

Scientific Advisory Committee on Nutrition

&

COMMITTEE ON TOXICITY OF CHEMICALS IN FOOD CONSUMER PRODUCTS AND THE ENVIRONMENT

Advice on fish consumption – overview

1. The FSA sought advice from SACN and COT on the benefits and risks of fish consumption, with particular reference to oily fish. The aim was to bring together the nutritional considerations from SACN on fish consumption and the toxicological considerations of the contaminants in fish from COT. This would weigh the nutritional benefits against possible risks and develop sensible dietary advice for the public on consumption of fish, with particular reference to oily fish.

The nutritional considerations

2. For detail see nutritional considerations section. The SACN reviewed the evidence on the health benefits of fish and fish oil consumption with specific reference to cardiovascular disease risk and pregnancy outcome. The Committee considered the UK recommendations on fish consumption and long chain n-3 polyunsaturated fatty acid (LC n-3 PUFA) intake (Department of Health, 1994) with regard to the evidence that had arisen since. The reported benefits of fish consumption on the development of some cancers and other aspects of brain function (e.g. cognitive decline) were not considered due to the paucity of data.
3. Fish consumption, particularly of oily fish, decreases the risk of cardiovascular disease; this has been shown to be due to the consumption of LC n-3 PUFA.
4. In pregnancy and lactation there is a demand on the mother to supply the fetus and infant with LC n-3 PUFA, which are required for the development of the central nervous system. There is some evidence that increased maternal LC n-3 PUFA intake produces beneficial effects, especially in lower birth weight populations, and this may be more relevant in populations that tend to have a lower background intake of LC n-3 PUFA. No adverse effects of maternal LC n-3 PUFA supplementation were observed, even at relatively high doses.
5. The dose-response relationship is derived from the cardiovascular evidence, as the evidence for maternal intake and pregnancy outcome is not sufficient for this.
6. Randomized controlled trials (RCT) in subjects who have previously had a myocardial infarction only used one dose – 0.9g/d LC-n-3 PUFA, equivalent to two-three portions of oily fish per week. These trials provide evidence that increased fish consumption or fish oil supplementation decreases mortality among patients who have suffered a myocardial infarction. The most probable mechanism for the effect 1g/d LC n-3 PUFA on secondary CHD prevention is the stabilisation of arrhythmias.

7. The prospective epidemiological evidence is suggestive of a plateau effect, in high-risk populations, at levels of about 0.9g/d; however, where fatty acid composition analyses of blood or blood compartments are determined, a positive relationship, with no plateau, is observed.
8. The dose of LC n-3 PUFA required for a demonstrable effect on cardiovascular risk factors, such as a reduction of plasma triacylglycerol levels, blood pressure, platelet aggregation and the inflammatory response is greater than 1g/d. At least 1.5 g/d LC n-3 PUFA supplementation is required to produce beneficial effects on these factors.
9. The nature of the evidence provided by the RCTs is suggestive of beneficial effects occurring within a short time scale, with benefit becoming apparent within a few months to 2 years; however, evidence provided from prospective studies is suggestive of increasing impact of benefit with increasing time (e.g. effects of high fish consumption become evident after 5-10 years of follow up but not in the early years). The dose-response nature of the relationship between fish consumption and risk of CVD may be different in populations of differing risk of CVD, and although the UK population is, relative to other countries, at high risk of CVD, sub-population within the UK may exhibit differing degrees of risk.
10. The SACN, therefore, endorsed the population recommendation to eat at least two portions of fish a week of which one should be oily and stated that this should equally apply to pregnant women as it does to the rest of the population. Two portions of fish per week – one white, one oily – is approximately equal to 0.45g/d LC n-3 PUFA.
11. The recommendation states ‘at least...’ as this signifies a minimal achievable objective for a population average, and some evidence supports a beneficial effect of higher levels of fish consumption.
12. To discourage fish consumption of levels higher than the dietary recommendation would be inappropriate, unless there was an upper limit beyond which people should not consume.

The toxicological considerations

13. For detail see contaminants in fish section. Paper FICS/03/01, which was discussed by the inter-committee subgroup on 30 June 2003, noted that the key concerns were the dioxins and dioxin-like polychlorinated biphenyls (PCBs), methylmercury, and the brominated flame retardants (BFRs). This paper provides an update of COT discussions on these contaminants and considers the risks and uncertainties associated with them at various levels of fish consumption, taking into account the susceptibility of different subgroups.
14. It should be noted that the dioxins and dioxin-like PCBs and the BFRs of concern are persistent lipophilic compounds that accumulate in lipid. They are therefore particularly likely to be present in oily fish. In contrast, methylmercury is not specifically found in oily fish. It is present in the marine environment and

accumulates up the food chain in fish, with levels being highest in large predatory species.

15. This review aims to weigh the nutritional benefits against possible risks associated with fish consumption, in order to develop sensible dietary advice, with particular reference to oily fish.
16. Tolerable Daily or Weekly Intakes are established to protect consumers from the adverse effects associated with chemical contaminants in food. The tolerable intake is set to protect against the most sensitive toxic effects in the most susceptible subgroups of the population and is defined as an amount that can be consumed daily over an entire lifetime without appreciable risk to health. It is not a threshold for risk and there is uncertainty about the degree of risk above the tolerable intake. The most sensitive individuals may be at risk from a small exceedance, whereas many individuals will not be. Any risk is likely to increase with the degree and duration of exceedance of the tolerable intake, but COT has not previously considered it possible to quantify the risk.
17. There is currently no established methodology for risk-benefit analysis that can be applied to fish. This paper therefore focuses on whether separate intake guidelines can be developed for different population groups. Such an approach would support dietary advice to consumers that would allow individuals at lesser risk of the toxic effects to maximise the nutritional benefits.
18. The most sensitive effects of chemical contaminants in fish relate to developmental changes in the unborn child, resulting from maternal exposure. On the basis that it takes about 5 half-lives to reach steady state body burden, for cumulative contaminants a woman's exposure before pregnancy is likely to be more important for the total body burden than intake during pregnancy. In the case of dioxins and PCBs, which have half-lives of several years in humans, exposure throughout life up to time of pregnancy will determine the exposure to the fetus. The half-life of methylmercury is about 70 days in humans; fetal exposure is likely to be determined by maternal exposure in the year leading up to pregnancy.
19. The COT has concluded that a separate guideline level could be used to protect against non-developmental adverse effects of methylmercury. This is based on neurotoxicity in non-pregnant populations.
20. This paper invites COT to consider a similar approach for protection against non-developmental effects of dioxins and dioxin-like PCBs. The aim would be to protect against the effect of most relevance for the general population, i.e. increased cancer risk.

Questions

- Can Members comment on the extent of exceedance of a tolerable intake that would be considered toxicologically insignificant in light of the imprecision, uncertainties and precautionary approaches involved in setting tolerable intakes.

- Do Members consider that a guideline value of 8 pg WHO-TEQ/kg bodyweight per day can be applied to prevent against cancer risk?
- If Members agree to this guideline value, to whom should it be applied?
 - a. All males and women past reproductive age on the basis that they are not susceptible to the most sensitive effects of dioxins (i.e. developmental effects on the fetus resulting from the mother's body burden)

or the more precautionary
 - b. Men over the age of 40, and women past reproductive age on the basis that they are not susceptible to the most sensitive effects of dioxins and are at less risk of life-long accumulation of dioxins.
- Is it possible to comment on the risk for women consuming larger amounts of oily fish during pregnancy?
- Is it possible to comment on the benefit to the population, and subgroups therein (e.g. pregnant women, people at risk of cardiovascular disease), of consuming more than one portion of oily fish per week?
- Is it possible to quantify any increased risk or benefit from consuming more than one portion of oily fish per week – to determine whether the risks outweigh the benefits or vice versa?