Canadian section:

Fish oils dominate annual meeting

The possible health benefits of fish oil, particularly omega-3 fatty acids, as well as fish oil chemistry, production and legislation were the dominant themes at the first meeting of the Canadian section of AOCS, held Oct. 8–9, in Guelph, Ontario. The section drew 110 registrants for 39 technical papers and 11 poster sessions.

R.A. Karmali, in her keynote talk on developments in n-3 fatty acid use in cancer research, suggested that n-3 fatty acids might be used in metabolic pathways to block the tumor-promoting activity of n-6 fatty acids. Karmali is an associate professor of nutrition at Rutgers University and a researcher at Memorial Sloan-Kettering Cancer Institute.

In studies on rats fed n-3 fatty acids, Karmali found that the n-3 fatty acids inhibited the development of carcinogen-induced mammary tumors and growth of transplanted mammary and prostatic tumors when compared with rats fed an n-6 fatty acid diet.

She said what often happens in tumor development is biochemical changes occur in the immune system. Normally, the body synthesizes prostaglandins from n-6 fatty acids as it needs them. However, this control is lost in cancer, and prostaglandin production rises. According to Karmali, when unrestrained, prostaglandins are likely to negatively influence host immunologic response.

Results in this area still are not definitive, Karmali said, as the underlying mechanisms require much work, but n-3 fatty acids might be used to compete with n-6 fatty acids in the metabolic pathways to prevent the synthesis of n-6 end products. She said the health benefits of n-3 fatty acids should be taken into consideration, and these nutrients should be included in the diet and also might be considered as a control agent in disease stages.

The roles of n-3 and n-6 fatty acids in cancer cell death were the subject of M.E. Begin's talk. Begin, a researcher with Efamol Research Institute, Kentville, Nova Scotia, said work at Efamol indicates gammalinolenate, 18:3n-6 (GLA); arachidonate, 20:4n-6 (AA); and eicosapentaenoate, 20:5n-3 (EPA), are able to kill cancer cells in vitro. The three fatty acids had been used against human breast and prostate cancer cells in culture.

Begin suggested cancer cells lack the ability to resist peroxidation products, and what made a fatty acid effective at killing cancer cells was its ability to produce peroxides and free radicals. Results indicated the n-6 fatty acids seemed to stimulate greater peroxide production in tumor cells over normal cells, and equal amounts of peroxides were produced in normal and tumor cells treated with EPA.

Begin speculated that the products most likely to be candidates as tumor cell killers were hydroperoxides, peroxy and alkoxy radicals and various aldehydes. The peroxidation products of GLA, AA and EPA that were shown to have no effect on the cells were 4-hydroxynonenal and malondialdehyde, Begin said. He concluded that before the precise toxic agent could be identified, more research would be required.

Also speaking on the role of dietary fat in cancer, R.P. Bird, a nutritional toxicologist at the Ludwig Institute for Cancer Research, Toronto, said high fat diets may have some causative effect in colon cancer, but it may not necessarily be through increased production of bile acids as is generally thought. She said recent research suggests that increases in bile acids promote tumors in the colon, and high fat diets alter microflora concentration in the gut so that more secondary bile acids are produced.

However, Bird said, recent work in her lab indicates that high fat diets change the membrane composition of the colon, but bile acid alone does nothing to affect colonic membrane composition. According to Bird, a high fat diet may have some causative effect in cancer, but not necessarily through the production of bile acid. Bile acid cannot be claimed to be the sole cause of cancer growth in the colon, she added.

With the current interest in the

Roy Carr, AOCS Canadian section president, greets program participants at the section banquet Oct. 8 at the University of Guelph, Ontario.

James Rattray acknowledges the section's thanks for serving as general program chairman for the 1986 Canadian section meeting.

health roles of dietary fats, particularly marine lipids such as EPA, it is important in relating disease incidence to diet to look at more than one fatty acid in the diet, according to S.M. Innis, assistant professor in the University of British Columbia pediatrics and nutrition departments.

Innis noted that most experimental work on cardiovascular disease among Arctic peoples has concentrated on their intake of eicosapentaenoic acid from fish. But Innis has found in studies of the Canadian Inuit that most of their omega-3 fatty acid intake comes from marine mammals, not fish. She said the omega-3 makeup of marine mammals differs greatly from that of fish.

Before making conclusions about the relationship between rates of heart disease and specific omega-3 fatty acids in the diets of people living in the Arctic, Innis said, the sources and types of omega-3 fatty acids should be studied.

From a regulatory point of view, what concerns the U.S. Food and Drug Administration (FDA) is that "health claims are getting out of hand," according to Alan Sheppard, chief of the experimental methods research section for FDA's nutrition division. Sheppard said FDA is monitoring public interest in the possible health benefits of fish oils and is doing research, but still has no official position regarding fish oils and their use for human consumption.

What has concerned FDA, Sheppard said, is the highly variable quality of fish oil supplements sold as health foods. In blind studies, the agency found that the omega-3 content was highly variable from brand to brand of fish oil health product. "We need a definite set of definitions and parameters for oil products," he said.

One organization that plans to produce consistent fish oil products is the U.S. National Marine Fisheries Service (NMFS). Jeanne Joseph, a research chemist with NMFS, said it will begin full-scale production of refined menhaden oil, omega-3 concentrates (75%), deuterated 20:4 omega-6 and 22:6 omega-3 fatty acids for biomedical test purposes in April 1987. Beginning January 1988, it will produce C20 and C22 chain length concentrates, purified 20:5 omega-3 and 22:6 omega-3 fatty acids and restructured glycerides.

Joseph said these products will be available at no charge to investigators approved by the National Institutes of Health (NIH). With increased research on the role of fish oil in health, Joseph said, NIH probably will call for research proposals for the next five to 15 years, and those scientists who do receive grants will need samples that are consistent from lab to lab.

So far, $1.7 million has been invested in the project, and Joseph expects similar expenditures over the next two to three years to launch the project. The project is funded by the U.S. Department of Commerce to help the U.S. fishing industry.

The Canadian fishing industry also is showing signs of interest in the eventual manufacture of EPA and DHA concentrates from fish oils, according to James McClare of James H. McClare and Associates Ltd., Nova Scotia. The fish oil industry has shifted from a high level of activity in the late 1960s to a by-product industry. In terms of volumetric growth, McClare said, the areas where fish oil use may increase will be in oleochemicals, fuel, tanning, animal feed and pharmaceuticals.

The value of the raw material won't change, McClare said, but fish oil's worth in value-added products such as pharmaceuticals will probably increase. McClare said he could envision people being willing to pay a premium for good quality oil.

One way to maintain oil quality, according to David Josephson, a doctoral candidate at the University of Wisconsin, is to limit stress on fish during capture. Josephson said limiting fish stress appears to curtail production of enzymatically derived hydroperoxide products, precursors to the compounds which contribute to fish oil aromas.

This would be of interest to fish oil producers because hydroperoxides are catalysts in the autoxidative deterioration of polyunsaturated fatty acids, Josephson said. While fish odor could never be completely eliminated, better handling of fish could result in less deterioration of the oil.

During biochemical and physiological studies of salmon, Josephson found fish produced different volatiles depending on life cycle. He said the evidence suggests that lipids are converted by a lipoxygenase reaction to volatiles, which

Section officers

During the Canadian AOCS section's Oct. 9 breakfast business meeting at the University of Guelph, officers for 1986/87 were named. Roy A. Carr, executive director of the POS Pilot Plant Corp., Saskatoon, Saskatchewan, will serve as president; vice president is Levente L. Diosady, professor of food engineering at the University of Toronto. Theodore K. Mag, research manager of Canada Packers Inc., is the section's secretary/treasurer.

Among the actions agreed upon by the section were to continue supporting student participation by offering free registration at meetings and to establish a section newsletter, to be organized by Michael Eskin, University of Manitoba.

Next year's section meeting is tentatively scheduled to be held in Winnipeg in early October. James Daun will serve as program chairman for the meeting.

Expert meeting

The Canadian Expert Committee on Fats, Oils and Other Lipids (ECFOL) met in October in Guelph, Ontario. A report of the ECFOL meeting, including committee recommendations, will appear in *JAOCS* in January.

are characteristic of species-specific flavors. Because enzymatic action is important to the development of flavors, and because it increases with stress, Josephson said reducing stress might prevent the development of undesirable fish odors and flavors.

Among those who spoke on marine lipid analysis were R.G. Ackman and W.M.N. Ratnayake, both from the Canadian Institute of Fisheries Technology, Technical University of Nova Scotia, and G.E. Napolitano, Department of Oceanography, Dalhousie University.

Ackman described the mobility of various cod-derived molecular species of fatty acids and lipids when analyzed by Iatroscan-TLC after development in one of four solvent systems of varying polarity. Peak separation depended on polarity of the solvent, chain length and degree of unsaturation in acyl groups. These variables make it difficult to establish a baseline separation among all marine lipids using only one solvent system as a standard, Ackman said. He suggested that more than one solvent system and at least two standards be used when identifying peaks of marine lipid samples of unknown composition. Total hydrogenation would also improve peak separations, he said.

Ratnayake described work on the analysis of specific fatty acids found in certain fish species; Napolitano described work on isolating 18:5n3 fatty acids from microalga.

Among the other topics covered were the production of EPA concentrate from redfish and menhaden oils on the pilot-plant scale, by Bjarne Olsson, a University of Nova Scotia graduate student; possible microwave applications in grain and oilseed processing, by Y.J. Owusu-Ansah, POS Pilot Plant Corp., Saskatoon; evaluation and identification of sulfur compounds in canola oil, by R.C. Wijesundera, Ceylon Institute of Scientific and Industrial Research; and dietary fat versus caloric intake in the promotion of mammary cancer, by K.K. Carroll, University of Western Ontario.

James Rattray of the University of Guelph served as general chairman. Program chairmen were R.G. Ackman of the Canadian Institute of Fisheries Technology and James Daun of the Grain Research Lab of the Canada Grain Commission.

Northeast section

Speaker outlines fats' use in feed

The Northeast AOCS section meeting Oct. 14, 1986, featured a talk by Raymond H. Rouse of Rouse Marketing Inc., Cincinnati, Ohio, on the use of fats and oils in feed and quality controls.

According to Rouse, the feed fat market has grown sizeably since the first measureable amounts of fat were used in 1954. "Feed fat today represents almost 50% of the total domestic use of inedible animal fat. Fatty acids and soap usage run neck and neck as the second and third largest users of inedible animal fat," Rouse told meeting attendees (Table 1).

Noting fats currently are priced as an attractive energy source for feeds, Rouse predicted higher levels of usage in poultry and livestock feeds for the balance of 1986.

The categories of fats offered to the feed industry today include animal fat (rendered fats from beef or pork by-products), poultry fat (fats from 100% poultry offal), feed

TABLE 1

Domestic Usage of U.S. Inedible Tallow and Grease (Million Lb)

Year	Total	Soap	Fatty acids	Feed	Lubricants	Other
1950	1,777	1,280	250	—	28	217
		72%	14%		2%	12%
1960	1,745	732	351	443	70	151
		42%	20%	25%	4%	9%
1970	2,628	616	568	1,140	89	214
		23%	22%	43%	3%	8%
1975	2,908	662	698	1,282	115	149
		23%	24%	44%	4%	5%
1976	3,367	764	834	1,463	144	161
		23%	25%	43%	4%	5%
1977	3,180	737	760	1,407	127	148
		23%	24%	44%	4%	5%
1982	2,894	550	737	1,393	53	161
		19%	25%	48%	2%	6%
1984	2,949	632	720	1,352	62	183
		21%	24%	46%	2%	6%
1985	2,789	530	759	1,376	65	60
		19%	27%	49%	2%	2%

Source: U.S. Department of Commerce, "Bureau of Census M20K Report."

grade vegetable fat (vegetable oil, acidulated vegetable soapstocks and other refinery by-products), blended feed grade animal fat (blends of tallow, grease, poultry fat and restaurant grease) and blended animal and vegetable fats (blends of feed grade animal, poultry, vegetable fats and/or restaurant grease). Rouse noted that a significant volume of restaurant grease is blended into feed grade fats. "The fat can be vegetable or animal or blends, depending on the components of the cooking fat involved. Much of this fat is partially or wholly hydrogenated," he said, pointing out that during the 1970s, restaurant grease became a major component of feed grade animal fat.

Rouse predicted approximately 1,775 million pounds of feed fat would be used in the U.S. during 1986. This includes 450 million pounds of animal fat, 300 million pounds of poultry fat, 75 million pounds of vegetable fat, 250 million pounds of blended animal fat and 700 million pounds of blended animal and vegetable fats.

Rouse said the four basic types of fat suppliers serving the industry are renderers, fat blenders, brokers and in-house rendering. Renderers, he said, may have large quantities of their own tallow and grease available for sale to the feed industry. Many now offer animal and vegetable blended fats and have their own quality control laboratories to run analyses of concern to the feed industry. Some renderers may specialize in selling to soap and chemical industries and consequently do not offer, for example, pre-check of fats for pesticides. Fat blenders, meanwhile, include a range of sellers, from small trucker-sellers to larger blenders. Quality controls by the blender, Rouse said, usually vary with the size of the operation. Fat sources are varied and may include by-products of the soap and chemical industries. Rouse said brokers must depend mainly on quality control by the renderer and refineries from whom they buy the fats. With in-house rendering, on the other hand, a company is completely dependent on its own quality control program.

Rouse listed three quality considerations in buying feed fat:

- basic quality—moisture, impurities, unsaponifiables, total fatty acid, free fatty acid
- safety—LB edema test, residues of pesticides and PCBs, stability, gossypol
- energy—fat structure, uniformity

He also outlined quality specifications for different types of fat and suggested ways to check the quality of feed fats purchased. Rouse said his goal was to give listeners the tools to implement a feed fat quality control program and to purchase feed fats more efficiently.

Outstanding paper

Virginia Stout of the National Marine Fisheries Service in Seattle, Washington, has been cited for presenting an outstanding paper at the 1986 AOCS annual meeting in Honolulu, Hawaii, in May.

Stout spoke on "The Use of Supercritical Fluid CO_2 to Fractionate Fatty Acid Ethyl Esters Derived from Menhaden Oil."

South Central meeting

Thirteen members and guests attended the Oct. 7, 1986, dinner meeting of the South Central section of AOCS held at the Harvey Hotel, Dallas, Texas.

Outgoing chairman, Lisa Lambert, gave a welcome and introduced special guests. Jesse Covey gave the treasurer's report. Newly elected officers present were Monoj Gupta of Anderson Clayton, Houston, Texas, chairman, and Gerard Hasenhuettl of W.L. Clayton Research Center, Richardson, Texas, treasurer. Although absent, John P. Wagner, incoming vice-chairman, sent a letter expressing his willingness to serve the section.

Gupta outlined plans for the section for the year, including an all-day symposium and more meetings than last year.

Carl Miller, group leader in analytical chemistry and new products, research and development, for Novo Laboratories, was the guest speaker. His topic was biotechnology of fats and oils.