

## Skretting document on Astaxanthin

The pink color of salmon flesh, wild or farmed, results from the retention of carotenoids in the fish flesh. Astaxanthin is a naturally occurring carotenoid and is the major carotenoid naturally found in wild salmon and crustaceans (shrimp, lobsters) and is responsible for their pink-red pigmentation.

Pigments are biological substances that impart color to the tissues of organisms. Carotenoids are classed as pigments. Carotenoids are naturally present in the diet of most animals. Apart from their natural coloring effects, some have important biological roles.

Salmon cannot make their own astaxanthin, they consume it via their diet. The wild salmon diet includes krill, zooplankton, small fish and crustaceans all of which naturally contain astaxanthin.

The main source of astaxanthin used by the aquaculture industry is synthesized, yielding a molecule that is identical to that found in nature. There is no difference between natural and synthetic astaxanthin. Their chemical structures are identical.

Carotenoids are a naturally occurring group of pigments. More than 600 naturally occurring carotenoids have been identified in plants and animals. They are responsible for the colors of many fungi, fruits (tomatoes, paprika, citrus fruits), flowers (marigold), insects (ladybirds), birds (flamingos), fish (salmon, goldfish) and they produce the colors of the autumn leaves.

As salmonids are unable to synthesize astaxanthin, they must consume it as part of their diet. Astaxanthin is approved for addition to the diet of farmed salmonids, to meet the fish's nutritional needs.

### **Fish health benefits**

Crustaceans and krill contain carotenoids that are absorbed by the salmon and deposited mainly in the muscle but also in the skin and in the eggs. There is evidence to show that there are several health benefits from the pigments for salmon and trout. The primary role of astaxanthin is as a potent antioxidant. Astaxanthin is also a pro-vitamin A source. These two functions help protect tissues against oxidative damage, stimulate the immune system, and improve fertility and growth.

### **Statutory limits**

The EU Regulation (2015/1415) authorizes astaxanthin as a feed additive for all fish, crustaceans and ornamental fish. The EU Commission has adopted a Directive to specify the authorized level of astaxanthin in feed as a maximum of 100 mg/kg. No MRL has been set for salmon flesh since the concentration of astaxanthin is limited naturally, reaching a plateau at near the maximum level proposed for use.

The abstract of the scientific opinion;

## SCIENTIFIC OPINION

### Scientific Opinion on the safety and efficacy of astaxanthin (CAROPHYLL® Pink 10% CWS) for salmonids and ornamental fish<sup>1\*</sup>

EFSA Panel on Additives and Products or Substances used in Animal Feed (FEEDAP)<sup>2,3</sup>

European Food Safety Authority (EFSA), Parma, Italy

#### ABSTRACT

Astaxanthin is a pigmenting carotenoid naturally occurring in plankton, crustaceans and fish. The FEEDAP Panel considers synthetic astaxanthin safe for salmonids up to 100 mg/kg complete diet. This conclusion is extrapolated to ornamental fish at the same dose. Based on a BMDL<sub>10</sub> of 3.4 mg/kg bw per day (calculated for liver hypertrophy in female rat in a carcinogenicity study) and applying an uncertainty factor of 100, it is possible to set an ADI of 0.034 mg ATX/kg bw (equivalent to 2.0 mg ATX per 60 kg person per day). The use of astaxanthin up to the maximum permitted dietary level for salmon and trout is of no concern for the safety of the consumer. Skin or eye exposure to astaxanthin is unlikely to be irritant to workers. Sensitisation is unlikely to occur subsequent to skin exposure. The risk of inhalation toxicity is minimal for the formulation under assessment, but the risk for other formulations cannot be assessed. The FEEDAP Panel considers that the use of synthetic astaxanthin (100 mg astaxanthin/kg fish feed) does not pose a significant additional risk to the environment compared with natural astaxanthin. Astaxanthin is efficacious in colouring the flesh of salmonids and in pigmenting the skin of ornamental fish.

© European Food Safety Authority, 2014

The full EFSA opinion can be found at: <http://www.efsa.europa.eu/en/efsajournal/pub/3725>