UCDAVIS COLLEGE OF AGRICULTURAL AND ENVIRONMENTAL SCIENCES

IMPACT

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IMPACT is a series of publications highlighting how UC Davis' College of Agricultural and Environmental Sciences makes a difference in the lives of Californians. Through research, teaching, and outreach programs, UC Davis research touches almost all aspects of Californian life. Today, millions of people eat safer foods, breathe cleaner air, and drink healthier water with the help of our researchers. We're making discovery work -- for California and the world.

DEVELOPING HEALTHY INFANT FORMULAS

THE ISSUE

Over the years, nutritionists have recommended many changes in the types of fats we consume in foods to improve their nutritional value and decrease the risk of heart disease.

Ann Filmer / UC Davis

First, they declared that animal fats are undesirable because they are rich in saturated fatty acids that raise blood LDL cholesterol, thereby increasing the risk of heart disease. They recommended that we change from animal fats to vegetable fats that are rich in linoleic acid, an essential fatty acid that lowers LDL cholesterol. However, linoleic acid also lowers HDL cholesterol, which adds another risk factor.

Later, nutritionists decided that we consume too much vegetable oil rich in linoleic acid, causing our bodies to produce excessive amount of eicosanoids, hormone-like compounds that are implicated in atherosclerosis (heart disease), cancer, and autoimmune disorders.

More recently, nutritionists recommended that we increase fish and fish oils in our diet, which are rich in omega-3 polyunsaturated fatty acids, because they offer many desirable biological effects such as reducing the risk of heart disease.

Unfortunately, each of these dietary recommendations has dire consequences on lipid (fat) oxidation, which leads to rancidity, reduced shelf life of foods, and compromised food safety. Linoleic acid and omega-3 fatty acids are much more readily oxidized than saturated fatty acids in animal fats, leading to rancidity; this poses significant problems for food processors and consumers.

In addition to concerns about fat oxidation leading to rancidity, food processors must also deal with the challenge of supplementing foods with iron, an essential mineral. Cereal foods and infant milk formulas are often supplemented with iron to meet nutritional recommendations, but this practice further limits the shelf life of milk-based formulas and other foods because iron greatly accelerates rancidity in foods.

Combining iron supplementation with oxidized (rancid) fatty acids may also contribute to inflamma-

tion and increase the risk of heart disease. Therefore, the current practice of iron supplementation of flour and cereal products may be imprudent in light of possible health risks.

Food scientists are challenged when nutritionists make health recommendations to change the fatty acid composition of fats in foods and to incorporate iron mineral supplements. They must develop methods for food processors to incorporate nutritional recommendations in food products, while not compromising food quality or posing potential long-term health problems.

An important research goal at the University of California, Davis, is to develop science-based recommendations for nutritious infant formulas that contain iron, have a long shelf life, do not go rancid, and do not pose any long-term health risks.

WHAT WE'RE DOING

Professors Edwin Frankel and Bruce German, along with their colleagues in the Department of Food Science and Technology at UC Davis, found that the oxidation of polyunsaturated fats, which causes rancidity, can be controlled in iron supplemented milk formulas by using lactoferrin, a natural protein found in human and cow milk.

Lactoferrin acts by binding iron in foods, and inhibiting rancidity. Lactoferrin has a second added benefit, by acting as an antimicrobial preservative, which further improves the shelf life of infant formulas, flour, cereals, and bread.

Recently, commercial infant formulas have been supplemented with DHA and arachidonic acid, which are present in mother's milk and are recognized for their nutritional value. However, these polyunsaturated fatty acids are also very easily oxidized, leading to rancidity that is difficult to control, especially in formulas supplemented with iron.

Frankel and German, in collaboration with visiting scientist Anne Meyer from the Technical University of Denmark, researched the use of fish oils and DHA-rich algae oils as nutritional supplements in infant formulas. They found that in combination with EDTA, a food additive used to inactivate metals, these recommended oils could be added to foods, including infant formulas containing iron.

The result is an infant formula that contains recommended iron and omega-3 polyunsaturated fatty acid supplements, and which resists oxidation and rancidity.

A SHARED VISION

Developing recommendations for infant formulas that are healthy for the child, are shelf stable, and which do not pose long-term health consequences is a fundamental research mission at UC Davis. Food science researchers, working with nutritionists and food processors, have developed methods to produce quality infant formulas and are continuing to conduct research in this important field.

That's impact – UC Davis scientists developing healthy and safe foods for infants.

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