small market.

The instrument reported in this paper, and developed by the synergy of an R&D institution and a industrial high tech company, intends to contribute to reduce this gap by moving biosensors from the research laboratories to market developing a system that can be used for a large range of applications: agro-food, industry for drinkable products, fermentation industry, waste water management, microbial contamination, security, defence and several al. In particular, we designed and fabricated a new advanced biosensor for the detection of agrofood pollutants by combination of amperometric and optical transducers with microorganisms and enzymes as bioreceptors (1-3). It utilizes as biosensing elements a multi-array of photosynthetic unicellular green alga \textit{Chlamydomonas reinhardtii} as well as Laccase and Tyrosinase enzymes, immobilised on screen printed electrodes over an area of few millimetres. It was developed for the detection of pesticides present in food owning to large classes of chemical compounds such as triazine, fenylurea, diazine and phenolic pesticides, with very low limits of detection that ranged from $0.9 \times 10^{-11}$ to $3.0 \times 10^{-9}$, depending on the biomediator and the herbicide pairing tested (4). Environmental and human health problems related to the use of synthetic pesticides have created an increasing pressure against their use. According to the FAO’s dossier issued in Jakarta in May 2001 the human and material costs of the giant pesticides business accounts for 25mln of people poisoned every year and 30bhn of annual turnover. The most recent EU directive concerning pesticides (EC Regulation No 149/2008 of 29th January 2008) fixes the maximum residue levels of pesticides in food and feed of plant and animal origin to values between 0.01-0.05 mg/kg depending on the compound. The proposed biosensor aims at providing solutions to these issues by offering low cost easy to use tools for real time monitoring.

POSTER ABSTRACTS: EMERGING TECHNOLOGIES

Poster 1

STORAGE STUDY OF *E. coli* O157:H7 CELLS INJURED BY HIGH HYDROSTATIC PRESSURE APPLICATION IN FOOD MATRICES

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Research studies about application of High Hydrostatic Pressures (HHP) by various research groups are advancing at rapid pace. In present study, *Escherichia coli* O157:H7 were inoculated (approx. 7 log cfu/ml) in the selected matrices (Skimmed milk, Orange juice and Tris Buffer pH 6.85). The samples were treated with HHP treatment at 600 MPa for 3 minutes at 4 °C. Immediately after HHP treatment, microbiological analyses in non selective media (Tryptone Soy Agar, TSA), revealed highest total count in orange juice samples (5.7 log cfu/ml), as compared to Tris buffer solution and skimmed milk (5.0 and 4.3 log cfu/ml respectively). While in selective media (Violet red bile glucose agar, VRBGA) no growth could be detected in any matrix. After 24 hours storage at 4 °C, drastic decrease in total count was observed in orange juice leading to no detectable growth after 15 days of storage at 4 °C. The behavior of injured cells in skimmed milk and Tris buffer solution was quite different from orange juice. In both matrices TSA count increased after overnight storage at 4 °C but during prolonged storage for 15 days the tendency changed to lower count in TSA. Whereas after overnight storage stressed cells were able to grow in VRBGA and continue to increase in number throughout further storage up to 15 days, recovering from the effect of HHP treatment. It is concluded that *E. coli* O157:H7 is more sensitive to HHP in skimmed milk and Tris buffer than orange juice, but during storage skimmed milk and Tris buffer are more favorable media for recovery of injured and stressed cells. Whereas in orange juice although immediate effect of HHP lethality on *E. coli* O157:H7 is least one (regarding total count) but it inhibits the growth of injured and stressed cells during storage.

Poster 2

EFFECT OF PROCESSING AND STORAGE ON AROMA COMPOUNDS AND RELATED ENZYMES OF TOMATO JUICE TREATED BY PULSED ELECTRIC FIELDS OR HEAT

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Aroma is one of the most important parameters of tomato juice quality. Thermal processing has a dramatic impact on the aroma of fruit juices. Therefore, non-thermal technologies are under study in order to minimize these changes. Because low temperatures are maintained during processing, high-intensity pulsed electric fields
HIPEF treatments (35kV/cm for 1500μs, 4-μs bipolar pulses at 100Hz) were compared with thermal processing (90°C-60s). Some volatile compounds that are typically associated with tomato flavour (hexanal, trans-2-hexanal and cis-3-hexenol) were analyzed by gas chromatography after a solid-phase microextraction (SPME). In addition, the activity of enzymes involved in the synthesis of the studied compounds, namely lipoxygenase (LOX) and hydroperoxide lyase (HPL), were determined spectrophotometrically. HIPEF-treated juices exhibited higher amounts of hexanal and trans-2-hexanal compared to the thermally-treated, whereas the concentration of cis-3-hexanol was not affected by any of the treatments. In general, the release of aldehydes decreased in all the juices after a week of storage, but it was maximal in the HIPEF-treated juice beyond day 7. A slight increase in the amount of cis-3-hexanol was observed throughout juice storage. This accumulation was significantly higher in the heated samples at the end of storage. On the other hand, no substantial changes in the initial residual LOX activities (70% for HIPEF and 80% for heat) were observed after processing. HPL was almost completely inactivated when the juice was subjected to the heat treatment, whereas roughly a 50% of the control tomato juice was depleted after HIPEF-processing. A dramatic decrease in the residual HPL activity was observed in both untreated and HIPEF-treated juices during the first 3 weeks of storage. These results suggest that HIPEF processing may help to improve flavour quality and stability of tomato juice.

Poster 3

POSSIBLE CONTROL OF FUNGAL AND INSECT INFESTATION OF LEGUMES USING OZONE

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The objective of this study was to evaluate the effectiveness of gaseous ozone and ozonated water on fungal contamination and insect damage and its effect on the nutritive value of four legumes, namely, peanut, soybean, kidney bean, and black-eyed pea. After 3 months storage of test samples, species of Aspergillus, Alternaria, Cladosporium, Fusarium and Curvularia were the predominant fungi, while Tribolium castaneum, Cadra cautella, and Bruchus rufimanus were the frequent insects. Treatment of the legumes with ozone as fumigant at 30 ppm for 16 hours resulted in 95-100% reduction in fungal contamination while 88-100% mortality of insects was achieved with 80 ppm ozone for 24 h. Complete decontamination of legumes from infested fungi and insects was possible with 50 ppm ozonated water for 3 min. Application of gaseous ozone and ozonated water induced 78-93% degradation of AFB1 in artificially contaminated legumes. in vitro study indicated steadily drop in AFB1 production of the ozone treated fungi. Chemical analyses of nutritional contents of legumes indicated that proteins and carbohydrates were completely resistant to the action of ozone. These data demonstrate the potential usefulness of using ozone in managing stored legumes and possibly other agricultural commodities.
EFFECTS OF IRRADIATION ON ANTIMICROBIAL AND ANTIOXIDANT ACTIVITIES OF SPICES ASSESSED IN GROUND BEEF DURING REFRIGERATED STORAGE

Arin, B. and Gunes, G.

Spices are commonly used in meat to give special flavor. Ground beef mixed with various spices is used in different kebabs and meatball products. In addition to specific flavor, spices have antimicrobial and antioxidant activities contributing to the quality of the products. Spices are commonly preserved by gamma irradiation and this may affect their antimicrobial capacities. Our objective was to investigate the effects of irradiation on antimicrobial and antioxidant activities of spices in ground beef during storage. Irradiated and unirradiated spices (rosemary, thyme, red pepper, black pepper, cumin, onion powder, garlic powder) were added (5% by weight) to ground beef separately, mixed thoroughly and stored at 3±1°C. Total plate count (TPC) and TBARS values were determined during storage. Data was analyzed statistically by ANOVA and Tukey tests.

Irradiation did not affect antimicrobial and antioxidant activities of the spices. All the spices significantly reduced TPC in ground beef. The reduction in TPC was in the range of 0.4-1.0-log during storage. Onion, red pepper, garlic and thyme had relatively higher antimicrobial activities than the others. Thyme and red pepper decreased TBARS values from 1.84 mg MDA/kg in control to 1.00 and 1.27 mg MDA/kg, respectively, after 7 days.

In conclusion, the spices had significant antimicrobial activities. Thyme and red pepper prevented oxidation in ground beef significantly. Irradiation did not affect these properties of spices. Spices directly used in meat products can contribute to quality and shelf-life.

Poster 5

SELECTION AND MOLECULAR CHARACTERIZATION OF LACTIC BACTERIAL STRAINS ANTI-LISTERIA MONOCYTOGENES BACTERIIOCIN PRODUCERS

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Listeria monocytogenes is a potential dangerous foodborne pathogen, which has been isolated from different foods. L. monocytogenes represents a primary safety concern in
the production of many PDO Italian cheeses (e.g. Gorgonzola and Castelmagno PDO cheeses from Piedmont, Italy).

First aim of our interdisciplinary Research Project was the screening of the autochthonous bacteria isolated from some PDO cheeses, followed by their selection based on antagonistic activity against a pathogen strain of \textit{L. monocytogenes}.

All the samples analyzed were representative of different Piedmont cheese typologies: Castelmagno, Raschera and Toma Piemontese PDsO. The cheeses were purchased in firms chosen for not using microbial starters in their production. 355 microbial strains were selected from the cheeses and their ability to inhibit the growth of \textit{Listeria} spp was tested. Only 24 strains were able to produce bacteriocins; 10 among these strains were then used to produce miniature cheeses (Toma Piemontese type), in order to verify their proteolytic activity (SDS-PAGE, HPLC-DAD) and the ability to produce biogenic amines. The proteolytic activity was different; the Principal Component Analysis of dataset obtained from the proteolytic patterns easily allowed to the strains clustering.

The remaining 4 strains (2 \textit{L. plantarum} and 2 \textit{L. lactis} subsp \textit{lactis}) were characterized in order to identify the bacteriocins. One \textit{L. plantarum} produced an unidentified bacteriocin of MW <1000 Da, moreover the second \textit{L. plantarum} strain was positive for the gene of the Plantaricin EF. The 2 \textit{L. lactis} sub \textit{lactis} produced a protein, with N-terminal sequence corresponding to the LysM domain, typical of peptidoglycan hydrolases.

Poster 6

FORCES AND OBSTACLES IN INNOVATION IN HUNGARIAN FOOD INDUSTRY ON THE BASIS OF PRIMER SURVEY

Bánáti, Diána\(^1\); Lakner, Zoltán\(^2\); Szabó, Erzsébet\(^1\); Szűcs, Viktória\(^1\)
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The term “innovation” was first used by an Austrian economist Joseph Schumpeter (1883-1950). Innovation is an expedient, professional, intensive developing activity, which results in the more or less comprehensive reformation of the organization, structure, operation, equipment, technology, product (service), dissemination, utilization etc.

Within the framework of NOVELQ European FP6 Integrated project the influencing factors of the innovation (process and product) were surveyed. The main objective of this study was to understand the forces promoting and hindering the food industrial innovation.

To survey the innovation practises of the Hungarian food industry 457 questionnaires were sent to company leaders in e-mail. The final number of responses was 39. 10 factors (management, knowledge sharing, time, up-to-date information about consumers’ demand, the innovation process, connections, supply conditions, retail, legal regulation) were studied which presumably influence the innovation facilities on five-grade Likert scales. The enterprises were classified into three well definable clusters with k-Means cluster analysis.

The first cluster’s (18%) innovation forces were less successful, while the second and third’s (41-41%) innovation forces were adequate. Both (second and third) clusters generate information about consumers, the management sets great store by control, they have clear goals for new products, the managers are personally committed to
innovation. While the second cluster develop in a structured and systematic but rapid system, the third cluster’s innovation system is less structured and systematic, but they involve all departments when develop, co-operate with knowledge centres when conduct innovative activities and lean on knowledge exchange with experts. According to the respondents the personal communications of people from trade, industry and consumer research were the most important sources of the information in the innovation processes.

It can be concluded that good internal communication, promotion of external relations, the personal commitment to innovation at the company and up-to-date information about consumer’s demand are the main facilitators of innovation in the Hungarian food production.

Poster 7

MODELING OF COMBINED EFFECTS OF CITRAL, LINALOOL AND β-PINENE USED AGAINST SACCHAROMYCES CEREVISIAE IN CITRUS-BASED BEVERAGES SUBJECTED TO A MILD HEAT TREATMENT

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The importance of predictive microbiology in food is gaining importance as well as the search for new mild stabilizing techniques in food processing. In this perspective, the aim of this work was to model the antimicrobial activity of three terpenes (citral 0-120 ppm, linalool 0-60 ppm and β-pinene 0-60 ppm), in combination with a mild heat treatment (55 °C, 15 min). The study has been carried out on an orange based soft drink inoculated with a wild strain of Saccharomyces cerevisiae (10^4.4 log cfu/bottle).

The results, expressed as growth/no growth data, were analyzed with the logistic regression. A model describing the relationships between terpene concentrations and the probability of having unspoiled beverages was obtained. When citral and β-pinene were combined, the citral concentration required to achieve a 50% probability of having unspoiled bottles (P=0.5) dropped from about 100 ppm without β-pinene to about 47 ppm in the presence of β-pinene at 20 ppm. The same probability (P=0.5) was obtained with 60 ppm of linalool combined with about 40 ppm of citral. The addition of both linalool and β-pinene (20 ppm) reinforced citral bioactivity: the concentration of citral needed to reach P=0.5 was less than 40 ppm. The presence of both linalool and β-pinene at a concentration of 40 or 60 ppm in the absence of citral led to a low spoilage probability (P=0.6 and P=0.9, respectively).

In conclusion, the antimicrobial potential of the three terpenes alone can be strengthened combining appropriate concentrations of each of them. This study confirmed also the potentiating effect of a mild temperature treatment on the antimicrobial efficacy of the molecules. Neither the thermal treatment alone nor the presence of the terpenes at their maximum concentrations (without thermal treatment) were able to guarantee the microbial stability of the beverages.
Poster 8

INACTIVATION KINETICS OF *Salmonella* Enteritidis IN THE THERMOULTRASONICATION OF WHOLE EGGS

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Thermoultrasonication greatly reduces the heat resistance of both sporeforming and vegetative bacteria. The efficacy of ultrasounds depends on several factors, including amplitude and frequency of the waves, vessel geometry, composition of the medium, volume of ultrasonication and temperature. In this work the relationships among variables affecting the resistance of *Salmonella enterica*, serovar Enteritidis against thermoultrasonication treatments were studied. For this purpose, whole eggs were ultrasonicated in several volumes (100, 200, 500, 750 and 1200 mL) of distilled water at temperatures ranging from 52 to 58°C. For each volume and using multiple regression, the values of $D$ and $z$ and their corresponding joint confidence regions were determined. From the confidence intervals, it was concluded that all the treatments were significantly (p<0.05) different from each other. The higher the ultrasonication volume, the greater the decimal reduction times. E.g.: the $D_{54.9^\circ C}$ ranged from 0.78 min to 2.98 min for 100mL and 1200mL, respectively. An equation was developed to include the effect of temperature, time and the treatment volume on the inactivation of *S. Enteritidis* in eggs. This model allowed explaining the 95% of the variance contained in the experimental data and therefore it could be useful for the design and scale-up of thermoultrasonication systems.

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Poster 9

MODELLING KINETICS OF SENSORY CHANGES AND SHELF-LIFE IN E-BEAM TREATED COOKED HAM

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Irradiation is an effective technique to eliminate foodborne pathogens like *Listeria monocytogenes*, *Salmonella* spp and others. The application of irradiation may be limited if sensory changes are produced during treatment, which can directly affect the quality of the food product. The aim of this work was to find models that can describe both the changes in the quality of E-beam treated coked ham and the growth of spoilage.
organisms after a treatment optimized to achieve the food safety objective (FSO) in relation with \textit{L. monocytogenes}. Slices of cooked ham were contaminated with this bacterium. The samples were irradiated with doses of 0, 1, 2 and 4 kGy at room temperature (18-20 °C). A panel of 20 tasters evaluated the sensory changes of cooked ham slices after 2 and 18 days of treatment. Shelf-life was determined by periodically counting the bacterial number. Different inactivation and growth models were used to explain the effect of E-beam irradiation on the changes of the quality properties and on the growth of spoilage bacteria after irradiation. Changes in the appearance after 2 and 18 days of irradiation was satisfactory described by the Gompertz’ model ($R^2 = 0.99$). Odor and flavor fitted to the Weibull’s model ($R^2 = 0.99$) after 2 days and to the Activation / Inactivation Model ($R^2 = 0.99$) after 18 days. On the other hand, the growth of spoilage bacteria after irradiation of vacuum packaged samples was satisfactory defined by the Hills’s Model ($R^2 = 0.97$; 0, 1, 2 kGy) and the Tail’s model ($R^2 = 0.98$; 4 kGy). The models fitted to the experimental data allowed to describe the changes in the sensory quality and the shelf-life of irradiated cooked ham and, therefore, could be used to find the optimal process conditions.

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Poster 10

SURFACE RESPONSE APPROACH TO MODEL INACTIVATION OF ENTEROCOCCI ON CURED HAM AFTER HIGH HIDROSTATIC PRESSURE

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Enterococci may occur in dry cured ham and could contribute to the spoilage of the product during refrigerated storage of sliced product; therefore it would be desirable to reduce its occurrence. High hydrostatic pressure is a non thermal technology that can be applied in ready-to-eat meat products for microbial inactivation as alternative to heat pasteurization.

The aim of the present work was to model the inactivation of a virulent \textit{E. faecalis} strain of meat origin inoculated on dry cured ham as a function of the intensity, length and the fluid temperature of high pressure processing.

Slices of cured ham were inoculated with \textit{E. faecalis} CTC8000 (at\(10^6\)-\(10^7\) cfu/g), vacuum packaged and treated at different processing conditions (at 347 – 852 MPa; for 138 to 945 seconds; at 7.6 to 24.4) following a central composite design. Bacterial inactivation was assessed in terms of logarithmic reductions, as the difference between counts on M-Enterococcus agar after the treatments and the initial inoculum. Multivariant linear regression was used to find the polynomial quadratic model able to describe the relationship among variables and drawn the most relevant surface response graphs.

The pressure resistance of the \textit{E. faecalis} CTC8000 was considerable. Total inactivation was not achieved even after the most intense and long treatment. According to the best fitting (\(R=0.97\)) and most significant (\(P<0.00001\)) polynomial equation, pressure and time were the most important factors determining the inactivation extent. The signification of the quadratic term of pressure indicates that little effect was observed below 450 MPa, whereas time had a lineal effect throughout the range tested. Pressure
and time showed a statistically significant interaction. On the other hand, the
temperature was not significant at the range assayed and thus it was not included in the
equation model.
This type of studies would contribute to extend the knowledge of the inactivation of
microorganisms in food products processed by high hydrostatic pressure.

Poster 11

RESISTANCE OF ENTEROCOCCI TO HIGH HIDROSTATIC PRESSURE

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Enterococci are ubiquitous and can be found in a variety of foods, though the benefits as
bioprotective organisms is controversial due to the potential virulence and aminogenic
activity. Therefore, traits of enterococcal strains and their behavior during food
processing (for instance high hydrostatic pressure) should be evaluated in a case by case
basis.
The aim of the present work was to assess the behavior of 8 strains of enterococci
isolated from meat environment, with and without virulence traits, after the application
of high hydrostatic pressure.
Three virulent *E. faecalis*, one tyraminogenic *E. faecium* and four bacteriocin producing
non-virulent non-aminogenic enterococci (*E. casseliflavus, E. malodoratus, E. faecium,
E. devriesei*) strains were pressurized at 200, 400 and 600MPa. Inactivation was
measured on TSAYE.
Sublethally injured cells were estimated from differential counts on TSAYE and
TSAYE with 3-4% NaCl. Pressurized broths were diluted (1/3) with TSAYE and
incubated at 37ºC and 14ºC to assess the recovery of the resistant cells.
The inactivation extent depended on the treatment and the strain. At 200MPa no
significant reduction was observed, whereas increasing inactivation degree was found
by the other treatments. In general, non virulent strains were more sensitive than the
aminogenic and virulent strains. The exception was the non virulent *E. faecalis*, which
was the most resistant strain at all treatments. Higher proportion of sublethally injured
cells was detected at 400 MPa in comparison with the more intensive treatments, but
they generally recovered in 24h at 37ºC and 3-7 days at 14ºC. The recovery of cells
resistant to 600MPa varied widely even among the independent trials.
To sum up, the variability of enterococci strains against high hydrostatic pressure was
the most noticeable finding. It was noticeable the highest resistance of the non virulent
*E. faecalis*, which was also the strain showing the fast recovering at both temperatures.

Poster 12

IDENTIFICATION OF BACTERIOPHAGES WITH POTENTIAL AS NOVEL FOOD
PROCESSING AIDS FOR FOOD QUALITY AND SAFETY.

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A variety of bacteriophages (phages or bacterial viruses) have been isolated, which inhibit specific food pathogens and spoilage bacteria. Despite the fact that phages have long been known as inhibitors of bacterial starter cultures in food fermentations, the aim of our research was to show that these ubiquitous agents could be put to beneficial use. Here we describe some examples from our programme where broad-host-range phages have been isolated and shown to eliminate several undesirable bacteria which frequently occur in foods and beverages. These include the food pathogens *Salmonella enterica*, *E. coli O157* and *S. aureus* and the spoilage bacteria *Lactobacillus brevis* and *Pediococcus damnosus*.

To date many of the phage genomes have been sequenced confirming that they are exclusively lytic and thus capable of bringing about immediate cell death in host bacteria without integrating into the bacterial chromosome. In the case of *S. aureus*, three phages were selected one of which had a lytic host-range which included all species within the genus *Staphylococcus*. In the case of *Salmonella enterica* three broad-host range anti-Salmonella phages were characterised and shown to inhibit a wide range of serotypes. In the case of spoilage bacteria, a large number of phages which are specific for common spoilage bacteria associated with brewing processes were identified. These include the hop-resistant *Lactobacillus brevis* and *Pediococcus damnosus*. In the case of *E. coli O157*, two phages specifically targeting this pathogen were isolated. As an example, these latter phages were then applied to beef and shown to eliminate *E. coli O157* which had been deliberately added to the meat surface at $10^3$ CFU/g. Our studies (and several others) indicate that bacteriophages are worthy of consideration as useful antibacterial agents in foods.

Poster 13

THE EFFECT OF HIGH PRESSURE PROCESS ON COLOUR OF DRY-CURED MEAT AT DIFFERENT WATER CONTENT

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Most changes in the colour of meat products are commonly referred to composition and processing conditions. High Pressure processing (HPP) is a preservative technique that may change some sensorial parameters. The objective of this study was evaluate the changes in colour of dry-cured meat at different water contents when are submitted to HPP. Slices of sausages (70 mm diameter) were dried by QDS process® up to 20, 30, 40 and 50 % weight loss and then vacuum packaged. HPP was performed at 500 MPa during 420 s. Colour measurements were done with a Minolta Chroma Meter CR-300. CIE Lab L* lightness, a* redness and b* yellowness values were determined. The water content of samples ranged from 43 to 66 %. When water content decreased L* decreased and a* and b* values increased. However, the effect of HPP on colour parameters was more important at higher water content and hardly apparent at lower water content.

Poster 14

COMBINED EFFECTS OF NISIN, SUCROSE LAURATE ESTER AND PRESSURE-ASSISTED THERMAL PROCESSING TO INACTIVATE BACILLUS AMYLOLIQUEFACIENTS SPORES
Pressure-Assisted Thermal Processing (PATP) is an emerging food processing technology to obtain shelf-stable low-acid food products. The process combines elevated pressures (600 to 900 MPa) and temperatures (from 90 to 121°C) for a short holding time (up to 5 min) to treat the food. Nisin is bacteriocin produced by Lactococcus lactis subsp. lactis that is active against Gram positive bacteria including sporeformers. The objective of this work was to study the effect of nisin, alone or combined with sucrose laurate ester (SL), on enhancing Bacillus amyloliquefaciens spores inactivation by pressure-assisted thermal processing (PATP). Spores of B. amyloliquefaciens (10^8 CFU ml^{-1}) were suspended in sterile phosphate buffer saline (pH 7.6), nisin (100, 200, 1000, 1500, and 2000 IU ml^{-1}), 1.0% of SL and combinations of nisin (1000, 1500 and 2000 IU ml^{-1}) and SL (1.1%) and treated by PATP (700 MPa and 105°C, for 1 min). Nisin did not show any synergistic effect with PATP in all the concentrations tested. The addition of 1.0% of SL to nisin samples improved the inactivation of B. amyloliquefaciens spores by 1.72 log units. Nevertheless, this synergetic effect was mainly produced by the presence of SL than the combination of both antimicrobial compounds. Our findings show that under the experimental conditions of this study, nisin did not yield any synergy on the PATP inactivation of B. amyloliquefaciens spores.

Poster 15

PRESERVATION OF MARINATED CHICKEN DRUMSTICKS WITH MODIFIED ATMOSPHERE PACKAGING

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Consumption of marinated chicken products has been increasing. However, these products have short shelf life due to microbial and chemical spoilage. Therefore, effective food preservation techniques should be developed to maintain quality of these products. The objective of this study was to investigate the effects of different packaging conditions on quality of marinated chicken drumsticks during storage. Chicken drumsticks were dipped in a marinade ( %56 water, %24 sunflower oil, %10 vinegar, %4 salt, %2.75 red pepper, %1.75 thyme, %0.75 cumin and %0.75 black pepper) at 3±1°C for 5 hours. Marinated chicken drumsticks were packaged in different gas combinations (vacuum, 70%CO2+30%N2, 5%O2+70%CO2+25%N2, and aerobic). Total aerobic mesophilic bacteria (TAMB), lactic acid bacteria (LAB) and yeast and mold counts were determined using the spread-plate method during storage at 3±1°C. Changes in lipid oxidation were measured by TBA method. pH of marinated drumsticks were also measured. Data were analyzed statistically by ANOVA and Tukey tests. Modified atmosphere packaging resulted in a significant decrease of TAMB, LAB and yeast and mold counts compared to vacuum and aerobic packaging. 5%O2 in modified atmosphere packages did not significantly affect the TAMB, LAB and yeast and mold counts. pH values were between 5.19-5.81 and did not change significantly during
storage. Lipid oxidation increased with increased O₂, highest TBARS values (0.68-0.84 mg MDA/kg sample) were observed in aerobic packages. The difference in TBARS values of samples in packages with 0%O₂ and 5%O₂ was insignificant.

In conclusion, the microbial and chemical quality of marinated chicken drumsticks were maintained with 70%CO₂+30%N₂ and 5%O₂+70%CO₂+25% atmospheres during 15 day refrigerated storage. For safety of product, 70%CO₂+30%N₂ atmosphere conditions can be recommended to control growth of anaerobic pathogens.

Poster 16

PRELIMINARY CHARACTERIZATION OF A BACTERIOLYSIN-LIKE PROTEIN PRODUCED BY A CHEESE-ISOLATED L. LACTIS STRAIN

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Lactic acid bacteria are used for food improvement in a wide range of fermented foods and some strains can also produce antimicrobial peptide, named bacteriocins, active against food pathogens.

The aim of this study was to characterize an antimicrobial molecule active against Listeria monocytogenes produced by a strain of Lactococcus lactis isolated from an Italian cheese.

The bacterial strain was grown on a rich medium until its late exponential phase and screened for its bacteriocin production using well-diffusion assay.

It was established that stress conditions (a growth temperature of 30°C instead of 37°C and presence of oxygen, considering that LAB are microaerophilic) improve bacteriocin production. Since inhibitory molecules are released in the culture broth, a 60% ammonium sulfate precipitation of cell-free supernatant was performed to obtain the active fraction. This fraction was separated by using Tricine-SDS-PAGE leading to the determination of the molecular size of the bacteriocin (between 6 and 10 kDa). However SDS interference prevented a satisfactory peptides separation: for this reason a native Tricine PAGE was set up. Each band isolated in native gel was tested against Listeria monocytogenes in an overlay assay: a single band showing antimicrobial activity was detected.

N-terminal sequencing of the peptide corresponding to this band led to the identification of the following sequence: DEVYTVKSGDSL. In BLASTP a 100% match with LysM domain, that frequently occurs in bacterial lysins was found. This is consistent with the identification of this molecule as a class III bacteriocin (bacteriolysin). To characterize the bacteriolyisin-like molecule produced by the L. lactis strain, the band showing antimicrobial activity is now undergoing identification by micro HPLC and N-terminal sequencing in order to obtain an internal sequence of the peptide. On the basis of this sequence, degenerated primers will be created to identify the bacteriocin gene.

Poster 17
REAL-TIME PCR ASSAY FOR THE DETECTION OF ARCOBACTER IN RETAIL CHICKEN PRODUCTS

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Nowadays Arcobacter sp. is recognized as a potential zoonotic foodborne pathogen. Therefore the objective of this study was the development of a rapid, specific and reliable real-time PCR method to target Arcobacter sp. in food samples.
The assay was applied to 36 commercial chicken products (26 carcasses and 10 livers). The samples were analyzed directly and after enrichment at microaerophilic conditions. Optimal PCR conditions consisted of 2 µl of DNA, 0.5 µM of each primer, 2 mM MgCl₂ and 2 µl of LightCycler Fast-Start DNA Master SYBR Green I Mix in a total reaction volume of 20 µl. The reactions were performed in a LightCycler 2.0 with a preliminary incubation for 10 min at 95°C (slope 20°C/s), followed by 40 cycles of denaturation at 95°C for 10 s, annealing at 58°C for 4 s and extension at 72°C for 14 s (20°C/s), with a single fluorescence acquisition step at the end of the extension. Melting curves consisted of denaturation at 95°C for 0 s, annealing at 65°C for 15 s and melting at 95°C for 0 s at 0.1°C/s, with continuous fluorescence acquisition. A final cooling step was performed at 40°C for 30 s.
The real-time PCR protocol showed to be a specific, reproducible and sensitive method with a detection level of 5.6*10 CFU/ml. The method enabled detection in 25 of the 26 chicken carcasses (96%) and in 4 of the 10 liver samples (40%). Our results about the presence of Arcobacter in chicken carcasses in our geographical area are strong enough to consider the organism as one of the emerging foodborne bacterial pathogens that may represent a human health hazard. In conclusion, the application of our novel real-time PCR assay will facilitate the monitoring for this bacterium as it can be performed automatically in less than two hours, reducing the risk of its transmission via food chain.

Poster 18

INVESTIGATION OF SOME PHYSICAL-CHEMICAL PARAMETERS OF PULSED ELECTRIC FIELD TREATED CITRUS FRUIT JUICES

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There is an increasing demand towards the fresh, long-shelf life products. This fact emphasizes even more the importance of novel processing methods. Consumers desire healthy products by consisting the favourable sensory properties. The pulsed electric field (PEF) technology is a non-heat based gentle preservation process. By using it, the shelf life of the product increases, by preserving the important nutritional values of food during the process.
In this research the effects of the PEF treatment was investigated towards some physical-chemical parameters compared to the untreated and heat treated samples.
In the experiments 100 % orange, grapefruit, tangerine juices were analyzed. The measured properties were as follows: pH, Brix°, non-enzymatic browning index
The PEF treatment was carried out by OSU-4B PEF bench scale continuous flow high voltage electric field unit. During the treatments 2 µs of bipolar pulse duration and square waveform were selected. The flow rate was adjusted to 84 ml/min, while peak electric field strength of 25 kV/cm with 50 pulses was applied. The total treatment time was 100 µs.

It was established that during the PEF treatment there had not been significant differences in pH, Brix°, electric conductivity, NEBI, HMF, acid and polyphenol content respectively radical scavenging activity over against the heat treatment. In the colour analysis visible changes had been occurred.

**Poster 19**

**USE OF PULSED LIGHT TECHNOLOGY FOR THE DECONTAMINATION OF SHELL EGGS**

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Pulsed light (PL) appears to be an adequate technology for the decontamination of food surfaces. It consists of the application of short duration pulses of an intense broad spectrum light. This is a study on the efficacy of this technology for the inactivation of *Salmonella enterica* serovar Enteritidis on shell eggs. Freshly laid clean eggs were purchased at an experimental farm and two batches, unwashed and washed, were prepared. Washed eggs were brushed with soap and warm water, then immersed in ethanol, and finally flamed. Both batches were inoculated with *Salmonella* to provide a microbial concentration on the shell of $10^4$ and $10^6$ CFU/egg in unwashed and washed eggs, respectively. Different fluences, ranging from 2 to 12 J/cm$^2$ were assayed. Immediate enumeration and a photoreactivation test were carried out. Bacteria were recovered from the shell by cracking the eggs under aseptic conditions and enumerated on TSA and SS media. A one way ANOVA was conducted to compare the results of the different assays. When unwashed eggs were pulsed, 24 to 80% of the samples showed the maximum decontamination achieved (3.6 log units), depending on the fluence applied. The efficacy of the treatment was noticeably lower in washed eggs, reaching a maximum reduction of 1.8 log units with a fluence of 12 J/cm$^2$. Therefore, PL can be a useful method for egg processing as far as the integrity of the cuticle is preserved, which involves that the treatment should be applied as soon as possible after laying and on unwashed eggs. The results obtained in the photoreactivation test were not conclusive as there are many factors that greatly influence microbial inactivation by PL on porous surfaces. However, as in studies on smooth surfaces such as agar, have shown that *Salmonella* can photoreactivate, it is recommended to store eggs protected from light once they have been treated.

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**Poster 20**
APPLICATION OF A COMBINED METHOD OF CONVENTIONAL AND MULTIPLEX-PCR ASSAYS IN IDENTIFICATION OF *ESCHERICHIA COLI* O157:H7 FROM WELL WATER SAMPLES COLLECTED FROM DAIRY FARMS IN MASHHAD-IRAN

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In this study, during the summer months of 2007 a number of 50 water samples from the wells which were considered as water supply for dairy herds in Mashhad suburb were collected. For isolation of *Escherichia coli* O157:H7, samples were firstly enriched in modified tryptase soy broth containing novobiocin, followed by plating onto sorbitol Mac Cankey agar supplemented with cefixime and potassium tellurite. Consequently the suspected non sorbitol fermenting(NSF) colonies were confirmed by biochemical tests as *Escherichia coli* and then employed for multiplex-PCR assay, using primers specific for O157 and H7 antigens gene. In this study a number of 5 NSF *Escherichia coli* colonies were isolated, and in multiplex-PCR assay only one sample (6%) confirmed as *Escherichia coli* O157:H7. The PCR assay employed in this study may be a possible alternative to immunological assays which detects somatic and flagellar antigens. As for workers in dairy farms, this source of water is the only available water, it is necessary to educate them and decontaminate this source of water.

Key words: *Escherichia coli* O157:H7, multiplex-PCR, well water

Poster 21

MICROBIAL AND CHEMICAL QUALITIES OF PRE-CUT AGED WHITE CHEESE UNDER MODIFIED ATMOSPHERES

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Aged white cheese are ripened for 3 months in brine and usually sold in 500-1000g vacuum or aerobic individual packages. It can also pre-cut into small pieces or slices for consumption by the final user. Vacuum packaging can disrupt the shape and physical integrity of small pieces of cheese. Modified atmosphere packaging (MAP) can prevent microbial spoilage and chemical quality loss without physical damage to the cheese pieces. Thus, the objective was to determine the effects of MAP on microbial and chemical qualities of pre-cut aged white cheese.

Commercial aged white cheese were cut into cubes of 2x2x2 cm and packaged in different atmospheres (100%N\textsubscript{2}, 90%N\textsubscript{2}+10%O\textsubscript{2}, 25%N\textsubscript{2}+75%CO\textsubscript{2}, 15%N\textsubscript{2}+10%O\textsubscript{2}+75%CO\textsubscript{2}, aerobic and vacuum as control). Total plate count (TPC), lactobacilli, lactococci and yeast/mold count were determined using pour plate method during storage at 4±1°C. Changes in proteolysis (amount of free amino acids), lipolysis (acid degree value), oxidation (TBARS-value), titrable acidity (% lactic acid) and pH were also investigated. Data were statistically analyzed using ANOVA and Tukey test. TPC was higher in CO\textsubscript{2}-containing packages. CO\textsubscript{2} decreased acidity significantly. Lactococci count was decreased by O\textsubscript{2}. Lipolysis and oxidation were higher in aerobic packaging. Lactobacilli and Lactococci counts were higher in vacuum and 100%N\textsubscript{2} packages, respectively. Overall, TPC, lactobacilli and lactococci counts and pH...
decreased while lipolysis and proteolysis increased during the storage period. Acidity decreased during the first seven weeks and then increased. Oxidation and yeast/mould count did not change during 13-week storage. MAP with 75% CO\textsubscript{2} generally preserved microbial and chemical qualities during 13-week storage. In conclusion, MAP can be used in preservation of pre-cut aged white cheese instead of vacuum and aerobic packaging.

Key words: aged white cheese, modified atmosphere packaging, pre-cut

Poster 22

EFFECT OF HIGH HYDROSTATIC PRESSURE ON BIOGENIC AMINE DURING THE STORAGE OF LOW ACID FERMENTED SAUSAGES INOCULATED WITH SELECTED ENTEROCOCCI STRAINS

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Enterococci are frequently reported to be strongly tyramine producers in slightly fermented sausages, where they constitute an important part of the natural microbiota. High hydrostatic pressure (HHP) is presented as a good technology to stabilize meat product during their storage.

The aim of this study was to elucidate if HHP treatment could affect the biogenic amine formation during the storage of artisanal low acid fermented sausages inoculated with selected enterococci strains.

Eight batches of slightly fermented sausages (ripened at 14ºC for 21 days) were manufactured with eight enterococci strains, isolated from fermented sausage environment, four of which were able to decarboxylate tyrosine \textit{in vitro} and the other four were not. An additional control batch, without enterococci inoculation, was included. HHP treatment (600MPa for 5 min at 17 ºC) was applied at day 21 and sausages were stored one week at 14ºC. Biogenic amines were determined by Ultra Performance Liquid Chromatography (UPLC\textsuperscript{TM}) at selected times during ripening (days 0, 7 and 14), in the end product and after storage, of both non-pressurized and pressurized batches.

The accumulation of tyramine was detected in all batches and occurred mainly during the second week of the ripening process, whereas during the last week their increase was low or even stable. The use of selected non-aminogenic strains of enterococci, allowed obtaining fermented sausages with low amine contents comparable to those of the control batch. HHP increased the tyramine contents, from 1.4 to 2.5-fold, in three tyraminogenic enterococci and control batches. There was no increase in tyramine content after HHP treatment in batches with non-tyraminogenic strains. However, during storage tyramine formation was stopped, since its levels remained constant in all pressurized batches. The results seem to show that in some cases HHP could have stimulated the enzymatic tyrosine decarboxylase activity of enterococci, may be because amine formation could be a response to the stress provoked.

Poster 23
Reducing mycotoxins contamination of the worldwide food and feed chains is a major challenge to improve human and animal health. Mycotoxins are responsible for a variety of toxic effects including the induction of cancer, and digestive, blood, kidney and nerve defects. One quarter of the world’s food crops, including many basic foods, are affected by mycotoxin producing fungi. In order to comply with the needs of EU and address global strategies for mycotoxin reduction, a four years large collaborative project, MYCORED as acronym, has been recently approved within the European FP7—“Food, Agriculture and Biotechnologies” Work Programmes.

MYCORED aims at developing strategic solutions to reduce contamination by mycotoxins of major concern in economically important food and feed chains. The following toxins and commodities are especially considered in the project: aflatoxins, trichothecenes, zearalenone, fumonisins in wheat/maize food and feed chains; ochratoxin A in grape-wine and wheat chains; and aflatoxins in dried fruit chain. Novel methodologies, efficient handling procedures and information, dissemination and educational strategies are considered in a context of multidisciplinary integration of know-how and technology to reduce mycotoxins exposure worldwide. Five work-packages (WPs) will develop novel solution driven strategies to reduce both pre-and post-harvest contamination in feed and food chains. They involve: i) optimization of plant resistance and fungicide use; ii) biocontrol to reduce toxigenic fungi in cropping systems; iii) predictive modelling and optimise logistics; iv) novel post-harvest and storage practices and v) application of new food processing technologies. Two horizontal WPs will develop enabling methodologies for i) advanced diagnostics and quantitative detection of toxigenic fungi and ii) rapid and multi-toxin detection of mycotoxins and relevant biomarkers. The project will significantly build on the outcome of several European projects (through most coordinators/partners of FP5 and FP6) on mycotoxins by supporting, stimulating and facilitating education and cooperation with countries having major mycotoxin concerns related to (international) trade and human health. The direct involvement of ICPC countries (Argentina, Egypt, Russia, South Africa) and international organizations (CIMMYT, IITA) together with strong scientific alliances with International Experts will strengthen the project through sharing experiences and resources from several past/ongoing mycotoxin projects in a global context.

Poster 24

ENTEROCIN AS-48: AN INTERESTING ANTIMICROBIAL PEPTIDE FOR FOOD PRESERVATION IN COMBINATION WITH HIGH-INTENSITY PULSED ELECTRIC FIELDS

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Enterocin AS-48 is a broad-spectrum cyclic antibacterial peptide of great interest for food preservation. The purpose of the present study was to increase antimicrobial activity by combination of AS-48 and high-intensity pulsed electric field (HIPEF) treatment. Enterocin AS-48 was tested in apple juice in combination with HIPEF treatment (35 kV/cm, 150 Hz, 4 µs and bipolar mode) against *Salmonella enterica* CECT 915 and the cider-spoilage, exopolysaccharide-producing strain *Lactobacillus diolivorans* 29. Survivors were determined after treatments and during storage. Statistic analysis was performed with Design Expert 6.0.1 software. The maximum inactivation of *S. enterica* (4.5-log cycles) was achieved with HIPEF treatment for 1000 µs in combination with 60 µg/ml of AS-48 and a treatment temperature of 40 ºC. Synergism between enterocin AS-48 and HIPEF treatment against *S. enterica* depended on the sequence order application, since it was observed only when HIPEF was applied in the presence of previously-added bacteriocin. Highest inactivation of *L. diolivorans* 29 (4.87 logs) was achieved by 1000 µs HIPEF treatment in combination with 2.0 µg/ml AS-48. While application of treatments separately did not protect juice from survivors during storage, survivors to the combined treatment were inactivated within the following 24 h of storage, and the treated samples remained free from detectable lactobacilli for at least 15 days at temperatures of 4ºC as well as 22ºC. In conclusion, the combined treatment of AS-48 and HIPEF results in greater inactivation of *S. enterica* and *L. diolivorans* in apple juice compared to the separate treatments, increasing the safety and stability of the juice.

Poster 25

THE USE OF HYPHENATED TECHNIQUES IN THE ANALYSIS OF COMPLEX FOOD MATRICES

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In the European Union, the maximum residue limits (MRLs) for several substances are defined for different food matrices of animal origin. The presence of these compounds is an indication of illegal practices and need to be accurately measured. The Global Food Market has become more competitive and equally cost responsive, hence the need of analytical procedures that permit high sample throughput as well as higher sensitivity in combination with good reproducibility. Liquid Chromatography allied with Tandem Mass Spectrometry is a powerful tool in food analysis, especially when combined with an automated on-line extraction if it reduces the interference of the matrix on the signal suppression or enhancement during analysis. The sample preparation was reduced to dilution of honey samples with water and filtration before injection and centrifugation followed by injection of supernatant of the milk samples. This represents a large reduction on sample preparation time when comparing with traditional extraction methods. The automated on-line extraction was performed using TurboFlow technology which exploits the difference between large and small molecules and column chemistry to retain compounds of interest while matrix molecules flow to
waste. The analysis was performed by LC-MS/MS in the selective reaction monitoring mode (SRM).

Methods for the determination of 16 quinolones, including 12 fluoroquinolones in honey and different classes of antibiotics, including tetracycline, in milk by LC-MS/MS combined with automated on-line extraction are presented. The methods proved to be linear in the concentration range studied (1-100 µg/Kg for honey and 5-500 µg/L for milk) as well as reproducible and precise (RSD %).

Poster 26

EFFECTS OF HOLDER PASTEURIZATION AND HIGH-PRESSURE PROCESSING ON THE VITAMIN C AND FATTY ACIDS CONTENT OF MATURE HUMAN MILK

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Breastfeeding is the ideal way to nourish infants up to 6 months of life. When women are not able to adequately supply their own child with breast milk, donor human milk can be the next more convenient choice. Human milk banks must collect, process and store milk in a way that ensures its microbiological safety and optimum nutritional quality. Nowadays, milk is pasteurized by the Holder Pasteurization (HP) technique to inactivate pathogenic microorganisms even when it is known to degrade key biochemical components. Alternative processes that cause minor degradation of some compounds while maintaining the same ability to inactivate microorganisms in comparison with HP need to be explored.

In the present work the effects of High-Hydrostatic Pressure (HHP) processing of human milk on its fatty acids and vitamin C content were studied. Additionally, this new technique was compared with the traditional HP.

Milk aliquots from 10 participants were pasteurized by the Holder technique (62.5°C, 30 min) or treated with HHP (Wave 6000/120 System, NC Hyperbaric, at 10-12°C and 400, 500 or 600 MPa for 5 min). Vitamin C was extracted from milk and analyzed by HPLC. Fatty acids methyl esters (FAMEs) were analyzed by GC-FID. Total bacterial count (CFU/mL) was also studied in all samples. One-way ANOVA and SNK post hoc analyses were used to detect differences among groups.

Results showed that HP and HHP had the same effectiveness inactivating microorganisms. Fatty acids were stable under all treatments but vitamin C was not. Regarding HHP, the higher the pressure applied to the sample, the lower the content of Vitamin C.

HHP may be a good alternative to HP for the treatment of human milk for human milk banks because it ensures the microbiological safety of the product and maintains its nutritional quality.

Poster 27
THE EVALUATION OF FULL FACTORIAL DESIGN FOR THE CONCENTRATION OF APPLE JUICE BY OSMOTIC MEMBRANE DISTILLATION PROCESS

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The production of high quality concentrated apple juice according to a new integrated membrane process, an alternative to thermal evaporation, was studied. The effect of main process parameters involved in osmotic membrane distillation such as osmotic agent concentration (0-65% CaCl$_2$), flow rate (10-30 l/h) and temperature difference between feed and osmotic agent (10-30°C) on concentration factor was evaluated using a three level full factorial design. The parameters of the model were estimated by multiple linear regression (MLR). Analysis of variance (ANOVA) has been employed to check the significance of the mathematical models. The quadratic model regression equations obtained revealed that all the three factors had significant but different influences on concentration factor of apple juice concentrate produced by osmotic membrane distillation process. The effect of osmotic agent concentration was the most distinct one followed by temperature difference and flow rate, respectively. The best results, with a concentration factor of up to 4 in 180 minutes (from an initial concentration of 12 °Brix up to 48°Brix), were achieved with 65% (w/w) CaCl$_2$ concentration, 30 l/h flow rate and 30°C temperature difference conditions.

Keywords: Osmotic membrane distillation, apple juice, concentration, full factorial design

Poster 28

DEVELOPEMENT OF NOVEL TECHNOLOGIES FOR ASSURING THE SAFETY AND QUALITY OF CHILLED FISH AND POULTRY IN THE FOOD SUPPLY CHAIN

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Food supply chains require an implementation of novel technologies to deliver product with highest quality attributes and low risk level to consumers. The recent outbreaks of foodborne illnesses, involving 53,586 people in 22 Member States in 2006 according to EFSA report, call for more stringent guarantees of safety and quality of food. The abuse of shelf-life and presence of pathogens in food are the major reasons of outbreaks. Emerging technologies for supporting management in the entire food supply chain are under development within framework of the European project CHILL-ON. The novel approach considers Quantitative Microbial Risk Assessment (QMRA) and Shelf Life Prediction (SLP) modules, being a part of Decision Support System (DSS). The aim of those modules is to provide information on safety and quality levels at the end of the supply chain, considering environmental parameters, e.g. temperature. Both modules are based on integration of two main mathematical models for microbial growth: due to Baranyi and Gompertz. That approach facilitates prediction under dynamical environmental conditions being a result of the variations along the supply chain. The QMRA predicts the growth of certain pathogen, whereas SLP predicts the growth of...
Spoilage bacteria in the product based on the given initial count. The QMRA output provides the prediction of the probability for infection at the end of the supply chain due to contamination with pathogen bacteria. The novelty is to compare results given by QMRA with HACCP practice to verify the implemented system. SLP module provides the remaining shelf-life before it becomes obvious that the shelf-life of the product has been reduced, e.g. due to temperature abuse. The outcome from QMRA and SLP modules enables to react in time in order to prevent or reduce losses and risks that in fact affect the safety and quality of the final product.

Poster 29

PEACH PIECES PROCESSED BY HIGH PRESSURE PROCESSING: INITIAL RESULTS

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Currently, consumers demand for more “fresh appearing”, more convenient and healthier fruit products. At the same time, fruit industry and fruit packinghouses look for fast and convenient technologies to decontaminate fruit products minimizing losses of nutritional and sensorial parameters. In the framework of the European Project ISAFRUIT (www.isafruit.org) different studies have been undertaken on peaches to answer these demands. One of the technologies proposed is the High Pressure Processing (HPP) which allows a non-thermal pasteurization of food products. Peaches (Ryan sun variety) were cut in pieces, vacuum packaged in a ‘Darfresh’ packaging and then processed at 300 and 400 MPa during 5 minutes. Total aerobic mesophilic microorganisms (TAM) as well as yeast and mould counts were determined before and after HPP treatments. Viability of such microorganisms was studied during 28 days at two storage temperatures (5°C and 10°C). At the same time peach colour data L*, a* and b*and texture, with the puncture test, were analyzed before and after HPP treatments. Colour data were also recoded during the storage period. Results showed a microbiological reduction due to HPP treatments, especially for yeast and moulds. During storage, TAM population significantly increased but even after 28 days of storage at 5 or 10°C its level was below the established by Spanish Regulation (RD3484/2000). Colour ratio L*/b* was lightly modified by the treatments and then maintained stables values during storage time. For texture a significant difference was observed in samples treated at 400 MPa while samples treated at 300 MPa showed no difference with control samples.

This encouraging results show that with a mild HPP treatment, it was possible to give a microbiological and colour stability during 28 days to vacuum packaged peaches wedges.

Poster 30

KINETIC STUDY ON THE INACTIVATION OF L. monocytogenes IN A MODEL SYSTEM OF ALGINATE TREATED BY HIGH HIDROSTATIC PRESSURE (HHP)
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This study is part of a comprehensive research Project where different food conditions (pH, Aw and physical state) will be studied using a model structure of sodium alginate. The aim of this study is to evaluate the inactivation kinetics of *Listeria monocytogenes* treated by HHP along with the storage time (24 hours) at 4 ºC and to correlate this kinetic with the evolution of the damaged cells.

Sodium alginate disks (10 cm ø) at pH=8 and aw=0.95 inoculated with *L. monocytogenes* (CECT 4032) (10⁶ UFC/g) were treated at different pressure intensities (200-600 MPa) during different intervals of time (0 - 15 minutes).

Survival curves were different if disks were spread immediately after treatment (time=0) form those spread after incubation for 24 hours at 4 ºC. Reached effectiveness was higher when samples were spread at time 0 than at time 24 hours. All survival curves were concave upwards when alginate models were spread after storage at 4ºC. However, a mix of shapes (concave downwards, linear and concave upwards) was observed when alginate was spread at time 0.

Weibull model was applied in order to compare the inactivation curves obtained at 0 and 24 hours. This mathematical model accurately described the kinetics of inactivation at both studied times.

On the other hand, cells were recovered in PCA agar with and without 6.5% NaCl. This selective medium allowed to quantify the fraction of damaged cells at time 0 and 24. An irreversible damage (at least 1.5 log cycles) was observed in treated cells of *L. monocytogenes* from low pressure intensities (285 MPa). Damage in those cells could not be repaired during refrigerated storage. In addition, depending on the treatment applied (time and intensity) a significant reversible damage was observed. Part of this damage was repaired after 24 hours incubation.

In conclusion, this study contributes with new data to clarify the bactericide action mechanism of HHP and, on the other hand, demonstrates that the HHP effectiveness must be studied after at least 24 hours of storage to allow damaged cells to repair themselves and to have a right estimation of bacterial survival.

Finally this research justifies the use of other antimicrobial agents during storage to improve safety and to extend shelf life of HPP treated foods.

**Poster 31**

**VOLATILE COMPOUNDS IN GROUND BEEF SUBJECTED TO HIGH PRESSURE PROCESSING. A COMPARISON OF DYNAMIC HEADSPACE AND SOLID-PHASE MICROEXTRACTION.**


Through its ability to kill spoilage microrganisms, and inactivate food enzymes, high pressure processing (HPP) has been proved to render microbiologically safe products keeping the flavour characteristics of fresh foods. However, published information on the effect of HPP on volatile compounds is scarce.
The food volatile profile strongly depends on the extraction technique used. For that reason, we have undertaken a study on the effect of HPP on the volatile fraction of ground beef, comparing two extraction techniques: dynamic headspace (DHS) and solid-phase microextraction (SPME), both coupled to GC-MS.

Ground beef was divided into equivalent portions and vacuum-packaged in a multilayer plastic bag, previously wrapped in aluminium foil. Half of the portions were pressurized (400 MPa, 10 min, 12 ºC) and the rest were kept untreated. Samples were stored at 4 ºC for 4 days, and then frozen (- 40ºC) until analysis. Prior to analysis, samples were cooked to an inner temperature of 60 ºC and homogenized with sodium sulphate and cyclohexanone as internal standard.

Different volatile profiles were obtained with the two techniques. Compounds such as diacetyl and ethanol were more efficiently extracted by DHS, whereas fatty acids and esters were more efficiently extracted with SPME.

HPP seemed to increase the levels of branched chain aldehydes, originating from the metabolism of amino acids, and caused a steep decrease in the formation of some compounds resulting from carbohydrate metabolism, such as ethanol and acetaldehyde, as compared with control samples. Lipolysis and lipo-oxidation products, such as linear aldehydes and 1-alcohols were also formed at a lower rate in HPP treated samples.

During refrigerated storage, some compounds found in the initial product (diacetyl and acetoin) decreased more pronouncedly in control than in HPP samples.

The results prove that pressurization can help in maintaining the flavour characteristics of fresh beef.

Poster 32

TANGENTIAL FILTRATION OF USED SALTING CODFISH BRINES

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Membrane technology is developing and its usage in new processes in order to obtain new or added-value products is emerging. This study intended to investigate the application of ultrafiltration/nanofiltration to treat codfish salting wastewaters into a concentrate rich in proteins and a permeate that can be reused in codfish brine salting or in the preparation of storing solution of fish bits. The effluent is generated during the salting process and a significant proteinaceous material content and a low fat content was expected in its composition. The effluent was treated with ultrafiltration (500, 100, 30 and 4kDa) and nanofiltration (650 Da) lab scale membranes. The salting wastewater composition was analysed and the rejection factors of several components and its relation to the membrane cut-off was established. Parameters like water content, ashes, sodium chloride, total protein, collagen and some characteristic amino acids, like creatine and hydroxyproline, were analysed in the concentrate and in the filtrate with the purpose of evaluate its separation thru the membrane process. Analysis by SDS-PAGE was done in order to obtain the molecular weight of the proteins present in the filtrate, concentrate and in the effluent. The results show that ultrafiltration is clearly an efficient method to eliminate a substantial portion of protein from the salting brine, achieving 89% rejection of protein with a 100 kDa membrane cut-off. Since the final result is a filtrate that is colourless and odourless, clear, salted solution, it’s possible to introduce this product in codfish brine salting or in the preparation of storing solutions and
consequently eliminate its dumping in the nature. The protein present in the concentrate can have many applications in fish meals, animal feed, human food and seasoning.
Keywords: nanofiltration; ultrafiltration; salting brine; protein recovery; codfish.

Poster 33

FAT CONTENT INCREASES THE LETHALITY OF LISTERIA MONOCYTOGENES IN MILK TREATED BY ULTRA-HIGH PRESSURE HOMOGENISATION

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Listeria monocytogenes CCUG 15520 was inoculated in milk samples with different fat contents (0.3 %, 3.6 % 10% and 15%) at final cell concentrations of both 3.0 and 7.0 CFU/ml. Inoculated milk samples were subjected to a single cycle of UHPH treatment at 200, 300 and 400 MPa with inlet temperature of 4 ºC. Microbiological analysis was performed 2 h after the UHPH treatments and after 5, 8 and 15 days of storage at 6 ºC. Maximum lethality values were obtained in milk samples with 15 % and 10% of fat treated at 400 MPa (7.95 and 7.46 Log CFU/ml respectively). However, in skimmed and 3.6 % of fat milks complete inactivation was not achieved and during the subsequent 15 days of storage at 6 ºC L. monocytogenes was able to recover and replicate until achieving initial counts. Nevertheless, in milks with 10 and 15 % of fat L. monocytogenes only recovered the initial counts in the milks treated at 200 MPa, but no in milk samples treated at 300 and 400 MPa. When the load of L. monocytogenes was only about $10^3$ CFU/ml in milks with 0.3 and 3.6 % of fat, complete inactivation was neither achieved and L. monocytogenes was able to recover and grow during the cold storage. In this case, the recovery of the microorganism was much better in the 3.6 % fat milk than in the skimmed milk what is contradictory with the possibility that some compounds present in the milk fat inhibit L. monocytogenes.

Poster 34

PATTERN RECOGNITION MODELS FOR HERBICIDE RESIDUES DETECTION ON INTACT OLIVES BY NEAR INFRARED SPECTROSCOPY

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The use of pesticides in the olive grove has not only reported significant benefits in the agricultural productivity but has also contributed to the emergence of diverse problems arising from the accumulation and diffusion of its residues.
In this study, the possible olive contamination by herbicides in the oil production line is evaluated, analyzing by NIR technology a collective of olive samples that was fortified.
For the development of the discriminant models between contaminated and untreated olives, we base us on the prior knowledge of the behaviour of the samples set (method of supervised pattern recognition) using the analytical results obtained by the reference
laboratory. Based on these data, were created by borders 3 areas of samples concentration (from 0.2 to 0.8ppm, from 1 to 2.5ppm and from 3 to 5ppm), dispensing with all those samples with reference values situated in zones of confluence of the groups (5%). The spectral collection was carried out using a spectrophotometer NIRSystems 6500. Classification models were obtained with modified partial least squares regression (MPLS), and different mathematical pretreatments of NIR spectra were tested.

The results showed a classification error between treated and untreated olives of 5.02%. These spectra were submitted to scatter correction and derivation process. It is shown that the selected model based on reference data obtained a similar behaviour to the developed model in previous work, sorting with a method of unsupervised pattern recognition (classification error of 4.68%, scatter correction and second order of derivation).

Therefore, NIRS technology is a potential tool that allows the detection of herbicides in olives, making possible the control in the receiving mill, ensuring that the oil obtained is toxicologically acceptable and safe for consumers.

Poster 35

PROTEIN BASED EDIBLE FILMS TO CONTROL THE RELEASE OF ANTIMICROBIAL ENZYMES

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Food preservation by non-thermal processing technologies might rely on the application of combined hurdles. Among them active packaging strategies based on the controlled release of antimicrobials seem promising to extend food shelf-life and could be useful in combined strategies. Here antimicrobial edible films based on the incorporation of lysozyme to sodium caseinate (NaCas) were modified by chemical or biochemical crosslinkers to achieve a sustained release of the antimicrobial enzyme. Kinetic studies on the release of lysozyme in liquid-like food solutions from pH 3.02 up to pH 5.80 were undertaken, also to state the influence of the crosslinkers on the release rate. Lysozyme activity was determined spectrophotometrically by the decrease in absorbance of *Micrococcus lysodeikticus* cells at 450nm. Either the pH or the use of crosslinkers had a strong effect on the protein solubility, and as a consequence, a significant influence on the release rate of lysozyme. NaCas films were slowly soluble networks at pHs close to the isoelectric point of caseinate, therefore decelerating remarkably the release rate of lysozyme without the addition of crosslinkers. Additionally a sustained release of the enzyme was obtained after mixing with glyoxal, with a gradual increase of antimicrobial activity as the protein was solubilised. Other crosslinkers, as calcium chloride or transglutaminase, almost blocked enzyme release and were not found adequate to achieve enough antimicrobial activity. The addition of lysozyme slightly modified the film mechanical properties, but films were highly transparent after treatment at pHs near the isoelectric point, or crosslinking with glyoxal. These results suggest that it’s possible to obtain active films and to control the release of the enzyme using sodium caseinate as matrix and glyoxal as crosslinker. The developed films will be tested in combined strategies with emerging technologies.

Poster 36
PHYSICOCHEMICAL EQUIVALENCE OF APPLE JUICE RAW AND TREATED BY ULTRA HIGH PRESSURE HOMOGENIZATION

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Recently development in processing technologies urges food processors to adopt Ultra High Pressure Homogenization (UHPH) as alternative to thermal processing. Present study is a step to strengthen the concept of using UHPH. Fresh apple juice was homogenized at 200 and 300 MPa at inlet temperature of 20 ºC. Physicochemical properties like pH, titratable acidity, total soluble solids, color, and viscosity were measured and compared with untreated apple juice as well as with commercially pasteurized samples. Results showed that the analytical values for pH, total soluble solids, reducing sugars and total sugar in UHPH treated samples were more similar to fresh apple juice as compared to commercially pasteurized samples. Also the viscosity of UHPH treated apple juice was greater than that of fresh as well as pasteurized samples, contributing to better mouth feel. Raw and UHPH treated juice were not visually distinguished by sensory judges. Measurement of total phenolic compounds, as representative of antioxidant compounds, was also evaluated by HPLC assay. Results for total phenolic compounds in UHPH treated samples were more similar to pasteurized apple juice, and more than in fresh. Results showed that there were no significant differences in physicochemical attributes between UHPH treated and fresh apple juice. It is concluded that UHPH is a suitable technology to fulfill the consumer demand of “fresh like” products.

Poster 37

HIGH TEMPERATURE LIQUID CHROMATOGRAPHY AS A NOVEL TECHNIQUE FOR SACCHARIDES DETERMINATION IN MILK AND DAIRY PRODUCTS.


High-temperature liquid chromatography (HTLC) is a high-performance separation method in which mobile phase high temperatures are used. HTLC shows very interesting chromatographic properties compared to HPLC such as better analytes separation and the ability to use only water as solvent, which entails the elimination of any pollutant solvent. Furthermore, shorter retention times can be obtained at high elution temperatures due to the diminished in the water viscosity. The food industry demands more efficient and rapid analytical methods. Few reports have demonstrated the potential use of HTLC to carry out food analysis. The goal of the present communication was to develop a new chromatographic system to analyze milk and dairy products. With this purpose in this work, a set of carbohydrates have been determined by means of a HTLC system equipped with a porous graphitic carbon column (hypercarb).
Temperatures of up to 200 °C with water as mobile phase were tested and an ELSD (Evaporative Light Scattering Detector) was used to detect the analytes. The ELSD is a relatively inexpensive detector and it is suitable for non-volatile compounds determination. A systematic study of the effect of the mobile phase temperature on the peak resolution has been carried out. Lactose was selected as test compound. Additional analytes such as glucose, fructose, maltose and sucrose were also separated. Furthermore, in the case of the ELSD the mobile phase temperature influences the analytical results achieved. Considering both, the resolution and the sensitivity, the best results have been obtained at a temperature of 150°C. Milk and dairy products have successfully been taken as test samples and analyzed under the optimum conditions. In conclusion HTLC-ELSD can be considered as a good new alternative to achieve faster analytes separation, better resolution on the chromatographic peaks and by using pure water as solvent, the methodology is environmentally benign.

Poster 38

GAS PLASMA TREATMENTS FOR SUPERFICIAL DECONTAMINATION OF TABLE EGGS

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Although eggs are widely used as an inexpensive food of high nutritional value, it is widely recognized that they are one of the main sources of food-borne outbreaks in Europe. Eggshell washing is practised in some countries for reducing bacterial contamination in table eggs, but is not allowed in Europe (except Sweden and the Netherlands). The use of gas plasma offers an original alternative to conventional decontamination techniques of food mainly due to the atmospheric operating temperature, which results in minimal degradation of nutrients, changes in organoleptic properties as well as formation of new potentially dangerous molecules. The main objective of this work was to evaluate the efficacy of cold gas plasma technique in the superficial decontamination of eggshell from the pathogens most frequently associated with eggs. The resistive barrier discharge prototype used to generate cold plasma proved to have a good decontamination power towards *Salmonella* Enteritidis, *Listeria monocytogenes* and *Escherichia coli* deliberately inoculated onto the surface of eggshells giving cell load reductions ranging between 1 and 4 log10 CFU/eggshell depending on the time of treatment, the microbial species and process parameters such as the relative humidity of the chamber during the treatments. Cell inactivation of 1.5-2 log10 CFU/eggshell was observed for total mesophilic bacteria following a 90 minutes exposure to gas plasma. RT-PCR evidenced the presence of viable enterobacteria in 90-min treated eggs although they were not detectable with traditional counting methods. A 90-minutes treatment affected the eggshell color, while no significant differences were detected between the albumen pH of the control and the treated samples.

Poster 39
EXAMINATION OF YEAST STRAINS FOR PRODUCTION OF FERMENTED DAIRY PRODUCT FOR PATIENTS SUFFERING FROM GALACTOSAEMIA

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Galactosaemia is a rare, genetically determined disease. Galactosaemia is treated by life-long galactose restriction. This means that people with galactosaemia should not consume any milk or milk products.

The aim of experimental work was to develop dairy-products with galactose levels lower than 500 mg/100 cm\textsuperscript{3}. In order to decrease the galactose level the application of such yeast strains is suggested, besides the dairy industrial kefir cultures, that, according to professional literature, metabolise galactose more intensively.

Lactose hydrolysed UHT cow’s milk (Naszállyje Ltd) was used as a substrate for the fermentation. The raw materials were inoculated with kefir culture and three different yeast strains.

Yeast strains were being adapted to galactose for 72 hours. During the fermentation of the raw materials with kefir cultures and yeast, the following were examined: The acidity of samples was expressed as Soxhlet-Henkel degree (SH). The quantity of viable yeasts and lactic acid bacteria were determined by the pour-plate method in China-blue agar and were expressed as colony forming units (CFU). The level of galactose was measured by UV method using the Boehringer Mannheim enzymatic analysis. The samples were evaluated organoleptically by the Kramer method. SPSS software (version 9.0) was used for data analysis. Statistical analysis of the data was performed using one-way analysis of variance and independent \( t \)-test. The level of statistical significance was set at \( p<0.001 \) for all measurement, except organoleptic evaluation, which was set at \( p<0.01 \).

There were significant differences in the galactose level between the samples fermented by the three different types of mixed cultures. Applying kefir culture supplemented with \textit{Saccharomyces cerevisiae} Y 1528 it was concluded, that galactose content decreased to less than 200 mg/100 cm\textsuperscript{3}.

Poster 40

EFFECT OF ULTRA-HIGH PRESSURE HOMOGENISATION ON SHELF-LIFE OF A STARTER-FREE FRESH CHEESE

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The aim of the study was to evaluate the effect of homogenising milk with ultra-high pressure homogenisation (UHPH) on the microbiological shelf-life of a starter-free fresh cheese. UHPH (300 MPa at 30°C; model FPG11300, Stansted Fluid Power Ltd) was compared with conventional pasteurisation (PA; 80°C for 15 s) and homogenisation-pasteurisation (HP; 18 MPa at 60°C, 80°C for 15 s). Microbiological quality of cheeses
stored at 4°C was studied by enumerating total aerobic mesophiles, psychrotrophs, lactococci, lactobacilli, coliforms, *E. coli*, and yeast and moulds. The analysis was carried out every 2 days until the total counts reached 6 log cfu/g. Treated milks and pathogens in cheeses (*L. monocytogenes*, *Salmonella* spp. and *S. aureus*) were analysed on day 1.

Coliforms, *E. coli*, lactobacilli, and yeast and moulds were not detected in either conventionally or UHPH-treated milks. However, the effect of UHPH on total mesophiles, psychrotrophs and lactococci was significantly greater than that of conventional treatments. In cheeses, none of the pathogens were detected at day 1, nor were lactobacilli and *E. coli* throughout the storage period. UHPH-cheeses showed the lowest rate of growth of total mesophiles and psychrotrophs, with a concomitant increase in the shelf-life of cheeses (6 log cfu/g reached at day 13 vs. day 17). Moreover, UHPH triggered some unknown changes in the milk which enhanced the growth of lactococci at an early stage of the storage period. UHPH-cheeses showed the lowest rate of growth of total mesophiles and psychrotrophs, with a concomitant increase in the shelf-life of cheeses (6 log cfu/g reached at day 13 vs. day 17). Moreover, UHPH triggered some unknown changes in the milk which enhanced the growth of lactococci at an early stage of the storage period. No differences in the pH of cheeses were observed, thus pH seemed not to be related to these phenomena. UHPH has been proven to be less aggressive towards thermolabile compounds, i.e., vitamins, which could act as growth factors. Yeast and moulds were mainly detected in PA-cheeses; both UHPH- and HP-cheeses had higher moisture content, which could enhance bacterial growth thus inhibiting the growth of yeast and moulds.

**Poster 41**

INACTIVATION OF *Salmonella enterica* serovar Senftenberg 775W INOCULATED INTO FRUIT JUICE BY MEANS OF ULTRA HIGH PRESSURE HOMOGENISATION


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The inactivation of *Salmonella enterica* serovar Senftenberg 775W by ultra high pressure homogenisation (UHPH) was evaluated in grape and orange juices inoculated at a concentration of approximately 7 log CFU/ml. The fluid inlet temperature used was 6 ºC and the pressure levels assayed were 200, 300 and 400 MPa. Viable and injured bacterial counts were obtained for samples 2 h after the UHPH treatments and after 5, 8, and 15 days of storage at 4 ºC. Pressure level after UHPH treatment had a significant impact on the lethal effect and complete inactivation of *S. enterica* serovar Senftenberg 775W was achieved at 400 MPa. No sublethal injuries were detected in any case. The time evolution of viable counts in pressurized and control samples for both matrixes showed a decreasing tendency during the whole storage at 4 ºC. Considering the results obtained in this study we can conclude that the UHPH is presumably a technology with a great potential to be used in the industry of fruit juices.

**Poster 42**

LETHALITY EFFECT OF COMPRESSION AND DECOMPRESSION RATES OF HIGH HYDROSTATIC PRESSURE ON *E. coli* O157:H7 IN ORANGE JUICE

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High Hydrostatic Pressure (HHP) is a recently developed technology being considered to replace conventional thermal treatments for food preservation. The hypothesis of present study is that rapid compression and rapid decompression during HHP treatment may enhance the inactivation efficiency of treatment for selected microorganism (*Escherichia coli* O157:H7) in orange juice. UHT treated samples of pulp free orange juice inoculated with *E. coli* O157:H7 (approx. 7 log cfu/ml) were subjected to 600 MPa pressure level for 3 minutes at 4 °C with fast and slow compression rates (600 MPa in 55 seconds and 6 minutes respectively) as well as fast and slow decompression rates (45 seconds and 150 seconds respectively). Microbiological analyses after overnight storage at 4 °C, revealed that orange juice samples treated with fast compression rates had significantly lower total *E. coli* count (2.8 log cfu/ml) in non selective agar (tryptone soy agar, TSA) as compared to slow rate of compression (3.5 log cfu/ml). While in selective media (Violet red bile glucose agar, VRBGA) no survival could be detected for any of the treatment. Cells cultivable in TSA but not in VRBGA are sub-lethally injured. Regarding decompression, slow rates showed significant advantage (2.7 log cfu/ml) over faster ones (3.5 log cfu/ml) for total count, but the survivals were unable to grow on selective media because of injuries and stress caused by HHP treatment. It is concluded that in orange juice *E. coli* O157:H7 are more sensitive to fast compression rate and slow decompression rate. The effectiveness of slow decompression may be due to extended treatment time.
THE STATE OF FOOD SECURITY IN VENEZUELA: AN EVALUATION OF 1989-2007 PERIOD

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In 1989 Venezuela adopted a Neo-liberal economic program, based on macroeconomic adjustments and stabilization policies, suddenly interrupted in 1992 (owing to a Coup d’État). After a brief period with no-remarkable economical measures, in 1999 a new model, so called “Socialism of XXI Century” (after a Constitutional Reform and deep institutional changes), was implemented. Based on food consumption availability and some agro-food aggregate data (such food imports, household’s expenditures and Weigh-for-Height, Weight-for-Age and Height-for-Age indicators), this paper analyzes the main changes in food security situation during the 1989-2007 period (comparing both kinds of political models), as well as the main effects of economic and trade policies on the main food variables. It also studies the changes occurred in budget allocation of Venezuelan average consumer, particularly in food case. Main results show that, even when food availabilities covered minimal average requirements of food and nutrients in the most of years in such period, there were significant food deficiencies. Due to the high relevance of prices, income level and income concentration, the food energy (kilocalories/person/day) and nutrients intake had markedly deteriorated in the poorest stratum of Venezuelan population. Anthropometrical indicators of child population along 1990’s decade reveal an increasing number of children below the standard values for Venezuela, as well as a very heterogeneous nutritional situation among states/regions. Such situation indicates a great food insecurity risk along the studied period, especially in the poorest people, despite the moderate success reached by social programs of government, especially the so-called “Misiones” (Missions) that cover different axis of social and welfare policies. Finally, significant behavioural changes in the Venezuelan consumers were also found. They keep food intake level by reassigning their expenditures, as a mechanism to face up to a situation characterized by a constant increase of food prices and decreasing (of real values) of their income.

WINNER OF THE BEST POSTER PRESENTATION

Poster 46

INCIDENCE OF FOOD-BORNE PATHOGENS IN FRESH FRUIT AND VEGETABLE AND BIOPROTECTION TOOLS

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Fresh vegetables and fruits (FVF) support rapid growth of food-borne human bacterial pathogens such as \textit{Listeria monocytogenes} and \textit{Salmonella}, and consumption of these contaminated products has been associated to a number of food-borne disease outbreaks. We developed a real-time PCR method (including Internal Amplification Control, IAC) coupled to standard ISO enrichment steps to reliably detect \textit{S. enterica} and \textit{L. monocytogenes} in FVF products with limits of detection and accuracy equivalent to those of ISO methods. The incidence of \textit{Listeria} ssp.; \textit{Listeria monocytogenes} and \textit{Salmonella} spp. as well as the microbiological quality of FVF in the Catalonia market were determined to examine its potential public health importance. Lactic acid bacteria isolated from FVF showed antagonistic activity towards pathogen bacteria. The potential use of LAB as bioprotective agents in this type of products is proposed as an optional method to circumvent the limitations found with other antagonists. The CM160 strain of \textit{Leuconostoc mesenteroides} was the most effective against \textit{L. monocytogenes}. \text{ED}_{90} \text{ values varied from } 1.3 \times 10^{4} \text{ to } 5.0 \times 10^{5} \text{ cfu per g or wound, at ranges of pathogen levels from } 1.0 \times 10^{3} \text{ to } 5.0 \times 10^{5} \text{ cfu per g of lettuce or wound of apple.}

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THE EFFECT OF VARIOUS SURFACE DECONTAMINATION METHODS ON ORANGE SURFACES INOCULATED WITH \textit{E. coli}.

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Fresh squeezed orange juice is pure juice obtained from mature orange fruit and has not been further pasteurized, frozen or concentrated after extraction. The feature of fresh squeezed orange juice that sets them apart from conventional fruit juice products is the lack of these preservation methods to reduce microbial load and pathogens. For the production of high quality fresh juice, various surface decontamination processes are needed to clean and sanitize fruit surface before juice extraction. In this study, the effectiveness of various surface decontamination methods to decontaminate orange fruit surfaces inoculated with \textit{E. coli} ATCC 25922 was evaluated. Immersion in tap water, 5\% \text{H}_{2}\text{O}_{2}, 200 \text{ ppm chlorine and boiling water were used as decontamination methods in this study. The mean } E. \text{ coli loads on inoculated fruits were } 5.51 \text{ log cfu/cm}^{2}. \text{ Microbiological analyses showed that the highest decontamination effects were obtained by submersion of oranges in boiling water and 5\% \text{H}_{2}\text{O}_{2} \text{ solution, respectively. The reductions in E. coli counts were } 3.38 \text{ log cfu/cm}^{2} \text{ with boiling water and } 2.91 \text{ log cfu/cm}^{2} \text{ with 5\% } \text{H}_{2}\text{O}_{2} \text{ solution.}

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DETERMINATION OF EPOXIDIZED SOYBEAN OIL IN FOOD AND FOOD PACKAGING MATERIALS BY GC/MS

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Epoxidized soybean oil (ESBO) is a vegetable oil widely used as plasticizer and/or stabilizer for poly (vinyl chloride) (PVC) in food contact materials, in particular in the gaskets of lids for glass jars to form the airtight seal [1-2]. Their migration to foodstuffs is still not controlled. The specific migration limit established for ESBO in food contact materials is 60 mg kg\(^{-1}\) food simulant [3]. Specific regulation (2005/79/EC) lowered the ESBO migration limit to 30 mg kg\(^{-1}\) for infant food, because the tolerable daily intake (TDI) of 1 mg kg\(^{-1}\) body weight is often exceeded [4-5]. In order to give industry more time to find other alternatives, ESBO migration limit was increased to 300 mg kg\(^{-1}\) food simulant (except for infant food) for a transition period (EU Regulations 372/2007 and 597/2008) until 30 April 2009.

A simple, fast and economical method for ESBO analysis has been developed and validated in order to apply it to real food samples. The aim of this work was to screen the presence and quantity of ESBO in commercial lids of glass jars and its food content for the control of compliance of the current legal migration limits.

For lids and food analysis, a prior Soxhlet extraction of the fat was required. The developed method was then applied consisting of an initial transesthetylation of samples and a subsequent specific 1,3-dioxolanes derivatization from the epoxy compounds present in the soybean oil. Gas chromatography-Mass Spectrometry (GC/MS) for identification and quantification of ESBO was used using an SPB-5 capillary column (30 m x 0.25 mm x 0.25 µm). The detection was performed in SIM mode focused on 277 and 309 ions.

Results obtained shown the presence of ESBO and other plasticizers in several lids and mainly in high-fat foods. The founded validation data proved the suitability of the proposed method for determination of ESBO in food and food packaging materials.


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OCCURRENCE AND ENANTIOMER COMPOSITION OF THE TRANSFORMATION PRODUCT PHOTODIELDRIN IN AGRICULTURAL SOILS AND PUMPKIN SEED OIL

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Residues of the insecticide dieldrin in Cucurbitaceae (cucumbers, pumpkins, zucchini) have recently attracted attention\(^1\). Dieldrin was used in the 1950-1970s as broad spectrum insecticide. The chlorinated compound still persists in soils and is therefore listed under the Stockholm convention of persistent organic pollutants.

Photolysis is an important environmental transformation process of dieldrin leading to photodieldrin, which seems to be more toxic than the parent compound\(^2\). Whereas dieldrin has extensively been reviewed, surprisingly little is known on photodieldrin. We investigated the occurrence of photodieldrin in samples of dieldrin-contaminated soils and pumpkin seed oil. In contrast to dieldrin, photodieldrin is a chiral compound. Analyses were therefore performed using enantioselective gas-chromatography
(silylated γ-cyclodextrin as chiral selector) with detection by electron-capture, negative ionization mass spectrometry.

Photochemical experiments with technical dieldrin confirmed the formation of photodieldrin in racemic composition (enantiomer ratio, ER=1.0). However, in agricultural soil samples contaminated with dieldrin from former applications, the enantiomer composition of photodieldrin was clearly non-racemic (ER, 1.4-2.2), indicating that enantioselective biological processes are involved in its further dissipation. Concentrations of photodieldrin in these soils (0.1-4.4 ng/g) were 6-19% relative to those of dieldrin (2-24 ng/g).

In pumpkin seed oil, dieldrin was detected at concentrations of 3-80 ng/g (compare current EU-MRL for pumpkin seeds of 20 ng/g). Photodieldrin, however, was not detectable and amounted <1% relative to dieldrin in certain samples. This finding suggests that photodieldrin may be less bioaccumulated than dieldrin. Based on these preliminary analyses, photodieldrin has not necessarily to be considered as a significant residue in pumpkin seed oil.


OCCURRENCE OF PATULIN IN APPLE JUICE AND APPLE PRODUCTS AND EXPOSURE ASSESSMENT OF THE POPULATION FROM CATALONIA (SPAIN)

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This study was conducted to assess patulin exposure by Catalonian population. Patulin levels were determined in one hundred sixty-one apple juice samples, seventy-seven solid apple-based food samples and one hundred forty-six baby apple-based food samples obtained from six hypermarkets and supermarkets from twelve main cities of Catalonia (Spain). Patulin was extracted following the AOAC method 995.10 and determined by reversed-phase LC with UV detection. Patulin apple juice, solid apple-based food and baby apple-based food mean levels of positive samples were 8.05, 13.54 and 7.12 μg kg⁻¹, respectively. No samples exceeded the maximum permitted levels established by EU regulation. Dietary intake was separately assessed for babies, infants and adults through a Food Frequency Questionnaire developed from 1056 individuals from Catalonia. Babies were the main people exposed to patulin, however no risk was detected at these levels of contamination. Adults and infants consumers were far from risk levels. Moreover, exposure of the Catalonian population to patulin, was assessed through Monte-Carlo simulation which allows distinguishing variability of exposures from uncertainty of distributional parameters estimates.

HAZELNUT ALLERGENS: DETECTION OF 2S ALBUMIN (COR A14) USING REAL-TIME PCR

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In Western countries up to 1-2% of the total human population suffers from clinically proven food allergies; among childrens the prevalence is even higher, up to 5-6%. The symptoms of food allergies range from mild urticaria to life-threatening anaphylactic shock. The seeds of hazelnuts (Corylus avellana L.) belong to widely consumed tree nuts. They are used in a range of confectionery products (chocolates, wafers, cereal muesli mixtures, bakery products, cakes).

The 18 kDa major allergen of hazelnut was correlated to Cor a1, the major hazel pollen allergen. Cor a1 is highly homologous with Bet v1, the 17 kDa major birch pollen allergen. Patients with severe anaphylactic reactions to hazelnut showed specific IgE reactivity to a 9-kDa allergen, an LTP (Lipid Transfer Protein) named Cor a8. It is worth of notice that other hazelnut proteins like Cor a11 and 2S albumin (Cor a14) were established as minor allergens. This work concerns the validation of a Real-Time protocol (Sybr Green chemistry-based) useful to detect 2S Albumin in processed foods with great specificity, reliability and repeatability. Alb 2s F1/F2 primer set (designed on 2S albumin gene sequence) was able to detect hazelnut with reliability and specificity (Ct values change according to the real quantity of hazelnut in each food sample). Real-Time allows to detect up to 0.01% hazelnut spiked samples, corresponding to 10 ppm absolute quantity.

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INFLUENCE OF Listeria innocua ON THE GROWTH OF Listeria monocytogenes

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Several research reports have demonstrated that the presence Listeria innocua may mask Listeria monocytogenes, which could lead to a false negative result for the presence of L. monocytogenes. Different explanations for this have been proposed, such as a more rapid growth advantage of L. innocua against L. monocytogenes, in contrast to inhibitory interspecies interactions which have been attributed to the production of bacteriocin-like agents. At the present time, both explanations remain unclear.

The influence of L. innocua on the growth of L. monocytogenes was evaluated during this study. Different strains (individual strains or in a cocktail) at different concentrations (10^2 and 10^4 cfu/ml) and in different matrixes (growth medium and milk) were tested.

The response was shown to be strain dependent; L. monocytogenes was inhibited by L. innocua but the reverse was also observed. Furthermore, no inhibitory activity caused by bacteriocins and no correlation between the growth rate and the inhibition were demonstrated.

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Poster 53

MYCOTOXIGENIC MOULD GROWTH PARAMETERS AS AFFECTED BY SUBOPTIMAL ENVIRONMENTAL CONDITIONS AND INOCULUM SIZE
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Mould growth and mycotoxin production are associated to the presence of fungal inoculum on predisposed foods and feeds. The presence of mycotoxins in food products is a chemical risk of increasing concern due to the wide range of food types where they can be found. Despite the absence of direct correlation between mould growth and mycotoxins production, prevention of fungal growth effectively conduces to prevention of mycotoxin accumulation. Predictive models can be a tool to prevent mould development. Kinetic models determine microbial responses in relation to time and environmental conditions, and provide estimates for parameters of growth: lag phase ($\lambda$) and growth rate ($\mu$). The aim of this work was to assess the impact of a) high/low levels of inoculum and b) optimal/suboptimal environmental conditions on the distribution of the estimated kinetic parameters. Two mycotoxigenic moulds, *Aspergillus carbonarius* and *Penicillium expansum*, were chosen for this study, and experiments were performed with 50 replicates. While optimum conditions led to a colony diameter increase which followed Baranyi’s function, suboptimal conditions, in particular low temperatures led to different grow functions. In general, $\mu$ and $\lambda$ were normally distributed. $\mu$ showed similar distributions under optimal growth conditions, regardless of the inoculum level, with similar medians, while suboptimal $a_0$ and temperature conditions led to higher kurtosis distributions, mainly when the inoculum levels were low. Regarding $\lambda$, more skewed distributions were observed, mainly when the inoculum levels were low. Finally, an increasing number of ‘no-growth’ situations were recorded under suboptimal conditions, which suggest a high variability of results under such conditions. These results imply that low inoculum sizes and suboptimal conditions lead to high variability of the estimated growth parameters. These have to be considered in the design of kinetic predictive models.

Poster 54

SURFACE SAMPLING IN FOOD INDUSTRY

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Sampling methods have been studied on stainless steel surfaces contaminated with *Listeria monocytogenes* at a concentration of $10^5$ UFC per 100 cm$^2$. The procedures of surface sampling assayed were the following: mini-rollers of 6 cm of length (of naylon - MN -, of polyamide - MP -, of flocked foam - ME -) and the standard method of sponge. Homogenization was made by using Stomacher apparatus, and the Vibromatic apparatus was used for MN. Plating was made on the selective agars ALOA and PALCAM (37°C/24-48h) and the counts obtained were expressed as recovery percentage. All procedures were assayed with five replications and on 8 different strains of *L. monocytogenes* (one of human origin, four obtained from a plant producing ready-to-eat sausages, and one from chorizo dry-cured sausage, ham and chopped meat, respectively). Statistical analysis was made by two-way ANOVA using the software GraphPad Prism 4.
Percent recovery results showed no significant differences between 24 and 48 hours of incubation, nor among the two selective agars. Therefore, the counts can be obtained after a period of incubation of 24 hours in any of the selective medium. Significant differences were not observed among the sampling methods, with results varying from 2.7% to 3.5% percent recovery, though recoveries tended to be higher with the MN procedure using Vibromatic for homogenization. The variation of the results depended significantly (p < 0.01) on the environmental stress associated to the origin of the strain, being that the strain coming from ready-to-eat sausage was more stressed and showed lower recoveries while the human strain yielded better recoveries. The results obtained by the mini-rollers were similar to those of the sponge, although the food industry needs more efficient surface sampling procedures in order to recover higher percentages of microorganisms.

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Keywords: Stainless steel, Listeria monocytogenes, recovery, mini-roller,

FOOD SAFETY MANAGEMENT EVALUATION

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Public health care is one of the main goals of developed countries and is directly connected with food assurance policies promoting consumer health and safety. Studies have questioned the efficiency of the HACCP system, but opinions differ concerning the reasons for this inefficiency. The aim was to determine the actual state of food safety management at all stages of the food supply chain. Various quantitative and qualitative methodological tools were used. Results have shown deficiencies in understanding and the control of microbiological hazards were found at all analyzed stages of the food supply chain. This indicates the need to modify current training techniques and highlights the lack of trained and competent experts. The necessity for discussion concerning the work environment and role of the individual in the food supply chain to address potential hazards is presented. The proposed Good Nutritional Practice strategy combines all good practice systems, puts a consumer in an equal position and clearly defines a new hazard dimension, the so-called human factor, in food safety assurance. The findings of this study confirm that (A) permanent mutual non-cooperation of current good practices and their participants leads to mistrust, which is reflected by the inefficiency of the HACCP system, and (B) the human factor in organizational and execution levels is the reason for unacceptable deviations from the HACCP system, which appear in critical situations. A more effective system of primary education and lifelong learning of food-related topics is needed. A multi-disciplinary and innovative approach is required that provides quick and effective responses to maintain the safety of foods in the food supply chain. This would involve acknowledging the importance of the subjective comprehension of health and safety concepts, which is a component of well-being.
Application of Liquid Chromatography-Tandem Mass Spectrometry to Determine Macrolide Antibiotics in Bovine Milk

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An confirmatory and sensitive procedure has been developed for quantitative determination of macrolide antibiotics: tilmicosin (TLM), tylosin (TS), spiramycin (SPM), erythromycin (ERY), lincomycin (LM) and Tulathromycin (TULA) in 90 bovine milk samples from Valencian markets. Due to the relationship between agricultural uses an the antibiotics resistance in humans, the European Commission in the Council Regulation nº 2377/90 has set maximum residue limits (MRLs) in bovine milk which are 50, 50, 200, 40, and 150 µg/kg for TLM, TS, SPM, ERY and LM, respectively, while TULA is not permitted to use in animal from which milk is produced for human consumption.

The proposed method consists of pressurized liquid extraction (PLE) and detection by liquid chromatography coupled to tandem mass spectrometry by electrospray ionization positive mode. The main parameters affecting the performance of the different ionization sources and PLE parameters were previously optimized.

Mean recoveries studied at MRLs established for each one in bovine milk ranged from 69 to 87%, with relative standard deviations from 2.7 to 4.1%. The limit of quantification (S/N = 10) and the limit of detection (S/N =3) of the six studied antibiotics were < 0.6 and < 0.2 µg/kg, respectively.

A total of 90 milk samples were analyzed with this method, and were detected macrolides in 42% of them, with levels between 0.77 to 11.86 µg/kg of LM and TLM respectively.


Genomotyping Campylobacter jejuni; New Approach for an Improved Insight into this Health Threat.

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In Europe as well as the other parts of the world, Campylobacter is the most frequent occurring zoonose. A number of 197,363 cases were reported in 2005. In most cases, gastroenteritis is the fate of man ingesting Campylobacter, but the impact of illness may become more dramatic when Campylobacter jejuni is concerned. Symptoms include reactive arthritis or Guillain-Barré syndrome and occasionally even death.
Husbandry animals such as poultry and pigs are generally viewed as the prime source of infection. Other sources are formed by pets, surface water and raw milk. Identification of the source of infection is hampered by the lack of good tools for identifying and tracing individual Campylobacter strains that cause infections in humans. Such tools would also be useful for studying the epidemiology of Campylobacter spp. in food-producing animals in the farm environment. To enable the development of a molecular method for typing Campylobacter isolates, we have developed a pan-genomic microarray. The microarray contains 4600 randomly cloned genetic elements derived from twelve *Campylobacter jejuni* isolates including those originating from poultry and human gastroenteritis-, arthritis- and Guillain-Barré patients. Furthermore the microarray contains probes (1536) of *C. coli*, *C. lari* and *C. upsaliensis*. A collection of 350 isolates, among which the CampyNet collection was analyzed using the microarray. The data generated reveals information on the core and supragenome of the *C. Jejuni* species and shows clear evidence of lateral gene transfer between *Campylobacter* species. From the data, probes were selected that enable the identification of Campylobacter isolates at the species level and *C. jejuni* at the subspecies level. The microarray produced using this subset of probes enable efficient, high resolution array-based typing of Campylobacter isolates.

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**FUNGAL CONTAMINATION OF RED SPICE PAPRIKA**

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The pods of the paprika (*Capsicum annuum* L.) are widely used in various countries as spice and as food-colorant as well. Mould contamination occurs in the field during vegetation season, but also during post-harvest ripening and storage if conditions are favourable.

Sixty paprika powders of different origin (56 samples were grown at different places in 2004-2006 in Hungary, 1 sample originated from Africa, 3 samples from South-America and) were investigated for their microbiological quality (mesophilic aerobic total count, moulds and yeasts, coliforms and *Escherichia coli*, *Salmonella* sp., *Listeria* sp.). To characterize the overall mould contamination, ergosterol content was determined by HPLC method. Aflatoxins and ochratoxin A were also determined by HPLC method.

The microbiological parameters determined by traditional plating methods were generally low enough to be acceptable (mesophilic aerobic total counts: $10^3$-$10^8$, mould counts: $10^{-10^5}$, yeast counts: $10^{-10^2}$; coliforms: $10^1$-$10^5$ and the *E. coli*: $10^{-10^3}$ CFU/g). *Salmonella* sp. and *Listeria* sp. were not detected in any of the paprika samples. The samples could not be grouped by the microbial status. The water activity values of the paprika powder samples were low enough to inhibit the growth of the moulds ($a_w = 0.233 – 0.561$). Ergosterol, the component of the moulds, persists the technological processes (drying, grinding, steaming), therefore can be a valuable indicator of the overall mould infection of the product, and characterizes the hygienic conditions better, than the viable counts. The ergosterol contents were 0.5-7.5 µg/g, the highest ergosterol content was measured in a sample from the sub-tropical America, indicating an originally high fungal contamination.
There was no correlation between the viable mould count and the ergosterol content (indicating the microbicidal effect of the technological steps), and also no correlation between ergosterol content and the occurrence of mycotoxins, however, high mycotoxin level was always coupled with high ergosterol content.

Acknowledgement: The research was financed by the GAK 2005 (CPPAPR05).

Poster 59

**ANISAKIS** *spp. AS A CONTAMINANT IN THE FLESH OF BLUE WHITING* *Micromesistius poutassou* CAUGHT IN FAO 27

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The blue whiting *M. poutassou*, in common with other pelagic species in the NE Atlantic, are heavily contaminated with *Anisakis* *spp.*, a parasitic round worm which is found in great numbers in the larval form on the gut cavity and sometimes belly flaps in fish inspections. The aim of this work was to inspect for *Anisakis* *spp* the musculature of blue whiting samples caught in FAO 27. A total of 166 fresh individuals from Galician waters (ICES subdivision IXa north) and 50 frozen individuals from Ireland waters (NEAFC subdivision VIb) were necropsied. The heads and tails were removed from each fish, and the remaining musculature separated into the hypaxial (ventral) and epiaxial (dorsal) regions following the horizontal septum. The nematodes were detected by digestion of the fish musculature according to FAO protocol CX/FFP 08/29/7. The terms prevalence, abundance and density were used as defined by Bush et al. (1997).

Results revealed that *Anisakis* *spp* infection is more prevalent in the flesh of northern NE Atlantic fishes. Geographical differences were also observed in other demographic parameters. The same tendency occurs wherever the infection occurs in hypaxial or epiaxial regions. This information should be taking into account to reduce the risk of anisakid-induced allergies and gastrointestinal anisakidoses among consumers.

Acknowledgements: we thank Xunta de Galicia for providing financial support under Project INCITE-07MMA015CT.

Poster 60

**ANTIMICROBIAL ACTIVITY OF CHITOSAN AGAINST CAMPYLOBACTER SPP. AND OTHER MICROORGANISMS**

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Antimicrobial activities of three chitosans with different molecular weights (MW) were examined against six gram-negative and three gram-positive bacteria. *Campylobacter* *spp.* was the most sensitive microorganism to chitosan, regardless of its MW. The minimum inhibitory concentration (MIC) of chitosan to *Campylobacter* ranged from 0.005 to 0.05 %, demonstrating the global sensitivity of campylobacters to chitosan. Chitosan caused a loss in membrane integrity of *Campylobacter*, measured as an increase in cell fluorescence due to the uptake of propidium iodide (PI), a dye that is
normally excluded from cells with intact membranes. As cells entered the stationary phase, there was a change in cell membrane resistance toward a loss of integrity caused by chitosan. This study demonstrates that chitosans could be a promising antimicrobial to control Campylobacter.

Poster 61

TRANSFER OF Listeria innocua FROM CONTAMINATED COMPOST AND IRRIGATION WATER TO LETTUCE

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Outbreaks of some foodborne pathogens such as Escherichia coli O157:H7, Salmonella or Listeria associated with lettuce and other leaf crops have occurred with increasing frequency in recent years. Contaminated manure and polluted irrigation water are probable vehicles for the pathogen. Production is a critical point in which fresh produce could be contaminated and has to be taken into account for the fresh-cut industry. In this study, the potential transfer of Listeria innocua from soil fertilized with contaminated compost to the edible parts of lettuce grown on these soils under natural environmental conditions was determined together with its persistence in soil. Moreover, its survival on lettuce watered with contaminated irrigation water was evaluated. In one treatment, seedlings of ‘Romaine’ lettuce were transplanted onto flowerpots containing soil amended with contaminated compost (L. innocua 10^7 cfu/g). In the second treatment, irrigation water was contaminated with 10^7 cfu/ml of L. innocua and lettuce sprayed with a hand sprayer four and eight weeks after the seedlings were transplanted. Pots were left outside and watered regularly. Population of L. innocua was determined after 4, 6, 8 and 9 weeks on the inner and outer lettuce leafs and in the soil. L. innocua population in lettuce leaves was very high (approximately 10^5 cfu/g) on lettuce leaves after spraying, but decreased to undetectable levels at field conditions. There was also transfer of L. innocua from soil to lettuce leaves, mainly to the outer ones, after 4 weeks of transplantation but subsequently population decreased. Survival of L. innocua in soil was very high, 10^5 cfu/g after 10 weeks of inoculation. Our results indicated that contaminated irrigation water can play an important role in contaminating vegetables. Long-term survival of L. innocua in soil amended with artificially contaminated compost illustrates the need for appropriate farm waste management and manure should be treated to eliminate pathogenic microorganisms.

Poster 62

MICROBIAL ASSESSMENT OF FOOD SURFACES, TOOLS AND OPERATORS’ HANDS IN BUTCHERIES

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Contact between food material and inert surfaces leaves residual food debris that favours the growth of microorganisms which in time will multiply and become endemic in the processing plant. This therefore makes butcheries a place of bacterial cross contamination from food contact surfaces that could be contaminated to the uncontaminated meat. This study evaluates the effectiveness of food hygiene practices in five butcheries located in Burgos (Spain). From all the 5 butchers a total of 255 samples were taken within the period of 3 months. The samples were taken on food surfaces (cutting boards, hands, aprons) and tools (knives, grading machine). Each butcher was visited 3 times and within each visit there were 4 sampling times: before starting to work (BS), in the middle of the working shift (M), before clean and disinfection procedure (BCD) and after clean and disinfection procedure (ACD). For each food contact surface, the surface swab technique was used as described in the Regulation 2001/471/CE using a sterile template of 25 cm² area. All samples taken were analyzed according to the ISO procedures. The microorganisms study were total viable count (TVC), Enterobacteriaceae, Escherichia coli, Salmonella, Listeria monocytogenes and Staphylococcus aureus. Microbial data were statistically analysed using Statgraphics Plus for Windows ver. 5.1 through ANOVA procedures.

We found that grading machine was the tool more contaminated followed by the knives, obtained higher counts than allowed (TVC > 2 log cfu/cm² and Enterobacteria >0.9 log cfu/cm² were considered dirty surfaces) after cleaning and disinfection procedure. The hands have an acceptable level, although better or more hygiene measures can improve it, while the aprons, however, is the one that less contributes to cross-contamination. So, we concluded that further cleaning and disinfection procedure and training in good hygienic personnel practices are needed in butcheries to decrease the contamination and improve safety food product.

Poster 63

THE MANAGEMENT OF FOOD ALLERGY AND FOOD INTOLERANCE SEARCHING WITH MULTI-CRITERIA METHOD IN HUNGARY

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The prevalence of food allergy has been estimated to be around 1-3% in adults and 4-6% in children in Europe. The treatment of the food allergy is the lifelong allergen elimination diet that should be feasible only with appropriate information about allergen content and dietetic management. The adequately safe allergen free nutrition makes it difficult.

The aim of the research is finding the best opportunities, methods, intervention points or strategies for patients suffering from the food allergy in Hungary.

We used multi criteria, computer background interview method. The interviewers were the stakeholders of the different areas (e.g. public health, food industry, public catering, consumer protection, patient organisations, media etc.). We examined the opinion of different areas based on several criteria, and we compared it, developing an opinion spectrum. The interview contains twenty options and some viewpoints (feasibility, cost-benefit and concerned group) of their evaluation. The interview consists of four parts being built each other.
We received the next results after the statistical analyses. The importance of the three criteria was considered identical one in each single perspective. We can say that it is not possible to emphasize one of the criteria in the judgement of the options; there is need all three criteria respect. The labelling of the foods, than intervention point primarily the feasibility and it was considered good one in terms of the expense efficiency. The stakeholders’ media and marketing and the consumer protection specialists and the patient organisations’ representatives found the fair allergen labelling for a good intervention point. The consumers suffering from food allergy cannot understand the information on the labelling accordingly necessary the allergic consumers' education. The options have a picture about it, which measures may be effective to change the social environment that let it be allergen less.

Poster 64

OCCURRENCE AND CHARACTERIZATION OF AEROMONAS HYDROPHILA AND YERSINIA ENTEROCOLITICA IN MINIMALLY PROCESSED FRESH VEGETABLE SALADS

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A range of commercially available minimally processed ready to eat salads was examined for the presence of Aeromonas and Yersinia, to provide information about their occurrence and characterize them by some phenotypic criteria. The SDS-PAGE of whole-cell proteins was also applied as a taxonomic tool for the rapid and effective identification of Aeromonas hydrophila and Yersinia enterocolitica found among a number of Aeromonas and Yersinia isolates. The results showed the prevalence of A. hydrophila isolates and the low occurrence of Y. enterocolitica in the minimally processed salads.

Keywords: Aeromonas; Yersinia; Characterization; SDS-PAGE; MPV

Poster 65

MONIQA – AN EU-PROJECT TOWARDS THE HARMONIZATION OF ANALYTICAL METHODS FOR MONITORING FOOD QUALITY AND SAFETY IN THE FOOD SUPPLY CHAIN

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MoniQA is an EU funded Network of Excellence (2007-2012), which works towards harmonization of analytical methods for monitoring quality and safety in the food supply chain. The MoniQA Network of Excellence (NoE) is coordinated by ICC, International Association for Cereal Science and Technology, Vienna, Austria (Dr. Roland Ernest Poms). MoniQA seeks to establish durable integration of leading research institutions, industrial partners and SMEs working in complementary fields of food quality and safety. MoniQA aims at overcoming European and worldwide fragmentation in
analytical methods for monitoring food quality and safety by integrating key organisations across the food supply chain. Main objectives of MoniQA will be:

1) to develop harmonisation guidelines for risk assessment and standardisation of analytical methods and technologies in food safety and quality (in particular emerging and rapid test methods).

2) to assess implications of advanced processing and monitoring technologies implemented in modern HACCP systems. Identify and prioritise gaps and needs for future food quality and safety research.

3) to develop a database of food quality and safety issues and corresponding analytical tools for food production and supply chain including information on the validation level and a thesaurus of terms and definitions used in standardisation/validation of analytical methods.

4) to analyse new EU food quality and safety regulations with respect to industry, control and regulatory bodies and regarding their socio-economic impacts in terms of efficiency, effectiveness and consistency, their administrative costs and their impact on international trade.

Furthermore the consortium will investigate mechanisms for coordinating and finally merging research activities, personnel and infrastructure to achieve synergetic affects. As a result, harmonised methods, databases and training will be made available beyond the network via associated partners and involved stakeholders. Ultimately, industry and SMEs and international trade will benefit through application of harmonised analytical methods and technologies, in particular emerging and rapid methods, as will the consumers of high quality and safe food.

Poster 66

INCIDENCE AND CHARACTERIZATION OF STAPHYLOCOCCUS AUREUS IN SEAFOODS MARKETED IN GALICIA (SPAIN)

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Staphylococcus aureus is one of the main etiological agents of food poisoning worldwide. This is due to previous biosynthesis of heat-stable enterotoxins in food. Antibiotic-resistant S. aureus strains have been increasingly emerged in the community, including foods.

This study has aimed to determine the incidence of S. aureus in seafoods marketed in Galicia (Spain), as well as the enterotoxigenicity and antibiotic resistance of strains isolated.

A total of 271 seafood products were analysed for S. aureus. Strains were identified by standard biochemical tests (growth on Baird-Parker agar, coagulase, DNAse, mannitol fermentation) and then subjected to RAPD-PCR using three primers. Multiplex PCR was carried out for detecting se genes (sea-see, seg-sei). Susceptibility to cefalotin, clindamycin, chloramphenicol, erythromycin, gentamicin, oxacillin, penicillin G, tetracycline, vancomycin, ciprofloxacin, co-trimoxazole and methicillin was also determined by either broth microdilution or disk diffusion methods.

S. aureus was detected in 17% of seafood products. About 9% of samples exceeded 1000 CFU/g. The incidence was highest in frozen products and, amongst refrigerated seafoods, in fresh, ready-to-cook and smoked products. With RAPD, 33 different banding patterns were observed. Patterns were then compared by cluster analyses.
Strains were predominantly sea positive. Most strains were penicillin-resistant but oxacillin-sensitive. It is concluded that enterotoxigenic *S. aureus* has a relatively high incidence in seafoods marketed in Galicia. There is therefore a need for caution to prevent food contamination.
Poster 68

ASSESSMENT OF SAFE ENTEROCOCCI AS BIOPROTECTIVE CULTURES IN FERMENTED SAUSAGES COMBINED WITH HIGH PRESSURE PROCESSING

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Slightly fermented sausages are traditional products highly appreciated by the consumers. Enterococci are lactic acid bacteria that may constitute an important part of the microflora of these products. In the last decade their function in food products have been discussed, and despite some authors point out they have an important role for food biopreservation, others suggest their presence must be avoided due to their association with nosocomial infections, presence of virulence factors, antibiotic resistance, transference mechanisms and production of biogenic amines. High hydrostatic pressure (HHP) is a promising non-thermal emerging technology for dry-cured raw products.

From meat environment we selected three different bacteriocinogenic, non-aminogenic, non-virulent Enterococcus strains, E. faecium, E. devriesei and E. casseliflavus/flavescens, to assess their capacity of implantation and their bioprotective effect against L. monocytogenes and S. aureus in independently challenged sausages, either when applied in solitary or in combination with HHP treatment at 600 MPa after ripening.

Through RAPD-PCR, a 100% dominance of inoculated strain was observed among the enterococci population. Nevertheless, a higher ability to growth of E. faecium versus the other strains and a higher bioprotective role of this strain against Listeria monocytogenes were observed. Despite the in vitro activity of E. casseliflavus/flavescens strain against S. aureus, no significant count differences were observed among the different batches of manufactured sausages. HHP treatment was able to eliminate the remaining Enterobacteriaceae population but only to slightly diminish the inoculated food-borne pathogens, L. monocytogenes and S. aureus. From a safety point of view, the best results were obtained by the combination of the addition of selected E. faecium and pressurization of dried sausages at 600 MPa for 5 min.

Poster 69

PROTEOMIC CHANGES IN STAPHYLOCOCCUS AUREUS DUE TO HIGH PRESSURE TREATMENT

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High hydrostatic pressure (HP) is a non-thermal food preservation technology that is being used to increase the safety of food products. The exact mechanism by which HP inactivates microorganisms has not been fully elucidated, but it is generally believed that HP causes morphological, biochemical and genetic alterations resulting in cell death owing to multiple or accumulated damage. The mechanisms used by microorganisms to resist or recover from an HP treatment are also poorly known. The aim of the present work was to determine which proteins were induced in S. aureus, one of the most high-pressure-resistant non-sporulated bacteria, in response to HP.
treatments. Overnight cultures of *S. aureus* grown in Brain Heart Infusion were pressurized at 300 and 400 MPa for 10 min and the viability of the cultures was determined by differential plating. 2D-electrophoresis gels were performed to compare the protein expression patterns from pressurized and non-pressurized cells and induced proteins were identified by peptide mass fingerprinting. After treatment at 300 and 400 MPa, *S. aureus* counts decreased by 0.5 and 1.5 Log CFU/ml and the level of sublethally injured cells was 1.4 and 2.0 Log CFU/ml, respectively. Despite higher inactivation recorded after 400 than 300 MPa both cultures showed the same counts after 2 days of recovery. Proteomic analysis showed that 16 proteins were induced more than 2.5 fold after treatment at 400 MPa and most of those proteins were also induced, in lower levels, after 300 MPa thus indicating a physiological response proportional to the level of stress. HP induced proteins included a wide variety of cell functions such as enzymes related with the carbohydrates and intermediary metabolism, protein synthesis, regulatory and stress proteins. It is noteworthy that the induced stress proteins (ferritin, thioredoxin and methionine sulfoxide reductase B) have been related with protection against oxidative stress which indicates that HP treatments induce a certain degree of endogenous oxidative stress to *S. aureus*. 
Poster 1

ANTIOXIDANT ACTIVITY OF SOME VEGETABLES AND THEIR PEELS

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The food and agricultural products processing industries generate substantial quantities of phenolics-rich by-products, which could be valuable natural sources of antioxidants. The aim of this study was to determine antioxidants and antioxidants properties. Polyphenols content of some vegetables (potato, red beet, and their peels) were extracted by organic solvents (methanol, ethanol, diethylether, acetone, and hexane). Methanol extracts of all tested samples showed that significantly higher at (P ≤ 0.05) in both extraction yield % and total phenolics, also potato and red beet peels were contained the higher values of polyphenols, flavonoids and flavonols than the edible portion. Moreover, potato peels showed similar antioxidant activity of BHT. On the other hand, there were relationship between total phenolics of samples and their antioxidant activity as measured by either DPPH or ABTS+ radical scavenging activity. It could be concluded that, potato and red beet peels as rich source of natural antioxidants and we suggested that, it could be use their extracts instead of the synthetic antioxidants.


Poster 2

COMPARISON OF THE ANTIBACTERIAL ACTIVITY OF OIL AND WATER EXTRACTS OF CULINARY SPICES

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Culinary spices are known to preserve traditionally prepared foods to some degree, but the functionality of current ingredients used in modern versions of foods products is not always clear. In this study eleven extracts (oleoresin and aquaresin) of edible plants (rosemary, cinnamon, clove, black pepper, mint and sumac) were screened and compared for their antibacterial and antioxidant activity in vitro, as a preliminary experiment to explore their application into meat products with high fat content. The antibacterial activity of these extracts were tested at concentrations of 0.01, 0.1, 1% (w/v) to determine the inhibitory effect on the growth of ten strains of pathogenic and spoilage bacteria (Listeria monocytogenes, Bacillus cereus, Clostridium perfringens, Salmonella typhimurium, Staphylococcus aureus, Escherichia coli, Bacillus subtilis, Listeria innocua, Pseudomonas aeruginosa and Lactobacillus sake). The activity of two-fold dilutions of each extract was measured using an agar well diffusion method.

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Of the different extracts tested, only cinnamon, clove aquaresin, mint and sumac alcoholic extract had a strong inhibitory effect against some of the strains tested, followed by those with a moderate effect including clove oleoresin, rosemary and sumac water extracts. Black pepper exhibited a weak activity against one strain only. The activity of these spices extracts ranged from 50-2000 AU ml\(^{-1}\), with *Clostridium perfringens* as most sensitive 200-2000 AU ml\(^{-1}\) to all spices extract while *Lactobacillus sake* and *Pseudomonas aeruginosa* were found to be more resistant with an activity range from 100-1000 and 250-1000 AU ml\(^{-1}\) respectively. Spice extracts could be useful for high fat content meat, and further experiments will include the application of the most effective extracts into ready-to-eat donner kebab products.

**Poster 3**

DEVELOPMENT OF PORK CARPACCIO PREPARED FROM AUTOCHTHONOUS MALLORCA PIGS

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Carpaccio has been considered traditionally a dish of raw beef, veal or tuna, thinly sliced and served as an appetizer with a dressing containing olive oil, Parmesan cheese and seasonings. The home-prepared carpaccio is made of tender cuts that are slightly frozen and cut with a very sharp knife or meat-slicer to obtain thin slices. However, the meat industry is currently preparing more convenient ready-to-eat carpaccio by curing pieces of meat, that are then frozen, sliced, packaged under vacuum or modified atmosphere without oxygen, and marketed at refrigeration temperature. As a result of this process, a stable red color is obtained and the growth of anaerobic pathogens is reduced. However, the consumption of this product is limited probably due to safety concerns, fresh meat appearance and short shelf life.

In order to improve the safety and quality of cured pork carpaccio, fermentation and slight drying are processes evaluated in the Q-PORKCHAINS project (http://www.q-porkchains.org). Preliminary results obtained from the comparison of the autochthonous Mallorca pigs and two other commercial pig lines, show that tenderloins from black Mallorca pigs are better suited to the production of high quality slightly dried pork carpaccio from the sensory point of view, than those from intensively reared pigs. In general, samples of black Mallorca pigs were scored with a higher intensity of color, intramuscular fat, odor, flavor and crumbliness. The same results were also observed when samples were prepared and tasted with olive oil and Parmesan cheese in order to simulate usual consumer conditions. This product is therefore expected to allow for the creation of a safer and more flavorful pork product, and offer the consumer a wider variety of carpaccio currently based only on fresh beef.

Keywords: carpaccio, safety, autochthonous, pigs

**Poster 4**

SIMULTANEOUS DETERMINATION OF FREE AMINO ACIDS AND BIOGENIC AMINES BY HPLC WITH FLUORIMETRIC DETECTION IN WINE SAMPLES

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Biogenic amines can be found in a variety of foods, especially in protein-rich ones. The determination of biogenic amines in foods is of great interest due to their possible toxicity in humans and as a parameter by which to assess the freshness or spoilage of foods. These compounds are produced by decarboxylation of the free amino acid fraction of foods hence the determination of this aminoacid fraction can provide interesting information related to the biogenic amines content of foods.

In this study a RP-HPLC methodology has been optimised for the simultaneous determination of 26 compounds. The method involves a pre-column derivatization of the analytes with o-phthaldialdehyde (OPA) in the presence of 2-mercaptoethanol (2-MCE) and subsequent separation of the compounds in a C18 column with fluorescence detection.

The amino acids included in the study were: aspartic acid, glutamic acid, asparagine, serine, histidine, glycine, threonine, arginine, alanine, tyrosine, methionine, valine, phenylalanine, isoleucine, leucine, and lysine. Meanwhile, the amines were: γ-aminobutyric acid, ethanolamine, histamine, methyamine, ethylamine, tyramine, tryptamine, putrescine and cadaverine. In order to obtain a good separation of all the compounds some variables of the chromatographic process were optimized. The best conditions to obtain a good selectivity among the entire peaks were obtained working at 35 °C, with a flow rate of 1 ml/min and using a gradient of two solvents which contained methanol, phosphate buffer and tetrahydrofuran. 1,7-Diaminheptane was selected as internal standard.

The optimized methodology was applied for analysis of white and red wines of Alicante. From the results obtained it can be concluded that none of the wine samples analysed presented levels of biogenic amines such as histamine, tyramine, and tryptamine below 1.5 mg/l. Moreover, in all the wines even lower levels of putrescine and no cadaverive were detected showing no spoilage symptoms of the wines.

Poster 5

ISOLATION OF NON STARTER LACTIC ACID BACTERIA (NS-LAB) BACTERIOCIN PRODUCING IN ITALIAN TRADITIONAL SHEEP'S CHEESE ACTIVE AGAINST LISTERIA MONOCYTOGENES

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Keywords: Bacteriocin, Listeria monocytogenes, semi-hard cheese
Background: Bacteriocins are antimicrobial proteinaceous compounds produced by Lactic Acid Bacteria isolated from many foods. Aim of work was to evaluate the antimicrobial activity linked to bacteriocin-producing of non starters Lactic Acid Bacteria (NS-LAB) isolated from “Carmasciano” a traditional Italian cheese made of raw sheep’s milk without cultures starters.
Methods: 25g of samples collected during cheese ripening were 10-fold diluted in Ringer solution and plated on MRS7 and LM17 agar (Oxoid). 121 NS-LAB (39 Lc. lactis; 30 Lb. plantarum; and 27 Lb. paracasei; 25 Lactobacillu spp. identified using API 50 CHL) were isolated and screened against 22 strains of Listeria monocytogenes, 5 strains of Yersinia enterocolitica, 1 strain of Staphylococcus aureus, Pseudomonas
spp., *Salmonella* spp., and *Bacillus cereus*. All strains were identified by validate methods, and submitted to antagonistic activity experiments in solid and liquid media using the spot on lawn and the agar well diffusion assay, respectively. NS-LAB strains producers of bacteriocin-like substance in solid media, were then tested for bacteriocin producing in broth, sensitivity to heat (60-80°C/1h; 100°C/30 min.; and 121°C/10 min.), and to proteolitic enzymes.

**Results:** 23.9% of NS-LAB strains showed antimicrobial activity in solid media by proteinaceous substance against *Listeria monocytogenes* and *Yersinia enterocolitica*, confirmed through the use of proteolytic enzymes. The strains belonging *Lactococcus lactis* Fc 1, 9, 27, 51, 58 and *Lactobacillus plantarum* Fc 29, 30, 32 were able to produce bacteriocin in MRS7 broth with a powerful antilisterial activity. The increasing bacteriocin production of strains Fc 9 and Fc 32 were observed after short incubation time, at pH 5.6 with maximum titre between 2,560 and 640 Arbitrary Units ml⁻¹. The bacteriocins were inactivated to heat exceeding ≥ 80°C, and after treatment with pronase E and ficin.

**Conclusions:** The presence of NS-LAB bacteriocin-producing is important to prevent the growth of pathogenic bacteria especially against *Listeria monocytogenes* in ready to eat foods like cheese. Finally NS-LAB play an important role in flavour formation because they have a high biosynthetic capacity and produce interesting aromatic compounds.

**Poster 6**

**HUMAN MILK BANKS: THE EFFECT OF PASTEURIZATION ON PROTEIN QUALITY.**

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Pasteurized donor breast milk is considered a safe alternative and a good choice when mother’s milk is unavailable or in short supply. Pasteurization is thought to partially affects some nutritional and biological properties of breast milk. During thermal treatment, milk proteins could be oxidatively modified, thus leading to the formation of carbonylated amino acid residues.

**Holder pasteurization method** (65°C for 30 minutes) is the most widely employed in human milk banks, but more recently an alternative a pasteurization, called Flash (72°C for 15 seconds) method, has been suggested.

**Aim of this study was to evaluate the effects of Holder and Flash pasteurization on protein quality, in order to identify which method best preserves milk characteristics.**

Pooled milk from 4 mothers was pasteurized by Holder and Flash method and compared with Crude pooled milk for the following parameters: available lysine, carbonylation degree on single protein induced by Maillard reaction and carbonylation on single protein induced by lipid oxidation.

Our results display that pasteurized milk, Holder in particular, contains more available lysine, and is less modified by carbonylation. Holder method, and, to a lower extent Flash method, seem to increase nutritional value of milk proteins and their digestibility. Lactosylation is mainly concentrated on lactotransferrin and on a bile salt-dependent lipase oncofetal isoform. Crude and Flash milk protein have a basal content in
carbonylated protein, not due to heating. Holder milk has a minor content in lactotransferrin, which seems to be partially degraded: this is probably the reason why holder milk is less carbonylated.

Against current opinions, Holder pasteurization seems to increase protein quality of human bank milk.

Poster 7

DEVELOPMENT OF A SOLID-PHASE MICROEXTRACTION METHOD FOR DETERMINATION OF VOLATILE COMPOUNDS IN ALMOND OILS FROM DIFFERENT ALMOND CULTIVARS

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“Alicante” and “Jijona” nougat is a manufactured product widely commercialized in Spain being made from toasted almonds, sugar and honey. These food products are elaborated in a traditional way using raw materials from Eastern Spain and are protected by the Regulation Council of the Protected Designations of Origin Jijona and Alicante Nougat1. Spanish almonds production has considerably decreased in the last years; therefore some American almond cultivars (such as Butte cultivar) are being used in the elaboration of this sweet because they are cheaper and easier to be found than other Spanish cultivars.

In order to avoid adulteration practices, determination of volatile compounds from 3 different almond cultivars (Guara, Marcona and Butte) was performed to obtain a set of parameters for discrimination between Spanish and American cultivars. Solid-phase microextraction was proposed for isolation and determination of headspace volatile compounds obtained from extracted almond oils2. A divinilbenzene/carboxen/polydimethylsiloxane (DVB/CAR/PDMS) fiber coating was used. Main SPME variables were studied by a $2^3$ factorial design: incubation temperature, time and agitation speed3. 1 g of almond oil was placed in a closed 20 ml vial and immersed in a water bath. The SPME needle was inserted through the septum and left in the headspace. After extraction, the fibre was immediately transferred into a Perkin Elmer TurboMass Gold GC-MS equipped with a split/splitless injector and a SPB-5 capillary column (30 m x 0.25 mm x 0.25 µm). The column temperature program was from 50°C (10 min) to 280°C (5 min) at 4°C/min. Injector and detector temperatures were 270 ºC. The fibre desorption time was 10 min and helium was used as carrier gas (1 ml/min). The detection was performed in scan mode.

Several volatile compounds were found, obtaining clear differences between Spanish and American almond oils studied. These results proved the suitability of the proposed method for discrimination between different almonds cultivars.


Poster 8
IDENTIFICATION OF SPOILAGE MICRO-ORGANISMS OF BROWN “PURUS” SHRIMPS (CRANGON CRANGON)

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The common shrimp (Crangon crangon) is a typical product of the Belgian fishery that has recently received a regional product label, “Purus”. “Purus” shrimps are exclusively caught in the North Sea by Belgian trawlers and prepared by Flemish fishermen predominantly in a traditional way and without preservatives and landed within 12h after catch.

In this study the microbial population of cooked and peeled brown shrimps without preservatives was investigated during storage at different temperatures till the end of shelf life.

Shrimps were caught, sorted, washed and cooked on board according to normal fishery procedures necessary to obtain the “Purus” label. At these different stages of processing, shrimps were collected and put on ice for transport. Microbiological analyses started one day after catch. Some cooked shrimps were peeled manually as sterile as possible, in the laboratory. From all different stages of processing, shrimps were stored on ice (0 ±0.5°C) and at 7.5 ± 0.5°C for several days. Microbiological analysis was performed at regular time intervals during storage. The study of the microbiota was done on several general and group-specific media. Molecular techniques (rep-PCR (GTG)5 clustering and 16S rRNA gene sequencing) were used for clustering and identification.

The results showed that the boiling process leads to a two $10^{10}\log$ decrease in microbial count. In addition, a steep decrease in bacterial count was noticed after peeling. Results of total counts during storage showed that cooked and peeled shrimps stored at the highest temperature were microbiologically spoiled (>10$^8$ cfu/g) after 7 days, while iced shrimps had a shelf life of 12 days.

Preliminary identifications of the microbiota on cooked and unpeeled shrimps using molecular techniques have revealed two genera which were mainly present on as well peeled as unpeeled shrimps without using preservatives and stored aerobically on ice.

POLYCHLORINATED BIPHENYLS PROFILES IN DIFFERENT SHELLFISH SPECIES FROM THE MEDITERRANEAN COAST OF SPAIN (CATALONIA)

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Polychlorinated biphenyls (PCBs) are a group of toxic chemicals, which, due to their physical and chemical properties, may persist long time in the environment and in the food chain. European Union Commission established that the levels of 7 persistent PCBs (28, 52, 101, 118, 138, 153 and 180) can be used to monitor the PCBs distribution in food and feed. Mussels and other bivalve species, which are widely distributed in
coastal areas, may accumulate selectively PCBs and can be used as bio-indicators of chemical pollution in the marine environment. PCBs bioaccumulation has been previously observed in cephalopods (horned octopus) in the Adriatic Sea [Sagratini G. et al., Food Add. Contam., 1 (2008), 69-77]. The aim of this study was the evaluation of the PCBs profiles in different shellfish samples coming from the Mediterranean coast of Spain (Catalonia). A total of 347 samples of seven different shellfish species (mussel, Pacific oyster, grooved carpet shell, smooth clam, wedge shell, and purple dye murex) coming from the Mediterranean coast of Catalonia were analysed in the years 2001-2008 for their content of 16 ortho-PCBs. Lyophilized samples were extracted with hexane and purified with concentrated H\textsubscript{2}SO\textsubscript{4}. Extracts were dried and analyzed by GC-ECD using a large volume splitless injection technique (LVI). Total PCBs content varied from 5.6 ng/g to 154.9 ng/g (median values) for smooth clam and purple dye murex respectively, indicating a significant variability between species. PCB #153 was the most important congener in all species, notwithstanding purple dye murex showed a characteristic profile with significant higher contents of PCB #180 and #138 if compared to the other samples. PCA analysis confirms specific bioaccumulation of PCBs in purple dye murex.

Poster 10

TRANSFER OF AFLATOXIN M\textsubscript{1} FROM MILK TO CHEESE IN TWO ITALIAN TRADITIONAL CHEESE PRODUCTION METHODS

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Two experiments were conducted in order to determine the transfer of aflatoxin M\textsubscript{1} (AM\textsubscript{1}) from milk to two Italian traditional cheeses: Robiola and Primosale. The cheeses were produced in two cheese-making trials, with AM\textsubscript{1} artificially contaminated milk. For each experiment, raw whole milk was artificially contaminated with AM\textsubscript{1} at the levels 5 and 50 ng of AM\textsubscript{1} l\textsuperscript{-1}. The first concentration was chosen since it is a contamination level frequently recorded in monitoring programmes and the second as it is the maximum AFM\textsubscript{1} acceptable level in milk set by the EU. Concentrations of AM\textsubscript{1} in milk, whey, curd and in the produced cheese were determined by HPLC and fluorimetric detection, coupled with immunoaffinity column extraction. In cheeses produced with 5 ng l\textsuperscript{-1} contaminated milk, AM\textsubscript{1} found was 12.5 ng kg\textsuperscript{-1} in Primosale cheese and 22.8 ng kg\textsuperscript{-1}, with a AM\textsubscript{1} concentration of 2.4 and 4.1 times in Primosale and Robiola cheese, respectively. In cheeses produced with 50 ng l\textsuperscript{-1} contaminated milk, AM\textsubscript{1} found was 63.5 ng kg\textsuperscript{-1} in Primosale cheese and 77.5 ng kg\textsuperscript{-1} in Robiola cheese, with a AM\textsubscript{1} concentration of 1.4 and 1.6 times in Primosale and Robiola cheese, respectively. Results confirm the findings of other studies, that cheese usually contain a higher concentration of AM\textsubscript{1} than does the milk from which it is made. Results also show that cheeses produced from milk containing aflatoxin AM\textsubscript{1} at a concentration close to the maximum acceptable level of 50 ng l\textsuperscript{-1} set by the EU will contain the toxin at a level which is much lower than the maximum acceptable level of 450 ng of AM\textsubscript{1} kg\textsuperscript{-1} cheese set by Italy (and also lower than the level of 250 ng of AM\textsubscript{1} kg\textsuperscript{-1} cheese set by other countries).
Poster 11

RESTRUCTURED DRY-CURED HAMS WITH REDUCED SALT AND K-LACTATE ADDITION: EFFECTS OF THE POST-RESTING TEMPERATURE AND THE FINAL WEIGHT LOSS

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There is general concern for reducing salt consumption due to sodium effects on hypertension. Salt, when reduced in dry-cured ham, affects the safety and the quality (softer texture) of the final product.

The aim of this work was to study the effect of different post-resting temperatures and final water content on the physicochemical and sensory parameters of restructured dry-cured hams with NaCl reduction, with or without the addition of K-lactate.

Bonied hams were salted using different salting treatments: standard salting (30g/kg NaCl) and 50% of NaCl reduction with and without potassium lactate addition (19.7 g/kg). After the resting process (below 5 ºC, 3.5 months), hams were kept vacuum-packed in water impermeable bags at different temperatures (5 ºC, 15 ºC and 25 ºC) for 1.5 months. Subsequently, hams were repacked in water permeable bags and dried until reaching the target water content (57% or 50%). Physicochemical parameters and sensory attributes were evaluated. A variance analysis was performed. Salting treatment, post-resting temperature, drying level and their double interactions were included as fixed effects in the linear model.

The main effects of reducing the NaCl addition from 30 g/kg to 15 g/kg in restructured dry-cured hams were the reduction of saltiness and the increase of water activity, proteolysis and softness. The addition of K-lactate contributed to reduce these effects. Hams processed for a longer period had a higher proteolysis index, but a lower water content and harder texture. The increase of post-resting temperature to above 5 ºC reduced the processing time and the metallic flavour. However, at 25 ºC hams were spoiled.

Therefore, the technological and sensory problems due to the reduction of salt in restructured dry-cured hams could be reduced by adding K-lactate and drying at 15 ºC or below, until a final weight loss of around 45% is reached.

Poster 12

VOLATILE BEHAVIOUR DURING THE ANAEROBIC COLD STORAGE OF MORCILLA DE BURGOS PREVIOUSLY INOCULATED WITH Weissella viridescens AND Leuconostoc mesenteroides

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Blood sausage, a widely consumed traditional product, would benefit from an increased commercial life. It is therefore pertinent to investigate the behaviour of the Lactic Acid Bacteria responsible for their spoilage. This study aims to clarify the role played by Weissella viridescens and Leuconostoc mesenteroides, identified as their principal spoilage agents in vacuum-packaged morcilla de Burgos, through the volatile profile changes, following their inoculation over the morcilla, both jointly and separately.
Initially, 155 morcillas were divided up into 5 batches: control (C) made up of only vacuum packaged morcillas, the remaining batches were pasteurized, obtaining a pasteurized control batch (P), and 3 batches of morcilla were inoculated adding 5 ml (10^6 UFC/g) of each specie (W; L) and both (WL) inside the pouches and after vacuum-packaged. Samples were stored at 4 °C for 75 days. A αFOX 4000 electronic nose (AlfaMOS, Toulouse, France) was used for olfactory profile analysis. The chromatographic analysis was performed using an Agilent Technologies 6890N Gas Chromatograph coupled to a 5973i mass detector (Agilent Technologies, CA, USA). Solid-Phase Dynamic Extraction (SPDE) was used as extraction method. Volatiles compounds data were statistically analyzed using the Statgraphics Plus for Windows ver. 5.1 through ANOVA procedures and Principal Component Analysis. Electronic-nose showed that both inoculated species have a completely different behaviour over time, as it was confirmed by chromatographic analysis. L. mesenteroides samples showed high amounts of aldehydes (hexanal) and acids (acetic), on the contrary W. viridescens samples showed greater amounts of alcohols (ethanol) and ketones (acetoin and diacetyl). The inoculated species appears to use different metabolic pathways and perform different roles in the production of volatiles compounds concerning to the spoilage product. Both species must be present in order to obtain an olfactory smell similar to the control samples.

Poster 13

A SURVEY OF THE MICROBIAL QUALITY OF TRADITIONAL SLOVAK SHEEP CHEESE – “BRYNDZA” WITH ACCENT ON ENTEROCOCCUS SPECIES

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“Bryndza” is traditional Slovak soft cheese made from freshly fermented cheese prepared from either raw sheep milk or from a mixture of sheep and cow milk. The objective of this study was to evaluate the microbial quality of Bryndza cheese by determining the occurrence of selected microorganisms especially of enterococci. 33 samples from bryndza cheese were obtained from local retails.

The selected microorganism groups determined by direct plate method included coliform bacteria, yeasts and microscopic moulds as indicators of insufficient sanitation; lactobacilli, streptococci and enterococci as microorganisms necessary for prerequisite fermentation in bryndza cheese. The count of coliform bacteria fluctuated between 1.0x10^2 CFU/g and 6.8x10^5 CFU/g. The yeast and mould counts ranged from 6.1x10^4 CFU/g to 1.3x10^8 CFU/g and from < 1.0x10^2 to 1.4x10^6 CFU/g respectively. Streptococci counts showed a range of 2.0x10^6 CFU/g to 2.1x10^9 CFU/g and counts of lactobacilli ranged from 9.0x10^5 CFU/g to 2.2x10^9 CFU/g. Enterococci ranged from 1.0x10^2 CFU/g to 3.0x10^7 CFU/g. This high number of enterococci does not necessarily indicate the inadequate hygienic conditions. On the contrary, presence of these “lactic acid bacteria” is very relevant to developing organoleptical properties and quality of Bryndza cheese. In Bryndza, 50 enterococcal strains were isolated and the following species were identified: E. faecalis (46%), E. faecium (46%) and Enterococcus sp. (8%). Enterococci were tested for their susceptibility to antibiotics by using the disc diffusion method and among the enterococci isolated from Bryndza cheese, 14% strains
were resistant to ampicilin, 14% to gentamicin and 6% to erythromycin. Enterococci were not resistant to tetracycline and all tested enterococcal isolates were sensitive to vancomycin. Based on obtained results it can be concluded that the enterococcal composition of Bryndza cheese corresponds with those of other European artisanal cheeses, where *E. faecium* and *E. faecalis* represent the dominant enterococcal microflora.

Poster 14

CHARACTERIZATION OF HIGH ADDED VALUE COMPOUNDS IN DRAINED WATER DURING COD FISH (*Gadus morhua*) SALTING PROCESS

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Atlantic cod fish (*Gadus morhua*) is usually dry-salted by mixing with food grade marine salt and stacking in a tank for six days. Along the salting process, cod fish not only incorporates salts but also releases water up to 22 %(w/w) of its weight. This by-product is normally directly discharged, carrying a significant amount of important compounds (such as free amino acids and proteins) that are presently not being valorized.

In the present study, the generated drained water which is formed during cod fish salting process, was collected and analyzed all along the six days processing, in order to determine the content of amino acids - taurine and creatine, myofibrillar proteins and chloride salinity.

In this research, taurine and creatine content have been determined by HPLC-UV/Vis analysis, while myofibrillar proteins have been screened by SDS-PAGE electrophoresis and further quantified by a spectrophotometric method. Chloride salinity has been determined by conductivity measurements and by titration. All samples have been collected in duplicate and have been analyzed in triplicate.

The results revealed that along cod fish salting process, the daily losses of taurine were about 0.3 g/l, creatine 2.5 g/l and 0.5 g/l of myofibrillar proteins. It was demonstrated that 14.5 % of taurine and 24 % of creatine of the initial content in fresh cod fish was drained away to the generated salting water.

Despite of the alkaline salting process (i.e. salt pH=8.5), a significant protein release was observed, inducing that this process is mostly promoted by the high salt content. The high biological and physiological value of those specific compounds, gives place to a new area that can be explored through the extraction of those bioactive components, to be further incorporated in functional foods or to be used in food supplements.

Poster 15

EFFECT OF SALT REDUCTION AND K-LACTATE ADDITION ON SAFETY OF RESTRUCTURED DRY-CURED HAMS.

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The development of reduced-salt meat products is of major interest to food standard agencies and industries but is not straightforward, since flavour and microbiological safety may decrease when salt content is reduced. K-lactate may be used as salt substitute to prevent the growth of pathogens and to maintain a certain salty level. Moreover, a boning-salting-binding methodology may help to shorten and control the salting processes, therefore avoiding the drawbacks produced by a reduced salt addition during the process.

The aim of this work was to determine the effect of salt reduction and the addition of K-lactate on the microbial flora of restructured dry-cured hams at the end of resting and at the end of the process, for different process temperatures after resting. Computed tomography (CT) as a tool to control dry-cured ham processes was also investigated.

Boned hams were salted using different salting mixtures (g / kg raw meat): standard (30 NaCl), salt reduction (15 NaCl) and salt reduction with K-lactate addition (15 NaCl and 39.74 K-lactate 60% pure). At the end of the resting period, some hams were sampled (Tª<5ºC). Thereafter, the rest of the hams were processed at 5, 15 or 25ºC until reaching a weight loss of around 40% before sampling. Aerobic mesophilic total count and lactic acid bacteria as well as pathogenic bacteria, Enterobacteriaceae, Listeria monocytogenes, Staphylococcus aureus and presence of Salmonella spp. were investigated.

No pathogenic bacteria were found in the dry-cured hams processed using a boning-salting-binding methodology. Potassium lactate decreased the microbial flora of restructured hams mainly on the inner muscles where water activity is higher. CT was proved to be a useful methodology for characterizing and controlling industrial processes in the meat industry.

Poster 16

TECH4WINE: INTEGRATED TECHNOLOGY PLATFORM SUPPORTING THE QUALITY AND SAFETY OF TYPICAL WINES OF PIEDMONT - ITALY.

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Viticulture and wine production represent one of the most relevant agro-food sectors in Piedmont, and viral infections are largely spread in north-western Italian vineyards. A research project named TECH4WINE, involving three Agro-food CNR Institutes and four private companies, is currently funded by Regione Piemonte to support the production of Piedmont typical wines through an integrated technology platform. Relationships between virus infection and grape and wine quality, between different environments and vine growth, yield and wine quality, between soil arbuscular mycorrhizal fungi and vine performances, and between sanitary status, cultivation environments and grape and wine protein fingerprintings, are under investigation.

The phytosanitary status of Nebbiolo clones 308, 415 and 63, grown in different environmental conditions was assessed by ELISA, and virus concentration quantified by RT-Real time PCR. Clones resulted to be infected by a mixed infection of Grapevine leafroll virus 1 (GLRaV1) or Grapevine leafroll virus 3 (GLRaV3) with Grapevine virus A (GVA), and Grapevine fanleaf virus (GFLV), respectively.
Healthy or infected progeny of these clones was compared in terms of vegetative behaviour, and grape and wine quality. Preliminary results indicate that virus-infected and healthy progenies of the same clone performed differently in terms of vegetative behaviour, yield and juice quality. The healthy clone also varied in term of production and grape composition, depending on environmental conditions.

Soil samples and roots were analyzed using arbuscular mycorrhizal fungal-specific primers. Phylogenetic analyses identified *Glomus* groups Aa, Ab, Ad and B, *Diversisporaceae* and *Gigasporaceae* families. In particular, *Glomus* group Ad was the best represented in both compartments, suggesting a correlation between intra and extra radical communities. Protocols for protein extraction and 2D electrophoresis suitable for berry samples were set up: berries were dissected into skin and pulp, a phenol based extraction method was chosen for polyphenol-rich skin tissue and a TCA/acetone method for sugar-rich pulp.

Poster 17

**INNOVATIONS IN TRADITIONAL FOOD PRODUCTS: HOW RISK PERCEPTION MAY INFLUENCE THEIR ACCEPTANCE**

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Producers and manufacturers of traditional food products (TFP) face the challenge of further improving the safety, health or convenience of their products by means of different innovations. Consumer acceptance of these innovations depends on several factors such as individual innovativeness or risk perception. This last aspect may be strongly influenced by optimistic bias or unrealistic optimism (over-estimation of the probability of having positive events and/or under-estimation of the possibility of suffering negative events). Hypothetically, people who exhibit a more optimistic bias might be less prone to adopt health and safety food-related innovations, simply because they might believe that they do not need them. The main objective of this study was to find out to which extent the potential acceptance of health and safety related innovations in TFP were influenced by individuals’ unrealistic optimism.

A sample of 100 habitual consumers of a local traditional unsalted fresh cheese (“recuit de drap”) was selected. Participants completed a questionnaire about the effect that different health and safety related innovations would produce on the traditional image of this cheese. Optimistic bias was measured by means of three items linked to the potential health/safety benefits derived from these innovations.

Almost half of the consumers showed unrealistic optimism. About 10% of them underestimated simultaneously the likelihood of suffering from high cholesterol, heart attack and food intoxication/infection. After applying a hypothetical improvement for health benefits, a significant negative relationship between optimistic bias and the traditional image of the selected cheese was observed, although only for those individuals having a high level of unrealistic optimism. This result indicates that risk perception may be an important aspect to take into consideration to better understand and predict the chance of success of health and safety related innovations in TFP, especially for those consumers having a high optimistic bias.

Poster 18
COMPARISON AND CORRELATION OF ANTIMICROBIAL ACTIVITIES OF TURKISH OLIVE OILS WITH THEIR PHENOLIC CONTENTS

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Olive oil is the main component of the Mediterranean diet. The chief active components of olive oil include oleic acid, phenolic constituents, and squalene which have different benefits such as cancer prevention, antimicrobial and antioxidant activities, and lowering the incidence of skin cancer, respectively. It has been reported that the main phenolics including hydroxytyrosol and tyrosol, which occurs in highest level in extra virgin olive oil (EVOO) have demonstrated antimicrobial activity. Among the food-borne pathogen organisms, Salmonella enteritides, E. coli O157:H7 and Listeria monocytogenes accounted for the largest number of outbreaks, cases and deaths. Salmonella sp. causes gastrointestinal disease called salmonellosis which S. enteritides is responsible for 14% of all cases. E. coli O157:H7 is an enterohemorrhagic strain of E. coli gives rise to food-borne infections. L. monocytogenes causes listeriosis, fatal non-enteric disease, meningitis, and miscarriage. The aim of this study is to determine the antimicrobial activities of Turkish EVOOs from different varieties (Nizip, Memecik, and Erkence) against these three pathogenic bacteria and to correlate the antimicrobial activities with their phenolic compound profiles which were elucidated by reversed phase HPLC/DAD analysis. EVOO and phosphate-buffered saline with Tween 20 were inoculated with target strain solution and shaken in an orbital shaker for either 1 h or 30min at 200 rpm at 37°C. After treatment, survivors were determined by viable cell count method. As a result, all EVOOs showed bactericidal effect against these bacteria. In order to determine the antimicrobial activities of 10 major phenolic compounds found in EVOO samples, microtiter plate assay was performed. There is no antimicrobial effect of phenolic compounds in tried ranges. Although they didn’t show any individual antimicrobial activity, they might have a synergistic interaction with each other since the EVOOs showed an antimicrobial activity.

Poster 19

ABILITY OF BACTERIA FROM FERMENTED MILKS TO DEGRADE HISTAMINE

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Histamine is a biologically active amine, with several physiological functions, that is present in many foods. It is rapidly metabolized to inactive compounds by the intestinal enzyme diamine oxidase (DAO), although this does not always occur. Histamine intolerance could appear in individuals with genetic defects, pathological conditions, or under treatment with DAO inhibitors. The presence of histamine in food is mainly due to histidine decarboxylation by certain bacteria, including lactic acid bacteria (LAB). This could be responsible for high levels of histamine in fermented food, like cheese. However, the histamine content of fermented milk is low. This could be due to the inability of microorganisms to decarboxylate histidine, or to the presence of DAO.
activity of bacterial origin. The aim of the present work was determine if the bacteria in fermented milks have DAO activity. A total of 22 fermented milk samples from local stores were analyzed by HPLC-FD to determine their histamine content. Histamine was not detected in any sample. DAO activity was measured by two procedures, in resting cells and growing cells, in both aerobic and anaerobic conditions. *L. bulgaricus* did not show DAO activity, whereas *S. thermophilus* reduced the histamine content by 40.43% and *L. casei* by 43.99%. *S. thermophilus* showed DAO activity only under anaerobic conditions. In contrast, *L. casei* degraded histamine in both aerobic and anaerobic conditions, being the last condition where DAO activity was expressed faster. The present study reports the DAO activity of *L. casei* and *S. thermophilus* isolated from fermented milk samples. This suggests a potential protective role of these kinds of foods against histamine intolerance by providing the DAO enzyme capable of degrading exogenous histamine.

**Poster 20**

IDENTIFICATION AND TRACING OF GRAM-POSITIVE CATALASE-POSITIVE COCCI FROM FactORIES OF TRADITIONAL FERMENTED SAUSAGES.

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Gram-positive catalase-positive cocci (GCC+), including coagulase-negative staphylococci, *Kocuria* and *Micrococcus* spp., are important microorganisms for dry fermented sausages production since they participate in desirable reactions occurring during the ripening of these products. In the present study, different points during the production of a traditional fermented sausage type (*fuet*) were evaluated at 2 local small-scale factories (C2 and C3). Species-specific PCR- multiplex and the partial sequencing of *sodA* gene and also 16S rRNA gene sequencing allowed the identification of the isolates: *Staphylococcus equorum* was the predominant species (46.5%) followed by *Staphylococcus carnosus* (10.8%), *Staphylococcus warneri* (8.1%), *Kocuria kristinae* (8.1%), *Staphylococcus succinus* (5.9%) and *Kocuria palustris* (5.9%) among others. RAPD-PCR was used to type and to determine the sources of the GCC+ isolates in fuet sausages. All the genotypes found in fuet samples were traced back to their origin source. In factory C2, the isolates recovered from the fuet samples were grouped in 2 distinct genotypes. The predominant genotype (83.3% of fuet isolates) was also found in the initial meat batter, the cutting table, the mixing machine and the casing. In factory C3, the isolates from fuet were also grouped in 2 distinct genotypes. The predominant genotype (76.9% of fuet isolates) was also recovered from the casing.

**Poster 21**

MILK FERMENTATION: A BASE FOR GROWTH CONTROL OF *STAPHYLOCOCCUS AUREUS* IN ARTISANAL DAIRY PRODUCTS

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Staphylococcus aureus plays the substantial role in hygiene and safety of the artisanal cheese production as it is the case of the Slovak ewes’ lump and Bryndza cheese. The aim of our work was to characterize the growth of Staphylococcus aureus 2064 in milk in temperature range from 7 to 51 °C, firstly. Next, the growth of Staphylococcus aureus in dependence on inhibitory effect of lactic acid bacteria cultures in milk was studied in relation to the cheese production conditions (temperatures from 15 to 21 °C). The growth of Staphylococcus aureus 2064 in milk was successfully described by the Ratkowsky model $\dot{N}_{STA} = 0.0456(T - T_{min})^*(1 - e^{-0.447(T - T_{max})})$, in whole investigated temperature range. Due to excellent lactic acid production by the Fresco culture, the S. aureus growth rate at 15, 18 and 21 °C was decreased by the following relation: $Gr_{STA} = -1.411 + 0.02174*T - 0.04515*N_{0\_FR}$ ($R^2_{Gr-STA} = 0.901$). The Fresco addition higher than $10^4$ CFU/ml allowed S. aureus to increase its numbers only about 1 log in stationary phase. On the other hand, addition of strain Lactococcus lactis 1881, even in high concentration approximately $10^6$ CFU/ml, had only very inconsiderable inhibitive effect, most likely because of the low environment acidification. The growth rate of S. aureus was characterized in dependence on the temperature and L. lactis concentration according to the equation: $\dot{N}_{STA} = -0.194 + 0.05847*T - 0.00452*T*N_{0\_LC}$ ($R^2_{\dot{N}_{STA}} = 0.921$). This work has proven the fact that growth dynamic of pathogen microorganism during milk and young lump cheese fermentation is influenced by the numbers, type and activity of present lactic acid bacteria.

This work was supported by the contract No. APVV-20-005605 and VEGA project No. 1/0126/09.

Poster 22

MICROBIOLOGICAL CHARACTERISATION DURING RIPENING OF “CARMASCIANO” A SHEEP’S RAW MILK CHEESE

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Keywords: semi-hard cheese, microbiological characterisation, ripening

Background: “Carmasciano” is a traditional cheese made with sheep milk without culture starters. It is produced by small-scale dairies in the Avellino province area. The aim of the present work was to study the bacteria present in unpasturized milk and during the ripening of “Carmasciano” cheese.

Methods: The raw milk and cheese, manufactured according to traditional procedures was obtained from just one dairy farm. The raw milk from the evening and morning milking sessions was used and analyzed. The cheese was sampled, in the ripening room, on Day 1, 17, 36, 82, 117, 175, 201 and 229 of ripening. 25g of the samples were diluted in Ringer solution (Oxoid) and serial decimal dilutions (up to $10^{-7}$) were used to enumerate total viable count, enterobacteriaceae, coliforms, yeast and mould, Non Starter Lactic Acid Bacteria, E. coli, Bacillus cereus, Salmonella spp. and Listeria monocytogenes according to validate methods.

Results: The number of total viable count, enterobacteriaceae and yeast-mould in milk were on average $7.7 \times 10^7$ ufc/ml$^{-1}$, $7.6 \times 10^7$ ufc/ml$^{-1}$, $6.6 \times 10^6$ ufc/ml$^{-1}$, while in cheese on $3.6 \times 10^7$ cfu/g$^{-1}$, $4.6 \times 10^5$ cfu/g$^{-1}$, $2.3 \times 10^4$ cfu/g$^{-1}$, respectively. The NS-LAB population showed a value of $10^6$ ufc/ml$^{-1}$ in raw milk and of $3.7 \times 10^7$ cfu/g$^{-1}$ in cheese ripening. Coliforms and E.coli showed a range of between $10^2$ to $10^3$ ufc/ml$^{-1}$ in the milk and in five samples of the cheese. Regarding the presence of pathogenic
bacteria, *Bacillus cereus* at $\geq 10^4$ ufc/ml$^{-1}$ was found in the milk, *Bacillus cereus* at $\geq 10^2$ ufc/g$^{-1}$, was found in the cheese and *Listeria spp.* at 36, 47, 147, 175 days.

Conclusions: The quality of the raw milk employed in cheese making is important in the evolution of the various microbial group during ripening particularly when the cheese was made without culture starters. NS-LAB were the dominant microbial group in the ripening period. NS-LAB possess a wide range of proteolytic enzymes and may contribute to the aroma of the finished cheese.

Poster 23

HEALTH BENEFITS AND RISKS ASSOCIATED WITH SEAFOOD CONSUMPTION

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Actually, consumers have recognised the important role that diet plays in determining population health outcomes, both adverse and beneficial. In addition there is growing evidence of a relationship between early nutrition and later outcomes in terms of susceptibility to disease. As a direct result, food and dietary issues are one of the most important topics of debate throughout many countries. Consequently, consumers search products that meet their needs and contribute to improve their quality of life, by providing health benefits and lowering risks.

Within the broad variety of available foods, fish products play an important role due to the high number of available species and the diversity of preparations to which might be subjected. The traditional view of seafood as a source of high-quality animal protein to fulfill the basic food requirements has been shifted, and a significant part of the actual demand is related to the its peculiar texture and physical, chemical and sensorial attributes. On the other hand, the relevance of seafood has been linked especially to the presence of long-chain, highly polyunsaturated omega-3 fatty acids, namely the eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). Supported by the results of a high number of epidemiological studies and meta-analysis, there are several evidences about the role of these compounds to diminish the increased incidences of e.g. cardiovascular, cancer and inflammatory disease and to improve the consumer well being.

On the other hand, it is known that many chemical contaminants are present in waters and sediments at very low concentrations. Some of these chemicals concentration can increase by bioaccumulation and biomagnification processes in aquatic organisms via their diet, attaining levels that are much higher than in the water itself. This is especially true for substances that do not break down readily in the environment, such as persistent chemicals, like heavy metals, polychlorinated biphenyls (PCBs) and polychlorinated dibenzo-p-dioxins and dibenzofurans (dioxins). Thus, the main objectives of this work are to discuss the nutritional value and the benefits and risks associated to the consumption of fish products, based on the work accomplished under the frame of the QALIBRA Project [FOOD-CT-2006-022957 - “Integrated Benefit and Risk Analysis. Web-based tool for assessing food safety and health benefit”], which expected outcomes are: (i) develop a generalized modular approach to risk-benefit analysis using valuation functions, (ii) implement the risk-benefit analysis methods developed in QALIBRA in web-enabled software that is available for use by all stakeholders via an integrated website, (iii) develop targeted risk
communication strategies for integrated risk-benefit analysis, adapted to the needs of different stakeholders and (iv) use the methods and software developed by QALIBRA to carry out comprehensive risk-benefit analyses for selected food groups including oily fish and functional foods, for selected EU populations.

Poster 24

IDENTIFICATION OF LACTIC ACID BACTERIA FROM HUMAN MILK

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Human milk is the beneficial food for infants since it has many nutritional requirements, immunoglobulins, immunocompetent cells, different antimicrobial compounds and also prebiotic substances. Studies indicated that breastfeeding protects infants against infectious diseases.

The bacteria commonly isolated from human milk include staphylococci, streptococci, micrococci, lactobacilli, and enterococci. It is known that the certain strains of lactobacilli and bifidobacteria are widely used in food industry as probiotic.

The aim of this study was isolation and identification of lactic acid bacteria from human milk. The lactic acid bacteria from human milk have probiotic property and getting importance in food industry.

In this study, the human milk samples obtained from 60 of healthy mother were inoculated on to KAA agar, MRS agar, M17 agar and RCA agar and then inoculated KAA agar and M17 agar were incubated at aerobic but MRS agar and RCA agar were incubated at anaerobic culture conditions.

At the beginning of identification the Gram staining and catalase test were performed to the pure cultures of the isolates.

Gram-positive and catalase negative isolates were identified by using api 50 CH ve api 20 Strep biochemical test kits.

Certain number of Enterococcus spp, Lactococcus spp ve Lactobacillus spp. were isolated and identified from human milk samples in this study. It is suggested that the availability in the food industry of the isolates should be investigated in the future. The importance of these isolates for human health and the potential of use of them in the food industry have been evaluated in this study.

Key words: Human milk, lactic acid bacteria, isolation, identification

Poster 25

THE PRESENCE AND IMPORTANCE OF ENTEROCOCCI IN NATURALLY FERMENTED TURKISH WHITE CHEESE

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Enterococci contribute to ripening and aroma development in cheese by their proteolytic and lipolytic activities and ability to produce important volatile compounds like as diacetil. Their resistance to pasteurization temperature and the ability to be adapted different temperatures and growth conditions are other advantages. Moreover, it is indicated that enterococci have the beneficial effects with inhibition of pathogens such
as *Listeria monocytogenes* by producing bacteriocin in cheese. Recently, studies on the use of enterococci as the cultures of starter, adjunct and probiotic have been increased. Enterococci are evaluated as indicator of hygienic quality in certain foods because of their resistance to high thermal processes and the different environmental conditions. However, enterococci may carry a risk for human health due to the potential virulence genes and antibiotic resistance features.

In this study, totally 83 enterococci suspicious isolates were obtained from 17 of 20 naturally fermented Turkish white cheese samples by using a selective medium. Seventy nine isolates were identified to species level by using morphological, physiological and biochemical tests. Sixty two isolates were identified as *Enterococcus faecalis*, 12 isolates as *E. faecium*, 5 isolates as *E. avium*. Their pathogenicity potential and the use of these isolates in the food industry will be investigated in the future.

Key words: natural fermented cheese, *Enterococcus*, isolation and identification

Poster 26

ANTIMICROBIAL ACTIVITY ASSESSMENT OF LACTIC ACID BACTERIA BY BIOSCREEN C SYSTEM ® IN TURKEY’S MOST CONSUMED TRADITIONAL BEVERAGE

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Ayran is a traditional Turkish dairy based fermented beverage like diluted salty yogurt. *Streptococcus salivarius thermophilus, Lactobacillus delbrueckii bulgaricus* and *Lactobacillus helveticus* species play an important role in the traditional Ayran fermentation. Antimicrobial effect of 8 *Streptococcus salivarius thermophilus*, 9 *Lactobacillus delbrueckii bulgaricus* and 6 *Lactobacillus helveticus* species were isolated from artisanal yoghurt and characterized. Identified strains were analysed for their antimicrobial activity on *Echerichia coli* (ATCC 25 922), *Bacillus cereus* (ATCC 14 579) and *Staphylococcus aureus* (ATCC 25 923).

An automated turbidometer Bioscreen C system (Labsystems, Finland) was used for the screening of antibacterial potential of lactic acid bacteria strains. Firstly the standart curves of pathogens were obtained. Than filtrates of liquid lactic acid bacteria cultures were used in test system without dilution.

Antibacterial activity of homo-fermentative lactic acid bacteria was investigated. It was found that these strains showed antimicrobial activity against *E. coli* and *B. cereus* as 0.37±0.26 log cfu and 0.61±0.55log cfu respectively, while they were found to stimulate growth of *S. aureus* 0.24±0.20 log cfu. Also the effect of Lactic acid bacteria species screened and the effect of target organisms on their antimicrobial activity were investigated.

Significant differences are observed between antimicrobial effects of Ayran *S. salivarus thermophilus* and *L. delbrueckii bulgaricus* against *S. aureus* and *E. coli* or *B. cereus*. Significant difference is also observed between antimicrobial effects of *L. helveticus* against *S. aureus* and *E. coli* and *B. cereus*.

Significant difference is only observed between antimicrobial effects of S. thermophilus/L. helveticus against B. cereus, whereas significant differences is not
observed between antimicrobial effects of Ayran lactic acid bacteria against E. coli and S. aureus. From these results it can be assumed that antimicrobial activity is a subspecies related or plasmid mediated phenomenon. Further studies have to be done to determine the source of these antimicrobial activities.

This work was supported by European Commission within the Sixth Framework Programme (Horizontal Research Activities Involving SMEs - Co-operative Research Project FERBEV contract № 031918).

Key words: Ayran, Bioscreen, Lactic acid bacteria, Antimicrobial activity

Poster 28

COMPARISON BETWEEN CALCIUM AND MAGNESIUM LEVELS IN DIFFERENT FERMENTED MARKETED GOAT AND COW MILKS

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The consumption of goat milk and its derived by-products has been progressively enhanced in the last years due to their nutritional benefits and positive influence on health status. Among other aspects the goat milk presents a higher digestibility and lower allergenic capacity when compared with cow milk (Alférez et al., 2001; Barrionuevo et al., 2002).

We determined the Ca and Mg levels in different fermented marketed goat and cow milks in order to compare them. Despite nutritional statements about the higher nutritional value of goat milk versus cow milk, no studies comparing their calcium and magnesium levels in fermented marketed milks derived from them have been performed.

Milk samples were analysed: 5 goat yoghourts, 2 goat kefirs, 4 cow yoghourts and 2 cow kefirs. Digested sample was diluted to 25 ml with double distilled water obtaining the analytical dissolution. The Ca and Mg levels present in sample were measured by direct aspiration into the flame of an atomic absorption spectrometer equipped with a multielement Ca-Mg hollow cathode lamp.

Mean Ca levels found in analysed samples were 1,955.2 and 1,631.3 µg/g for goat and cow yoghourts, respectively, and 2,097 and 1,843.3 µg/g for goat and cow kefir samples, respectively. Ca concentrations found in fermented marketed goat milks were higher although no significant differences were found (p>0.05).

The mean Mg contents found were also not significantly higher in goat yoghourts and kefirs (1,620.6 and 1,680.4 µg/g, respectively) than in cow yoghourts and kefirs (1,380 and 1385.3, respectively). Other researchers reported Mg concentrations of 1,360.1 (Farnsworth, 2006), 1,490 (Park, 2000) and 1,360 µg/g (Gambelli et al., 1999) in goat yoghourts also slightly lower than those found in the present study. For cow yoghourts Abdulrahman et al. (1998) found mean Mg levels of 1,340 µg/g.

Poster 29

THE ASHES OF BEE POLLEN, THEIR RELATION WITH THE ELECTRICAL CONDUCTIVITY AND ITS ORGANIC ACIDS

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The ashes of a food are the equivalent term to inorganic residue remaining after burning the organic matter represents the mineral content of the food, which in our study is the bee pollen, bee product, collected by bees from the pollen of plants along with her own secretions. Studies in other products of the hive, as honey, which relates the ash content with electrical conductivity, always trying to simplify the development of a quality parameter that is related to the botanical origin of honey and therefore depends on the predominance of pollen (Vorwohl G., 1964). The electrical conductivity is a measure of the flow driven by the ions present in solution, is also associated with the ash content with the organic acids contained in food (Vorwohl G., 1964).

The aim of this study is to determine the relationship between ash content and electrical conductivity of a solution of bee pollen, reducing the analysis time for determining the inorganic content in the bee pollen.

For this study, we have 48 samples of bee pollen in different parts of Spanish territory, and which have been conducted the following analysis: ash content by incineration of the sample at elevated temperatures and determination of its mass, electrical conductivity from a solution of 2% (by mass per volume) at 20 °C, content of organic acids from the method described by Vazquez Oderiz, ML, 1992, by HPLC, with special emphasis on the ascorbic acid content. This is achieved by means ash content 1.86%, 0.360 mS / cm and a relationship in which there is a probable dependence on the content of organic acids according to the botanical origin of the sample.

This work comprises of project INIA-Feder RTA2007-00072-C03.

Poster 30

FATTY ACID PROFILE DETERMINATION IN DIFFERENT ALMOND OILS BY GC-FID USING ULTRASOUND ASSISTED DERIVATIZATION

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Nowadays, the different fatty acids present in edible oils can be separated, quantified and analyzed by gas chromatography. The official method UNE 55.037(1) is based on the derivatization of fatty acids that consists of a transesterification with acid or/and basic catalysis by thermal heating with reflux. Then, the fatty acid methyl esters (FAMEs) are partitioned in hexane by means of liquid-liquid extraction, and then analyzed by gas chromatography.

The new developed method shows that the transesterification process is performed successfully using ultrasonic irradiation with analytical purposes, providing several advantages over the conventional method (2). The sonication process is better with a titanium sonotrode than with an ultrasound bath. Ultrasounds are transmitted through the sample mixing the liquid and providing the necessary energy for the transesterification (3).

The aim of this work is to determine the fatty acid profile of several almond oils from different cultivars with the optimized ultrasound-assisted derivatization method. The factors affecting the derivatization and extraction processes such as derivatizing-reagents, reagent concentration, amplitude, derivatization-time, basic and acid catalysis and reagent volume are optimized. The developed analytical method shows several
advantages in terms of simple sample preparation, low cost and reduced analysis time regarding to the conventional method.

The method has been applied successfully to analyse four samples of Marcona almond cultivar (Jaén, Ibi, Granada and Muro de Alcoy) and four samples of Butte almond cultivar obtained from a Spanish importer (Colefruse, San Juan, Alicante).

The developed method is performed at room temperature faster than the conventional method. The fatty acid profiles obtained with both methods are comparable, allowing the discrimination between almond cultivars based on oil composition.

Poster 31

ANALYSIS OF VALUE OF TRACEABILITY IN THE MEAT INDUSTRY IN SPAIN

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Many of the Spanish meat companies have implemented methods of traceability to minimize food risks as a result of legal obligations, not voluntarily. In this context, this research plans to analyze if meat traceability adds value to the product or constitutes a waste of work.

This research has been performed by surveys to Spanish meat companies in 2008. The results are accurate at a 95% confidence level, taking plus or minus five points of percentage of error. The data have been analyzed mostly with Descriptive Statistics, Frequency Analysis, Crosstab Tables (With Chi-Square Tests), Breakdown Analysis, Sample T-Test, Cronbach’s Alpha and Correlation Analysis.

Among the results of this research, it is worth commenting that, according to Spanish Meat Industry:
-Traceability is an activity with positive results when implemented by meat companies. This idea is related to the size of the companies (measured according to the number of workers, their total assets and their volume of business), as well as their competitive vision.
-If we focus specifically on economic aspects, the benefits of implementing traceability overcome its costs, being related this valuation to the size of the company (number of workers, total assets and the volume of business), as well as to the variety of products.
-It is possible to see that traceability adds extra value to the product. With regard to the value added by this technique, it is not possible to reject the hypothesis of independence between this variable and its economic components. Likewise, the valuation of traceability is correlated to the vision of the company about its own chain of value and its size measured through the number of workers.

According to the studied companies, traceability does not suppose a wasting resource, so its elimination would not be advisable within the current situation.

Poster 32

MODELING THE GROWTH OF ESCHERICHIA COLI O157:H7 AS AFFECTED BY BONIUM PERSICUM ESSENTIAL OIL TEMPERATURE, pH AND INOCULUM LEVELS

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E.coli O157:H7 is an important human pathogen causing haemorrhagic colitis, hemolytic-uremic syndrome and thrombotic thrombocytopenic purpura. Knowing the precise boundary for the growth-no growth interface of E.coliO157:H7 and also determining the period of time needed for bacterial growth initiation is necessary for food safety risk assessment. This study was designed to modeling the combined effects of different levels of Bonium Persicum (black cumin) essential oil, temperature, hydrochloric acid and inoculum levels on the growth of E.coliO157:H7 in brain heart infusion broth media. Growth was monitored by visible turbidity over 30 days. The measured 108 data points, showed significant effects for selected parameters on growth of E.coliO157:H7. The experiment was carried out in triplicate. For data analysis, SAS statistical software- version 8.2 was employed. Stepwise Multiple Regression Program was used to predict the growth initiation. The model equation was as follows: TTD (Time To Detection) = 29.083 + 4.84 EO â€“ 6.028 pH - 3.90 Temp â€“ 5.33 IL For obtaining a boundary model the logistic Regression Program was used: Y(growth/no growth) = - [6.2218 + (1.89 Eo) - (1.41 Temp) - (2.57 IL) - (2.73 pH)] The models adequately predicted the growth initiation and growth inhibition of E.coli O157:H7.

Keywords: E.coliO157:H7, modeling, Bonium Persicum essential oil, pH, temperature

Poster 33

POTENTIAL VALORISATION OF VINIFICATION BY-PRODUCTS

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Management and disposal of the large amounts of waste produced by food-processing industry is a serious environmental problem. New processes for a controlled disposal of waste are currently being sought, aiming at waste valorisation into added-value bio-products. Nowadays, Portuguese wine industry produces up to 65000 ton/year of grape (Vitis vinifera) pomace, composed of grape seeds, skins and stems. These by-products currently treated as waste, or valorised via distillation, can be an alternative source of natural antioxidants with potential applications in agro-food, pharmaceutics and cosmetics.

The aim of this work was to characterise the whole grape pomace and their constituents, namely skin and seeds in terms of antioxidant activity, total phenolic compounds and fatty acid profile of seeds oil, present in six Portuguese wine cultivars.

Antioxidant activity has been evaluated by ABTS method, quantification of total phenolic compounds has been performed by Folin-Ciocalteu method, grape seeds oil has been extracted by Soxhlet method and extracts composition has been carried out by GC-FID.

Aqueous extracts of grape seeds showed a higher antioxidant activity (1.381 g l⁻¹ equivalent of ascorbic acid) than skin (0.828 g l⁻¹ equivalent of ascorbic acid);
additionally, they exhibited a greater content of total phenolic compounds (1.477 g 1⁻¹ equivalent of gallic acid) than skin (0.961 g 1⁻¹ equivalent of gallic acid). The total content of oil in the different type of grape seeds ranged between 5-10%. The main fatty acids present in these samples have been found to be linoleic acid between 63-65%, oleic acid between 20-23%, palmitic acid between 7-9% and stearic acid between 4-5%, all by weight.

The obtained results in this study demonstrate a very high polyphenolic content, suggesting that further studies towards their valorisation can lead to economical viable processes.

Poster 34

IMMUNE-ANALYTICAL DETECTION OF CEREAL ALLERGENS AND THEIR DATABASED IDENTIFICATION

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Wheat is one of the most important crops among the cereals, cultivated on the biggest area in Hungary. Besides of its favourable physiological effect, unfortunately wheat is one of the most prevalent allergen sources for wheat sensitive and celiac patients. In the background of these diseases, there are different immunological processes, and also different allergens play different role in their elicitation.

The main objective was to make comparative study of the major wheat allergens and their cross-reactive allergens having importance in celiac disease and wheat allergy in respect of domestic wheat cultivars, other cereals (triticale, rye, barley, oat, rice, corn) and pseudo-cereals (buckwheat, amaranth).

For these studies, the combination of SDS-PAGE with immune blotting was used for the determination of allergenic proteins. In the immune blot tests, antigen-specific polyclonal antibody produced in rabbit, celiac (IgA) and wheat-sensitive (IgE) human sera were used. Since wheat proteins from α-amylase inhibitor superfamily are particularly prevalent allergens for wheat-allergy-diseased persons, it seemed to be practical to focus extensively on those existing in the water/salt soluble fraction of wheat. For preparation of α-amylase inhibitor-concentrated fractions, a selective and reproductive DEAE-cellulose anion-exchange chromatographic separation was developed. Stability of the allergenic proteins was confirmed by a newly developed immune blotting method using PVDF membrane-blotted proteins to investigate the resistance of IgE-reactive proteins towards pepsin. Finally the most frequently recognized major cereal allergens, by wheat-sensitive sera, were identified by LC-MS/MS with the application of NCBInr Plant database.

The most important findings besides the newly developed methods were the identification of the novel IgE-reactive and pepsin resistant allergens and to find unexpectedly IgA-reactivity of water/salt soluble proteins of wheat, corn, amaranth and buckwheat against sera from celiac patients.

Poster 35
USE OF PREDICTIVE MODELLING SOFTWARE IN THE EVALUATION OF CORRECTIVE ACTIONS, HACCP PLANS, WITHIN ARTESANAL DAIRY PRODUCTS

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Traditional Portuguese cheeses are ready-to-eat products, with variable $a_w$ and pH, inherent to its empirical process of manufacture. Also the parameters affecting the behaviour of pathogens throughout the food supply chain are considerably variable. For certain ready-to-eat (RTE) products, the EU Regulation 2073/2005 no longer requires zero tolerance for *Listeria monocytogenes* but rather specifies a maximum allowable concentration of 100 CFU/g by the end of their shelf life and foods are differentiated into those that are capable of supporting *L. monocytogenes* growth and those that are not.

When the cool chain is interrupted for some reason, product conformity needs be evaluated and corrective actions taken, if needed. Clearly, one way for the food processor to do this is by using predictive microbiological models. There is increasing interest in the application of available predictive modelling software like COMBASE as a tool for decision-making process in the maintenance of HACCP plans. This study aims to apply predictive microbiology tools to evaluate the safety of traditional cheese in the event of a malfunction in the refrigerated storage equipment. This work was supported by FCT/FEDER Project PTDC/AGR-ALI/64662/2006.

Poster 36

MORPHOLOGICAL AND STRUCTURAL CHARACTERISTICS OF WINE LEES

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Current bibliographical references indicate the ability of yeast walls to bind off-flavors (volatile phenols) and pollutants as heavy metals (e.g. cadmium and lead) and ochratoxin A. Moreover, the use of mannoproteins as enological adjuvant is one of the practices and enological treatments authorized with experimental character, to guarantee a greater control of the wine production, and not displaying risk for the health of the consumers (DOUE L345 28/12/2005 Reglament (CE) Nº 2165/2005 of 20 de December 2005).

This work focuses on the study of the morphological and structural characteristics of wine lees. The lees were investigated using several techniques in order to establish the cell counts, size, and cellular disruption status of these winemaking by-products: Confocal microscopy, Coulter Multisizer, and Transmission Electron Microscopy (TEM) were applied. The morphology of the lees is mainly ovoid and their diameter ranging between 2 and 10 μm (average 5μm). TEM images show that the walls of lees are preserved but no cytoplasm organelles are distinguished.

In conclusion, our data indicate that lees by-product are a very resistant material (not cellular disruption occurs after their death), although cytoplasmatic content and yeast cell walls were most disorganized.
PRELIMINARY SURVEY ON SODIUM AND OTHER MINERALS CONTENT OF TYPICAL ITALIAN DRY FERMENTED SAUSAGES

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Sodium intake exceeds the nutritional recommendations in several industrialized countries. The main source of sodium in diet is sodium chloride (salt), a basic ingredient of processed food. In Italy the estimated sodium chloride consumption is 10 g/day/person. Cured and processed meats contribute around 20% to the sodium intake and the reduction of the use of sodium chloride in these products is an important goal for decreasing the overall dietary sodium. A number of strategies to formulate healthier dry fermented sausages, not only by the reduction of sodium chloride but also by the simultaneous addition of minerals such as magnesium and/or calcium, have been proposed for some traditional Spanish and Northern Europe products. Information is lacking, however, on typical Italian dry fermented sausages.

A preliminary survey has been carried out to evaluate the level of sodium, potassium, magnesium and calcium in typical Italian dry fermented sausages, in view of possible technological interventions aimed to improve their mineral content. Twenty-seven typical Italian salami were purchased by local producers and characterised for their proximate composition, pH and aw. The sodium, potassium, magnesium and calcium content were determined by ICP-AES after acid digestion. The sodium chloride content was measured by titration with silver nitrate according to the Volhard method.

The sodium content ranged from 1.46 to 2.35 g/100g of sausage (average 1.88±0.26 g/100g). The mean concentration of sodium chloride was 4.32±0.49 g/100g (min 3.51- max 5.20 g/100g), respectively. These values exceed 2-4 times the proposed targets for dry fermented sausages to be achieved by 2010 according to some international public health agencies. The mean concentration of potassium was 0.44±0.06 g/100g and those of magnesium and calcium were 15.5±11.1 and 36.5±29.4 mg/100g respectively.
ABSTRACT POSTERS: MICRO- AND NANOTECHNOLOGIES

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QUANTITATIVE DETECTION OF *STAPHYLOCOCCUS AUREUS* BY TAQMAN REAL TIME PCR, USING A DNA-BASED MICROFLUIDIC BIOSENSOR

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A portable integrated detection platform was used for the rapid identification and quantification of *S. aureus*, one of the most common bacterial pathogens responsible for food poisoning worldwide. In particular, monolithic DNA purification/real time PCR silicon microchips were fabricated and tested for their ability to purify and quantitatively detect *S. aureus* DNA by TaqMan real-time PCR targeting the thermonuclease (*nuc*) gene. Microchips were used in conjunction with an automated detection platform integrating a microprocessor, pumps, valves, thermocycler and fluorescence detection modules. The resulting miniaturized, fully automated and integrated detection system was assayed for its sensitivity against serial dilutions of either *S. aureus* broth culture or *S. aureus* pre-purified DNA. As few as 1 pg of pre-purified DNA (approximately \(10^2\) *S. aureus* genome equivalents) as well as \(10^5\) cells of the pathogenic microorganism could be detected with an average time for detection (DNA extraction/real time PCR amplification) of only 40 min. While ongoing work is focusing on improving the detection limit this is one of the first fully automated, miniaturized detection systems for integrated sample preparation and detection of pathogenic bacteria.

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AN IMPEDIMETRIC IMMUNOSENSOR BASED ON INTERDIGITATED MICROELECTRODES (IDµE) FOR THE DETERMINATION OF PESTICIDE RESIDUES IN FOOD SAMPLES

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The objective of this work is the development of an immunosensor device for pesticide residue analysis in food products. In this sense the potential of the impedance spectroscopy as transducing principle has been assessed using immunoreagents. This technique is based on the variation of the electric properties of a circuit when a change in the surface occurs (i.e. when a biomolecule is attached to the surface). Different strategies of biomolecule immobilisation onto interdigitated microelectrodes (IDµE) have been evaluated. The covalent union of the hapten conjugate has been found to be the most reliable procedure avoiding to a large extent non-specific absorption phenomena on the electrode gold surface. The technology presented does not use any redox mediator or labels (fluorescent compounds, enzymes…) and relies on the direct detection of the immunochemical competitive reaction between the pesticide and a haptenized-protein covalent attached on IDµEs for the specific antibody. This technology has been used for the direct detection and quantitation of pesticides residues in food matrices. Suitable protocols for the biofunctionalization of the surface have been optimized and the new IDµEs fabricated have been used for the determination of pesticides (herbicides, organophosphorous insecticides and acaricides). The proposed procedure reaches or is near to the sensitivity required for the pesticides in drinking water (maximum admissible concentration set by the Directive EEC 80/778 at 0.1 μg L⁻¹). The performance of these devices has been evaluated in different beverages (wine and fruit juices) as well, where in most cases a sample clean-up step was needed. The results obtained show that these new devices are capable to detect the pesticides in an easy and selective way, with a sensitivity near to or below the maximum residue limit set by the EU (2006/61/EC, 2004/59/EC and 82/528/EEC).

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MICRO-CAPILLARY ELECTROPHORESIS AS A USEFUL TOOL TO STUDY BIOACTIVE PEPTIDES FROM DONKEY MILK.

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The digestion of milk proteins represents an important mechanism to obtain peptides which play important physiological roles in addition to their nutritional importance. In the last years, donkey milk has inspired the scientific interest, mainly owing to its attractive nutrient and functional contents: due its chemical composition, similar to human milk, it can be believed a valid alternative for infants with severe Ig-E mediated cow’s milk protein allergy. Aim of our study was to explore the potential presence of components, present in the N-soluble fraction of milk, capable of inhibiting the growth of microorganisms, after milk hydrolysis performed with the same in vitro conditions taking place in infants’ stomach. Components of pepsin-treated donkey milk were separated by RP-HPLC and, after the exclusion of lysozyme, the other fractions, collected in pools, were assayed for the antimicrobial activity against different pathogen strains. Pools were analysed by the “Lab-on-a-chip” version of size-based micro-capillary electrophoresis. The antimicrobial test showed a different inhibitory capability of HPLC pools against all the pathogen strains used in our experimentation. This finding highlights on the presence of bio-molecules, generated by the hydrolysis of
milk, capable to contribute, in different manner, to its antimicrobial activity. Micro-capillary electrophoresis of milk and its pools revealed the presence of several bands, with MW ranging from 0.78 to 25.2 kDa; the most active pool was also the richest in N-components. The first results show that donkey milk provides many antimicrobial components, all generated by the hydrolysis of the major milk proteins. They might play an important role in the enhancement of the host defence system in those newborn and small infants sensitive to other milks.

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MICROENCAPSULATION OF PEPTIDE EXTRACTS USING HIGH INTENSITY ULTRASOUND

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Keywords: Microencapsulation, High intensity ultrasound, Proteins

The application of high intensity ultrasound (HIUS) represents an innovative technology, aimed at conveying new properties to proteins—particularly as substitutes of fats, or else as carriers of bioactive compounds. The objective of this study was to assess the possibility of encapsulating concentrated peptides, possessing biological activity, in β-Lactoglobulin (Lg)-based gels, and assess the effect of high-intensity ultrasound upon their particle size. Solutions of 15 % (w/v) commercial β-Lg and 3 % (w/v) peptide extracts, at various pH values (3, 4 and 5.5), were submitted to gellation in a dry bath kept at 80°C for 30 min. The gelled systems were then subjected to HIUS, and the effect of processing time was studied. The size distribution of particles, prior to and immediately after HIUS treatment, were measured by dynamic laser light scattering and confocal microscopy. The peptide encapsulation efficacy was studied after precipitating of the encapsulated material, and analysis of the soluble peptides via chromatography.

The gels obtained at pH 5.5 and 4 exhibited a higher firmness than those obtained at pH; this may be explained by the relationship between this experimental pH range and the isoelectric point of β-Lg (pI=5.4), which suggests absence of particle aggregation. The impact of ultrasound treatment upon particle size led to a reduction in the particle average diameter with increase of the sonication time—for gels at pH 5.5, but not at pH 4. However, there was an important reduction in the average diameter—which dropped from 54.9±0.3 µm (at pH 5.5) and 10.8±0.05 µm (at pH 4), to 8.8±0.1 µm and 1.13±0.2 µm, respectively. Based on the size distribution following different sonication times, an analysis was conducted of the degree of polydispersity: at pH 4, a bimodal distribution was observed, whereas at pH 5.5, a monomodal dispersion resulted instead. Confocal microscopy unfolded that the application of HIUS produces round and monodispersed particles, at both pH 5.5 and pH 4. Finally, the chromatographic techniques employed confirmed microencapsulation of said peptides.

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DEVELOPMENT OF A NEW MULTIPLEX PCR FOR THE DETECTION OF Clostridium spp., RESPONSIBLE FOR THE LATE BLOWING IN CHEESE

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Late blowing, caused by the outgrowth of clostridial spores present in raw milk and originating from silage, can create considerable product loss, especially in the production of hard and semi-hard cheeses. The conventional method for the isolation of Clostridium spp. from cheeses with late-blowing symptoms is very complicated and the identification of isolates is problematic.

The aim of this work was the development of a multiplex PCR method for the detection of the main dairy-related clostridia such as: Cl. beijerinckii, Cl. butyricum, Cl. sporogenes, Cl. tyrobutyricum. Genomic DNA from five reference strains, Cl. baratii DSM 601, Cl. beijerinckii DSM 791, Cl. butyricum DSM 10702, Cl. sporogenes ATCC...
Cl. tyrobutyricum DSM 2637, was extracted following the protocol described in the literature. All PCR primer were designed using the Primer3 programme (http://www-genome.wi.mit.edu/cgi-bin/primer/primer3_www.cgi). All the primer were chosen on the basis of similar melting temperatures and minimal interactions, and resulted in differently sized products distinguishable in agarose gel electrophoresis. The specificity of the primer was tested by individually analysing each primer pair and the primer pair combined in the multiplex PCR.

Samples derived from silage, raw milk and hard cheese were analysed by the most probable number (MPN) enumeration. Forty-eight bacterial strains isolated from gas positive tubes were used to check the reliability of the multiplex PCR assay. It is interesting to note that the samples not identified by the multiplex PCR assay were amplified by V2-V3 16S rRNA primer pair and the sequencing revealed the aligned 16S rRNA sequences to be Paenibacillus spp. This method provides a simple promising alternative to traditional microbiological methods for a rapid, sensitive detection of clostridia in dairy products.

ANTIBIOTIC RESISTANCE OF L. monocytogenes ISOLATED FROM TRADITIONAL FERMENTED MEAT PRODUCTS

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The selective pressure exerted by the widespread use of antibiotics on humans and animals has caused the accelerated emergence of resistant bacteria, including in Listeria species, which for many years were thought to be uniformly susceptible to all antibiotics active against Gram-positive bacteria. However, since the late 1980s, an increasing number of reports have documented the existence of antibiotic resistant strains of Listeria spp. isolated from food. Since it is now widely recognised that human listeriosis originates from alimentary sources, the presence of antimicrobial-resistant Listeria spp. in foods is a significant public health problem, especially given that the risk of treatment failure is increased. Therefore, monitoring for resistant L. monocytogenes strains on a large scale and assessing the risk of infection by these strains is required. Minimum inhibitory concentrations (MICs) of ampicillin, penicillin G, ciprofloxacin, chloramphenicol, rifampycin, erythromycin, gentamicin, nitrofurantoin, tetracycline, trimethoprim/sulfamethoxazole and vancomycin were assessed for 94 different L. monocytogenes isolates from traditional fermented meat products. All the tested isolates were susceptible to the antibiotics most commonly used to treat listeriosis (ampicillin, penicillin and trimethoprim/sulfamethoxazole). Three different isolates were resistant to tetracycline (MIC of 128 µg/ml), or gentamycin (MIC of 512 µg/ml), or erythromycin (MIC of 512 µg/ml). A noteworthy finding was the detection of resistant isolates, which presented high MICs. This may be due to the extensive use of these antibiotics as a supplement in animal feed and veterinary practice. Tetracycline resistance has also reported as the most frequent resistance trait in L. monocytogenes isolated from humans and foods. The detection of antibiotic resistant L. monocytogenes isolates from traditional fermented meat products underlines the concern for possible
misuse of antibiotics in animal production as well as the widespread use of these antibiotics in therapeutics.
This work was supported by FCT/FEDER Project PTDC/AGR-ALI/64662/2006.
SYNERGISTIC EFFECT OF MODIFIED ATMOSPHERE PACKAGING AND USE OF FOOD ADDITIVES IN THE CONSERVATION OF CORN CAKES

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In numerous occasions, the impact of modified atmosphere packaging (MAP) on the shelf life of food products has been demonstrated. This study has sought to go further, investigating the synergistic effect between the MAP and the addition of food additives. The raw material of this study has been some corn cakes made by a traditional process. The goal was to prolong shelf-life time up to five weeks at room temperature. The mixture of 40\% CO\textsubscript{2}/60\% N\textsubscript{2} and a barrier film were used. There were four different references: samples with or without additive, and with or without MAP. Head space gas composition (\%), pH, weight loss (g), microbiological characteristics and sensory parameters were assessed in the packaged cakes. Microbiological results were conclusive for shelf-life of the product without additive. At ten days, the samples without MAP and without additive exceeded the maximum allowed level of molds enforced by law; the same result was observed at four weeks with samples packaged in MAP without additive. In case of samples packaged without MAP and with additive, the levels of molds remained below the permitted levels for up to 30 days (four weeks) but exceeded the limit afterwards. However, in cakes with MAP and additive, microbiological levels always remained below the detection level in case of molds and yeasts, and at low levels (10-30 ufc/g) in case of aerobic plate count. For this reason, the study was extended to eight weeks for these samples, and the microbiological results were proved again to be satisfactory. Nevertheless, there was a slight loss of sensory characteristics of this product (texture, flavour, etc.).

INDIVIDUAL-BASED MODELLING AND SIMULATION: TOWARDS A BETTER UNDERSTANDING OF GROWTH DYNAMICS FROM SMALL INOCULA

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The lag phase is one of the main aspects to be considered in extending the safe shelf life of foods. It has mostly been investigated with continuous population models, using rather high inoculum levels. However, foods are often contaminated with just a few microorganisms and, therefore, they demand an individual-based approach. The aim of this contribution is to explore the effect of the inoculum size in population and individual lag phases using an Individual-based Model (IbM). Specifically, we have tackled the dynamics of bacterial and yeast cultures separately, due to the importance of...
these microorganisms in food. INDISIM is an Ibm designed for modelling and simulation of microbial growth, and it has been already used in the study of different microbial communities with success. Several simulations changing the initial inoculum size were carried out with INDISIM, covering inocula levels from 1 cell/ml to 1000 cell/ml. These simulations showed that there is no influence of inoculum size in the population lag-parameter, but that there is an effect on other parameters related to lag phase such as first division time and detection time. The analysis of our simulation results showed that classical continuous models were not useful to deal with small inocula because of the excessive influence of the discrete nature of the microbial division. Moreover, we observed that the culture lag time is shorter than the mean of the single cell lags, as has been stated previously in the literature. These preliminary results suggest that INDISIM builds a bridge between individual behaviours and collective observations. It is a helpful tool to acquire deeper understanding of cell behaviour during the first stages of microbial growth, which is a keystone of predictive modelling in food contamination.

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MODIFIED ATMOSPHERE PACKAGING FOR BULK SARDINE TRANSPORT

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Sardines are highly perishable good. Traditionally sardines are transported using ice, because other methods of fish transport such as the slurry ice is not allowed by the authorities. The objective of this study was to explore the possibility of using Modified Atmosphere Packaging (MAP) as an alternative to traditional fish transport. Sardines were stored in slurry-ice, in MAP (80%O₂/20%N₂) with two different gas:product ratios (2:1 and 3:1) or in trays for bulk fish transport combined with MAP (80%O₂/20%N₂). All samples in MAP were kept in slurry ice owing to the need for keeping sardines at the same temperature (around -1°C). Samples for microbiological (psychrotrophic bacteria, mesophilic aerobic bacteria and Enterobacteriaceae), and sensory analyses were taken on days 3, 5, 7 and 12. By using the GLM procedure of SAS, the data were subjected to analysis of variance in order to determine any differences between treatments. In general sardines kept in slurry ice without MAP showed better results in the sensory fish quality assessment (P<0.05 in stiffness, flesh firmness, cornea clarity, gills cover and total score). Regarding the microbiological results, in general sardines stored in slurry ice without MAP registered lower microbial counts in the different microbiological analysis (P<0.05). No differences were observed between the bulk and tray treatments or gas:product ratios (P>0.05). Sardines stored in MAP showed a 5-7 days shelf life, whereas sardines stored in slurry ice showed a 7-day shelf life. Main benefits observed in sardines stored in slurry ice without MAP are probably due to the washing effect of the water around fish. Although bulk transport of sardines in MAP is an alternative to fish transport on ice, it did not show better results compared to slurry ice.

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THE TNO QUICK SCAN OF HYGIENIC PROCESSING: THE CASE OF ASEPTIC FILLING LINES.
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Aseptic filling lines face with the problem of excessive product contamination. The source of the contamination is often unclear. Nevertheless, food companies wish to improve the aseptic filling conditions and therefore to reduce contamination to an acceptable level.

The “Quick Scan of Hygienic Processing” is a methodology developed by TNO. The results of the Quick Scan show possible vulnerabilities and opportunities for optimization, resulting in cost savings and give insight in the process conditions, the hygienic design of the plant, routing, zoning, air handling, food product requirements and the control measurements according to HACCP and other regulatory criteria.

TNO examined the entire production processes in a number of factories -including raw material and heating processes. The sanitation programs were also reviewed according to European directives as well as the EHDG directives. The following causes of product recontamination were identified:

- Insufficient heating of the products.
- Insufficient pre-sterilization of the aseptic zone in the filling process.
- Cross contamination during filling through the migration of contaminated water droplets, aerosols, condensation, etc.
- Inadequate sanitation in the aseptic zone of the filler.

The following actions were taken with regard to improving the above:

- Modification of the heating and presterilisation process conditions.
- Evaluation of the hygienic design of the filling equipment.
- Improvements in the aseptic zones in the area of the filler.
- Optimization of the cleaning and decontamination procedures.

The final assessment after completion of the project has shown that the implementation of the program have led to a substantial reduction in production losses of the companies. The effectivity of the TNO methodology has been demonstrated by comparison of the microbiological results of the final product as well as environment samples before and after implementation of the improvements.

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DETECTION OF THE SPOILAGE BACTERIA ALICYCLOBACILLUS ACIDOTERRESTRIS AND THEIR INFLUENCE ON THE AROMATIC PROFILE OF FRUIT JUICES

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To assure high quality of fruit juices, wine and plant-derived food, it is essential to early detect spoiling yeasts and bacteria during production processes. We have established a specific and sensitive system based on real-time PCR in order to detect these microorganisms at species level qualitatively and quantitatively and before the formation of undesirable metabolites occurs.
Currently, we are working on the detection of *Alicyclobacillus acidoterrestris* in fruit juices. *Alicyclobacillus acidoterrestris* is an emerging food spoilage organism in fruit juice, fruit juice products and acidified vegetables manifesting a medicinal off-flavour which is caused by guaiacol and halogenated phenols produced by these bacteria (Murray et al., 2007, Borlinghaus and Engel, 1997). Alicyclobacilli are spore-forming, Gram-positive, thermo-acidophilic bacteria (Wisotzeky et al., 1992) and possess unique fatty acids (*ω*-cyclohexane, *ω*-cycloheptane) and hopanoids in the cellular membrane (Walls and Chuyate, 1998).

We are investigating the growth of *Alicyclobacillus acidoterrestris* on different substrates (BAT media, apple juices, concentrates) and under different cultivation conditions (temperature, CO$_2$). Cell numbers are determined using real-time PCR with specific primers and probe. Aromatic profiles of the samples are recorded with the SmartNose® equipment and a rapid screening for the off-flavour-causing metabolites (guaiacol, 2,6-dichlorophenol, 2,6-dibromophenol) is carried out using MALDI-TOF/TOF mass spectrometry.


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THE EFFECT OF LACTOBACILLUS RHAMNOSUS GG ON GROWTH OF GEOTRICHUM CANDIDUM IN MILK

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*Geotrichum candidum* is associated with the microflora of soft, semi-hard cheeses including artisanal ewes' and goats' raw milk cheeses. In fresh cheeses, the presence of *G. candidum* is considered as a contaminant and may lead to the product spoilage. This work was focused on the effect of probiotic culture Lactobacillus rhamnosus GG of the initial concentration about 10$^6$ CFU.ml$^{-1}$ on growth of *G. candidum* starting at $N_0 = 3.8 \times 10^1$ to $1.5 \times 10^2$ CFU.ml$^{-1}$ within the temperatures ranged from 12 °C to 25 °C. Addition of Lb. rhamnosus GG in milk caused partially inhibition of the yeast growth that was analysed through the comparison of growth rates of *G. candidum* with those in co-culture with Lb. rhamnosus GG. Ratkowsky square root model that linearized relation between growth rate and incubation temperature was used with the following equations for pure and mixed culture, respectively: √Gr$_{Gc}$ = 0.011T + 0.081 ($R^2$$_{Gr}$ = 0.993), √Gr$_{Gc,LGG}$ = 0.015T - 0.065 ($R^2$$_{Gr}$ = 0.915). It is supposed that relationship between Lb. rhamnosus GG and *G. candidum* was not only determined by the production of lactic acid, phenyllactic or pyroglutamic acids but
also by mutual competition for nutrients or oxygen. The growth data provided sound predictions that might help to control this organism in products where is undesirable. Similar results we were obtained within our previous work dealt with co-cultivation of L. rhamnosus strains GG and VT1 with the yeast Candida maltosa YP1. The growth rates of the yeast in mixed cultures were decreased about 78 % (GG) and 50 % (VT1) compared with the rates of its pure cultures at 18 °C.

This work was supported by the contract No. APVV 20-225605 and VEGA project No. 1/0126/09.

Poster 56

MONITORING TEXTURAL QUALITY OF VACUUM-PACKED COLD-SMOCKED SALMON (*Salmo salar*) DURING REFRIGERATED STORAGE

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**Introduction:** Smoked salmon is the most important smoked fishery product in Spain. However, it is a lightly preserved product with a short shelf life, limited by a fast loss of quality, being texture one of the most affected parameters.

The aim of this work was to monitor the changes in textural quality along refrigerated storage of smoked salmon, as a contribution to the knowledge of the degradation pattern for future predictive modelling.

**Material and methods:** Atlantic Salmons of 2.5K±0.3 kg were filleted and cleaned before salting them by immersion in a 210g/l brine for 16 h at 4°C. After drying, they were smoked (except for control samples, Ctrl). Four treatments were applied: cold smoking (T°<30°C) with natural smoke produced from beech and oak wood chips and two commercial liquid smoke flavourings, coded LS1 (greater proportion of phenolic compounds) and LS2 (richer in carbonyl compounds). The resulting batches were named BS, OS, LS1 and LS2, respectively. All the fillets were vacuum-packed and stored at 4°C for five weeks. Texture analyses were performed weekly in a TA.XT2i texture analyser (stable Micro System, UK) with a load cell of 25 Kg. A Kramer shear cell was used with a crosshead speed of 1 mm/s. From the force-time plots, the following parameters were extracted: maximum force (N), force to fracture (N), time to fracture (s), slope (N/S), area under the curve (N-s) and decaying force (slope, N/s). Two-way ANOVA as a function of time and treatment was performed and the relation of each parameter with storage time was fitted to a linear model (p<0,05) (SPSS, 16.0).

**Results:** BS and OS samples showed the highest linear relation with storage time, in most of the parameters, but only “slope” maintained this significant relation in most of the batches, except for LS1. Attending to the results, two groups could be defined according to the similarities among batches: LS1 and Ctrl; and LS2, BS and OS.

**Conclusions:** The Kramer shear test could be a useful tool to characterize the changes occurring during refrigerated storage of vacuum-packed cold-smoked salmon fillets.

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ANTIMICROBIAL ACTIVITY AND IDENTIFICATION OF BACTERIOCIN GENES IN *ENTEROCOCCUS* AND *LACTOCOCCUS* STRAINS ISOLATED FROM ITALIAN RAW MILK AND CHEESES
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Besides their technological roles, lactic acid bacteria (LAB) also improve the hygiene quality and safety of dairy products by inhibiting competitive natural flora, which include spoilage and pathogenic bacteria.

As well as producing organic acids, LAB can produce a range of antimicrobial metabolites and bacteriocins, the latter being ribosomally synthesized substances of proteinaceous nature that kill or, at least, inhibit the growth of some microorganisms.

From the screening of 238 lactococcal and enterococcal strains isolated from raw milk and traditional Italian cheeses, we found 19 (10 \textit{Enterococcus faecalis}, 4 \textit{E. faecium} and 5 \textit{Lactococcus lactis ss lactis}) that produced antimicrobial substances. The enterococcal strains were active against \textit{Listeria monocytogenes}, \textit{L. innocua}, \textit{Staphylococcus aureus} and \textit{Escherichia coli} indicator strains, while the \textit{Lc. lactis ss lactis} isolates presented a wider spectrum of antimicrobial activity which included \textit{Bacillus cereus}. Instead, none of the bacteriocin producers inhibited \textit{Salmonella enterica}.

We performed the PCR amplification of known structural genes of nisin and different enterocins (A, AS-48, B, CRL35, L50A and B, P, Q, 1071A and B, mundticin KS and bacteriocin 31).

Enterocins A, AS-48, P, Q and bacteriocin 31 genes were detected in the \textit{E. faecalis} and \textit{E. faecium} strains, while three \textit{Lc. lactis ss lactis} harboured the nisin gene. Enterocin AS-48 was the most frequent among the enterocins looked for, and was produced by 10 of the 14 enterococcal isolates.

One \textit{E. faecium} and two \textit{E. faecalis} isolates harboured different enterocin genes (two, three and five respectively). Bacteriocin identification, and the determination of their spectrum of activity towards a wide range of pathogenic strains, could be useful in defining the applicability of strains as bioprotective starter cultures.

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MICROBIOLOGICAL EVOLUTION OF SEABASS (\textit{Dicentrarchus labrax}) STORED AEROBICALLY IN ICE


The spoilage of Aquacultured Seabass (\textit{Dicentrarchus labrax}) and predictive microbiology model in this species were studied in Gran Canaria Island (Spain). Predictive microbiology model is a good system to predict the self-life of foods when the Total mesophilic aerobic flora (TMAF), is known. In this study fishes were stored in aerobical conditions in melting ice (0-3°C) to investigate the microbiological evolution in ungutted fresh fish, in which, strains of skin, muscle and gills was analized. The study was carry out from the sacrifice’s day until 18\textsuperscript{th} store day, performing
evaluations (7 controls) at regular intervals on development of Mesophiles, Psychrotrrophic, sulphide-reducers Clostridium, Aeromonas spp, Pseudomonas spp, Shewanella putrefaciens, Photobacterium phosphoreum and Total Coliforms. Results of this study and predictive model for seabass show that the self life of whole un gutted seabass stored in ice determined by microbiological data (considering $10^6$ cfu/g of SSO (specific spoilage microorganism)) is around 10 days, and the main spoilers are represented by Pseudomonas spp, Aeromonas spp and S. putrefaciens. The analysis show significantly more contamination on gills, follow by skin and muscle; and a daily growing rate that suppose a duplication of studied microorganisms (in 10 days), except for sulfide-reducers Clostridium, P. phosphoreum and Total Coliforms, which reproduces each two days, approximately.

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SPOILAGE OF GILTHEAD SEABREAM (Sparus aurata) DURING ICE STORAGE

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Gilthead seabream (Sparus aurata) is one of the most widely farmed species in the Mediterranean countries. This paper reviews information about microbial action in spoilage of fresh fish. The study was carried out in un gutted Gilthead seabream (Sparus aurata), which is very successful in aquaculture in Gran Canary island. Microbiology aspects are determinant in food spoilage, even more in highly perishable food. It is the case of fish because of its chemical composition and many other enzymatic reactions which are involved, the process finishes with degradation and a high bacterial growth. The aim of the study was to determine which microorganisms were responsible of the spoilage and their concentrations during the iced storage in this un gutted fish. Gilthead seabream (Sparus aurata) was stored in ice (0 - 3°C) for a period of 18 days from the capture, to carry out microbiological evaluations of skin, muscle and gills from the fish at regular intervals (0, 2, 4, 7, 10, 14 and 18 days). Microbiological changes of un gutted fish were analysed for Total mesophilic aerobic flora (TMAF), Psychrotrrophic, sulfide-reducers Clostridium, Aeromonas spp., Pseudomonas spp., Shewanella putrefaciens, Photobacterium phosphoreum and Total Coliforms. Results show that The changes of the microflora of Gilthead seabream stored aerobically in ice at 0-3°C were: TMAF increased at 1011UFC/g towards the end of the storage period. Pseudomonas was the dominant population of the stored fish, followed by H2S producer bacteria.

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STUDY OF THE SHELF LIFE OF COOKED HAM MANUFACTURED WITH NITRITES OR WITH VEGETABLE JUICE POWDER

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Increased concerns about the potential health risk associated with the consumption of processed meat have led the meat industry to modify traditional products to make them healthier. Recent research has focused on the use of vegetable juices powder as source of nitrates and nitrites in cooked meat products, obtaining meat products of acceptable hygienic and sensory quality. Nevertheless, no study about the effects of these substances on microbiological quality and shelf life of these products has been development. Therefore, the aim of the present study was to determine the shelf life of cooked ham manufactured with nitrite or without nitrite added. To achieve this objective two batches of cooked ham were manufactured: (1) with nitrites added and (2) with vegetable juice powder. Then, four pieces of each batch were sliced and 100 g of them were placed in trays. The trays were individually placed in commercial plastic bags, were subjected to vacuum and sealed using a packer. Half of the packages were stored in darkness at 4ºC, whereas the other half were stored under retail display conditions. Packs of each treatment were opened for subsequent analysis after 0, 7, 14, 21, 28 and 35 days of storage. The following microbiological parameters were tested: Psychrotrophic Bacteria, Anaerobic Bacteria, Enterobacteriaceae, Pseudomonas, Lactic Acid Bacteria and Yeasts and Molds. The counts of the microorganisms studied increased steadily during storage. The psychrotrophic and anaerobic counts were nearly to 7 lg cfu/g in both batches at 21 days of storage when the samples were stored in darkness. The samples stored under retail display conditions presented counts higher 7 lg cfu/g at 14 days. It could be concluded, on the basis of the results, that the cooked ham manufactured with vegetable juice powder did not show lower shelf life than cooked ham manufactured with nitrite added.

Poster 61

EFFECTS OF LYSOZYME ON THE MICROBIOLOGICAL STABILITY AND ORGANOLEPTIC PROPERTIES OF UNPASTEURIZED BEER

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Lysozyme is an antimicrobial enzyme that could be applied against those bacterial species, which, due to their own metabolic activity, possess notable beer-spoilage ability, leading to turbidity, acidity and undesirable off-flavours, and resulting in a loss of beer quality.

Experiments were carried out to assess lysozyme potential to prevent or delay growth of beer spoilage bacteria, and, consequently, to verify the effect of lysozyme on the microbiological stability and sensory attributes of unpasteurized beer.

Eight replicates, all from the same lot of beer received from an Italian brewery, were treated with 0 and 100 ppm lysozyme. The samples were analysed bimonthly, from the beginning of the storage period till 12 months after production.

Microbiological analyses were conducted to investigate the presence of spoilage bacteria. In order to obtain a complete microbiological profile of beer, yeasts were detected along with lactic acid bacteria (LAB), contaminating micro-organisms non LAB, and acid acetic bacteria.
Lysozyme concentration was monitored by the agar plate method, and sensory analyses were performed with the purpose of determining any slight, but significant, differences in sensory impressions between the beers produced with and without lysozyme. The results demonstrated that the samples without lysozyme addition presented LAB contamination.

It was recognized that lysozyme exerts a strong inhibitory action on LAB growth in beer and, moreover, that the enzyme added to beer was very stable during the study. Sensory tests proved that there was no unfavourable influence on beer flavour when using lysozyme. Indeed, the shelf-life of the beer with added lysozyme proved to be extended: as late as 1 month after the expiry date it still met with the panelists’ approval, having, according to them, a pleasing, more mellow flavour.

In conclusion, lysozyme may be regarded as an effective agent contrasting microbiological contamination and prolonging the stability of unpasteurized beer.

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EFFECT OF MANUFACTURING WITH VEGETABLE JUICE POWDER AS SOURCE OF NITRITES ON THE SHELF LIFE OF COOKED LOIN

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Due to the recent recommendation from the World Cancer Research Fund to avoid the intake of processed meat, it is necessary an urgent adaptation of meat processing industry in relation to the health value of processed meats. In this sense, alternatives for the use of nitrate and nitrite from meat processing have been proposed. So, meat products using vegetables juices as sources of nitrates and nitrites have been recently development. The aim of this study was to investigate the influence of this production system on the shelf life of cooked loin packed under vacuum. To achieve this objective three batches of cooked loin were manufactured: (1) with nitrates added and without phosphates, (2) with vegetable juice powder and with phosphates and (3) with vegetable juice powder and without phosphates.

Four pieces of each batch were sliced and 100 g of them were placed in trays. The trays were individually placed in commercial plastic bags, were subjected to vacuum and sealed using a packer. Half of the packages were stored in darkness at 4°C, whereas the other half were stored under retail display conditions. Packs of each treatment were opened for subsequent analysis after 0, 7, 14, 21, 28 and 35 days of storage. The following microbiological parameters were tested: Psychrotrophic Bacteria, Anaerobic Bacteria, Enterobacteriaceae, Pseudomonas, Lactic Acid Bacteria and Yeasts and Moulds. The microbial counts increased steadily during storage, reaching 7 log cfu/g at 21-28 days and the highest counts were found in samples stored under retail display conditions. Taking the formulation into account, the cooked loin manufactured with vegetable juice powder and without phosphates showed higher (p<0.05) psychrotrophic bacteria, Enterobacteriaceae and yeasts and moulds counts. Results indicate that the use of vegetable juice powder instead of nitrite added had not effects on the shelf life of cooked loin when phosphates were included.