

2nd Open SEAFOODplus Conference

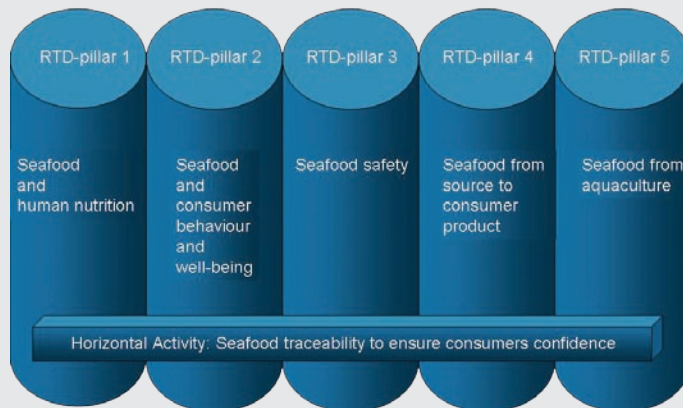
Steady stream of results from SEAFOODplus

Scientists from Europe's biggest seafood research project, the EUR26 million SEAFOODplus, gathered together in October for their second annual conference. With exciting new results from studies conducted over the last 12 months on fish proteins and their applications, patterns of seafood consumption, and traceability, the event proved once again to be a vital forum for information on cutting edge research in the seafood sector. Held this year in Granville, France, the conference was arranged back to back with the Health Sea International, a French symposium which also drew heavily on research conducted in SEAFOODplus. "With scientists from so many different scientific (and geographical) areas, the challenge is to integrate the research," said SEAFOODplus Project Coordinator Professor Torger Børresen in his welcome address.

In the latest edition of its annual report State of World Fisheries and Aquaculture the FAO mentions that since 1974 there has been a downward trend in the proportion of fish stocks offering the potential for expansion and that the proportion of stocks that are depleted and overexploited has increased from 10% in the seventies to 25% in the early 2000s. The information available reconfirms that globally marine capture fisheries have reached their maximum potential.

Fish protein isolates show promise as functional ingredients in foods

In this situation it becomes ever more important to extract the maximum possible value from the available resource and to explore the possibilities to better utilize byproducts from fish processing operations. These are in fact the objectives of the PROPEPHEALTH project within Pillar 4 of the SEAFOODplus Integrated Project led by Gudjon Thorkelsson from the Icelandic Fisheries Laboratories. Thorkelsson and his team of researchers from laboratories



across Europe are engaged in three areas: (1) in identifying and recovering substances from fish byproducts that have health value using mild refining techniques; (2) in developing new functional seafood ingredients; and (3) in developing uses for these ingredients both directly for the food industry and as new functional seafood products.

The functional properties of products include their water holding capacity, oil binding capacity, solubility, and foaming ability. The water holding capacity of a product determines its texture, juiciness and mouth feel as well as the loss of liquid during cooking and freezing

processes. Oil binding capacity is important, for example, in the production of sausages, while adding peptides that reduce the repulsion between oil and water is useful when making emulsions such as mayonnaise or butter. The ability to regulate a product's foaming capacity is of particular significance in the beer industry.

Soya and milk proteins currently more widely used

Functional ingredients derived from fish protein are not very common on the market which is dominated by soya, milk proteins and synthetic

chemicals. The PROPEPHEALTH team used 9 different protein hydrolysates from 3 manufacturers and derived from 7 species – shark, saithe, red bream, blue whiting, cod, salmon, and plaice. The composition (fat, protein, salt and water content) of the samples was measured. Further tests established that the samples all had good water holding capacity while the foaming and emulsifying abilities varied.

Future research will compare the samples derived from fish with other commercially available proteins such as from soya and milk. To evaluate the practical application of the fish protein samples, they were injected into chilled and frozen fillets which were then tested for yield and subjected to a sensory analysis. The results showed that the yield after two months of frozen storage was considerably higher than that of a control which had not been injected with the protein isolate. The yield after cooking was also higher than that from the control. The sensory analysis tested for juiciness, tenderness, flakiness, softness and salt taste, and revealed that injecting the protein isolates had no negative effect on the fillets, leading to the conclusion that protein isolates from fish have valuable potential as functional ingredients.

Taste, odour, and price of fish proteins are hurdles

Fish proteins are however being overshadowed by new food and nutraceutical products claiming functional properties. There is some use of fish proteins in dietary supplements as a gut health enhancer and in sports where it is used to build up muscle. But according to Sjöfn Sigurgísladóttir, also from the Icelandic Fisheries Laboratories, fish proteins need to demonstrate equal or better effects on health and body function and to meet demands for taste, convenience and price. Health and well-being are increas-

ingly driving the food industry and the boundaries between functional and regular foods are becoming noticeably fluid as, for example, the fat and sugar content of products is decreased and the use of whole grains increases. Consumer trends point towards more personalized nutrition aimed at the wellness of the individual, which could be low calorie, good for the heart, high calcium against osteoporosis, and low sugar for diabetics. These trends are borne out by market data. In the US, for example, the market for func-

foodstuffs and dietary supplements. Another issue is price. At between USD2.46 and USD56.87 for a pound (0.453 g) fish proteins are far more expensive than soy (USD0.38-1.64 per lb) or whey (USD1.27-3.89 per lb).

Products defined by consumer research

Another project (Project 4.4) within RTD 4 deals with the development of seafood products based on consumer perceptions and demands.

The exercise used a variety of tools including surveys, discussions, and interactive sessions to arrive at the final stage where product concepts were explored. Consumers were segmented based on consumer survey data and desirable and undesirable characteristics of seafood for each group was described. The result was 6 groups of consumers of which two were selected, the Practical and the Involved Healthy, for further discussions. These two represented groups with interesting opportunities for new convenient and healthy seafood products, how-

project CONSUMERPRODUCTS within Pillar 4. Another block relates to the use of new functional components in seafood product development. In her presentation Dr Mercedes Careche from the Instituto del Frío, CSIC in Spain described the development of seafood products by modifying the diet of the fish.

In this block fish feed enriched with selenium from vegetable sources was used to produce selenium enriched seafood. Selenium is an essential micronutrient for humans and



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tional products grew at an average of 7.2% over the period 1999-2004 according to a Datamonitor report (Insights into Tomorrow's Nutraceutical Consumers, Datamonitor, 4 October 2005). And sales of nutraceuticals are projected to reach USD25 billion in 2009 from USD18.9 billion in 2004.

Fish products are currently used extensively in animal feed. To enter the more lucrative ingredients market which is currently dominated by soy protein, whey ingredients, casein, and gelatin there is a need for new processing methods and new products, says Dr Sigurgisladóttir. Soy and whey protein are found in a range of products designed for human consumption, so why not fish proteins? A reason could be that more work needs to be done on fish proteins in order to resolve problems with taste and odour so as to be able to use them in

Called CONSUMERPRODUCTS the project is divided into 4 blocks one of which was presented at the SEA-FOODplus Conference by Dr Adriaan Kole from the Netherlands Institute for Fisheries Research. The overall objective of the project is the development of functional seafood products containing health promoting compounds that improve intestinal health, lipid metabolism and could potentially prevent certain cancers. In Block 1 consumer perceptions of healthy seafood are investigated and analysed to identify market opportunities for functional food products based on seafood. Closely involving consumers at each stage of the development will ensure that the final products reflect consumer requirements. The first phase involved identifying consumer attitudes to seafood, what were the positive aspects and the barriers to its consumption. Attitudes to the health and convenience aspects of functional food were also investigated.

ever each from a different perspective. The outcome of the discussion was for each group a list of general preferences involving concepts like natural, fresh, quick and easy, variation as well as several product ideas. In the final phase three factors, convenience, naturalness, and health ingredients, were selected to be tested in product concepts. A concept could be, for example, "fishmeat cuts for stir-frying, that don't fall apart. To the fish that was used for the cuts, dietary fiber has been added. Anti-oxidant dietary fiber is anti-carcinogenic." The product concepts will be further discussed with food technologists, consumer, and marketing experts to create the prototypes which will then be tested amongst consumers.

Enriching seafood products by modifying fish diets

Studying consumers to develop products is one of the blocks of the

it is thought that some organo-Se compounds have an anti cancer effect. The first step in the study was the production of selenium-enriched garlic, which accumulates those organo-Se compounds, by growing garlic on soil that had been enriched with selenium. Different types of garlic plants were used to establish which was the most efficient in the uptake of selenium. The garlic was then fed to African catfish by incorporating it in the feed. The selenium content of the fillets proved that selenium could be added to the fish diet and tests showed that 6 mg of selenium per kilo of feed was sufficient to reach the target concentration in the fillet. The presence of garlic in the feed did not hamper feed intake, however it has an impact on the taste of the fillet. More research is needed to establish whether the selenium compounds in the fillet have anti cancer properties and whether cooking, refrigerating or freezing has any significant effect on the compound.

Adding functional ingredients to waste fish flesh

Functional seafood products can also be obtained from underutilized fish or waste flesh. Restructured products technology can be used to modify texture, colour, odour and appearance, and the product can in addition be combined with functional ingredients such as antioxidant dietary fibre, which improves intestinal health and prevents lipid oxidation of the restructured product. Researchers combined dietary fibres derived from red and white grape, seaweed and wheat with mince from horse mackerel. The addition of grape or wheat fibres improved yield, and prevented deformation as well as breakage of the coating in battered products. In addition the grape fibres preserved the mince from oxidation though they also tended to impart a colour to the product. Tests were also performed on surimi to which wheat fibre and red grape fibre was added. The surimi showed, in the presence of fibre, less elasticity, while hardness and water holding depended on the formulation. Future work will identify antioxidant dietary fibres that give less colour and evaluate the changes to these beneficial compounds due to household cooking and storage. Finally real consumer products have to be made based on the prototypes that were tested.

Analysis of seafood consumption patterns can lead to better products

The factors influencing seafood consumption are many and varied. Analysing them can help companies design better products with wider acceptance amongst consumers as well as market their products better amongst different consumer groups. RTD 2 of the SEAFOODplus project looks at current patterns of seafood consumption across Europe with the objective of using the information to get people to eat more seafood.



The Third SEAFOODplus Open Conference

30 May 2006,
Conference Center Arktika,
Tromsø, Norway

Featuring the latest new and innovative results from the last 2.5 years of research.

Wim Verbeke from Ghent University in Belgium presented some of the results of his team's analysis of data collected from a survey spread over 5 countries covering 4,786 respondents.

Analysing different factors such as behaviour, perception, use and trust of information sources, interest in traceability, and socio-demographics the researchers concluded that traceability in the absence of quality verification has little value to consumers. They also found that of all the information provided the most commonly used was expiry date, price, species name, and weight. Capture area, brand, nutritional information and date of capture were less relevant to buyers.

The research also demonstrated that customers were interested in quality and safety guarantees for the product, recipes and methods of preparation as well as whether the product was environmentally friendly, while more technical information such as batch identification number, whether the fish was farmed, and information on fish welfare was given a lower rating. For his presentation Wim Verbeke won the prestigious award for best speaker at the SEAFOODplus conference.

Good fish welfare gives a better product

Studies suggesting that information on fish welfare is near the bottom of consumers' priorities may give credence to aquaculture's detractors, who argue among other things, that today's intensive farming does not take into account the welfare of the fish. RTD 5 of the SEAFOODplus project will address this concern, finding a compromise between efficient production and the requirements of other stakeholders for fish that are reared under ethical conditions. In his presentation at the SEAFOODplus conference the coordinator of RTD 5 Børge Damsgård from the Norwegian Institute of Fisheries and Aquaculture Research showed that the two are not necessarily mutually exclusive – a "happy" fish is a healthy fast growing animal, and good welfare practices may actually increase muscle quality and freshness. To be able to monitor the welfare of farmed fish new non-invasive technologies are being developed such as smart-tags which will monitor certain parameters such as respiration rate under specific conditions.

Smarter smart-tags

Smart-tags or Radio Frequency ID (RFID) tags are expected to replace or at least supplement what is currently the most common technology for the automatic identification of items, the bar code. They have several advantages over bar codes including the fact that they are smaller, do not require a direct line of sight to be read and multiple tags can be read simultaneously. Large retail chains including WalMart, Tesco, and Metro have introduced pilot projects where suppliers deploy RFID tags at pallet and increasingly at case level, said Gunnar Senneset, a researcher at SINTEF Fisheries and Aquaculture in Norway. Project 6.2 under the traceability activity is

evaluating new technology for the automatic identification and capture of data. However, he cautions that the seafood environment is particularly challenging for the tags and the readers, although rapid strides are being made. In experiments with RFID tags on returnable plastic cases on conveyors, the percentage of reading errors dropped from 30% in December 2004 to about 2% in September 2005. There is also increasing focus on RF based sensors and sensor networks. RF temperature loggers are particularly interesting for the seafood industry. They offer the advantages that they can be read without breaking the pallet and opening the case. Readings can be made while loading or unloading the pallet allowing deviations from the permitted temperature range to be picked up immediately. Currently a number of factors such as the location of the logger within a case, the location of the case within the pallet, the distance of the logger from the reader, and the surrounding environment all have an impact on the results. These technical challenges as well as others will be addressed in SEAFOODplus and other related projects.

Technology plays a key role in the seafood sector. Not only in the tools used by the researchers, but also in applications being developed for the industry. In his concluding remarks Professor Børresen noted that if the cost of technology, whether equipment to analyse proteins, or the price of RFID tags, continued to fall the benefits would be felt throughout the industry.

Results from the conference are being disseminated through the SEAFOODplus newsletter and from the project website www.seafoodplus.org. The next wave of new and innovative results to emerge from SEAFOODplus will be presented at the third open conference to be held on 30 May in Tromsø, Norway. ■