Risk Assessment of "Other Substances" – Collagen from Fish Skin

Trine Husey, Ellen Bruzell, Berit Granum, Ragna Bogen Hetland, Jens Rohloff, Trude Wicklund and Inger-Lise Steffensen

1Norwegian Scientific Committee for Food Safety (VKM), Norwegian Institute of Public Health (FHI), Norway.
2Norwegian Scientific Committee for Food Safety (VKM), Nordic Institute for Dental Materials, Norway.
3Norwegian Scientific Committee for Food Safety (VKM), Norwegian University of Science and Technology, Norway.
4Norwegian Scientific Committee for Food Safety (VKM), Norwegian University of Life Sciences, Norway.

Authors’ contributions

This work was carried out in collaboration between all authors. The opinion has been assessed and approved by the Panel on Food Additives, Flavourings, Processing Aids, Materials in Contact with Food and Cosmetics of VKM. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/EJNFS/2018/41555

Received 9th February 2018
Accepted 20th April 2018
Published 1st May 2018

ABSTRACT

The Norwegian Scientific Committee for Food Safety (Vitenskapskomiteen for mattrygghet, VKM) has, at the request of the Norwegian Food Safety Authority (Mattilsynet; NFSA), assessed the risk of "other substances" in food supplements and energy drinks sold in Norway. VKM has assessed the risk of doses in food supplements and concentrations in energy drinks given by NFSA. These risk assessments will provide NFSA with the scientific basis while regulating the addition of “other substances” to food supplements and other foods.

"Other substances" are described in the food supplement directive 2002/46/EC as substances other than vitamins or minerals that have a nutritional and/or physiological effect. It is added mainly to food supplements, but also to energy drinks and other foods. VKM has not in this series of risk assessments of “other substances” evaluated any claimed beneficial effects from these substances, only possible adverse effects.

The present risk assessment is based on a previous risk assessment of collagen from fish skin and articles retrieved from literature searches.

*Corresponding author: Email: tron.gifstad@vkm.no;
According to information from NFSA, collagen from fish skin is an ingredient in food supplements sold in Norway. The food supplements on the Norwegian market may contain collagen hydrolysate. NFSA has requested a risk assessment of 750 mg/day of collagen from fish skin in food supplements. The intake of collagen from fish skin was estimated for the age groups children (10 to <14 years), adolescents (14 to <18 years) and adults (≥18 years).

Other sources of collagen from fish skin, such as foods and cosmetics, have not been included in the present risk assessment.

Collagen is the major insoluble fibrous protein in the extracellular matrix and in connective tissue in vertebrates. The various collagens and the structures they form all serve the same purpose, to help tissues withstand stretching. All collagens contain an abundance of the amino acids glycine, proline and hydroxyproline. Fish gelatins are produced by extraction and hydrolysis of fibrous, insoluble collagen from skin or bones. Collagen and gelatin hydrolysate are processed forms, which are more water-soluble.

No studies on metabolism of fish collagen, gelatin or collagen/gelatin hydrolysates in animals or humans have been found in the literature. However, as collagens or gelatins are proteins of variable solubility that will be partly absorbed from the gastrointestinal tract after digestion, it is anticipated that the absorbed parts will become building blocks of new proteins in the body. Hydroxyproline, which is a non-proteinogenic amino acid, will be metabolized to glycine and pyruvate and eventually oxidized.

There were no toxicity studies found on fish collagen or gelatin or collagen/gelatin hydrolysates in the general human population. A 2-year oral toxicity study in rats on effects of marine collagen peptides prepared from chum salmon (Oncorhynchus keta) skin showed that there were no adverse effects of collagen up to 8.6 g/kg bw per day, which was the highest dose tested. One study on chromosomal aberrations and another study on allergic sensitization in Guinea pigs reported no effects of fish collagen.

The value used for comparison with the estimated exposure in the risk characterisation is the NOAEL of 8.6 g/kg bw per day taken from the chronic oral toxicity study in rats.

From a daily dose of 750 mg collagen from fish skin, the exposure is 17.3 mg/kg bw per day for children (10 to <14 years), 12.2 mg/kg bw per day for adolescents (14 to <18 years) and 10.7 mg/kg bw per day for adults (≥18 years).

The margin of exposure (MOE), the ratio of the NOAEL value to the exposure, was calculated. An acceptable MOE value based on an animal study is ≥100. For a daily intake of 750 mg/day of collagen from fish skin, the MOE values were above 100 for all age groups.

VKM concludes that it is unlikely that 750 mg/day of collagen from fish skin in food supplements causes adverse health effects in children (10 to <14 years), adolescents (14 to <18 years) or adults (≥18 years).

Collagen from fish has been identified as a fish allergen. Persons allergic to fish are therefore vulnerable and might experience adverse effects from fish collagen. Two studies in humans indicate that individuals allergic to fish may also have allergic reactions to fish gelatin, which is processed fish collagen.

**Keywords:** Adverse health effect; collagen from fish skin; gelatin from fish skin; hydrolysed collagen/-gelatin; negative health effect; Norwegian Food Safety Authority; Norwegian Scientific Committee for Food Safety; other substances; risk assessment; VKM.

Available: [https://vkm.no/download/18.761cd04215dabe8a9e82c2d/150279765030515/d671b34aa6.pdf](https://vkm.no/download/18.761cd04215dabe8a9e82c2d/150279765030515/d671b34aa6.pdf)

**ISBN:** 978-82-8259-255-0
NOTE:

This work was carried out in collaboration between all authors. The opinion has been assessed and approved by the Panel on Food Additives, Flavourings, Processing Aids, Materials in Contact with Food and Cosmetics of VKM. All authors read and approved the final manuscript.

Competence of VKM experts: Persons working for VKM, either as appointed members of the Committee or as external experts, do this by virtue of their scientific expertise, not as representatives for their employers or third party interests. The Civil Services Act instructions on legal competence apply for all work prepared by VKM.


COMPETING INTERESTS

Authors have declared that no competing interests exist.