



Seafood is Nutritional Gold for Seniors

A/Professor Alexandra McManus, Margaret Merga, Dr Wendy Newton, Avinna Trzesinski

Centre of Excellence for Science, Seafood and Health (CESSH), Curtin Health Innovation Research Institute, Curtin University

REVIEW

Please cite this paper as: McManus A, Merga M, Newton W, Trzesinski A. Seafood is nutritional gold for seniors. AMJ 2010, 3, 13, 855-859.
Doi: <http://dx.doi.org/10.4066/AMJ.2010.442>

Corresponding Author:

A/Professor Alexandra McManus
Director, Centre of Excellence for Science, Seafood & Health,
Curtin Health Innovation Research Institute,
Curtin University Perth, Australia
Email: A.McManus@curtin.edu.au

Abstract

Objectives

To conduct a systematic review of published evidence around seafood, health and seniors.

Method

Data sources reviewing included: Proquest; PubMed; Science Direct; Taylor and Francis; Cochran Collaboration; Web of Knowledge and Web of Science. Key search terms included seniors, ageing, fish, seafood, protein, health and various lifestyle conditions

Results

A diet high in marine source Omega-3 poly unsaturated fatty acids affords particular benefits for seniors in a reduced risk of all cause mortality, with the strongest evidence around coronary heart disease and ischemic stroke. Other benefits include reduced inflammation associated with arthritis and delay to onset and slowed progression of dementia and Alzheimer's disease.

Conclusion

There is increasing evidence to support the regular seafood consumption (particularly oily fish) as being protective against a number of aged-related health conditions. Seniors should be encouraged to consume 3500mg- 4000mg of marine source Omega-3 PUFAs each week.

Background

Seafood is increasingly recognised as a vital component of a healthy diet to support good health across the lifespan. Understanding the need to regularly consume oily fish is associated with eating competence, which is, in turn, associated with optimal health outcomes for seniors including a favourable cardiovascular risk profile.¹ Increasingly, marine source polyunsaturated fatty acids (PUFAs) are linked with improved health in older people, with sound scientific evidence and increasing consumer awareness resulting in an increase in intake of omega-3 PUFAs in older Australians over the last ten years.² The inclusion of at least 2 to 3 serves of seafood each week can confer significant protective health advantages. A diet high in omega-3 PUFAs is now supported by expert consensus 'to prevent not only heart disease but also cancer forms and other chronic disease such as type 2 diabetes mellitus'³ in addition to a range of other health conditions. A recent publication study noted potential health benefits of seafood consumption for specific physical conditions related to ageing, such as presbycusis. This article identifies both established and emerging conditions for which seafood consumption confers protection or aids management.

Method

A comprehensive search was conducted of evidence relating to seafood and human health utilising the following databases: Archive of Life Sciences; Proquest; PubMed; Science Direct; Taylor and Francis; The Cochran Collaboration; Web of Knowledge; Web of Science; and Wiley Interscience. Other sources of information were: National and international seafood-based databases; Seafood industry websites or databases; Major national and international academic libraries; Electronic sources of information (e.g. Google, Google Scholar, international websites); Departments of Health within Australia; and Educational institutions.



Supplementary to this major systematic review,⁴ a search was conducted of literature specific to ageing and health. Key search terms included seniors, elderly, ageing, fish, seafood, protein, health, healthy, cardiovascular disease, rheumatoid arthritis, cancer, hearing, macular degeneration, depression, mood, periodontal, and osteoporosis.

Results

Overall the evidence strongly supports the consumption of 3550mg to 4000 mg of marine source omega-3 poly unsaturated fatty acids (PUFAs) each week to gain health benefits. There are a number of low cost species (such as sardines in oil) that provide the entire weekly recommended levels of PUFAs in just one or two 150gm serves. Key findings presented are for those health conditions with the strongest evidence linking health and ageing.

Cardio-vascular disease (CVD)

Strong evidence exists supporting the assertion that fish intake significantly contributes to the maintenance of heart health, protecting against cardio-vascular diseases, particularly ischemic stroke.⁵ Even a small amount of fish can provide a protective health effect for seniors.⁶ For example, 1 to 2 serves a week of oily fish (sardines, salmon, trout) is associated with a reduced rate of hospitalisation and mortality, with the highest evidence for older women.⁷ As cardio-vascular disease is the leading cause of death in Australia, seafood intake can play a vital role in preserving life.⁸

Arthritis (including rheumatoid arthritis)

The risk of developing arthritis is reduced in adults by regularly consuming around 3500-400mg of marine source (oily fish) omega-3 PUFAs each week.^{9,10} Furthermore, ingestion of oily fish can reduce inflammation and joint tenderness associated with all forms of inflammatory arthritis. Fish oil is currently used as an adjuvant to approved medications for arthritis and studies support its' efficacy in conjunction with non-steroidal anti-inflammatory drugs (NSAIDs).^{11,12} While consumption of fish and fish oil does not prove efficacious in all cases, some individuals have been able to 'discontinue or reduce NSAID therapy' while continuing fish oil ingestion.¹³

Studies of advanced rheumatoid arthritis recommend significantly higher levels of omega-3 PUFAs over a prolonged period of time to gain maximum benefits. It is therefore recommended that people with advanced rheumatoid arthritis intake at least 3500-400mg per week but seek medical advice for a treatment regime that integrates an appropriate increased level of omega-3 PUFAs.

Cancer

High fish intake has been associated with significantly reduced risk of ovarian¹⁴ and colorectal¹⁵ cancer. Furthermore, findings from a recent United Kingdom Women's Cohort Study of 35,372 women supports the assertion that post-menopausal women who consumed fish experienced a significantly reduced risk of breast cancer when compared with red meat consumers, indicating reduced risk in older women who prefer fish as a primary protein source to the exclusion of red meat.¹⁶ High level evidence supports fish consumption as protective in reducing the risk of prostate and lung cancers in males.⁴ (not sure this sentence makes sense) Increased consumption of seafood also confers protection against the development of esophageal cancer in males aged 45 years and older in large population-based studies.¹⁷

Hearing loss

Recent research suggests that marine source omega-3 PUFAs may have a protective effect in preventing or delaying age-related hearing loss (presbycusis).¹⁸ Consumption of at least two servings of fish per week significantly reduced the risk of presbycusis in a recent study¹⁹ opening an exciting potential field for future research.

Macular degeneration

It is becoming increasingly apparent as further scientific research emerges that regular fish and seafood consumption may reduce the likelihood of age-related macular degeneration (AMD) with the odds of AMD '51% lower in the highest quartile of fish intake compared to the lowest quartile'.²⁰ Many studies support the significant protective effects of a diet high in seafood.^{21,22}

Cognitive function

Omega-3 PUFAs in seafood play an important role in neurological structure and function. Docosahexaenoic acid (DHA), a long chain marine PUFA found in seafood, is a catalyst for the slowing of early stage progression of dementia.^{23,24} Further study is expected to shed light on how DHA potentially prevents the neurological damage that results from dementia.

It is difficult to test the process by which fish consumption arrests cognitive decline, primarily as decline occurs gradually over an extensive time period which is beyond the parameters of most test periods. However, research from marine²⁵ and human epidemiological studies suggest that 'higher fish consumption is associated with better cognitive



function in later life',²⁶ enabling resistance to cognitive decline.^{27,28} Recent evidence strongly associates a dietary profile in which fish features prominently, with lower risk of developing Alzheimer disease (AD)²⁹ and maintaining cognitive function.³⁰ Evidence increasingly supports the assertion that marine source omega-3 PUFAs in fish play a role in delaying onset and arresting the progression of AD,^{31,32} though further studies are needed to investigate the mechanism involved.³³

While further study is necessary, it is possible that DHA rich seafood may ultimately play an adjuvant role in future efforts to reduce the increasing impact of dementia on our aging population.

Mood

Intake of omega-3 PUFA rich seafood is linked to increased dispositional optimism in the elderly,³⁴ and has, in some long term studies, been linked to reduced depression,³⁵ with a recent meta-analytic review of polyunsaturated fatty acid levels in patients with depression concluding that 'n-3 polyunsaturated fatty acids play a role in the pathogenesis of depression'.³⁶ Therefore, omega-3 PUFA rich seafood could benefit individuals suffering from depression.³⁶ Further research on the possible role of seafood consumption in moderating depression is required for these findings to be substantiated.

Periodontal disease

There is some evidence supporting the intake of dietary DHA in reducing the progression of periodontal disease in older people,³⁷ however further research is needed to add further weight to these findings.

Osteoporosis

Seafood is a rich source of both Calcium and Vitamin D, important bone-building micronutrients. Vitamin D rich seafood can play an important role in the maintenance of bone mineral density as people age.³⁸ Potential reduced sun exposure and an increased requirement of Vitamin D in older people underpins the need for high-quality, bioavailable Vitamin D. Seniors also have a reduced capacity to 'synthesize provitamin D3 in skin and to hydroxylate vitamin D3 in kidneys'.³⁹

It is widely recognised that a diet high in oily fish prevents vitamin D deficiency;⁴⁰ and commonly consumed, affordable sources of seafood such as Australian salmon and silver perch contain more than double the recommended daily intake of Vitamin D⁴¹ in a 150g serve. A 150g serve of Australian Salmon will also deliver more than half the recommended daily intake of calcium. Calcium requirements increase with age and seafood presents rich serves of calcium combined with

optimal amounts of Vitamin D to aid its absorption, protecting bone mineral density (BMD).

Loss of calcium through urinary excretion is of concern to bone health. Evidence is emerging showing lower fractures and higher bone mineral density with the consumption of adequate levels of calcium rich, high protein seafood.⁴² This may be due to increased intestinal absorption, which negates the impact of urinary excretion.⁴³ When calcium and vitamin D intake is adequate, dietary protein at moderate levels is beneficial to total body BMD⁴⁴ particularly for seniors.⁴⁵ Seafood is a good source of calcium, vitamin D and protein therefore can favourably contribute to BMD.

High intake of sea fish is independently associated with greater bone mass and lower osteoporosis risk in women,⁴⁶ especially those consuming more than 250grams per week of seafood.³⁸

Conclusions

There is strong evidence supporting regular seafood consumption (particularly fish) as protective against all cause mortality. There is also significant evidence supporting a diet rich in seafood for seniors for protection and/or management of aged-related conditions such as coronary heart disease, stroke, arthritis and colorectal cancer.

References

1. Lohse B, Psota T, Estruch R, et al. Eating competence of elderly Spanish adults is associated with a healthy diet and a favorable cardiovascular disease risk profile. *J Nutr.* 2010;140(7):1322-1327.
2. Flood V, Burlutsky G, Webb K, Wang J, Smith W, Mitchell P. Food and nutrient consumption trends in older Australians: a 10-year cohort study. *Eur J Clin Nutr.* 2010;64(6):603-613.
3. Yngve A. A Historical Perspective of the Understanding of the Link between Diet and Coronary Heart Disease. *Am J Lifestyle Med.* 2009;3(1 Suppl.):35S-38S.
4. McManus A, Howieson J, Nicholson C. *Review of literature and resources relating to the health benefit of regular consumption of seafood as part of a healthy diet.* Perth: Centre of Excellence for Science, Seafood and Health, Curtin Health Innovation Research Institute, Curtin University of Technology;2009. 090101.
5. de Goede J, Geleijnse J, Boer J, Kromhout D, Verschuren W. Marine (n-3) fatty acids, fish



- consumption, and the 10-year risk of fatal and nonfatal coronary heart disease in a large population of Dutch adults with low fish intake. *J Nutr.* 2010;140(5):1023-1028.
6. Kromhout D, Feskens E, Bowles C. The protective effect of a small amount of fish on coronary heart disease mortality in an elderly population. *Int J Epidemiol.* 1995;24:340-345.
 7. Levitan E, Wolk A, Mittleman M. Fatty fish, marine omega-3 fatty acids and incidence of heart failure. *Eur J Clin Nutr.* 2010;64(6):587-594.
 8. Australian Institute of Health and Welfare. *Cardiovascular disease mortality: trends at different ages.* Canberra: AIHW;2010.
 9. Pedersen M, Stripp C, Klarlund M, Olsen SF, Tjønneland AM, Frisch M. Diet and risk of rheumatoid arthritis in a prospective cohort. *J Rheumatol.* 2005;32(7):1249-1252.
 10. Rosell M, Wesley A, Rydin K, Klareskog L, Alfredsson L, the EIRA study group. Dietary Fish and Fish Oil and the Risk of Rheumatoid Arthritis. *Epidemiology.* 2009;20(6):896-901.
 11. Bahadori B, Uitz E, Thonhofer R, et al. ω -3 Fatty Acids Infusions as Adjuvant Therapy in Rheumatoid Arthritis. *J Parenter Enteral Nutr.* March 1, 2010 2010;34(2):151-155.
 12. Gupta A, Mosharraf Hossain A, Hilalul Islam M. Role of omega-3 fatty acid supplementation with indomethacin in suppression of disease activity in rheumatoid arthritis. *Bang Med Res Counc Bull.* 2009;35:63-68.
 13. Kremer J. n-3 Fatty acid supplements and rheumatoid arthritis. *Am J Clin Nutr.* 2007;71(suppl):349S-351S
 14. Kolahdooz F, van der Pols J, Bain C, et al. Meat, fish, and ovarian cancer risk: Results from 2 Australian case-control studies, a systematic review, and meta-analysis. *Am J Clin Nutr.* 2010;91(6):1752-1763.
 15. Chan A, Giovannucci E. Primary prevention of colorectal cancer. *Gastroenterology.* 2010;138(6):2029-2043.
 16. Cade J, Taylor E, Burley V, Greenwood D. Common dietary patterns and risk of breast cancer: analysis from the United Kingdom Women's Cohort Study. *Nutr Cancer.* 2010;62(3):300-306.
 17. Fan Y, Yuan J, Wang R, Gao Y, Yu M. Alcohol, Tobacco, and Diet in Relation to Esophageal Cancer: The Shanghai Cohort Study. *Nutr Cancer.* 2008;60(3):354- 363.
 18. Gopinath B, Flood VM, Rochtchina E, McMahon CM, Mitchell P. Consumption of omega-3 fatty acids and fish and risk of age-related hearing loss. *Am J Clin Nutr.* 2010;ajcn.2010.29370.
 19. Dullemeijer C, Verhoef P, Brouwer I, Kok F, Brummer R, Durga J. Plasma very long-chain N-3 polyunsaturated fatty acids and age-related hearing loss in older adults. *J Nutr Health Aging.* 2010;14(5):347-351.
 20. Montgomery MP, Kamel F, Pericak-Vance MA, et al. Overall Diet Quality and Age-Related Macular Degeneration. *Ophthalmic Epidemiol.* 2010;17(1):58-65.
 21. SanGiovanni JP, Chew EY, Agron E, et al. The Relationship of Dietary ω -3 Long-Chain Polyunsaturated Fatty Acid Intake With Incident Age-Related Macular Degeneration: AREDS Report No. 23. *Arch Ophthalmol.* 2008;126(9):1274-1279.
 22. Tan JSL, Wang JJ, Flood V, Mitchell P. Dietary Fatty Acids and the 10-Year Incidence of Age-Related Macular Degeneration: The Blue Mountains Eye Study. *Arch Ophthalmol.* 2009;127(5):656-665.
 23. Carrié I, Abellan Van Kan G, Rolland Y, Gillette-Guyonnet S, Vellas B. PUFA for prevention and treatment of dementia? *Curr Pharm Des.* 2009;15(36):4173-4185.
 24. Cole GM, Frautschy SA. DHA May Prevent Age-Related Dementia. *J Nutr.* 2010;140(4):869-874.
 25. Babenko NA, Semenova YA. Effects of long-term fish oil-enriched diet on the sphingolipid metabolism in brain of old rats. *Exp Gerontol.* 2010;45(5):375-380.
 26. Dangour A, Allen E, Elbourne D, Fletcher A, Richards M, Uauy R. Fish consumption and cognitive function among older people in the UK: Baseline data from the OPAL Study. *J Nutr Health Aging.* 2009;13(3):198.
 27. Robinson JG, Ijioma N, Harris W. Omega-3 fatty acids and cognitive function in women. *Women's Health.* 2010;6(1):119-134.
 28. Solfrizzi V, Frisardi V, Capurso C, et al. Dietary fatty acids in dementia and predementia syndromes: Epidemiological evidence and possible underlying mechanisms. *Ageing Res Rev.* 2010;9(2):184-199.
 29. Gu Y, Nieves JW, Stern Y, Luchsinger JA, Scarmeas N. Food combination and Alzheimer Disease risk: A protective diet. *Arch Neurol.* 2010;67(6):699-706.
 30. González S, Huerta JM, Fernandez S, Patterson ÁM, Lasheras C. The relationship between dietary lipids and cognitive performance in an elderly population. *Int J Food Sci Nutr.* 2010;61(2):217-225.
 31. Cunnane SC, Plourde M, Pifferi F, Bégin M, Féart C, Barberger-Gateau P. Fish, docosahexaenoic



- acid and Alzheimer's disease. *Prog Lipid Res.* 2009;48(5):239-256.
32. Hooijmans CR, Van der Zee CEEM, Dederen PJ, et al. DHA and cholesterol containing diets influence Alzheimer-like pathology, cognition and cerebral vasculature in APPswe/PS1dE9 mice. *Neurobiol Dis.* 2009;33(3):482-498.
33. Cederholm T, Palmblad J. Are omega-3 fatty acids options for prevention and treatment of cognitive decline and dementia? *Curr Opin Clin Nutr Metab Care.* 2010;13(2):150-155.
34. van de Rest O, de Goede J, Sytsma F, et al. Association of n-3 long-chain PUFA and fish intake with depressive symptoms and low dispositional optimism in older subjects with a history of myocardial infarction. *Br J Nutr.* 2010;103(09):1381-1387.
35. Bountziouka V, Polychronopoulos E, Zeimbekis A, et al. Long-term fish intake is associated with less severe depressive symptoms among elderly men and women: The MEDIS (Mediterranean Islands Elderly) Epidemiological Study. *J Aging Health.* 2009;21(6):864-880.
36. Lin P-Y, Huang S-Y, Su K-P. A meta-analytic review of polyunsaturated fatty acid compositions in patients with depression. *Biol Psychiatry.* 2010;68(2):140-147.
37. Iwasaki M, Yoshihara A, Moynihan P, Watanabe R, Taylor GW, Miyazaki H. Longitudinal relationship between dietary [omega]-3 fatty acids and periodontal disease. *Nutrition.* 2009:1-5.
38. Zalloua PA, Hsu Y-H, Terwedow H, et al. Impact of seafood and fruit consumption on bone mineral density. *Maturitas.* 2007;56(1):1-11.
39. de Groot CPGM, West CE, van Staveren WA. Meeting nutrient and energy requirements in old age. *Maturitas.* 2001;38(1):75-81.
40. Holick MF. Vitamin D: importance in the prevention of cancers, type 1 diabetes, heart disease, and osteoporosis. *Am J Clin Nutr.* 2004;79:362 - 371.
41. National Health and Medical Research Council. Nutrient reference values Australia and New Zealand. 2009; <http://www.nrv.gov.au>.
42. Heaney RP, Layman DK. Amount and type of protein influences bone health. *Am J Clin Nutr.* 2008;87(5):1567S-1570.
43. Kerstetter JE, O'Brien KO, Insogna KL. Dietary protein, calcium metabolism, and skeletal homeostasis revisited. *Am J Clin Nutr.* 2003;78(3):584S-592.
44. Dawson-Hughes B, Harris SS. Calcium intake influences the association of protein intake with rates of bone loss in elderly men and women. *Am J Clin Nutr.* 2002;75(4):773-779.
45. Hannan MT, Tucker KL, Dawson-Hughes B, Cupples LA, Felson DT, Kiel DP. Effect of dietary protein on bone loss in elderly men and women: The Framingham Osteoporosis Study. *J Bone Min Res.* 2000;15(12):2504-2512.
46. Chen Y, Ho S, Lam S. Higher sea fish intake is associated with greater bone mass and lower osteoporosis risk in postmenopausal Chinese women. *Osteoporos Int.* 2010;21(6):939-946.]

PEER REVIEW

Not commissioned. Externally peer reviewed.

CONFLICTS OF INTEREST

The team is partly funded by the Seafood industry of Western Australia.

FUNDING

This review was funded in part through Curtin University Australia, Australian Seafood Co-operative Research Centre and the Western Australian Department of Commerce.