NIZO Vision

№ 10 A news publication of NIZO food research

Fitness & Wellbeing

Consumer benefits based on technology

Fitness and well being are major trends in consumer food choices. While these consumer benefits are often used in marketing food products, such benefits have to be supported by functional qualities. NIZO food research is geared to providing industry with technologies to develop and produce foods to meet consumer demand.

Dr. A.C.Juriaanse, Managing Director of NIZO food research

The benefit-based model for product development in the food industry includes qualities such as convenience, pleasure, health and safety, and fitness and well being. "At NIZO food research we use this consumer benefit model because we realised that this is an effective way to serve our customers and to drive innovations in food. Using this approach, innovative new ingredients and technologies as well as proven technologies can be linked to properties of food products that, for example, promote fitness and wellbeing", explains Managing Director Ad Juriaanse.

The debate about the health risk of obesity, for instance, has stimulated the food industry to re-evaluate many of their products in terms of reducing the fat, sugar and salt contents.

"This is precisely where the experience of NIZO food research comes in. Through our regular contacts in consumer marketing, we are well aware of consumer trends in food choices. But most importantly, we have the scientific and technological knowledge and know-how to develop and improve the quality of food products to meet these demands. In most cases, the required product qualities can be achieved using different technological solutions. The question is which the most appropriate technology for a specific product is."

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Interview

Fighting the flu with fermentable fibres

With the winter months ahead, many people become infected with the influenza virus. One way to gain better protection against influenza is to consume prebiotic preparations, as indicated in a recent study in rats conducted by NIZO food research. In this study commissioned by Orafty, rats were fed a diet containing Raftilose® Synergy1 which consists of oligofructose and inulin. These fermentable fibres are known to have a stimulating effect on healthy Bifido bacteria in the gut. Recent studies support the role of fermentable fibres in modulating the immune system in the gut. In our study, we used these results to determine whether the immuno-modulating activity of fermentable fibres could also be of benefit in the respiratory tract.

After adapting to the new diet, the rats were infected with the influenza virus and developed flu similar to that in humans. Within two days, not only the immune reactivity was enhanced, but also fewer influenza particles were detected in lungs of rats fed this diet than in those on the control diet. While these preliminary results are very promising, further work will be required to strengthen the evidence for this positive effect.

hans.snel@nizo.nl

Innovation Seminars at the Hi

Want to keep up with innovative new developments and trends but have limited time to attend scientific conferences? Then you will be interested to know about the Innovation Seminars at the *Health Ingredients (Hi) trade fair in Amsterdam*, organised by NIZO food research in collaboration with CMP Information (Hi & Fi). To be held on 17 and 18 November 2004, these innovation seminars aim to give decision makers in food, beverage, dairy and ingredient companies an instant update on current developments.

The Seminars cover Weight management: healthy Choice made Easy - Vitamin Enrichment in Drinks - Yoghurt: Trends in a Healthy Product (17th Nov) - Bakery:The New Battle Field for Health - and Food Safety: Time to Act (18th Nov).

Each 1½ hour seminar will be organised along the same line. A **recognised market bureau** will give an overview of market facts and figures, and new trends. **Top management** of leading food & ingredient companies will present innovation options and approaches. **Leading scientists** from European research organisations will give an overview of how new technologies can support future innovations. Each will be concluded with "meet the speaker" drinks.

To register for the Innovation Seminars, visit www.hi-events.com

NIZO scores at the Olympics

The new sports recovery drink PeptoPro Sports® developed by DSM was supplied exclusively to the Dutch team at the Olympic Games in Athens. You may have even seen Inge de Bruijn and others using PeptoPro® Sports after their Olympic activities In view of their shining score of medals, the Dutch team seems to have benefited from the new drink. Commissioned by DSM, NIZO food research assisted in the development of this product.

The active ingredient in PeptoPro Sports® is a protein hydrolysate. The Hydrolysates contain peptides that stimulate production of insulin which in turn facilitates transport of glucose from the blood to the muscle cells. In effect, these peptides enhance refuelling of the muscles after intense exercise.

However, these hydrolysates are notorious for their bitter taste. DSM discovered an enzyme that can reduce this bitter taste to acceptable levels. At this point, DSM contacted NIZO food research. After only a few experiments with this enzyme, we were able to confirm that it could reduce the bitter taste. The enzyme technology and processing conditions were optimised on a laboratory scale.

Gold medal winner Inge de Bruijn using PeptoPro Sports
Photo: Associated Press

In scaling up the production process, several hurdles had to be overcome. For instance, the production process of the hydrolysate had to be optimised to prevent the formation of off-flavours. The next step was to formulate the recovery drink. Based on our expertise in flavour profiling and analysis, we proposed an alternative flavour in order to obtain a product to meet the shelf-life specifications set by DSM. Pilot batches of the recovery drink were produced in the NIZO food-grade pilot plant. The Nutrition and Toxicology Research Unit (NUTRIM) of University of Maastricht established that athletes consuming the PeptoPro® drink performed better than those using a drink without. Shortly, the PeptoPro® drink will be launched under the Multipower brand of Haleka.

rene.floris@nizo.nl

Interview

DSM accelerates ingredient development

Dr. R.W. van Leen, Director DSM Food Specialties

DSM has recently opened a € 12 million food innovation centre in Delft, the Netherlands, with 100 staff working on R&D, sensory analysis and product development. The new centre has a biochemical laboratory, kitchens and tasting facilities as well as a full-scale pilot plant for bakery products, cheese, yoghurt, savoury foods, beverages, and nutritional ingredients.

"DSM's investment in this centre underlines the company's ambitions in food ingredients which is one of its core businesses and is supported by the recent acquisition of the Roche vitamin business in Switzerland", says Rob van Leen, director DSM Food Specialties. "We will concentrate on developing functional food ingredients such as arachidonic acid for infant nutrition and on dietary supplements."

"The new DSM centre represents a strong commitment to the food industry. We can invite customers to visit us and we can carry out joint research projects. We have the same equipment as our customers use and this makes it relatively easy to control the various factors in food processing. We want to work in strategic alliances with food companies and research institutes. DSM has a long association with NIZO food research, working together especially on taste and texture, and pilot plant production. DSM's expertise in product development together with the experience of the former Roche in nutrition is a very strong combination", says Van Leen. "The new centre in Delft will enable us to work on incremental improvement of food ingredients as well as on new and innovative products such as active ingredients that can have an impact on cardiovascular diseases by lowering blood pressure, or on obesity, such as proteins that simulate satiety after a meal."

Van Leen considers that health and well being are of increasing importance to the food industry, with the focus on prevention rather than on treatment.

"DSM's most recent food innovation is PeptoPro® Sports, a recovery drink after intense physical exercise. This new drink was used by at least 80% of the Dutch team at the Athens Olympics. The main ingredient is a natural protein that is hydrolysed in a DSM-patented process. Absorption of the protein hydrolysate together with sugars stimulates the body's production of insulin, thus allowing the muscle cells to "reload" faster. Hydrolysed casein has never before been used in sports drinks because of its bitter taste. NIZO assisted DSM in reducing this bitter taste. Our research on genomics and the contribution of NIZO has enabled us to develop this successful new product."

Mouth feel: "a slip of the tongue"

Appropriate lubrication in the mouth is essential for the perception of creaminess and other texture attributes of food products. Poorly lubricated foods are hard to swallow while highly lubricated foods have a slippery, thin mouth feel and are swallowed rapidly. Thus to successfully replace fats, it is essential to find an ingredient with similar mouth feel properties. Research undertaken in the WCFS Structure and Functionality programme is now focusing on the effects of breakdown during oral processing. The work, which is being carried out at NIZO food research, is investigating both emulsions and fat-free products. The research involves using an opto-tribometric cell which allows simultaneous measurement of friction and imaging of the microstructure of the thin food layer. The results of these project put NIZO food research in a position that is unique in the world to help food manufacturers engineer key sensory attributes, such as creaminess of premium foods.

ronald.visschers@nizo.nl

Flavour and Fat

A firm and fit liaison

Obesity is a global issue that will change the food industry, as we know it today. In this respect, NIZO food research has given new impetus to the development of low calorie/low fat foods by developing new technologies and investing in new equipment enabling new break-through developments.

Lowering the fat content of food products will affect aroma and taste in various ways because fat has unique functions in capturing and delivering aromas. An example is a low fat cheese developed by NIZO food research. Replacing fat by protein, starch and water did not result in a tasty product. Only after combining this with improved fermentation conditions the product was successful.

Various factor play a role:

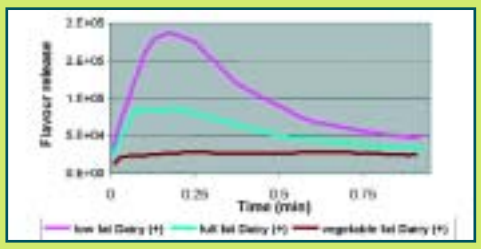
Mouth feel

Differences in texture resulting from new ingredients or processing conditions can be visualised by means of Confocal Laser Scanning Microscopy (CSLM). Scanning under shear conditions enables behaviour during consumption to be monitored. Use of this technique has led to products with significantly improved mouth feel or stability such as deserts and dressings.

Flavour release

With the MS Nose, the function of fat during mastication and subsequent flavour release can be measured in vivo. In a recent project, using the MS Nose, we discovered that proteins are not always flavour sinks they are thought to be. This knowledge has assisted ingredient manufacturers and flavour suppliers to compensate for these effects and to fine tune product formulation.

In product development, however, the effect of the food matrix cannot be disconnected from its aroma release properties.



Effects of percentage and fat type on in vivo *flavour relaese*

Texture-Flavour interaction

The best possible match of mouthfeel, food matrix and flavour release is achieved when each of these factors can be manipulated separately.

NIZO's recent acquisition of an olfactometer enables us to deliver a volatile aroma stimulus to panellists at a precisely controlled flow, concentration, duration and quality thus mixing and matching different aromas with different textures. The combination of this instrument with our existing instrumentation and procedures is unique in food research. Interactions in, for example, low or zero fat products can be applied in developing new products, offering enormous advantages ranging from optimal formulation and cost reduction to satiety regulation with specific aromas and novel flavour masking.

peter.de.kok@nizo.nl

Improved minerals for better health

The consumption of minerals in food products does not always meet the criteria for recommended daily intake. Based on this, Solvay's chemical and pharmaceutical group asked NIZO to highlight the characteristics and the specific health impact of minerals used in fortified food applications such as Calcium, Magnesium, Potassium and Sodium. It appeared that these minerals can be especially interesting for their global intake, for promising new functionalities, and for approved FDA claims. Furthermore, special attention was paid to factors influencing absorption in the gut. The results will soon lead to unique formulations for e.g. bone health or gut health, with optimal bio-availability. "This opens a door towards a future generation of basic but innovative nutritional ingredients", says Pascal Ronfard, from New Business Development of Solvay in Paris.

gerhard.de.ruiter@nizo.nl

Continuation of cover story
Consumer benefits...

Juriaanse refers to the development of low-fat cheese as one such example. “A low-fat cheese can be produced by replacing fat with a low-fat substitute, or by changing the fermentation process and particularly the cheese ripening process. In fact, a combination of technologies is required to produce a cheese suitable for a low-calorie diet.” Juriaanse sees many opportunities for developing food products that can promote fitness and well being. “NIZO food research can support food product developers to incorporate new ingredients into their products. In the case of a low-fat product, for example, producers have to adapt the flavour – since fat has unique functionalities to both capture and deliver aromas – and mouthfeel. When it comes to reducing sugar levels, low calorie sweeteners have to be incorporated.

Juriaanse anticipates a wave of new product concepts aimed at promoting fitness and well being – not only by enrichment with vitamins, calcium or probiotics but also more exotic ingredients such as ginseng.

“These ingredients are often difficult to incorporate into food products without the loss of bioactivity or without disrupting product processing. Processing conditions need to be optimised to ensure that the active ingredients are released effectively into the human body. Calcium, for instance, is not well absorbed in the presence of fruit juice. Milk has a high bio-availability of calcium because it is encapsulated in the casein micelle.”

“Of course, innovations have to be tested and tried”, continues Juriaanse. “We have invested in our pilot plant for the isolation and purification of natural food ingredients directed to giving new functionality to existing food products.

Our multidisciplinary approach is essential in developing new products ranging from recovery drinks to products to help prevent or reduce sensitivity to salmonella infection. Our expertise and experience in product technology together with our knowledge on the effects of nutrition on human physiology enable NIZO food research to respond directly to changing consumer demands for new food products.”

ad.juriaanse@nizo.nl

Three ways to improve probiotics

Survival, shelf life & release

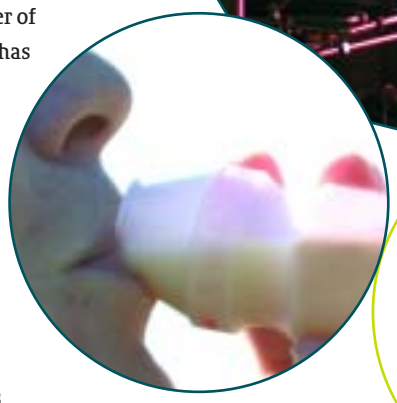
Many functional foods contain probiotics aimed at enhancing fitness and well being. The successful development of a probiotic product depends on a number of factors. First and foremost is the selection of a bacteria strain with the desired properties such as increased resistance to infection, immune modulation, vitamin production or even reduced risk to cardiovascular disease. Once a strain has been selected, the next step is to optimise the functionality of the food product.

Survival during drying

As a low-cost alternative to freeze drying, NIZO has developed a method of spray drying cultures under mild conditions with minimum losses of viability in wide range of strains. For specific applications, fluid bed drying or spray granulation can be used. Survival rates of up to 100 % have been achieved by optimising culture conditions and by making effective use of the bacterial stress response. These techniques have been demonstrated to reduce production costs by more than 50%.

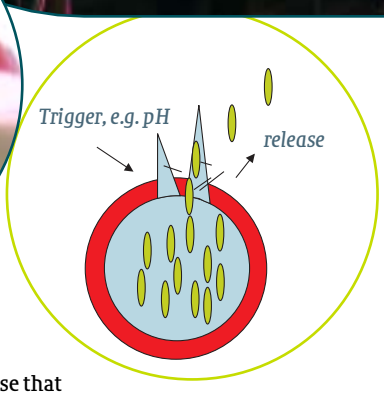
Shelf life

Another challenge in product development is to maintain the probiotic viability not only during drying but *also* during shelf life. Encapsulation can help to protect the culture against moisture and stresses. The success of this technique depends on the choice of matrix materials and processes. In a number of recent projects, NIZO food research has optimised the process and so reduced production costs by 50% while maintaining the shelf life within the required specifications.



Targeted Release

The probiotic has to be active at the required time and place. For encapsulated probiotics, this means controlled release. For intestinal delivery, for example, the encapsulate must remain stable in the stomach (low pH) but disintegrate in the intestines (high pH). NIZO uses technologies developed with a range of ingredients such as enzymes, flavours and health ingredients to control the release of encapsulated probiotics in the gut.



NIZO food research has all the technologies in house that are required to provide you with the optimal solution for your probiotic products – from health drinks to infant formula.

wouter.noordman@nizo.nl

New opportunities for vitamin enrichment of food products

Unlike many other food processing techniques, fermentation with lactic acid bacteria can greatly enhance the nutritional value of food raw materials/ingredients. Fermentation using specially selected lactic acid bacteria offers exciting new opportunities for developing naturally vitamin-enriched powder, for example milk or soy powder. This process can enrich a product naturally with B vitamins such as B2: riboflavin, B11: folate, and B12: cobalamin, organically bound selenium, and other health promoting ingredients. The powder can also be designed to contain probiotics by selecting the appropriate bacteria and by drying under specific conditions. Using a raw material with specific benefits, such as soy, the associated benefits of that raw material can also be claimed for the resulting product. The choice of raw material for fermentation and of functional ingredients will depend on your product marketing strategy.

NIZO food research has expertise in developing strains of lactic acid bacteria, fermentation, and downstream processing, as well as access to various strains and insight in their metabolism

NIZO is active in enriching natural products, such as milk and soy, with vitamins and other nutraceutical compounds using anabolic routes present in lactic acid bacteria and food-grade propioni bacteria. Specific methods have been developed to obtain strains with high levels of vitamin production and assays have been developed to screen for various functions related to probiotic traits. As well as developing the new functional ingredient, we can produce quantities of the ingredient in our food-grade pilot plant for use in marketing and for other commercial purposes.

wouter.noordman@nizo.nl

Increasing CLA levels in dairy

Many dairy companies consider or use CLA content claims for their products. CLA isomers (Conjugated Linoleic Acid) can come from various sources, one of which is milk fat. The unique composition of milk fat has been analysed by NIZO and the CLA concentration was found to be affected by the animal feed regime.

Using rapid screening techniques to establish the proportion of CLA and GC techniques for detailed analysis of the fatty acid composition, NIZO food research determined the effects of animal feed regimes on milk composition.

These studies have shown that a diet containing silage and concentrates results in milk with approximately 0.5 % CLA. This proportion can be increased to 2 to 3 % in free grazing without additional concentrates. Feed concentrates rich in linoleic and linolenic acid, such as linseed and sunflower seed, also increase the n-7 fatty acids concentration in milk.

The unique properties of milk CLA have led to the introduction of a range of new dairy products such as enriched milk and cheese.

geert.ellen@nizo.nl

NIZO Vision

Interview

Lipid Nutrition finds well being trend profitable

Lipid Nutrition, a division of Loders Croklaan in Wormerveer (Netherlands), is dedicated to R&D, production, marketing and sales of health promoting lipid ingredients. For over 110 years, Loders Croklaan has been in the business of oils and fats focusing on added-value products such as speciality fats for the confectionery and bakery industries. More recently, the focus has been on low trans products based on palm oil, with Loders Croklaan controlling the supply chain from palm tree to consumer .

Well being and health benefits have always been of major interest for Loders Croklaan. Since 1997, the company's nutritional activities have been concentrated in the Lipid Nutrition Division, and continue to be spearhead in the IOI organisation in Malaysia, to which Loders Croklaan was sold in 2002.

A.Visser, General Manager Lipid Nutrition

One of the first products developed by Lipid Nutrition was Betapol for use in baby foods and is very similar to the fat in breast milk. In Betapol, palmitic acid is in the sn-2 position and improves fat digestion and calcium absorption. Betapol has been marketed since 1998 and in 2003, was granted GRAS status in the USA by the FDA.

The company's product portfolio also includes Clarinol (weight management), Marinol (heart health), Membranol (liver, brain health) and Safflorin which boosts the immune system against colds and influenza.

"We are always on the look out for ingredients with proven health benefits for which we can develop sound patent (proprietary) positions. This is the only way to offer our customers added value and create a sustainable competitive edge", says Aat Visser, senior vice president and general manager of Lipid Nutrition. "We outsource most of our research on efficacy, safety and toxicity, and application to research companies such as NIZO food research and to universities and institutes. This enables our nutritionists and technologists to focus on initiating new processes and on developing ingredients. They also advise clients on using ingredients, and on legal implications of registering a functional product.

The partners that Lipid Nutrition selects for outsourcing the R&D obviously depend on the expertise they have to offer, but also on market and legal situations. The American market for example is leading in the development of dietary supplements. Consumer demand is high and the legal situation has been and still is more transparent than in Europe, which has led to a large and profitable market. Therefore quite some R&D is done at American universities and hospitals.

"We have used the expertise and experience of NIZO food research in substantiating claims on boosting the immune system to increase resistance to air-borne infections" continues Vissers. "Other recent projects entail processing of lipid supplemented dairy drinks to achieve a good taste and physical stability. Fish oil, for example, readily oxidises if appropriate measures are not taken. With support from NIZO food research, we have been able to solve this problem to a large extent in our heart health product, Marinol.

Vitamins on demand

With the steadily growing number of elderly people in our society, their well being is receiving more attention and provides new opportunities for the food industry. For example, research has shown that B vitamin deficiency in old age is a key risk factor in the development of cancer, cardiovascular and neurological diseases.

NIZO food research has introduced a new approach to food fortification which is based on fermentation. Many food grade bacteria used in food fermentation processes have the capacity to synthesize important B vitamins such as B2 (riboflavin), B11 (folate) and B12 (cobalamin). Food grade fermentative bacteria with a high natural capacity to produce B vitamins can be identified by means of high throughput screening and selection procedures. These procedures allow the selection of specific combinations of starter and adjunct cultures to produce fermented food products that are naturally enriched with B vitamins. NIZO uses non-GMO techniques, such as natural selection procedures and optimum fermentation conditions to improve the vitamin production capacity of specific strains of bacteria. This approach is now being used to enrich various fermented food products.

jeroen.hugenholtz@nizo.nl

Courtesy ladyline

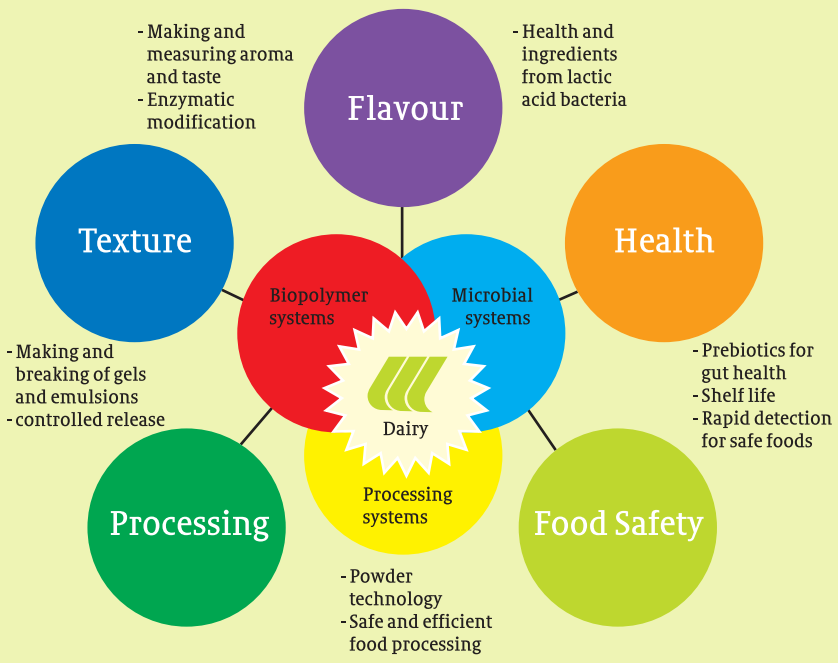
Safe dieting with natural L-tryptophan

Swings in moods and emotions that can make it difficult for some people to stick to a weigh-reducing diet may be caused by a low intake of L-tryptophan. This could be countered by increasing the intake of L-tryptophan, for example, in the form of an enriched beverage. To study the potential beneficial effects, our client Unilever commissioned NIZO food research to produce one kilogram of L-tryptophan. Based on our expertise in protein hydrolysis, processing and pilot plant production in our own facilities, NIZO food research was able to supply the required quantity to the extremely high purity specification.

This high specification was caused by an epidemic. Up until November 1989, L-tryptophan-containing food supplements were freely available in the USA. These supplements were based on L-tryptophan obtained by fermentation processes. FDA demanded a nation-wide recall of all over-the-counter food supplements.The epidemic was most probably was caused by impurities in the L-tryptophan.

A natural and safe source of L-tryptophan is milk protein, especially a-lactalbumin. This is an ideal starting material for the production of a L-tryptophan-rich ingredient. NIZO food research hydrolysed a-Lactalbumin using food-grade enzymes, and removed the residual protein and peptides by ultra filtration. Subsequent chromatography using an Amersham BioProcesser produced one kilogram of L-tryptophan to the required purity specification.

kees.olieman@nizo.nl



NIZO food research is a leading research company for the food and biotech industries. Based on 56 years expertise in dairy food we assist industry by solving their technological issues to improve flavour, texture, health, process efficiency and safety of food products.

With a unique team of experts both from industry and academia, and professional project management combined with the food-grade pilot plant facilities, NIZO food research is able to realise implementable solutions for its customers.

Ad Juriaanse member of the Food Valley board

'Conveniently located in the Food Valley', so states the NIZO website. Eurocommissioner Bosquin for research has suggested that Europe will be divided geographically into areas of expertise. The Netherlands has an obvious claim to the title Food Valley because of the concentration of expertise, food companies and science infrastructure here. Ad Juriaanse, Managing Director of NIZO food research and member of the Food Valley Board states:
"Participation in the Food Valley and other scientific networks enables us to build on our long tradition of combining excellent research and a high relevance to industry."

Calendar of events

2004

- **November 10** | NIZO training course 'Food textures: application and techniques'
  At NIZO food research, Ede, Food Valley
- **November 16-18** | NIZO food research presents its innovation services
  At the Health Ingredients trade exhibition (Hi), RAI, Amsterdam
- **November 17-18** | Innovation Seminars organized by NIZO food research in collaboration with CMP, organizer of the Hi trade fair.
  At the Health Ingredients trade exhibition (Hi), RAI, Amsterdam
- **November 23** | NIZO training course 'Hygienic Processing; design, cleaning and control in food factories'
  At NIZO food research, Ede, Food Valley
- **December 14** | Opening of the enlarged and improved food-grade Pilot Plant
  At NIZO food research, Ede, Food Valley

2005

- **March 7-11** | NIZO Dairy Master Class
  Modern dairy food topics for young professionals with a few years of experience in food science and technology
  Amsterdam
- **March 23 + 24** | NIZO Spring Courses (2 one-day courses)
  At NIZO food research, Ede, Food Valley
- **June 15-17** | 4th NIZO Dairy Conference 'Prospects for health, well-being and safety'
  www.nizodairyconf.elsevier.com
  At Papendal national sports centre, Arnhem.

For more information about any of the above events: contact us at info@nizo.nl

Colophon

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Website: www.nizo.com

Tel. +31 318 659 511 | E-mail: info@nizo.nl

Editorial team: Hendrik Prins, Miriam Korstanje, NIZO food research

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