

Revealing the finicky functions of fish oil

Fats in fish oil exert varied and often conflicting effects on heart-disease risk factors ranging from clotting to cholesterol. At this week's meeting in New Orleans of the Federation of American Societies of Experimental Biology, scientists offered explanations for several of the oil's more peculiar properties.

In a study of fish oil's anti-clotting action, scientists have now demonstrated in rats that the effect depends on the dosage of fish oil *in relation* to other kinds of polyunsaturated fats — not the absolute amount of fish oil consumed. If confirmed in humans, the finding may lead to recommendations on how much of the different kinds of polyunsaturated fats people should consume, say Prithiva Chanmugam, Daniel H. Hwang and Mary Boudreaux, nutrition scientists at Pennington Biomedical Research Center in Baton Rouge, La.

In their work, the researchers looked at the interaction between omega-3 fatty acids — the active ingredient in fish oil — and omega-6 fatty acids, in this case derived from safflower oil. Research by others had shown that omega-3s may decrease the risk of artery-blocking clots by suppressing the synthesis of clot-promoting chemicals such as arachidonic acid (an omega-6 fatty acid) and its metabolites. And Chanmugam says she and her co-workers had demonstrated in rats that higher doses of omega-3s enhance the anti-clotting effect *if* dietary omega-6 levels are held constant. In the group's most recent study, groups of rats ate diets containing three different levels of omega-3s for 16 weeks while their omega-6 intake was altered to maintain a constant dietary ratio of the two fatty acid types. Chanmugam found that the rats' blood platelets made similar amounts of anti-clotting chemicals. She suggests it may be easier to obtain a favorable ratio by controlling intake of both fatty acid types.

Other work presented at the meeting begins to explain some of fish oil's odd effects on fat and cholesterol synthesis. Past experiments have shown that while fish oil seems to markedly decrease the amounts of triglycerides and very-low-density lipoprotein (VLDL) cholesterol in human blood, it does not decrease the level of low-density lipoprotein (LDL) cholesterol, the type linked to coronary artery disease. In fact, it seems to increase LDL cholesterol levels in some patients (SN: 11/28/87, p.342). This has puzzled scientists because LDL particles are derived from VLDL particles. But new data suggest an explanation, reports nutritional biochemist William Harris of the University of Kansas Medical Center in Kansas City.

His study indicates that fish oil speeds LDL synthesis by changing the size and

chemical composition of certain VLDL particles made by liver cells. Liver cells make VLDL particles of varying sizes, and the smaller ones seem more readily converted to LDL. "We knew that fish oils changed the [overall] output of VLDL and we hypothesized that they might change the size," Harris says.

He and co-worker Masahiro Inagaki gave six men with high triglycerides 12 fish oil capsules per day for four weeks, measuring lipid levels before and after treatment. The fish oil not only prompted a marked decrease in the patients' blood

EPA offers options to slow global warming

The nations of the world could substantially reduce the threat of global warming by instituting a range of policies that do not require a change in basic lifestyle, according to an Environmental Protection Agency report, released in preliminary form last week.

"There are quite reasonable policy options available that do make a big difference," says Daniel A. Lashof, an editor of the EPA study.

Congress, which is considering several bills to ease global warming, had asked EPA to examine policy options that would stem the atmospheric buildup of greenhouse gases: carbon dioxide, methane, chlorofluorocarbons (CFCs) and nitrous oxide. Scientists have warned that these gases will raise Earth's surface temperature, with adverse effects on climate, sea levels and health, and have offered suggestions for slowing that warming.

But until now, no group had completed a comprehensive study on the efficacy of different policies, Lashof notes. "One of the major conclusions is that you don't have to sacrifice economic growth to make a substantial difference in limiting global warming," he says.

To test the policy options, EPA assembled a computer model of human practices and natural processes affecting the concentration of greenhouse gases in the atmosphere. This model contained six elements plucked from models at several federal agencies and academic research centers.

The EPA model showed that government policies play an extremely important role, and could either substantially decrease or increase global warming. No one action could stabilize the climate on its own. But in general, practices that reduce coal burning would make the biggest cuts in the growth of greenhouse gases. EPA's list of most effective specific policies includes:

- improving energy efficiency in cars, home heating and industry.
- developing biomass fuels, such as trees grown on special plantations. Wood

triglycerides and VLDL cholesterol, but also changed the size and composition of VLDL particles. Using a vertical column that separates particles by size, the researchers found that fish oil treatment caused liver cells to make fewer large VLDL particles and more small ones. Further chemical analysis revealed that the particles shrank because their lipid content had dropped by more than 50 percent, while their protein content stayed the same. Harris hypothesizes that LDL levels rise because the liver makes more of the smaller, protein-rich VLDL particles, which convert to LDL more readily than do larger, lipid-rich VLDL particles.

— I. Wickelgren

from these trees could be gasified, then burned to produce electricity. This would not add any net carbon dioxide to the atmosphere, since the trees would absorb carbon dioxide as they grew.

- introducing an energy-emissions fee that taxes fossil-fuel burners, with the heaviest taxes falling on coal burners.
- creating reforestation projects to absorb carbon dioxide from the atmosphere.
- completing a phaseout of CFCs and a freeze on methyl chloroform, both of which add to global warming and destroy stratospheric ozone.
- developing low-cost solar energy technology.

Such policies, along with others, would slow global warming to a rate of 0.6° to 1.4°C per century — at least 60 percent slower than what would occur without any policy response — and reduce its total magnitude, the report contends. If governments want to stop global warming completely, they must take much stronger action, essentially phasing out coal use during the next century, EPA says.

The model demonstrates that industrialized countries cannot stabilize greenhouse gases on their own; developing countries also must reduce their emissions. It also shows that Earth would experience much more significant warming if governments delayed action for 20 years.

At a hearing last week, Sen. Max Baucus (D-Mont.) said, "The policy options report makes a compelling argument for action now. The question confronting us is, will we heed this warning?" Baucus introduced a bill advocating some of the policies examined by EPA, such as raising energy-efficiency requirements and banning CFCs by the year 2000.

Missing from the bill was any mention of an emissions fee for fossil-fuel burning. Lashof says the idea of a fee is gaining some public support, while William Megonnell at the Edison Electric Institute in Washington, D.C., contends it remains politically unpopular. — R. Monastersky