

# Eat More Fish

The Impact of Omega-3 Fatty Acids  
on Osteoarthritis



*“To me, the  
big issue is  
whether we  
should have  
more fish oil in  
our diets.”*

**Colorado  
State**  
University

*Knowledge to Go Places*

The health benefits of the essential omega-3 fatty acids found naturally in fish and a few other foods are in the news. Associate professor Mary Harris and Rod Hansen of the Department of Food Science and Human

Nutrition are investigating how these omega-3 fatty acids might slow down the action and production of matrix metalloproteinases (MMPs), a family of enzymes that are influential in causing osteoarthritis.

MMPs are normal enzymes associated with growth and the turnover of tissue. They break down tissue so that new tissue can grow. However, when there are too many MMPs, osteoarthritis can result.

An estimated 20.7 million Americans suffer from osteoarthritis. It is a chronic, progressive, and debilitating disease characterized by the breakdown of the joint's cartilage. Cartilage breakdown causes bones to rub against each other, resulting in pain and loss of movement. The degenerative disease affects the hands and weight-bearing joints of mostly middle-aged and older people. The Arthritis Foundation reports that knee osteoarthritis can be as disabling as any cardiovascular disease except stroke.

Harris and Hansen speculated that supplementing a diet with omega-3, or fish oil, might help slow the course of this disease. As osteoarthritis is not unique to the human population, Harris and Hansen conducted

their research at the Colorado State University Veterinary Teaching Hospital on companion dogs that had torn cruciate ligaments needing a surgery called tibial plateau leveling osteotomy (TPLO). “When a dog comes into the Department of Clinical Sciences and Small Animal Orthopedics needing TPLO on one knee, its other knee is almost always bad as well, but the other knee has not yet become acutely affected,” Hansen explains. “The dogs with a bilateral chronic degenerative joint disease allow us to investigate how a diet containing fish oil might affect osteoarthritis in both its acute and chronic phases,” Harris says.

With a grant from the Colorado State University Agriculture Experiment Station and a separate grant from Purina, Harris and Hansen along with colleagues Ken Allen and Elizabeth Pluhar compared the health of dogs that were fed an omega-3 enriched Purina food with dogs in a control group that were fed a similar Purina product with no omega-3. The dogs were fed the special diets from 7 days prior to the surgery to 56 days post-surgery. “The dogs seemed to enjoy the food and had no trouble digesting it,” Hansen says. Blood and synovial fluid samples from the acute and chronic knees were taken on six different days during the recovery period. The researchers discovered that MMPs in the acute knee were not influenced by the omega-3 diet. “We think the surgery overwhelmed whatever nutritional intervention could accomplish,” Hansen says.

However, the MMPs in the chronic knee were regulated by fish oil. MMPs can be regulated in at least three different ways: the production of MMPs can be slowed, MMPs can be prevented from being activated, and

the body's disposal rate of MMPs can be increased. In Harris and Hansen's research the omega-3 diet seemed to affect all three control points of MMPs. Omega-3 slowed down the production and prevented the activation of MMPs and also helped increase the body's disposal rate of MMPs.

"To me, the big issue is whether we should have more fish oil in our diets," Hansen says. "In dogs, there were positive results after 63 days of treatment – a very small portion of a lifetime. If we ate more fish oil throughout our lives, would the results be more dramatic?"

Certainly treating osteoarthritis with fish oil seems preferable to traditional treatments. Osteoarthritis usually is treated with aspirin and other anti-inflammatory

drugs. These drugs act the same as fish oil but can be costly and have serious side effects like tendonitis, steroid-induced osteoporosis, gastrointestinal bleeding, and liver and kidney disease.



delivery. Hansen plans on looking at omega-3 and possibly other fatty acids in connection with other diseases such as gum disease and cancer.

In the future, Harris and Hansen will continue to investigate the health benefits of omega-3 fatty acids. Harris is enthusiastic about beginning a new project funded by the Agricultural Experiment Station in which she will study MMPs in a clinical population, following the progress of pregnant women as they intake fatty acids to reduce pre-term

Annual Report, 2003  
Colorado Agricultural  
Experiment Station  
16 Administration Building  
3001 Campus Delivery  
Fort Collins, CO 80523-3001  
[www.colostate.edu/Depts/AES](http://www.colostate.edu/Depts/AES)  
Phone (970) 491-5371  
Fax (970) 491-7396

## The Health Benefits of Omega-3

Omega-3 fatty acids are essential to human health. Promising research is being conducted on the beneficial effects of omega-3 on health problems ranging from psoriasis to cancer. In the womb, the omega-3 fatty acids play an important role in fetal brain and vision development, and they continue to play a major part in our health at every stage in life by assisting in the prevention and management of certain diseases and chronic conditions.

Oil-rich fish and supplements such as fish oil and cod liver oil are the richest and most readily available dietary sources of omega-3. Omega-3 fortified everyday foods like bread and fruit juices are in production in the United States.