SeaHealth UCD

Issue 5: January, 2013: This e-bulletin is aimed at personnel in fisheries & aquaculture, at fish packers, processors, distributors, retailers, and finally consumers.

Global Fish Oil Summit in Ghent

The summit took place in Ghent, Belgium (April 2012) and focused on the shortage of fish oils for use in aquaculture, pharmaceutical applications and in food products. Fish oils are the major source of the omega-3 PUFAs EPA & DHA which are linked to improved cardiovascular health and cognitive performance (see Issues 2-4 of SeaHealth–ucd). There were 15 lectures, four debates and 53 attendees from 19 countries. Some outputs were as follows:

Scope of aquaculture

Only 2% of global food comes from 'water', the remainder from the land. However, 16% of global protein is from 'water'. Most aquaculture production is in East Asia (90%) followed by Europe (4%), Africa (1.5%) and USA (1.2%). Aquaculture can be divided into food aquaculture (i.e. feeding coastal/rural families) and business aquaculture (i.e. business driven). Other sub divisions are fat aquaculture, i.e. supplying food to fish in cages, and extractive aquaculture where seaweeds and molluscs are mined for bio-actives. About 50% of seafood is farmed (FAO, 2008) and circa 30 million tonnes extra will be needed by 2020, i.e. an increase of 50%. Major changes are required if this increase is to be produced by sustainable and environmentally friendly means.

Fish oil shortage for aquaculture

The shortage of fish oil is pressurising salmon farmers to use increasing proportions of vegetable oil in fish feed. Potentially, this could lead to a consumer backlash as they purchase farmed salmon to obtain EPA & DHA in their diet. Feeding vegetable oil reduces the amount of omega-3s in salmon but also adversely affects the omega-3/6 ratio which is too low in the human diet in developed countries due to the over-consumption of vegetable oils. DHA can be produced in quantity by fermentation of micro-algae (oil contains 48% DHA; Omega-3 Directory; available at www.epax.com). However, this product is too costly for fish farm applications and is used as bio-fuel or in pharmaceutical products. Omega-3s thus produced are purer than those in crude fish oil, so less is needed to produce the same function/benefit.

Fish oil market

The overall market for fish oils is huge with big demands from aquaculture and the pharmaceutical industry. For example, €18.6 billion per annum is spent on EPA & DHA in fortified items/tablets; older people are more likely to use supplements. EPA/DHA for heart health is well known to consumers but DHA for brain development/health is less well known. DHA is required for **(i)** maternal health, **(ii)** infant formulae, **(iii)** children & adolescents, **(iv)** adults (health needs change with time).

Fish oil: - managing a limited supply

More effort must be made on conservation of oily fish in European waters, especially mackerel and herrings, as these are excellent sources of EPA & DHA. Conservation should be based on the importance of species for their oil rather than as just another fish species that needs to be conserved. Anchovies and sardines are the main species harvested for the production of oil needed for salmon farming; however, Antarctic krill also have major potential as an oil source. About 2-4kg of anchovies are needed for the production of 1kg of farmed salmon. This is not sustainable and anchovy and sardine stocks will be exploited to extinction as the requirements for more fish oil increase. These small species are also an essential feedstock for larger wild fish.

Summary and ways forward

- The growing demand for oils rich in EPA & DHA will continue. Both salmon farming and nutraceutical markets are expected to grow strongly over the next few years while fish oil production is expected to remain largely static.

- Novel sources of EPA & DHA are expected to yield <50k tonnes of extra oil by 2017 – most of this coming from algae.

- Integrated production systems embracing farming of fish, molluscs and macro-algae side-by-side where the molluscs use waste from the cages and macro-algae utilise some of the other by-products may be one of the ways forward.

- Vegetable oil seeds which have been genetically modified to produce EPA & DHA in quantity also have potential. Currently there is no commercial production of plant based EPA & DHA but the two species closest to market are soy and rapeseed (canola)

- New and modified fermentation technologies which will reduce the cost of producing EPA & DHA from micro-algae are required; this is being extensively researched worldwide.

- Increase the use of krill as a source of EPA & DHA. Antarctic krill biomass is estimated at 200-400 million tonnes; yet current catches are about 200k tonnes per annum.

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