Fats & Oils News

Irradiation of fats

The controversy over ethylene dibromide residues in foodstuffs has sparked interest in the U.S. in using irradiation to protect foods from spoilage and pests. The question of irradiating fats and oils has been studied by some researchers, who believe it to be a safe process.

Irradiation research was conducted by scientists at the U.S. Army Natick Laboratories, Natick, Massachusetts, until responsibility for this work was transferred several years ago to USDA, Eastern Regional Research Center. Charles Merritt, Jr., now retired, was active in the Natick research. According to Dr. Merritt, work centered on the radiolysis products produced by irradiation, chiefly with meat, fats, pure triglycerides, fatty acid esters and fatty acids. "There were no problems with the radiolytic compounds produced. All the compounds formed are ubiquitous to fat when energy is added," he said.

Dr. Wassef W. Nawar of the Department of Food Science and Nutrition, University of Massachusetts at Amherst, who worked with Dr. Merritt on research, agreed. "From all we can see in our many years of study and the research of our colleagues, there is not one example to give a hint of alarm in using irradiation in fats." He added, "The effect of frying foods in oil, for instance, is so much worse. Irradiation has been proven a safe process." But, he added, "The point is in science, nothing is black and white and there's always room for more research. No one on earth today can say heating, even cooking, food, is completely safe. Nothing has been found alarming with irradiation, but we want to continue to study it as a process to see what works best."

Currently, Nawar's laboratory at the University of Massachusetts is studying irradiation of fatty material and food, particularly in pasteurizing fish. "This is an attractive method to extend shelf life of fish," Dr. Nawar said, citing Japanese work to pasteurize fish in portable irradiators on board ships. Dr. Nawar said the International Atomic Energy Commission selected the university's laboratory for a scholarship winner to study effects of irradiation on the lipids of fish. That work is currently under way.

When the project ended at Natick, Natick's Cobalt 60 went to the University of Lowell, Lowell, Massachusetts, while its small cesium source went to USDA's Eastern Regional Research Center. Eugene Barry, chemistry professor at Lowell, would like to use the Cobalt 60 to do further irradiation studies on food providing he can receive funding to do so. "We have the facilities to study degradation of foods from irradiation if only we could arrange this with the government," he said.

Meanwhile, USDA's Eastern Regional Research Center has been responsible for overseeing the completion of a comprehensive long-term feeding study on rats, mice and dogs using irradiated sterilized chicken. Dr. Donald Thayer, chief of USDA's Food Safety Laboratory at ERRC, in March said he soon expected to complete a report summing up the findings. The study, originally designed by U.S. Army scientists in collaboration with scientists from the Food and Drug Administration and the National Academy of Sciences, was actually conducted by Research 900 of St. Louis, which later became Raltect Scientific, a division of Ralston-Purina.

Explaining that 300,000 pounds of chicken were used in the five diets studied, Dr. Thayer said, "We believe on the whole that the data seems to support the safety of high-dose irradiation for sterilization of chicken." However, he added, USDA has decided not to petition FDA for a ruling on high-dose irradiation as it hadn't been involved in designing or monitoring the study.

"Instead, we will make the data available to FDA. Only FDA can finally determine the safety of high-dose irradiation," Dr. Thayer said. He said the report also will be available to the many companies making inquiries about food irradiation as he will file it with the National Technical Information Service.

In February, the Food and Drug Administration came out with its long-awaited proposal to permit manufacturers and food processors to use low-dose irradiation—up to 100 kilorads—to destroy insects in such foods as fruits and vegetables and to inhibit the growth, ripening and spoilage of fresh fruits and vegetables. The regulation, published in the Feb. 14, 1984, *Federal Register,* also would increase the permitted radiation dosage, 1-3 megarad, for controlling bacterial contamination and insects in spices.

"Thirty years of research on the irradiation process have shown that the proposed levels of irradiation are safe and nutritious," U.S. Department of Health and Human Services Secretary Margaret M. Heckler said, emphasizing that unlike chemical pesticides, irradiation leaves no residue in food nor does it make food radioactive.

The proposal, the result of a food additive petition by Radiation Technology Inc., would require that records be kept for one year past the expected shelf life of the product and be made available for FDA inspection.

Dr. R. Burt Maxcy, who has worked on the microbiological aspects of low-dose irradiation of foods, primarily meats, for the past 12 years at the Department of Food Science, University of Nebraska, favors food irradiation "at reasonable levels." However, he is concerned that the 100 kilorad level now considered is too low to kill off all bacteria. "FDA should be looking at a higher level for public health protection," he said, warning that some spoilage microorganisms will survive at the lower level.

The only other existing irradiation regulation allows 15 kilorads of radiation to inhibit sprouts on potatoes and to kill insects in wheat and flour.

U.S. Congress is considering bills to shift irradiation of raw agricultural commodities from FDA's jurisdiction to the Environmental Protection Agency on the grounds that food irradiation is a process, not an additive.

In a report submitted to the House Agriculture and Appropriations Committee in February, USDA called gamma irradiation one of the most promising long-term alternatives to EDB fumigation but said it would not be available by the proposed EDB use cancellation date of Sept. 1, 1984. The report said a more realistic date for irradiation's full-scale commercial use as a quarantine treatment might be 1986, based on the assumption that FDA will approve food use later this year. Acting FDA Commissioner Dr. Mark Novitch, meanwhile, has said irradiation may not be widely available for three to five years.

Fats & Oils News

Reagan backs NSPA

In an official memorandum published February 16 in the *Federal Register,* President Ronald Reagan directed the U.S. Trade Representative's office to "pursue ... in a diligent and expeditious manner" resolution of a dispute involving allegedly unfair subsidies by Brazil on exports of soybean oil and meal. Noting that negotiations with Brazil had been undertaken last November, Reagan said it was disappointing that a settlement had not yet been reached. The U.S. Trade Representative initiated an investigation of the matter May 23, 1983, on the basis of a complaint filed by the National Soybean Processors Association.

Chevreul Awards

The Association Française pour l'Etude des Corps Gras (AFECG—French Oil Chemists' Association) awarded the 1983 Chevreul Awards to Dr. H. J. Vos, former collaborator of the TNO (Holland) and former president of the IUPAC Commission on oils and fats, and to Bernard Entressangles, manager of the research unit for biochemistry and biotechnology of the French Institute for Fat Research (ITERG) in Bordeaux.

AFECG will hold a symposium on vegetable and animal fats in cosmetology May 16-18, 1984, in Bordeaux, and its traditional meeting for the Chevreul Awards in Paris in December. Programs will be published in the Revue Française des Corps Gras. Mr. Prevot, regional manager of the ITERG Laboratory in Bordeaux-Pessac, is current president of AFECG.

Record soy imports

Japan imported a record 4,995,000 metric tons of soybeans during 1983, according to the U.S. Department of Agriculture. Soybean imports for 1984 are estimated at 4.7 million tons; 1982 imports were about 4.34 million tons.

Japan has imported more than 90% of its soybeans from the United States in recent years, with China the second largest source. Canada and Brazil export smaller quantities. Canada is the major supplier of rapeseed for Japan, a country in which rapeseed oil is a traditional cooking oil.

Peanuts promoted

The National Peanut Council, Washington, D.C., is opening its first overseas trade office, in Rotterdam, The Netherlands. Objectives of the trade office include market research, and development and direction of European promotional activities sponsored by the council's export committee.

Meanwhile, USDA figures published in February in the *Food Institute Report* showed U.S. peanut production dropped from 3,438.3 million pounds in 1982 to 3,273.5 million pounds in 1983. USDA said per capita consumption of peanuts in the U.S. rose from 6.4 pounds in 1981 to 6.6 pounds in 1982. Acreage intentions for 1984 released by USDA showed U.S. farmers intend to plant 1.4 million acres of peanuts, the same amount as in 1983, and 65.24 million acres of soybeans, about 3% more than in 1983 but 9% less than acreage planted in 1982.

USDA also predicted that although domestic use soybean oil in 1983-84 is expected to decline only slightly from 1982-83, exports are forecast to fall nearly one-third, to 1.4 billion pounds.

Separations research

The University of Texas at Austin has created a Separations Research Program aimed at finding less expensive, energy efficient separations processes.

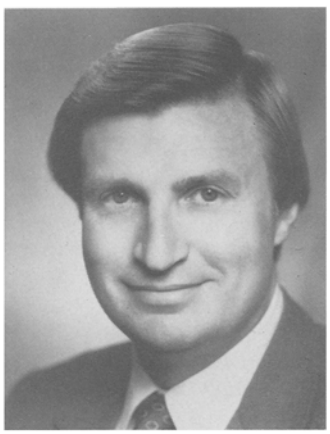
Participating sponsoring firms pay $20,000 for two years initial enrollment. Eight faculty members and 25-30 graduate students form the program staff. Research is expected to be of most interest to companies in the chemical, petroleum, natural gas, biological, pharmaceutical, food and textile industries. Further information is available from the program manager, Jim L. Humphrey, Center for Energy Studies, ENS 143, University of Texas at Austin, Austin, Texas 78712.

Margarine oils

Food Institute Report, Feb. 25, 1984, issue, noted that production and apparent disappearance of margarine during 1983 dropped 6% from 1982, to 2.45 billion pounds. Overall, 1.85 billion pounds of fats and oils were used in margarine production, a 7% drop from 1982. Soybean oil use in margarine totaled 1.5 billion pounds, down 10%, while corn oil use fell 4%, to 212 billion pounds. Cottonseed oil use increased 58%, to 34 million pounds.

News Briefs

Unichema Chemicals Inc., affiliated with Unichema International, has been formed to expand the sales and marketing of Unichema oleochemicals and nickel catalysts in the United States and Canada. **Robert J. Drennan** is president of the newly formed corporation; **Frank C. Morley** has been appointed sales vice president. The company has established its headquarter offices at One Sears Drive, Paramus, New Jersey. ... Stepan Company has appointed **Timothy L. Fitzgerald** as southern regional sales representative for surfactant products and **David Creeger** as eastern regional sales manager for surfactant products. Fitzgerald formerly served as the sales coordinator for by-product sales; Creeger had been business manager for detergent products at corporate headquarters. ... **John P. Wagner** has joined the Food Protein Research and Development Center at Texas A&M University, College Station, Texas, as associate director for engineering. He has 18 years' experience in industrial and contract research. Dr. Wagner earned a B.S. in chemistry from St. Joseph's University, Philadelphia, Pennsylvania, and M.E.S. and doctoral degrees in chemical engineering from Johns Hopkins University. In his new position, Dr. Wagner will lead the center's research in



Frank C. Morley

Robert J. Drennan

John P. Wagner

extraction processes of oilseeds and other agricultural crops, and basic studies in separations techniques. He recently has become an AOCS member. ... Harshaw/Filtrol Partnership has named **Gerald E. Earl** as director of marketing and sales for Filtrol catalysts. ... CasChem Inc. has appointed **Steve C. Kondracki** as customer service manager. ... The **Technical Services Development Group** at Fulton, New York, formerly part of The Nestlé Company Inc., has become part of Westreco Inc., a corporation that conducts research activities in the United States for the Nestlé group of companies. Westreco Inc.'s head offices are in Marysville, Ohio. ... **Barry V. Smith** has joined Wurster & Sanger Inc. in Chicago, Illinois, as a technical manager. ... The firm of **Gebr. Bauermeister & Co.** (GmbH & Co.) has been formed through the merger of Herman Bauermeister Maschinnenfabrik GmbH with Probat Werke v. Gimborn GmbH & Co. Both firms produced food processing equipment, with the new firm offering Bauermeister's range of equipment as well as Probat's roasting machines and equipment for cocoa, nuts, tea, surrogates and similar products. H. J. Paul Gehing is managing director of the new firm, whose offices will be in Hamburg. ... **Unilever U.S. Inc.**, subsidiary of Unilever Group, an Anglo-Dutch food, detergent and industrial products concern, has agreed to acquire almost all of the Shedd Margarine Group of Beatrice Food Co., a Chicago-based food and consumer products concern. ... **Carlin Foods Corp.**, a newly formed Chicago company headed by Jack Anton, has acquired the food ingredient businesses of Mallinckrodt Inc., a wholly owned subsidiary of Avon Products Inc. ... **Crown Iron Works Co.** of Minneapolis, Minnesota, has sold 2 extractors for processing rapeseed and soybeans to Oelmuhle Hamburg in Hamburg, West Germany. The new extraction facility is scheduled to handle 1,200 tons of rapeseed a day and 1,000 tons of soybeans a day, with production expected to begin in late 1984. The extractors are to be built in Memphis, Tennessee, then loaded onto special barges to be towed down the Mississippi River and transferred onto barge-carrying ocean ships for the trip to Hamburg. ... **Jojoba Growers & Processors Inc.**, a New York corporation, and **Jojoba Commodities Group** of Los Angeles, California, have merged operations, with Jojoba Commodities Group moving its offices to the administrative and manufacturing facilities of Jojoba Growers & Processors in Apache Junction, Arizona. Kelley Dwyer, executive director of Jojoba Commodities Group, will direct sales and marketing, while James Brown, president of Jojoba Growers & Processors, will oversee development of new jojoba-oil derivatives and technology. Antonia Casas will manage the East Coast regional sales and marketing office, which has been relocated to 15 Wilson St., Hartsdale, New York. ... The Government of Canada has announced it will contribute $10 million to the **Protein, Oil and Starch (POS) Pilot Plant Corporation** which has its research facilities at the University of Saskatchewan. POS does research for member and nonmember clients for a fee. It currently has 18 members, 2 of which are provincial governments.

Vegetable oil markets in fast foods, pet foods

The use of vegetable oils in fast-food restaurants and in pet foods were two of the topics discussed at the 33rd Oilseed Processing Clinic of the Mississippi Valley Oilseed Processors Association held during January 1984. In his paper on the use of vegetable oils in fast-food restaurants, William L. Barran notes fats and oils are a $2.17 billion part of the nation's food-service industry, but research about stability and suitability of various fats and oils has not reached much of the fast-food industry. In his paper on pet food, Harold Wilcke describes a somewhat limited market, but one that could provide an outlet for a sizable quantity of fats and oils.

Vegetable oils in fast-food restaurants

WILLIAM L. BARRAN, Director, Research and Development, Chick-fil-A Inc., Atlanta, GA

The fast-food area is a growing part of the food industry. It has been fourth in total industry growth in the past five-year period. However, it is relatively new compared with other industries, with most companies being less than 25 years old.

The food service industry can be divided into commercial and noncommercial categories. The majority of commercial food service units can be categorized as full-service restaurants or fast-food establishments. Total food-industry sales, including alcoholic beverages, were estimated at $159 billion during 1983. There are approximately 557,000 individual units, of which about 32% account for 80% of the total sales volume. Examples of the largest food organizations would be McDonald's, which has a sales volume of $7.1 billion from 6,700 units, and Kentucky Fried Chicken, $2.4 billion from 6,000 units.

The total food service industry buys about $57 billion worth of food and beverages each year. Full-service restaurants account for $17.3 billion of this total, fast-food restaurants for $11 billion. Of the $57 billion worth of food and beverage purchases by the food service industry, fats and oils account for $2.17 billion. To give some examples of the volume of fats and oils use, one 500-unit chain of fast-food restaurants uses about 800,000 pounds of oil annually; the Chick-fil-A chain, with approximately 280 units, uses about 1.5 million pounds of peanut oil and 200,000 pounds of animal and vegetable oil.

Various types of oils are used. The major types are soybean oil, blended oils (usually 90% animal, 10% vegetable) and peanut oil. Most of these products are hydrogenated so that they will withstand the high temperatures associated with fried foods. Also, frying oils are sometimes placed under 350-385 F temperatures for 10-hour periods. The three major oils seem to be the most stable under these conditions.

The oils are used to cook such food items as fried beef products, fish, chicken, french fries, apple pie, onion rings, vegetables and possibly other types of products. Many products are breaded with either wheat or corn flour.

There are two major types of cooking conditions. One is the open vat system, used for many products, and the second is pressure cooking.

Myths or Facts?

A number of facts or myths have developed in regard to shortenings and vegetables oils. I would like to discuss some of these and bring to your attention that they exist within the food service industry.

- *Hydrolysis breakdown causes free fatty acids, which are indicative of frying fat breakdown.* This may be the case, but other reactions and conditions must exist for the shortening to actually decompose. Such things as the amount of moisture, oxygen, salts, metal contaminants and types of foods may have an effect on fat breakdown.
- *Filtering techniques do not extend shortening life.* This statement has been made because of the complexity of filtering; the need to filter routinely may be why people make this statement. There have been very few studies or information within the food service industry to ascertain if this "myth" is correct.
- *The quality and flavor of a fat in use will improve as the rate of fat turnover increases.* I doubt very much that this condition can exist in any fast-food establishment. It may exist in a large frying operation in a manufacturing plant, but I do not believe that the filtering technique or the equipment would allow for such a statement within the food service industry. Many people believe this but through my experience, I have never seen it actually exist.
- *The type of fat or oil used determines the crispness, brownness and amount of fat absorbed by the fried food.* Although many shortening manufacturers would like to make such claims for their specific products, I do not know of any research information that would suggest that the type of fat does affect the quality of the fried food in crispness, brownness or the amount of fat absorbed.
- *Frying fats can be used indefinitely.* This has been discussed and is not the case in a food service situation.

Research Needs

Research is needed in the area of useful life determination—what the life expectancy of the oil in frying units should be. Would various filtering methods and filtering agents aid us in extending shortening life? If Chick-fil-A could get three more days out of each batch of shortening, it would save something like $500,000 a year.

How do various foods affect oil breakdown? What are the methods and ways of extending use life by changes in breading or various ingredients going into the foods?

Another area of concern in some restaurant units is the rotation of oils. What products should be fried in the oil first, can that oil be changed from vat-to-vat to extend the use life?

In summary, I feel that the oil and shortening industry

should look at the magnitude of the food service industry and begin research studies to help and aid the food service industry in using the proper shortenings and oils to help extend the use life of this valuable commodity.

Use of vegetable oils in pet foods and specialty feeds

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Investigating all avenues for the use of vegetable oils is important, particularly when we have an abundant supply of all vegetable oils. Some consensus should be reached as to which areas should be explored extensively as well as those where very little opportunity seems to exist for expanded use, at least at the present time. It is also quite evident that there will be competition among the various vegetable oils for certain uses. Thus, cottonseed oil will have to compete with soybean oil, palm oil, sunflower oil, rapeseed oil, peanut oil and perhaps others. Conversely, each of those oils will have to compete with cottonseed oil on the basis of economics, on certain indnvidual characteristics that may qualify one oil for certain uses better than on the basis of economics, on certain individual characteristics that may qualify one oil for certain uses better than others. In certain uses, particularly volume uses, all vegetable oils have to compete with animal fats and therefore, on the basis of present price relationships, will have to compete on the basis of physical characteristics and certain nutritional values.

Pet foods are indeed a large volume market. For the year 1982-83, some 1,072,900 tons of catfood were marketed and 3,677,550 tons of dog food, for a total of 4,750,450 tons. The market is still increasing but at a moderate rate.

In the case of catfoods, the tonnage breaks down to approximately 40% dry, approximately 52% canned and 7.8% moist. For dog foods, the corresponding figures are 66+% dry, 25.7% canned, and 4.5% moist, with an additional 3.5% in the form of snacks. Snacks are usually dry-type food.

Vegetable oils might well find some use in dry pet foods, provided that those foods are in pelleted form. The amounts used would be largely dictated by the economics of the use of the vegetable oils and alternative sources of energy, notably the animal fats. The amounts that could be used would be limited by the ability to form a solid pellet. For those types of pet foods in which the fat is added to the outside of the particle, such as the extruded products, vegetable oils would be at a disadvantage because they would impart a greasy feeling to the product. More seriously, surface oils would tend to migrate to the package, causing soaking of the package material or, as is commonly known, bleeding into the package, which would be objectionable in handling as well as in appearance. The amount that migrated into the packaging material would be lost as a nutrient. The packaging problem could be solved by using package liners that would serve as a barrier to the migration, but this would increase the cost and the handling properties would still be objectionable. These problems could be solved by converting the oils to a solid-state fat, but the conversion cost would decrease the likelihood of the vegetable oils competing on a cost-effective basis.

In the canned pet foods, the vegetable oils offer an advantage in appearance. Higher melting point fats tend to congeal and appear as white lumps in the canned product, which is not desirable for uniformity of distribution or appearance. Vegetable oils have been finding some use in canned pet food. However, canned pet foods are approximately 27-74% moisture, and a very low percentage of oil is needed to produce a 10-15% fat level on a dry basis. However, since canned cat and dog foods do represent something over 1.5 million tons of product, this market is well worth consideration. The same considerations would apply to moist-type pet foods, which will normally contain from 30-35% moisture or, conversely, 65-70% dry matter. Total tonnage of both cat and dog foods in this category would be on the order of 250,000 tons. This type of product probably would average about 10% total fat. Therefore, in each of thse cases, the canned and the moist, the amount of added fat would depend on the amount of fat carried in the original ingredients of the product.

For specialty-type feeds, the tonnages involved are much less. One that comes to mind is trout feed, where fats containing Omega 3 type oils are required. Fish oil has been used to satisfy this requirement but those vegetable oils that are high in linolenic fatty acid may well be used also. The recognition of this requirement is a somewhat recent development, and the exact nature has not been worked out as yet. Many have hypothesized that the requirement is really for arachidonic acid and, in this case, linolenic would serve as one of the intermediary products in the formation of arachidonic acid. The total market for trout feed at the present is estimated to be about 80,000 tons per year.

Vegetable oils, when competitive on an economic basis, might find a market in calf-starter feeds. Here again, the oils must be competitive on the basis of energy cost. The total market for this type of product appears to be about 100,000 tons per year.

In most types of products where avoiding even small amounts of possible contamination with residues such as those from pesticides, hormone or nitrosamines is critical, the vegetable oils would be the products of choice. This is not to say that all vegetable oils are free of contaminants, but when properly handled, the chances of contamination are much less.

With few exceptions, the market price for oils and fats intended for human consumption is higher than when the prospective use is for animals. This is to be expected because of the increased need for care and handling from the standpoint of sanitation and deterioration. Therefore, we must realize that we are talking about a lower price market when we are considering pet, specialty and other animal feeds.