What are the health impacts of fish diets high in mercury?

To test the possible health impacts of human exposure to methylmercury through fish consumption, researchers fed mice a diet containing fish at levels that corresponded to a typical Western diet for humans. The mice suffered adverse health impacts after two months of being fed this diet, including reduced body growth rates and modified gene expression patterns.

Methylmercury is the most toxic form of mercury, particularly affecting the nervous system in humans and other animals. The main source of exposure for humans is consumption of contaminated fish. However, information on the effects of mercury exposure via fish consumption on humans is limited and contradictory.

Two large-scale recent studies have concluded that human exposure to mercury through fish consumption could have observable adverse effects. For example, one of the studies, conducted in the Seychelles, found exposure to methylmercury by eating fish was linked to high blood pressure in teenage boys, while the other study, conducted in the Faroe Islands, concluded it could lead to neurological deficits in 7 year old children.

In this study, mice were fed a diet, of which 1.25 per cent was a mixture of cod, tuna and swordfish, representing typical fish consumption levels in a Western diet for humans. The fish was contaminated with an average of 35.75 ng Hg/g (nanograms of mercury per gram) of food, 92 per cent of which was in the form of methylmercury.

After two months of this diet, the researchers tested the behaviour, anxiety levels and body tissues of the mice, in comparison to control groups of mice which had either been fed no fish or a diet containing 1.25 per cent low-mercury salmon, in place of the cod, tuna and swordfish.

In all tested body tissues mercury concentrations were three to seven times higher in mice fed the mixed fish diet, compared with those fed the salmon or non-fish diets. Body growth was lower in the mixed fish-fed mice and changes in behaviour, such as poorer memory, and increased anxiety were observed. Furthermore, energy transfer in kidney and brain cells was affected and the pattern of gene expression in kidneys, liver and muscles also changed.

The researchers also considered whether healthy nutrients, such as polyunsaturated fatty acids (PUFA), found in fish could offset the harmful effects of methylmercury. Both the high-mercury cod, tuna and swordfish diet and the low-mercury salmon diet contained PUFA, so the researchers assumed that if PUFA’s benefits were to counteract methylmercury’s effects, that there would be no differences between mice fed the two different fish diets. However, because methylmercury did cause damaging effects, the researchers concluded that PUFA does not counteract the consequences of methylmercury.

These results are of concern because the mice diet containing 1.25 per cent cod, tuna and swordfish (on a dry weight basis) corresponds to people eating an average of 25 grams of fish per day (on a fresh weight basis). However, some populations eat substantially more fish than this. For example, Spanish men consume between 90-100g of fish per day and Greek men an average of 52g a day.

Ongoing research is examining mice whose mothers were fed a diet containing low levels of methylmercury contaminated fish when they were pregnant to gain a better understanding of methylmercury’s effects on unborn animals.


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