IN A NUTSHELL

PROMETHEUS has the objective to help the European food industry to reduce consumer exposure to undesirable compounds formed during food processing without affecting food quality or reducing microbiological safety. Several food processing technologies will be investigated: vacuum baking, high hydrostatic pressure treatment, ohmic heating and microencapsulation of heat-labile ingredients. In addition, in-line analytical techniques will be developed and associated with in the processing equipment to monitor the formation of such undesirable food-born compounds. The expected project outcomes will help the food industry to better control the safety and overall quality parameters of their products by implementing the most promising innovative technologies.

WHY PROMETHEUS?

PROMETHEUS STATES FOR "**PRO**CESS CONTAMINANTS: **M**ITIGATION AND **E**LIMINATION **T**ECHNIQUES FOR **H**IGH FOOD QUALITY **E**VALUATED **U**SING **S**ENSORS"

Prometheus is a figure of the Greek mythology who gave fire to humans after stealing it from Zeus. This fire allowed them to cook food, to be lit, to work metals, to get warm and to frighten wild animals. In other words, it strongly improved their lives. In continuity, the Prometheus project will contribute to improve the daily life and well-being of European consumers by promoting the production of healthier heat-processed food through a better control of the reactions taking place during food heat treatment. While Zeus sentenced Prometheus to have his liver eaten every day by an eagle for the eternity, the FP7 Prometheus project should also increase European life span, but under significantly better conditions.

PARTNERS

The project is coordinated by ACTIA with the help of Spectralys Innovation for scientific and technical aspects and Euroquality for project management.

ACTIA (France)
Christophe Cotillon
c.cotillon@actia-asso.eu

CAPSULAE (France)
Samira El Mafadi Jian
elmafadi@capsulae.com

CSIC (Spain)
Francisco J. Morales
fjmorales@ictan.csic.es

ETI MAKIA SANAYI (Turkey)
A. Fevzi Tuvay
ftuvay@etimakine.com.tr

EUROQUALITY (France)
Olivier Chartier
olivier.chartier@euroquality.fr

FERA (UK)
Colin Crews
colin.crews@fera.gsi.gov.uk

FOODDRINKEUROPE (Belgium)
Beate Kettlitz
b.kettlitz@fooddrinkeurope.eu

HACETTEPE UNIVERSITY (Turkey)
Vural Gökmen
vgokmen@hacettepe.edu.tr

RIKILT (The Netherlands)
Ine van der Fels-Klerx
ine.vanderfels@wur.nl

SIRO (Spain)
Juan Manuel Alava
juan.alava@gruposiro.com

SPECTRALYS INNOVATION (France)
Inès Birlouez
ines.birlouez@spectralys.fr

TECHNISCHE UNIVERSITÄT BERLIN (Germany)
Kai Reineke
k.reineke@tu-berlin.de

UNIVERSITY OF NAPLES (Italy)
Vincenzo Fogliano
fogliano@unina.it

VYSOKA SKOLA CHEMICKO-TECHNOLOGICKA V PRAZE (Czech Republic)
Jana Hajslova
jana.hajslova@vscht.cz

http://processing-contaminants-prometheus.com

September 2011

Coordinator ACTIA

PROMETHEUS

PROCESS CONTAMINANTS

MITIGATION AND ELIMINATION TECHNIQUES FOR HIGH FOOD QUALITY AND THEIR EVALUATION USING SENSORS & SIMULATION

Beginning of project: May 2011
Duration: 36 months
Prometheus is funded by the European Commission within its FP7 Programme, under the KBBE priority

Coordinator ACTIA

PROCESSING CONTAMINANTS

Processing contaminants are food-born molecules that are formed during the heat process of foods when temperature reaches high values. Such molecules exhibit in vitro toxic activity, so that mitigation is needed to prevent any possible negative long-term impact on the consumer. PROMETHEUS will investigate the impact of processing on the outbreak of six main neo-formed contaminants: 1 acrylamide, 2 furan, 3 HMF (5-hydroxymethylfurfural), 4 3-MCPD esters, 5 glycidol esters and 6 N -(carboxymethyl) lysine (CML). Four different food models will be studied: infant formula, biscuits, baby food puree and canned fish.

FOUR MITIGATION STRATEGIES

VACUUM BAKING

Applying vacuum during baking contributes to reduce the temperature compared to conventional baking systems. In the project, this technology will be used on biscuits to reduce the possible formation of processing contaminants such as acrylamide and HMF.

CONTACT *Vural Gökmen, Hacettepe University (Turkey)*

HIGH HYDROSTATIC PRESSURE

Using high pressure is another possibility to control the formation of Maillard reaction products. With this technology, the products are introduced in their final package into a vessel and subjected to a high level of isostatic pressure (between 300-600 MPa), transmitted by water. Here again, high pressure allows decreasing the sterilization temperature. The treatment will be tested on baby food puree and canned fish.

CONTACT *Kai Reineke, Technische Universität Berlin (Germany)*

OHMIC HEATING

Ohmic heating technology is an innovative thermal technology based on High Temperature Short Time treatment: unlike conventional treatments, ohmic processing heats products internally by passing an electric current through the product, rather than relying on heat transfer from a heated vessel. Ohmic heating will be applied to infant formulas and baby food puree.

CONTACT *Magali Wagner, CTCPA (Actia Centre France) - mwagner@ctcpa.org*

INGREDIENT MICROENCAPSULATION

Protecting by microencapsulation the nutrients involved in the formation of processing contaminants is a promising technique to mitigate contamination. The project will investigate the possibility to microencapsulate Vitamin C, iron, polyunsaturated fatty acids (PUFA) and sodium chloride in biscuits and infant formula.

CONTACT *Samira El Mafadi Jian, Capsulae (France) and Vincenzo Fogliano, University of Naples (Italy)*

	Liquid infant formulas	Biscuits cookies	Fruit and vegetable baby food purees	Processed Fish & Processed vegetables
Vacuum baking				
High pressure treatment				
Ohmic heating				
Microencapsulation				

THREE INNOVATIVE MONITORING STRATEGIES

FRONT FACE FLUORESCENCE ANALYSIS TO MONITOR FOOD PROCESS CONTAMINANTS

Fluorescence spectroscopy is a sensitive analytical technique particularly suitable for monitoring the impact of processing and storage on food quality parameters, especially on heat-derived undesirable compounds: the method is rapid, non-destructive and simple to apply. In the framework of Prometheus, an online sensor will be developed to control the heat charge absorbed by food products and monitor the main heat-influenced quality indicators. Software allowing prediction in real time will also be elaborated for an on-line follow-up of processing contaminant formation.

CONTACT *Inès Birlouez, Spectralys Innovation (France)*

AMBIENT MASS SPECTROMETRY

Direct analysis in real time (DART) is a novel ambient desorption ionization technique increasingly used in many areas. When coupled with high resolution mass spectrometry (HRMS), it enables fingerprinting of sample components, including processing contaminants and their precursors. Furthermore, DART technique has a possibility to induce thermal changes in the matrix, thus providing a comprehensive information on precursor reactions resulting in origination of various intermediates and final products. In the project, DART–HRMS will be employed for real-time investigation of conditions under which processing contaminants are formed.

CONTACT *Jana Hajslova, VSCHT (Czech Republic)*

COMPUTER VISION BASED IMAGE ANALYSIS

Computer vision-based image analysis can be used as a tool to predict the browning phenomenon associated to food severe heat treatment. This rapid and non-destructive technique will be used to monitor browning of biscuits during baking as well as formation of acrylamide that is strongly correlated with browning.

CONTACT *Vural Gökmen, Hacettepe University (Turkey)*

MODELLING

The data collected in the project will be analysed, and empirical as well as mechanistical models will be developed for a better understanding of the reactions mechanisms leading to the formation of processing contaminants and quantification of the kinetic parameters. Such modelling will make it possible to identify optimal processing parameters and formulation to mitigate process contaminants.

CONTACT *Ine van der Fels-Klerx, RIKILT (The Netherlands)*