

The role of seafood in a healthy New Zealand Diet

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Overview: Nutrition

- Seafood is an excellent source of protein
- Seafood is low in fat and SFA
- Key micronutrients include iron, iodine, zinc and selenium
- Fish eaten with bones also provide calcium
- Fish also contains B vitamins, and fish oil contains the fat soluble vitamins A and D

Overview: health benefits

- Cardiovascular disease (CVD)
- Diabetes
- Weight management
- Cancer
- Inflammatory conditions:
 - Asthma
 - Arthritis
 - Crohn's disease

Overview: Child development

- Pregnancy and foetal development
- Cognitive development of children
- Learning and behaviour
 - Attention-deficit hyperactivity disorder (ADHD)
 - Developmental coordination disorders (DCD)
 - Autism
 - Improved learning in healthy children?

Overview: Adult mental health

- Mood disorders
- Depression
- Schizophrenia
- Cognitive function in older people
- Dementia
- Increased brain performance in healthy adults?

New Report

**The Role of Seafood in a
Healthy New Zealand Diet**

By Amanda Johnson

In Press

History

- Humans have eaten seafood since the beginning of recorded history
- It is hypothesised that consumption of fish and other seafood provided the means for initiating and sustaining growth of the cerebral cortex in hominids
- The enlargement of the hominid brain culminated in the emergence of *homo sapiens*
- Edible fish species have been found in the East African Rift Valley lakes around which *homo sapiens* arose and eventually dominated

Key nutrients in seafood

- Protein
- Very long chain *omega-3* fatty acids
 - Eicosapentaenoic acid (EPA)
 - Docosahexaenoic acid (DHA)
- Vitamins
 - B vitamins
 - Fat soluble vitamins A and D
- Minerals
 - Iron, zinc, selenium, iodine, calcium

Protein

- Fish is a good source of high biological value protein
- Most finfish provides around 20-25g protein per 100g portion
- Cooked fish is low in connective tissue, so is easy to chew and digest

Fat

- White fish contains little fat; oily fish is slightly higher in fat
- Most of the fat present is in the form of the healthy LC*n*-3 PUFA
- Fish and other seafood are the richest dietary sources of LC*n*-3 PUFA

Vitamins

- Fat soluble vitamins A and D
 - Small amounts found in oily fish and the liver of white fish
- B vitamins
 - Fish is a good source of vitamin B₁₂ (100g of tuna or salmon provide 100% of the daily requirement for this vitamin)
 - Tuna is a good source of niacin
 - Seafood also provides small amounts of thiamin, riboflavin and vitamin B₆

Minerals

- Iron
- Zinc
- Selenium
- Iodine
- Calcium

Iron

- Iron is important for the production of red blood cells and enzymes
- Iron in fish is present in the haem form, which is easily absorbed
- Dark-fleshed fish are the best sources of iron
- This is an important nutrient since deficiency is prevalent in New Zealand among some population groups, especially infants, toddlers and women of childbearing age

Zinc

- Zinc is important for the production of enzymes, for optimal growth and development in children, for healthy pregnancy outcomes, and for healthy immune function
- Absorption of zinc is higher from animal foods such as fish
- Oysters are a particularly good source of zinc

Selenium

- Selenium is an antioxidant and is involved in thyroid metabolism, it is also needed for healthy immune function
- Fish and seafood are a major contributor to selenium intakes, providing 29% of adults' intake in New Zealand
- Among children aged 5-15, fish and seafood provide 8.6% of selenium, but when fish consumers are analysed separately, this increases to 65%
- The selenium status of New Zealanders remains low compared with other countries
- The clinical consequences of marginal selenium status are unclear
- The promotion of selenium-containing foods such as seafood should be encouraged, particularly in vulnerable groups such as infants and young children, women of childbearing age and older people

Iodine

- Iodine is needed for growth and metabolism
- Iodine deficiency leads to goitre and hypothyroidism, as well as impaired mental and motor development
- The major sources of dietary iodine are of marine origin - for example, fish, shellfish and seaweed
- Research suggests a possible re-emergence of iodine deficiency among New Zealand adults
- Mild iodine deficiency has also been documented in New Zealand children
- The clinical consequences of mild deficiency of iodine are unclear, however it would be prudent to increase iodine intakes in New Zealand

The role of seafood in promoting health and preventing disease

- Coronary heart disease (CHD) and stroke
- Cancer
- Obesity
- Type 2 diabetes
- Age-related macular degeneration
- Inflammatory conditions
 - Asthma, Crohn's disease, cystic fibrosis, rheumatoid arthritis

CHD and stroke

- In the 1970s research into Greenland Eskimos showed a low rate of CHD despite a high-fat diet
- LC *n-3* PUFA are anti-thrombotic, help to lower plasma triglycerides and have a small hypotensive effect
- Research suggests that the regular consumption of one or two fish meals a week will lower CHD risk factors and reduce incidence of sudden death post-MI
- The New Zealand Heart Foundation recommends that fish should be considered an integral part of the weekly food plan

Cancer

- The EPIC study found that the association between fish intake and decreased risk of colorectal cancer was highly statistically significant (Norat *et al.*, 2005)
- The WCRF Report (2007) concluded that much of the data on fish and colon cancer was inconsistent but there is limited evidence that fish may be protective
- Further research is needed into the role of fish in protecting against cancer

Obesity

- In New Zealand one adult in three is overweight and one in four is obese
- Diets high in protein may help facilitate weight loss
- Small scale studies have suggested satiety levels may be greater after fish meals than other types of meals
- Eating fish may reduce subsequent food intake later in the day, reducing overall energy intake
- Further research is needed into this area with studies on larger groups of people

Type 2 Diabetes

- Diabetes is a metabolic disorder resulting from a lack of the hormone insulin
- The effect of *n-3* PUFA in people with Type 2 diabetes has been studied but evidence of a beneficial effect is equivocal
- A recent review of 23 RCTs found supplementation with LC *n-3* PUFA did not have a significant effect on glycaemic control or fasting insulin levels
- Further trials are now needed to establish if *n-3* PUFA have a role to play in the management of Type 2 diabetes

Age-related maculopathy (ARM)

- ARM is the most common cause of blindness in Western countries
- Long chain *n-3* PUFA may operate as protective factors in retinal disease
- Fish intake at least twice a week is associated with a reduced risk of ARM
- Further studies are now needed before routine recommendations in relation to fish and *n-3* PUFA can be made

Inflammatory conditions: Asthma

- Asthma is a chronic inflammatory disease of the respiratory tract, and although medication and environmental manipulation are the cornerstones of treatment, diet has emerged as a potential therapy
- It is possible that *n-3* FUFAs may help to suppress inflammation in asthma; however, further research is needed in this area
- In the meantime, it has been suggested that people with asthma may benefit from eating fish at least three times a week as part of a well balanced diet

Inflammatory conditions: Crohn's disease

- Crohn's disease is an inflammatory condition affecting the bowel
- It has been suggested that a diet rich in fish oil may have an anti-inflammatory effect
- Results from early studies were promising
- Two more recent RCTs conducted between 2003 and 2007 at 98 centres in Canada, Europe, Israel and the USA found 4g/d *n-3* PUFA, over 58 weeks, was not an effective treatment for Crohn's disease
- The use of fish oils as a treatment for Crohn's disease does not currently look promising

Inflammatory conditions:

Cystic fibrosis

- Cystic fibrosis is an inherited disorder that results in lung disease and pancreatic insufficiency
- The anti-inflammatory effects of fish oils have been investigated in people with cystic fibrosis
- There is currently insufficient evidence in this area and larger and longer trials are needed to assess clinical benefits, dose required and duration of treatment

Inflammatory conditions: Rheumatoid arthritis

- Rheumatoid arthritis involves the progressive erosion of cartilage in joints
- Fish oil supplements have been found to reduce morning stiffness and decrease tenderness in joints
- It has been suggested that the dose of fish oil required is 2.7g daily

Foetal development

- Maternal concentration of long chain *n-3* PUFA may be important for later cognitive function in offspring
- Benefits on child development have been found at intakes of 340g fish per week
- Research suggests the benefits eating fish outweigh any risks from mercury consumption. However, pregnant women are advised to avoid longer-lived larger species of fish
- Although beneficial effects of long chain *n-3* PUFA in the diets of pregnant women have been demonstrated, further research is needed to fully establish the benefits of fish in the diets of women who are pregnant or breastfeeding

Learning and behaviour in children

- ADHD is one of the most common neuro-developmental disorders of childhood
- It has been proposed that *n-3* PUFA may play a role in ADHD and related developmental disorders
- The Oxford Durham study found that 3 month supplementation with fish oils improved spelling, reading and behaviour in children with DCD
- Dose-ranging studies are now needed along with large scale investigations to determine whether EPA and DHA are beneficial in those with ADHD and what the optimal intakes are

Adult mental health

- Depression
 - There is mixed evidence on the role of fish oils in the treatment of depression and further research is needed in this area
- Schizophrenia
 - The use of *n-3* PUFA as a treatment for schizophrenia still remains experimental
- Bipolar disorder
 - Some positive effects have been found for *n-3* PUFA and depressive symptoms but not for manic symptoms

Cognitive function in older people

- The *Zutphen Elderly Study* (2007) found fish consumers had less cognitive decline than non-fish consumers (the recommended daily dose of long chain *n-3* PUFA was 400mg/d)
- There is a growing body of evidence to suggest a protective effect of *n-3* PUFA consumption in reducing dementia
- More good quality evidence is needed in this area before firm recommendations can be made

Current intakes of *n-3* PUFA

- There are limited data on intakes of fish in NZ
- A recent Canadian study found children aged 4-8 consumed 55mg per day of *n-3* PUFA, which is about half the recommended intake
- Mean intakes of long chain PUFA in Australian adults is estimated to be 246mg/day
- Intakes of long chain *n-3* PUFA in NZ are thought to be modest

Recommended intakes of LC *n*-3 PUFA

- Men: 610mg/day
- Women: 430mg/day

(Reference: NHMRC, 2006)

Conclusions

- Seafood can make an important nutritional contribution to the diet in New Zealand
- Consumption of fish may help manage chronic diseases
- There may be beneficial effects of fish consumption in cognitive development in young children and in preventing cognitive decline in older people
- There is a large body of evidence to suggest that it is highly beneficial to consume seafood on a regular basis as part of a healthy, balanced diet