

Results of the **SEAFOODplus project**

Adding taurine increases the health value of seafood products

No one seriously doubts that seafood products are healthy, valuable foods. Nearly everybody knows that they contain Omega 3 fatty acids (EPA 20:5, DHA 22:6), numerous vitamins, plus minerals and trace elements. In contrast, hardly anyone knows that seafood also contains other important substances: taurine, for example, whose significance was for a long time disputed. New findings from the SEAFOODplus project have now revealed, however, just how important taurine is for our health.

The body of an adult contains about 70 g of the amino acid taurine. It is mainly found in the muscles and the brain, in the heart and in the blood. White blood cells, too, have high concentrations of taurine. It is particularly important for the development of the brain, the retina of the eye, and the liver of the newly born.

It is only a few years since scientists began re-evaluating the relevance of taurine for the human organism. Taurine facilitates the passage of numerous substances into the bloodstream and enhances fat metabolism (encourages the burning of fats). Taurine also plays an important



Tuna cubes enriched with taurine.

role during liver metabolism: in combination with bile acids it forms bile salts which enable good bile flow. Taurine has a

positive effect on the re-absorption of fat soluble vitamins and influences the serum cholesterol level.

In the face of the immense significance of taurine it is not surprising that various SEAFOODplus subprojects involve taurine. The first results were presented at the 3rd open conference in Tromsø.

Reduction of serum cholesterol

Edel O. Elvevoll (University of Tromsø) presented the results of a study on the influence of processing on the nutritional and health value of seafood which she had conducted together with Bjarne Østerud and other scientists. Due to the general trend towards convenience products processing methods are becoming increasingly important. On the one hand, processing can contribute towards making a product safer, it can make it taste better, and it can lengthen its shelf-life. On the other hand, however, it can also change or even destroy important ingredients as a result of temperature, storage or other influences. The

Multiple uses of taurine

Seen as a dispensable by-product of cysteine metabolism, the significance of taurine was underestimated for a long time. Because human adults can produce taurine themselves from the amino acids cysteine and methionine and vitamin B6 it was assumed that it was not necessary to supplement taurine intake with foods. At most it was thought that a taurine supplement might be useful in the case of vegetarians because taurine is only present in animal proteins (fish, eggs, meat, milk) but not in plants. Among its numerous virtues taurine protects the heart muscle from potassium losses which can

lead to pulse irregularities. The positive effects of taurine in the prevention and treatment of cardiovascular disease, oedema, high blood pressure, and low blood sugar levels have been frequently confirmed. It is presumed that a lack of taurine in the brain can increase the likelihood of epileptic fits.

Taurine level can be used for diagnostic purposes, too. Diabetes, intestinal disorders, physical and emotional stress, zinc deficiency, and regular alcohol consumption can lead to an increase in taurine excretion via the urine. An increased taurine level

in the spinal fluid is considered to be an indication of possible neurological damages in the brain. Because the taurine level can be measured easily and cheaply it is an additional indicator for physicians to prescribe the right medication quickly. In clinical practice taurine is being used increasingly for preventive purposes. Scientists recommend for example that patients with a reduced taurine level, which can occur in traumatised patients, or following radiation therapy or chemotherapy, after operations or sepsis, should be given additional taurine with their food to compensate.



Edel O. Elvevoll (University of Tromsø): Taurine may also be used as a marker of "destiny" of "small" water soluble molecules during processing and preparation.

extent of these changes is dependent on the raw material concerned and on the processing conditions.

For their study the researchers had divided 110 test persons into three almost equal groups. All persons involved in the test ate



Narcisca M. Bandarra (IPIMAR): At present there is still no recommended daily intake of taurine. Taurine values range between 8.4 (city area) and 760 mg/day (fishing area).

250 grams of fish pâté per week for a period of seven weeks, equal to a daily intake of 36 g. In addition, the three groups were also given different quantities of Omega 3 fatty acids and taurine to simulate a seafood-rich diet. The additives were given as follows:



Ronan Gormley (Ashtown Food Research Centre, Dublin): Tumbling and injecting are both suitable routes for introducing taurine into tuna fish cubes and salmon portions.

- Group 1 received an additional 1 g Omega 3-fatty acids / day
- Group 2 received an additional 1 g Omega 3-fatty acids / day and 425 mg taurine / day
- Group 3 received no further additives (control group)

Evaluation of the results showed that the second group (with additional taurine intake) had the best blood values. The cholesterol value had fallen by 4%, the HDL value ("good" cholesterol) had risen by 6%, and the LDL ("bad") cholesterol had fallen by 8%. These are clear signs that support the benefit of a taurine-rich diet – even if the scientists interpret their results cautiously and demand further testing to confirm the results.

Fish is healthy and protected against cardiovascular disease and thrombosis, Elvevoll assured her audience. However, anyone who hoped to confirm their findings using the Eskimos in Greenland generally overlooked the fact that Eskimos do not only eat the fillet but the whole fish – and pref-




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erably raw. The health value of the individual organs and body parts of fish varied greatly. The muscle of the fillet contained only one third to one sixth as much taurine as the liver, heart, intestine or other internal organs. Apart from that, a considerable share was destroyed by heating during preparation of the fish. Modern culinary trends such as sushi and sashimi were thus very welcome from the viewpoint of food scientists. Wherever possible, when preparing seafood products they should be heated for as short a time as possible and at not too high a temperature.

Narcisa M. Bandarra (IPIMAR) came to similar conclusions. She presented a study conducted by an international team of researchers. The group had investigated how the composition and nutritional value of seafood products changed during household preparation. They had chosen three typical preparation methods for comparison: cooking in aluminium foil, boiling, and deep-frying. As was to be expected there were partly very big differences, for example in the fat content (which increased by about 6% when the

Taurine – the basics

There are probably not many substances whose biological significance was contested for so long or as vehemently as that of taurine. The chemists Gmelin and Tiedemann isolated taurine (2-aminoethanesulfonic acid) from ox bile for the first time in the year 1827. Taurine is an organic acid which bears an amino group and is thus usually allocated to the amino acids. In a strictly chemical sense, however, it is not a true amino acid because actually it lacks the requisite carboxyl group which is typical of the amino acids and is thus unable to form peptides.

Taurine is often used as an additive in energy drinks. Although it does not itself have any energizing or activating effect it makes it easier for a lot of substances such as caffeine to pass into the bloodstream and thus increases their effectiveness.

product was deep-fried) or in the water content which determines the succulence of the product (fish loses least moisture and remains most succulent when cooked in foil). The content of free amino acids is also influenced by the cooking method. Boiling and deep-frying lead to a loss of at least half of the taurine content. In contrast, when cooked in foil over 60% of the taurine is preserved.

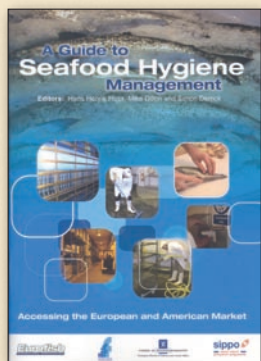
If taurine is so important and so valuable why not develop

new seafood products that are enriched with taurine? Ronan Gormley (Ashtown Food Research Centre, Dublin) had taken this approach with his research group. Seafood products that are tailor-made to consumer needs are known to be one of the expressed aims of SEAFOODplus. With taurine-enriched fish, functional food would undoubtedly be able to offer additional health benefits. Gormley and his team first tested with which methods various fish species (salmon,

tuna, flatfish) could be most effectively enriched with taurine. Whilst taurine injection led to an uneven distribution of the substance in the fillet, more homogeneous results were attained in a tumbler. Basically, however, both methods are suitable. Subsequently, the researchers tested the effects of different storage methods (deep freezing, chilled, freeze-chilled: 5 days frozen, then 6 days' storage at 4°C) on the stability of the taurine content. Taurine content was constant in air versus MAP stored plaice during 10 days at 2-4°C. During subsequent testing to ascertain which preparation method had the least influence on taurine content it was seen that grilling gave higher taurine retention in tuna cubes than microwaving or steaming. During a professional tasting session it was finally examined whether untreated and taurine enriched albacore tuna differed in flavour. The testers could not taste any differences at all which is sure to further enhance the acceptance of enriched products during marketing.

Dr. Manfred Klinkhardt

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