SeaHealthUCD

Issue 48: June 2025: This e-bulletin is aimed at personnel in fisheries & aquaculture, at fish packers, processors, retailers, health professionals & finally, consumers.

Astaxanthin - - a powerful antioxidant

Astaxanthin, a xanthophyll carotenoid, is the most abundant carotenoid in marine organisms. It was first isolated from lobsters by Kuhn and Soerensen in 1938. It is a strong antioxidant and is circa 6000 times more potent than vitamin C and about 100 times more potent than vitamin E. Astaxanthin is produced by algal species including *Haematococcus pluvialis*, *Chlorella zofingiensis* and *Chlorococcum,* and also by the yeast *Phaffia rhodozyma* (Boussiba, 2000). Astaxanthin confers the rich pink colour observed in various aquatic species including salmonids and crustaceans. Sea creatures cannot produce astaxanthin themselves and must obtain it from their diets, which include zooplankton, prawns and krill (Sztretye, et al., 2019). Astaxanthin has low bioavailability but a recent study suggests a range of procedures for improving bioavailability and furthering its potential as a nutraceutical (Wang et al., 2025; Bjørklund et al., 2022). Astaxanthin is a fat soluble compound and its bioavailability is enhanced in the presence of oil as when consuming salmonids; adding virgin olive oil to accompanying vegetables will further increase bioavailability.

Health aspects of astaxanthin

The many health aspects of astaxanthin have been reviewed by Bjørklund et al., 2022. They include the following: (i) seniors become more sensitive to oxidative stress and are prone to diseases caused by the lack of antioxidant protection; astaxanthin has a significant role in the suppression of oxidative stress and so dietary supplementation at any age can promote better health; (ii) astaxanthin supports normal healthy skin by improving skin elasticity and moisture thereby reducing wrinkle formation (Singh et al., 2020) (iii) astaxanthin can cross the blood-brain barrier and its intake, via diet and/or supplementation, could have a healing effect on brain ageing, cognitive function and the central nervous system (Fu et al., 2023).

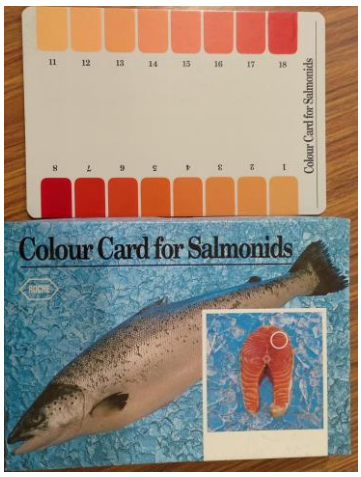
Astaxanthin levels in salmonids

Astaxanthin in the feed is used to colour the flesh of farmed salmonids whereas wild salmon source astaxanthin from marine creatures via their diet. Ambati et al. (2014) have shown the following astaxanthin levels (mg/kg flesh) in salmonids: sokeye (38), farmed rainbow trout (23), coho (21), farmed Atlantic salmon (8), wild Arctic char (7), farmed Arctic char (6), pink (6), chinooking (5), chum (4) and masu (4). Sutliff et al., 2020 showed that Astaxanthin concentration was higher in fresh salmon than in pre-packed and canned. However, astaxanthin levels were similar between fresh wild Pacific and fresh farmed Atlantic salmon and were unaffected by mode of cooking. Astaxanthin concentration in plasma

showed a 2-fold increase after farmed Atlantic salmon consumption and may be a biomarker of salmon consumption (Sutliff et al., 2020).

Surface colour of salmon

Red colour of salmon products is important for consumer acceptance. However, surface colour values of salmon were not correlated with astaxanthin concentration (Sun et al., 2023). ROCHE colour cards have been used routinely for many years to quantify the surface colour of salmonids. Recent spot checks of salmon colour by the author in a Dublin supermarket showed the following ROCHE card readings: organic farmed salmon darne (4-5), non-organic farmed salmon darne (3-4), organic farmed salmon side (6); non-organic farmed salmon side (4), farmed sea trout side (7). As expected organic salmon was redder and commanded a much higher price than non-organic while farmed sea trout had the reddest flesh of all. Hue angle values (degrees) for colour card numbers were quantified using a Minolta colour meter and were as follows: 55° (card 1), 50° (card 2), 45° (card 3), 40° (card 4), 35° (card 5), 29° (card 6), 26° (card 7) and 23° (card 8). The lower the hue angle the redder the colour.



Conclusions

(i) Astaxanthin is a powerful antioxidant and nutraceutical with positive health benefits; (ii) consuming salmon raises plasma astaxanthin levels; (iii) salmon surface colour is not correlated with astaxanthin content; (iv) ROCHE colour cards are a practical measure of salmon colour.

References:

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