

FOOD AND NUTRITION UPDATE



TNO innovation
for life

TNO ESTABLISHES OPEN INNOVATION NETWORK FOR LONG-TERM STRATEGIC RESEARCH

The international food industry increasingly prefers to share its research load via collaborative programs with partners. For many organizations around the world, TNO is their reliable strategic research partner, providing excellence, meeting deadlines and guaranteeing confidentiality. We are very proud of these relationships and now offer our partners the opportunity to participate in long-term Shared Research Programs (SRPs).

SRPs, financially supported by the Dutch Ministry of Economic Affairs, aim to build advanced knowledge and technology

platforms in specific research areas that offer broad application opportunities for industry partners. SRPs will run 8-10 years and will be conducted in close collaboration with other research institutes that deliver supporting technologies: universities, medical centers and industry. They are based on an open-innovation model: research and industry partners participate for a minimum of 3 years and will be able to enter and exit a program, at any time, under agreed conditions. Participants jointly own the programs, which will be orchestrated by TNO.

The SRP areas for 2014 are:

- › Towards a food-allergen-free world;
- › Personalized Dietary Health;
- › Structuring of processed health foods.

With the introduction of the SRPs, TNO will add value to the food industry by bringing in new technologies via our applied-program portfolio. In the programs, the participation fee for industry partners will be leveraged by TNO's knowledge-investment funds, by sharing the latest scientific insights, budgets and facilities, and the benefit from the longer-term commitment of the Dutch Ministry of Economic Affairs. Involvement in these research programs will enable our partners to participate, via TNO, in programs at a European level, via Horizon 2020.

Please contact if you are interested to become a strategic partner.

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A-CROSS: MODELING CROSS-CONTACT OF ALLERGENS

Undeclared allergens are a well-known hazard for food-allergic consumers. TNO has, in collaboration with Unilever and Intertaste, developed a model to track and predict the concentration of food allergens caused by cross-contact during the production of dry food powders.

In an effort to protect allergic consumers, food producers optimize their production processes to control the risk of cross-contact as much as possible. Previous tools have been developed for allergen risk assessment and risk management. However, little was known about the contribution of specific processing steps to allergen cross-contact. All current insights are developed through costly ingredient and final-product analyses which are only momentary glimpses into production.

CO-DEVELOPMENT

TNO and its partners, Unilever and Intertaste, created a co-development project to establish a model to predict unintended allergen presence, through cross-contamination during the production of dry savoury foods: the A-Cross model.

TNO expertise was combined with practical information from industrial partners, available scientific literature and controlled sample analyses to develop the first stage of the model. It enables companies to assess individual process units – such as weighing, transport and mixing - and thereby to focus on mitigation measures at the points which contribute most to allergen cross-contact. It should also be possible to use this tool pro-actively, to investigate optimum production-planning scenarios and avoid potentially risky situations without extensive and costly allergen analyses.



Stage 2 of the A-Cross model is currently in development with the partners. Multiple opportunities exist for the application and extension of the model across other production processes, other allergen forms and other ingredients.

For further information on this and other ways to examine the risk of allergen cross-contamination within food production facilities, please contact our food allergy experts.

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TNO TOOL FOR FAST & EFFICIENT FOOD-SAFETY ASSESSMENT

TNO has developed a tool that enables manufacturers to perform safety and regulatory assessments of food and feed products in an efficient and structured manner. This tool will be valuable in crisis situations and can be used for education and for maintenance of quality standards.

Food and feed should be safe and comply with appropriate legislation. Safety assessments can, however, be time-consuming and costly, and may require animal testing. Moreover, multidisciplinary expertise is needed, including regulation, exposure, toxicology and risk assessment. TNO's latest tool combines information from all these areas, allowing

users to perform safety and regulatory assessments in an efficient and structured way.

UP TO DATE INFORMATION

The food safety assessment tool contains up to date information from all expert fields relevant to safety and EU regulatory assessment. It provides knowledge and understanding of every factor in safety assessment and facilitates a transparent, well-documented assessment procedure. The tool is web-based: the user has to answer some questions on the product and is then guided through the evaluation process via decision trees, wizards and pop-up help boxes. Information on a specific case can be stored within the tool, which also allows for consistent and optimal registration of relevant information and

the easy generation of reports. Users can share data with each other.

The tool allows manufacturers to act decisively in crisis situations, or to determine which law is applicable to a new product. The tool combines optimal use of TNO expertise, with all available data, to enable the efficient safety and regulatory assessment of (new) food/feed products. For example through education on safety assessment, improving the efficiency of the assessment process and supporting maintenance of quality standards.

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TNO STARTS SHARED RESEARCH PROGRAM TOWARDS A FOOD-ALLERGY-FREE WORLD

Towards a food-allergy-free world is the subject of the Shared Research Program initiated and orchestrated by TNO. Partners from industry, academia and research institutes are invited to join this strategic, open-innovation program.

Food allergies cause significant stress for industry, governments and society as a whole. Affecting between two and four percent of the population, it is among the most prevalent disorders in the western world. Food allergens are one of the major causes of food-safety incidents and product recall, and the economic impact of food allergies for the food sector and society as a whole is very high. With the urgent global need for new, alternative and sustainable protein sources for food, the risk of developing new food allergies and new cross-reactions is clear. Fundamental science and technology now have reached a stage where we have sufficient entry points to start working on a food-allergy-free world, achievable around the year 2030.

FOUR PROGRAM LINES

Within the SRP Towards a food-allergy-free world a range of technologies will be developed, via four suggested program lines.

- › Protect the existing food allergic consumer (allergen & allergy management);
- › Prevent the introduction of new, highly allergenic foods (allergenicity assessment of (novel) foods (proteins);
- › Cure consumers' food allergies and prevent the development of new food allergies (therapeutic and prophylactic products and strategies);
- › Immune and gut health maintenance and optimization (creating the prerequisite conditions for a successful prophylaxis or therapy).

PRIORITY ISSUE

Food allergy is a priority issue in the Dutch Topsector Agri&Food innovation contract and TNO's Shared Research Program Towards a food-allergy-free world will be financially supported through TNO knowledge-investment funds. Parts of the research on food allergies have parallels with the goals of the European Technology Platform (ETP) Food for Life and the Food Safety Vision of the SAFE Consortium, and will strongly facilitate the achievement of the EU Horizon 2020 goals.

Discussions with partners have begun and we invite other interested parties to contact us and to discuss participation in one or more program lines.

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DO IT YOURSELF TRIAL CONCEPT CONFIRMED BY

In 2013, TNO introduced the Do it Yourself (DIY) trial as a new cost-efficient and reliable approach to human intervention studies. A trial, on the effects of coffee consumption was conducted which demonstrated that DIY trials can be a very cost-effective adjunct to and, in some cases, replacement for conventional clinical studies, especially where the research question is clearly defined.

Increasing numbers of portable apps and devices are available with which volunteers can take their own measurements. Many of us are familiar with heart rate apps, blood pressure devices, or long-term body-weight management applications. The data collected via these tools would be interesting for research purposes,



especially when a user is employing a nutritional or lifestyle intervention.

IT INFRASTRUCTURE

In 2013, TNO built the IT infrastructure needed to set up a DIY trial. It enables us to collect data from volunteers, who login

- at home, to a specially-created portal - and perform (cognitive) tests online. The stored data undergoes statistical evaluation by TNO. A DIY trial, on the effect of coffee consumption, has been conducted to examine the effectiveness of the infrastructure.

FIBER INNOVATIONS FOR SME-BAKERIES

TNO coordinates the HealthBread project that develops consumer oriented, whole grain and white breads with improved nutritional and product quality for SME bakeries across Europe.

The HealthBread (www.healthbread.eu) project translates scientific and technological knowledge gained in the EU FP6 HealthGrain project into practical solutions. This results in a HealthBread Bakers Manual which includes guidelines for selection and processing of raw

materials and appropriate nutritional statements. The Manual will be available in languages of the participating SMEs bakeries (German, Italian and Dutch, as well as English for wider use) to enable them to produce improved bread products for EU consumers.



A YEAR FULL OF PRACTICAL SOLUTIONS

TNO acts as a leader in the nutrition and technology work packages, which resulted in:

- Four novel types of wheat flour fractions with high levels of fiber (30-52%) and micronutrients with increased bio-availability were obtained by optimization of milling processes.
- Studies on wet processing resulted in:
 - 1) fermentation protocols for bakeries specifying fermentation time and temperature
 - 2) enzymes to be used
 - 3) increased levels of free ferulic acid (at least 200%)
 - 4) ~50% increase in bioavailability of iron, magnesium and zinc.

It can be demonstrated that consumption of HealthBread products substantially contributes to a higher intake of cereal fiber as well as minerals, vitamins, anti-oxidants. A nutrition claim 'high in fiber' will also be feasible for a range of HealthBread breads. Recipes have been developed for high quality HealthBread products high in fiber (i.e. > 6% fiber or > 9% fiber) which is a significant step forward.

IMPACT

The bakeries that participate in HealthBread will become leaders in the distribution of HealthBread products, high in cereal fibre and micronutrients. The business of bakeries and that of HealthBread ingredient suppliers is expected to grow by 20% or more in three to four years. More importantly consumers will benefit of an increased intake of bread high in cereal fiber. The HealthBread Bakers Manual will become available in the final quarter of 2014 and TNO welcomes interested parties for follow-up activities.

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PILOT STUDY

The infrastructure was developed by specialists in TNO's Enabling Technology - Systems Biology research program; experts from the Healthy Nutrition program set up the protocol for the clinical study. The popular websites, FoodLog and Facebook, were used to recruit participants. Information about the study was sent to potential volunteers and eligibility was checked.

Over one hundred volunteers showed interest in the study. Seventy-five signed an informed consent form, indicating their willingness to participate.

During the study, in their homes, participants were asked to perform computer-based tests before consumption of a cup of instant coffee and one hour after. Four sachets of coffee were sent to the volunteers: two with caffeine, and two decaffeinated versions. It was a blind study: the sachets were labeled A

or B. Subjects performed the tests in the morning, following an overnight fast, on four separate days.

EASY TO INCORPORATE

From the 75 participants, 50 individuals completed all the tests. A few more people dropped-out, compared to conventional studies, but enough individuals completed the study to make a statistical analysis possible.

The research data confirmed that consuming coffee with caffeine results in faster reaction times: a well-known, mostly beneficial effect of caffeine. In the subsequent evaluation, subjects reported that they found the study easy to incorporate into their daily lives. All were willing to participate in further studies.

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HEALTH EFFECTS OF WHOLEGRAIN WHEAT

TNO and the bakery sector are collaborating on a proof-of-concept project for using the challenge approach in nutritional-intervention studies, to support companies striving for EFSA-approved health claims for the effects of wholegrain wheat.

TNO is working on innovative concepts to help support substantiation of nutritional health claims. For example, we define 'optimal health' as the ability to adapt to challenges (resilience). This definition inherently describes health as a dynamic process, addressing the body's constant efforts to maintain homeostasis. In intervention studies, resilience is tested by applying dietary or other challenges (such as a high-fat meal or exercise), followed by determining the response and recovery time of the responding markers. Ultimately, 'improved resilience' - or similar wording - is expected to become a new EFSA-accepted health-benefit claim for particular food products.

CONCEPT OF RESILIENCE

This concept is also the foundation of the TNO project, Improving resilience with whole grain wheat products, that began in May 2013, in collaboration with the Netherlands Bakery Center and DSM. TNO has now collected and analyzed all the knowledge and data available, for a selection of health-claims. Based on an analysis of existing datasets from (TNO) studies, useful biomarker panels have been identified for quantification of resilience relevant to these particular claims.

INTERVENTION STUDY

In spring 2014, two additional food-industry companies will join for phase 2: Cereal Partners Worldwide and Kampffmeyer Food Innovation. Based on the outcomes of the first year, phase 2 will develop a detailed design and set-up plan for the wholegrain wheat products nutritional-intervention study. The study will be conducted at Wageningen University together with the University Medical Center Groningen.

PROOF-OF-CONCEPT

Previous TNO projects showed that short-term resilience can be linked to long-term health outcomes and that diet can improve resilience. The wholegrain project will put together the pieces of the puzzle and demonstrate that we are able to substantiate new types of health claims, for wholegrain wheat food products, based on new markers. It will provide a proof-of-concept for using the challenge approach in nutritional intervention to assess the health effects of specific food products. The final aim of the project is EFSA-approved health claims.

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FOODMANUFUTURE CONSORTIUM

The EU-funded FoodManufuture consortium has presented its blueprint for a cross-disciplinary research infrastructure intended to improve the competitive strength of the European food industry. TNO contributed to the identification of Dutch national technology needs and to communicating the project outcomes to the Dutch food-manufacturing industries.

Several vision scenarios of the future development of the food sector were discussed, a comprehensive list of technology gaps was compiled, based on

the input from seven different countries. This input significantly influenced the proposed research structure which now meets most of the stated industry needs (<http://foodmanufuture.eu>).

TNO has assured that the Dutch industry was in close contact with this development and welcomes parties that are interested in participating in the next step, which will be a PAN-European collaboration.

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MEET TNO AT:

Jun 3 - 4	Brussels (BE)
Free from Food	
Jun 4	Groenekan (NL)
TKI Annual Meeting	
Jun 7 - 11	Copenhagen (DK)
EAACI	
Jun 22 - 24	New Orleans (US)
IFT	
Jun 28 - Jul 2	Stockholm (SE)
ISSFAL	
Sep 7 - 10	Edinburgh (UK)
Eurotox	
Oct 9 - 11	Dublin (IE)
Food Allergy and Anaphylaxis Meeting (FAAM)	
Dec 2 - 4	Amsterdam (NL)
Health Ingredients Europe (HIE)	

TNO.NL

TNO HEALTHY LIVING

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