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AOCS

International News on Fats, Oils, and Related Materials

Centennial!

Coverage of the 100th AOCS Annual Meeting & Expo includes:

- the final article in our yearlong series chronicling the history of AOCS
- a profile of AOCS' incoming President
- AOCS Award Winners

Also inside:

Chloroesters in foods ● Biolubricants ● Sourcing long-chain omega-3s


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Departments and Information

AOCS Mission Statement
To be a global forum to promote the exchange of ideas, information, and experience, to enhance personal excellence, and to provide high standards of quality among those with a professional interest in the science and technology of fats, oils, surfactants, and related materials.

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Calendar

Bold type: *new listing*
For details on these and other upcoming meetings, visit www.aocs.org/meetings.

May

May 2–3, 2009. Lipid Oxidation and Antioxidants Short Course, Rosen Shingle Creek, Orlando, Florida, USA. Information: e-mail: meetings@aocs.org.

May 2–3, 2009. 8th Edible Oils Refining Short Course, Rosen Shingle Creek, Orlando, Florida, USA. Information: e-mail: meetings@aocs.org.

May 2–4, 2009. National Cotton Products Association 113th Annual Meeting, El Dorado Hotel & Spa, Santa Fe, New Mexico, USA. Information: www.cottonseed.com/calendar/default.asp.

May 3, 2009. New Tools for Surfactant and Polymer Characterization Short Course, Rosen Shingle Creek, Orlando, Florida, USA. Information: e-mail: meetings@aocs.org.

May 3–6, 2009. 100th AOCS Annual Meeting and Expo, Rosen Shingle Creek, Orlando, Florida, USA. Information: phone: +1-217-359-2344; fax: +1-217-351-8091; e-mail: meetings@aocs.org; http://Annual_Mtg.aocs.org.

May 3–7, 2009. TechConnect World Conference and Expo, George R. Brown Convention Center, Houston, Texas, USA. Information: www.techconnect.org/World2009.

May 3–7, 2009. Clean Technology 2009 Conference & Expo, George R. Brown Convention Center, Houston, Texas, USA. Information: www.csievents.org/Cleantech2009.

May 4–7, 2009. 22nd American Filtration and Separations Society Annual Technical Conference & Exhibition, Sheraton Hotel, Bloomington, Minnesota, USA. Information on short courses: www.afssociety.org/shortcourse; information on conference: www.afssociety.org/spring2009.

May 6–9, 2009. 17th European Congress on Obesity, RAI Exhibition and Convention Centre, Amsterdam, Netherlands. Information: www.easo.org/eco2009.

May 7–9, 2009. Feed Microscopy Short Course, Rosen Shingle Creek, Orlando, Florida, USA. Information: e-mail: meetings@aocs.org.

May 10–11, 2009. Symposium on Phospholipids in Pharmaceutical Research, Conference Center, Technologiepark Heidelberg, Heidelberg, Germany. Information: www.phospholipids.net/index.php?option=com_content&task=view&id=46&Itemid=36.

May 10–13, 2009. Frontier Lipidology: Lipidomics in Health and Disease, Quality Hotel 11, Gothenburg, Sweden. Information: www.swepharm.se/templates/kurs/kurstillfalle.aspx?id=2836.

May 10–14, 2009. Practical Short Course—Trends in Margarine and Shortening Manufacture. Non-Trans Products, Research Oil Mill, Texas A&M University, Bryan, USA. Information: http://foodprotein.tamu.edu/fatsoils/scmargarine.php.

May 11–12, 2009. Grains Are Functional, International ICC Conference, Bergholz-Rehbrücke, Germany. Information: www.icc.or.at/events.php.

May 12–14, 2009. 44th International wfk Detergency Conference, Hilton

AOCS Meeting Watch

Celebrate AOCS' 100-year anniversary in Orlando!

May 3–6, 2009. 100th AOCS Annual Meeting & Expo, Rosen Shingle Creek, Orlando, Florida, USA.

May 2–3, 2009. Lipid Oxidation and Antioxidants Short Course, Rosen Shingle Creek, Orlando, Florida, USA. Information: e-mail: meetings@aocs.org.

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For in-depth details on these and other upcoming meetings, visit www.aocs.org/meetings.

Hotel, Düsseldorf, Germany. Information: www.wfk.de/tagungen/idc.php?sprache=englisch.

May 17–19, 2009. 2nd Annual Society of Cosmetic Scientists' Scientific Symposium, Cosmetic Controversies—Seeing the Whole Picture, Belton Woods Hotel, near Grantham, Lincolnshire, United Kingdom. Information: www.scs.org.uk.

May 17–21, 2008. 64th Society of Tribologists & Lubrication Engineers Annual Meeting & Exhibition, Disney's Coronado Springs Resort, Orlando, Florida, USA. Information: www.stle.org/events/annual.

May 18–21, 2009. BIO International Convention, Georgia World Congress Center, Atlanta, Georgia, USA. Information: www.bio.org.

May 20–22, 2009. Czech Chemical Society, 47th International Conference on Technology and Analysis of Fats and Oils, Slovak Republic. Information: www.csch.cz.

May 21–23, 2009. 9th Yeast Lipid Conference, Berlin, Germany. Information: www.organobalance.de/yeastlipid2009l.

May 25–27, 2009. 2nd Annual Biofuels Summit, Singapore. Information: www.biofuelssummit.com.

May 27–28, 2009. Biofuels International Expo & Conference, Beurs van Berlage, Amsterdam, Netherlands. Information: www.biofuelsinternationalexpo.com.

June

June 3–6, 2009. International Symposium: Regulatory Oxylipins, University of Lausanne, Switzerland. Information: www.3emecycle.ch/biologie/pages/entry.php?code=pb32-09.

June 4–5, 2009. Society of Cosmetic Chemists 2009 Annual Scientific Seminar, Chicago Hilton, Chicago, Illinois, USA. Information: www.scconline.org/website/index_news.shtml.

June 9–11, 2009. Food and Function: Scientific Conference on Nutraceuticals and Functional Foods, Zilina, Slovakia. Information: www.foodandfunction.com.

June 11–12, 2009. XIII CID (Comitato Italiano Derivati Tensioattivi) Meeting, Palazzo Gnudi, Bologna, Italy. Information: www.ciditalia.it.

June 6–10, 2009. Institute of Food Technologists' Annual Meeting and Expo, Anaheim, California, USA. Information: www.ift.org.

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Letter from the President

Our 100th anniversary is here, and we are poised to review our history through the excellent chronology written by George Willhite and published in *inform* magazine and through the historic exhibits that will be placed in the Expo Hall. We will attend many technical sessions and celebrate with a gala event where we can socialize, network, reminisce, and meet new friends. As we think about and honor the past achievements of AOCS, we must give thanks to the many volunteers, Society officers, and staff, both now and then, who steered the affairs of the Society and made it possible for us to commemorate and celebrate.

Now is the time to chart the course for AOCS' future and provide strategic leadership and goals that will guide us in the next 100 years. In doing this, we must always be cognizant of the AOCS Mission:

To be a global forum to promote the exchange of ideas, information, and experience, to enhance personal excellence, and to provide high standards of quality among those with a professional interest in the science and technology of fats, oils, surfactants, and related materials.

Our leaders must provide vision and attainable goals to guide our actions in terms of membership recruitment and retention, fiscal policy, quality and searchability of journal publications, web-based delivery and packaging of AOCS products for varied end users, growth of Sections and meeting rotations at international sites, global economic impact on AOCS activities, Governing Board makeup, and ensuring a leadership pipeline for AOCS' future leaders.

I am happy to note that our membership, as well as our retention, is growing. The Asian Section held its first board meeting in conjunction with the International Society for Biocatalysis and Biotechnology (ISBB) in Taipei, Taiwan, on November 18–21, 2008. Executive Vice President Jean Wills and I were present. The Asian Section member countries in attendance were Japan, Korea, India, Taiwan, and Malaysia. The AOCS would like to continue to grow in membership from the Sections as we start to alternate regularly scheduled regional and federation meetings.

For the 2009 AOCS Annual Meeting & Expo, we had approximately 427 oral presentations, 202 posters, and 9 hot topics scheduled as of February 10, and a keynote speaker, Daniel Burrus (founder and chief executive officer of Burrus Research). Mr. Burrus will energize and prepare our minds for the next AOCS century and help us learn how to capitalize on the newest wave of technological changes. We are honored that a speaker of his caliber has accepted our invitation to give the keynote address. Be sure to attend the AOCS Business Meeting and Awards Recognition Breakfast on Tuesday morning to listen to his exciting presentation.

I would like to personally thank the centennial organizing committee, past presidents, the AOCS Governing Board and staff, and all the volunteers who helped in the planning and execution of this anniversary celebration.

At the Winter Governing Board meeting in Atlanta, Georgia, on March 2–3, 2009, the following major decisions were made:

- The Board approved the 332 new members that joined between September 9, 2008, and February 5, 2009.
- The Board reviewed and updated the Strategic Plan. Metrics to measure success will be added.
- The Board approved the presentation of plaques to Fellows starting in 2009 and replacement of paper certificates with plaques to previous Fellows.
- Proposed changes to Fellows Award Guidelines were sent back to the Ad Hoc Committee for more deliberations; their recommendation will be presented at a future date.
- The Board approved five new Fellows for 2009.
- The Board approved the AOCS Governing Policy Manual. The AOCS staff developed and adopted Standard Operating Procedures.
- Staff was directed to prepare an article for *inform* on how AOCS has adapted over the past five years to illustrate the sensitivity of the Society's leaders to economic conditions.
- An Ad Hoc Committee was appointed by the President to recommend processes to orient new Board Members and to develop succession planning for the Board and Committees. This came from the discussion on the concept of the possibility of providing Leadership Training.
- The Foundation Chairman and staff were asked to evaluate the Foundation structure and make a recommendation at the May meeting.

Finally, I would like to personally invite you, your family, friends, and all users of AOCS products and services to come and join us in Orlando, Florida, May 3–6, 2009, for the celebration of our 100th anniversary, and to take part in the many excellent technical programs and exhibits. I also encourage you to visit www.aocs.org/100 to learn more about the long and rich history of AOCS. I wish you a safe trip and a pleasant stay in Orlando.

See you in Orlando!

Casimir C. Akoh
AOCS President, 2008–2009

Chloroesters in foods: An emerging issue

The detection, in some foods and vegetable oils, of fatty acid esters of the contaminant known as 3-MCPD is an emerging issue for food and vegetable oil processors.

Catherine Watkins

Process-based food contaminants have existed for many thousands of years, ever since prehistoric man first threw a haunch of wooly mammoth on a fire and produced polycyclic aromatic hydrocarbons. By comparison, it has been considerably less than 100 years since food safety agencies began conducting risk assessments of food contaminants. At this point, there are more knowledge gaps than facts about most potentially suspect compounds.

One such group of food contaminants—the chloropropanols—is of growing significance to the fats and oils community, particularly in their esterified (or bound) state. The chloropropanol most commonly found in food, in either its free or bound form, is 3-MCPD (3-monochloropropane-1,2-diol), although others are also of interest, including 2-MCPD (2-monochloropropane-1,3-diol), 1,3-DCP (1,3-dichloro-2-propanol), and 2,3-DCP (2,3-dichloro-1-propanol).

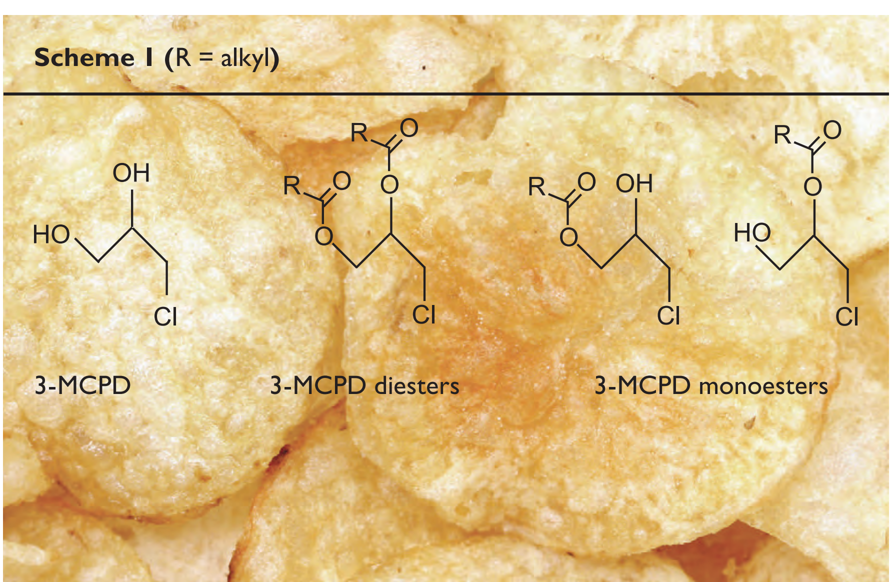
FORMATION AND TOXICOLOGY

Current thinking suggests that 3-MCPD is formed as a result of a reaction between a source of chlorine (chlorinated water or sodium chloride) in a food or a food contact material and a lipid. The mechanisms of its formation are not fully understood. Two basic pathways have been proposed: thermally driven and enzyme-catalyzed (generally lipase) reactions. Direct precursors are thought to be glycerol and chloride. Recent work has also suggested glycidol (2,3-epoxy-1-propanol) as a precursor. (Glycidol is highly reactive and has been found to be a multisite carcinogen in both sexes in animal models, as well as a genotoxin *in vitro* and *in vivo*.)

Fatty acid esters of 3-MCPD (see Scheme 1) were identified in the early 1980s in adulterated Spanish rapeseed oil treated with aniline and refined with hydrochloric acid. To date, however, the majority of the scientific investigations and regulatory actions involving chloropropanols have come as a result of the detection of high levels of free 3-MCPD in acid-hydrolyzed vegetable protein (acid-HVP) and nonfermented soy sauces made from acid-HVP.

Ingestion of free 3-MCPD induces carcinogenic and benign tumors in experimental animals after long-term intake; it has not been found to be genotoxic *in vivo*. Both the European Commission's (EC) Scientific Committee on Food (now the Scientific Panel on Contaminants in the Food Chain, or CONTAM) and the Joint FAO/WHO Expert Committee on Food Additives (JECFA) set a tolerable daily intake (TDI) of 2 μg/kg of body weight in 2001. (The TDI is an estimate of the amount of a substance in air, food, or drinking water than can be taken in daily over a lifetime without appreciable health risk.) In 2008, JECFA set the maximum allowable content of free 3-MCPD in foods at 0.4 mg/kg (400 μg/kg) for liquid condiments.

Germany, supported by the EC and Canada, requested in 2008 that JECFA undertake full toxicological and exposure assessments on 3-MCPD esters. JECFA agreed to include fatty acid esters of 3-MCPD in its priority list, but not to assign a high priority to them because of the lack of available data. No toxicological or risk assessment work has yet been done on esterified chloropropanols.



Scheme 1 (R = alkyl)

The presence of 3-MCPD esters in processed food was first described in 2004, followed by the determination of 3-MCPD esters in refined, bleached, and deodorized vegetable oils in 2006, and in human breast milk in 2008. So far, no or only traces of 3-MCPD esters have been found in unrefined and native vegetable fats and oils. Only traces of 3-MCPD esters appear to be present in unrefined animal fats. The list of food and ingredients in which 3-MCPD esters have

been detected includes bread, toasted bread, coffee and coffee creamer, non-HVP seasonings, cheese, cooked meat, salami, infant formula, margarine, french fries (chips), and doughnuts.

In November 2007, the German food safety agency (Bundesinstitut für Risikobewertung: BfR) called for levels of 3-MCPD esters to be reduced in oil-containing foods such as infant formula and margarine as well as in deep-frying fats, despite the absence of any indication of risk from bound 3-MCPD. In its assessment, BfR assumed that 100% of the bound 3-MCPD (and related isomers) is released from its esters during digestion in the gut. This assessment was based largely on an *in vitro* study using human intestinal Caco-2 cells that showed a high percentage of 3-MCPD esters were hydrolyzed.

However, based on an *in vitro* lipolysis model, Walburga Seefelder and coworkers at the Nestlé Research Center in Lausanne, Switzerland, propose that "the potentially slower release of 3-MCPD from 3-MCPD diesters, and the mono- to diester ratio, suggest 3-MCPD esters may in fact contribute only marginally to the overall dietary exposure to [free] 3-MCPD." In addition, "the analysis of 11 different samples of fat mixes typically employed in food manufacturing demonstrated that a maximum of about 15% of the total amount of 3-MCPD bound in esters is present in the monoesterified form," Seefelder and coworkers noted.

ANALYTICAL CHALLENGES

Adding to the uncertainty is the lack of a validated, fully collaboratively studied method for the detection of 3-MCPD esters. This makes it difficult to compare data from previously published articles as well as results obtained from analytical laboratories. Those working to mitigate the formation of 3-MCPD esters in vegetable oils have expressed frustration over the lack of reproducibility of analytical results. In fact, 3-MCPD can be either formed or lost during the process of extraction from food products.

One industry source, who wishes to remain anonymous, reports his company has sent identical samples on a weekly basis to a number of laboratories for 3-MCPD analyses, with widely varying results. "We have also sent portions of the same sample to the same lab over time, with widely varying results," he said. "Even as we are doing all this work, though, it is important to

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ILSI Europe holds workshop on 3-MCPD esters

A workshop on 3-MCPD esters in food and food ingredients (see main article on page 200 for background) was organized by two International Life Science Institute (ILSI) Europe task forces (Risk Assessment of Chemicals in Food and Process-Related Compounds/Natural Toxins) in cooperation with the Directorate General for Health and Consumer Affairs (DG Sanco) of the European Commission (EC). Held February 5–6, 2009, in Brussels, the workshop was attended by more than 70 participants from 20 countries, including scientists from government (US Food and Drug Administration, UK Food Standards Agency, and the European Food Safety Authority), academia, industry, and representatives of the EU Member States.

The primary aim of the workshop, according to ILSI Europe, was "to review all available data required for risk assessment, to identify the key data gaps for risk assessment, to define experimental research strategies to fill the data gaps, and to propose an action plan."

The two-day review of available data demonstrated that the issue of 3-MCPD esters in food is more complex than previously thought, with numerous molecular species requiring characterization and risk assessment. In addition, the lack of reproducibility of analytical results makes the development of a validated method vital for future work.

Presentations by key European regulatory and risk assessment agencies made it clear that, for the EC, the first priority is to reduce levels of 3-MCPD esters in food by risk mitigation measures taken by food business operators. Possible maximum allowable levels of 3-MCPD esters in food may be considered after more knowledge is gathered on the pathways of formation and on what levels are achievable by applying appropriate risk mitigation measures. "There is much work to be done," said Frans Verstraete of DG Sanco, "and that needs a global, comprehensive, and coordinated approach."

Participants agreed that:

- The issue of chloroesters in food needs to be examined from different perspectives: analytical, technological, and toxicological. In the meantime, there is no evidence that current food consumption patterns should be changed for public health reasons because of the presence of 3-MCPD esters.
- The first priority is for a ring-tested, fully collaboratively studied method for determination of chloroesters in food as well as a clear and coordinated global approach to answering the many questions surrounding chloroesters.
- Work on characterizing the formation of chloroesters is required to determine how to mitigate formation of 3-MCPD esters during refining and food processing.
- Because 3-MCPD esters in vegetable oils are probably formed during deodorization—a high-temperature process—the amount of esters as well as the ratio between 3-MCPD and 2-MCPD esters is most likely dependent on the deodorization temperature.
- Unintended consequences of mitigation must be elucidated carefully.

CONTINUED ON NEXT PAGE

- The lack of exposure data and information about the *in vivo* oral bioavailability of 3-MCPD esters makes risk assessment impossible at this time. Further, a better understanding is needed of the ratio of monoesters of 3-MCPD to diesters, which appear to be hydrolyzed preferentially to *sn*-2 monoesters. Finally, a determination about whether all chloroesters (and their mono- and diesters) need individual toxicological evaluation must be made.
- The significance of glycidol esters must be established through quantitative work (the only findings to date are qualitative). In addition to esters, the significance of other forms of MCPD-adduct formation in foods, such as 1,3-dioxolans, must be settled.

"In addition to developing a web page and communications tool in partnership with ILSI Europe, AOCS Technical Services is ready to help industry and our constituency develop the analytical tools and resources needed to meet this global challenge," said Richard Cantrill, director of AOCS Technical Services and a participant in the ILSI workshop.

A web page available at www.aocs.org/tech/3_MCPD.cfm includes background information as well as an extensive reference list and the presentations from the ILSI Europe workshop. Also, the analysis of 3-MCPD esters will be discussed at the 100th AOCS Annual Meeting & Expo in a session on contaminant analysis scheduled for Tuesday, May 5, from 1:55 to 5:00 p.m., tentatively scheduled in Gatlin E4.

*inform*ation

AOCS has developed a web-based reference list with explanatory material on 3-MCPD esters. The information is available at www.aocs.org/tech/3_MCPD.cfm, and includes a link to the presentations made at the ILSI Europe workshop on 3-MCPD esters in food products held February 5–6, 2009, in Brussels (see meeting coverage on page 201).

note that both free and bound 3-MCPD have been found in a great number of foods. It is unfair to highlight refined oils and fats too strongly," he stressed.

As a result of the BfR report in 2007, the European oil industry trade association, FEDIOL, developed an action plan. "In close collaboration with the European food industry . . . , FEDIOL continues to monitor the scientific information available on the analytical methods to determine 3-MCPD esters, their potential toxicity, and bioavailability, as well as investigate the origins of the 3-MCPD esters in foods . . . ," the group said in a written statement.

The first results of pilot-plant trials conducted by FEDIOL suggest that 3-MCPD esters are formed primarily at high temperature during oil deodorization, although some also are formed during bleaching. The degree of formation "is largely determined by crude oil characteristics and pretreatment conditions (especially crude oil type and bleaching conditions)," according to Gerrit van Duijn of Unilever. The preliminary FEDIOL work also found that the free fatty acid level at the start of deodorization had no effect on 3-MCPD ester formation. In addition, no significant difference in formation has been found between chemical and physical refining.

FEDIOL has established that in some oils, 3-MCPD esters have already formed at the minimum effective deodorization temperature of 180°C. "The level more or less doubles if the temperature is increased to 260°C," van Duijn said. The deodorization time, however, seems to be of "less importance."

"Our samples were analyzed by Eurofins using two methods," he clarified. "One uses NaCl in the sample preparation and one uses $(NH_4)_2SO_4$. The results with the NaCl-based method indeed showed a doubling of the 3-MCPD ester level when the temperature increased from 180 to 260°C. However, the results with the ammonium sulfate-based method showed hardly any effect of the temperature increase," he said.

Similarly, Katrin Hoenicke of Eurofins in Hamburg, Germany, has confirmed recent findings by Jan Kuhlmann of SGS Institut Fresenius in Berlin, Germany, suggesting that the 3-MCPD concentrations observed in some fats and oils were lower when sodium chloride was replaced by ammonium or sodium sulfate during sample preparation. The results can differ up to a factor of two or three, Hoenicke said. "In addition, other substances—such as glycidol—that may also be present in oils and fats can be converted into 3-MCPD during the sample preparation step when using the method published by the German official food laboratory (Chemisches und Veterinär Untersuchungsamt in Stuttgart)," Hoenicke noted. "This underscores the need to identify and validate methodology that accurately quantifies both free and bound 3-MCPD in fats and oils," she concluded.

Elsewhere, the Malaysian Palm Oil Board reports that it is conducting extensive research on 3-MCPD esters in a number of oils, looking at all stages of production. And the US Food and Drug Administration, which so far has been concerned only with free 3-MCPD in hydrolyzed proteins and soy sauces, told *inform* that the agency "will continue its collaborations to ensure that appropriate data are developed on the formation of 3-MCPD esters in foods and their potential impact on human health."

Catherine Watkins is associate editor of inform *and can be reached at cwatkins@aocs.org.*

Centennial!

George Willhite

It's time for a party. The American Oil Chemists' Society will open its centennial celebration on May 3, 2009, in Orlando, Florida, about 760 miles (1200 kilometers)—and not quite 100 years—from Memphis, Tennessee, where it all began.

If the nine founders of the American Oil Chemists' Society could attend the Orlando meeting, what would they think?

They would be dazzled by modern analytical techniques and the data they provide.

They would be astounded that their band of nine analysts from the southern United States has grown to 4,000+ members in 90+ nations.

And they would be delighted to socialize with colleagues—food and beverages have been important at AOCS meetings for a hundred years.

There's a direct link from 1909 to 2009.

Founding President Felix Paquin and 1961 President A. Richard Baldwin, both sons of farmers, met during the 1950 annual meeting in Atlanta, Georgia. Baldwin, who turned 91 earlier this year, says he doesn't recall what words were exchanged, but there's a photo of Paquin and Baldwin—along with two other AOCS members of the Education Committee—on page 24 of the July 1950 issue of *JAOCS*. Paquin was visiting various AOCS committee meetings in Atlanta for what modern publicists would call a series of "photo ops."

The infant society Paquin fostered has flourished. Although the group failed to muster a quorum of 10 members for its second meeting in 1910 in St. Louis, Missouri, since then approximately 110,000 persons have attended 140+ annual (spring) and fall meetings in the United States, approximately 11,000 additional registrants have signed up for approximately 150 AOCS Short Courses, and 25,000+ have attended AOCS world conferences or other AOCS-sponsored events around the world.

AOCS has published 85 volumes of the *Journal of the American Oil Chemists' Society* (including its predecessor journals), 43 volumes of *Lipids*, 19 volumes of *inform*, and 13 volumes of the quarterly *Journal of Surfactants and Detergents*. It has published 319 monographs, books, and proceedings, plus approximately two dozen CD/DVD titles. A sidebar to this article in this issue of *inform* (see p. 206) provides historical information on the *Official Methods and Recommended Practices of the AOCS*.

Felix Paquin (far left) makes a point about short course plans with (left to right) K.F. Mattil, A.R. Baldwin, and J.P. Harris. They are pictured at the 1950 AOCS Annual Meeting, held in Atlanta, Georgia, USA.

PAST CELEBRATIONS

Past anniversaries have been observed in a variety of ways. At the 25th anniversary meeting during 1934 in New Orleans, founding member E.R. Barrow read brief biographies of the four founders who had died.

The 50th anniversary meeting (1959, also in New Orleans) featured two symposia, one on five decades of research in the chemistry and technology of fats and oils, the other on 50 years of research in six countries. During the meeting banquet, one president from each decade reported on highlights from his era.

At Dallas in 1984, the 75th anniversary was marked with a multimedia presentation on the history of fats and oils. A membership campaign to enroll 750 new members during the 75th year appeared to have succeeded as the annual meeting began.

THE 100TH CELEBRATION

In Orlando, history will abound in the exposition hall.

- An opening ceremony will be held at 5:15 p.m. Sunday, May 3, in the hall.
- There will be a "Hall of Presidents" featuring photographs of past and current leaders, plus memorabilia from AOCS' history.
- The oilseed and oil processing industry and the soap industry will have mini-museums set up.

History also will be on parade in the lecture rooms as well.

- One "hot topic" session will feature talks on historical perspectives of fats and oils chemistry. Several divisions will hear historical perspectives.
- "Now and Then" is the theme for the Analytical Division's opening session on Monday, May 4, with historical talks blended with others looking forward.
- Marcel Lie Ken Jie of Hong Kong will open the Industrial Oil Products session on Tuesday afternoon, May 5, with "One Hundred Years of Oleochemistry: 45 Years Done, 55 More To Go."
- "Lecithin (Yesterday, Today and Tomorrow)" will be presented by the Phospholipid Division on Tuesday afternoon, May 5.
- The Processing Division's opening session on Monday morning, May 4, will have six reports on the history of oilseed and oil processing.
- The Surfactant and Detergent Division plans to update its history of industry changes during its Monday evening reception.

Although this is being written several months before the meeting, it appears AOCS will have enrolled 1,000 new members since the 2008 Annual Meeting & Expo by the time the Orlando meeting ends on May 6.

CENTENNIAL GALA

The big party will be an outdoor gala on Tuesday evening, May 5, preceded by a reception in the exposition hall.

Persons who have bought gala tickets will exit the reception for the party via a "red carpet" entry area with lots of hoopla.

There will be a VIP receiving line, including AOCS past presidents, to open the gala. Food and beverage will be available, with a karaoke band providing music. If karaoke singing ensues, it might raise echoes of long-ago annual meetings when there reportedly were competitions with participants striving for volume, not harmony, in booming out college fight songs and patriotic tunes, as well as sentimental favorites.

Provisions have been made in case of rain.

Meeting participants will collect various mementos, including a miniature glass Erlenmeyer flask bearing the AOCS centen-

AOCS Methods mark 100 years

For 100 years, AOCS' mission has been to provide its members and clients with tested, validated analytical methods. The latest example of that will be the publication, in AOCS' centennial year, of the sixth edition of AOCS' book of methods.

AOCS methods are referenced in trading rules that underlie the international trade in oilseeds, oilseed products, and other products in AOCS-related disciplines. Global value of such products easily reaches into the hundreds of billions of dollars annually.

It all began in 1909 when some experienced cottonseed product analysts were asked by the Interstate Cottonseed Crushers Association to put on paper guidelines for determining cottonseed oil quality.

The 2009 edition, a nearly 4-inch-thick three-ring binder, will provide approximately 450 analytical techniques for vegetable oil source materials, oilseed by-products, commercial fats and oils, soaps and detergents, glycerin, sulfonated and sulfated oils, and soapstocks, as well as specifications for reagents, solvents, and necessary apparatus. There also will be recommendations for testing industrial oils and derivatives, and test methods for those materials. (For information about ordering, see page 247.)

The book wasn't always so large. In fact, the first guidelines compiled by those early analysts were not published by AOCS. Those initial suggestions were incorporated into the cottonseed crusher organization's rule book. In 1928 AOCS published its first independent book of methods. By 1944, the book consisted of about 90 pages in a 5- by 7-inch three-ring binder, which was kept updated by inserting revisions or new methods as approved. AOCS decided in the 1940s it was time to publish an entirely new edition, which was done in 1946. Subsequent editions were printed in 1964, 1989, and 1998.

Electronic versions are now available. Large organizations with many laboratories can pay for web access to the book, which allows their chemists to retrieve methods electronically. Individuals also can pay to access the methods online. Single methods also can be purchased for downloading in PDF format by those who do not need access to the full book.

AOCS methods are used in hundreds of laboratories on six continents—from Norway to South Africa, from Beijing to Istanbul.

AOCS methods are developed through a rigorous procedure involving collaborative testing in diverse laboratories before being approved for inclusion in AOCS' *Official Methods and Recommended Practices.* As new methods are approved, they are issued in annual sets of additions and revisions. After several years of this process, it becomes less expensive to laboratories for AOCS to publish a new book of methods, rather than require a lab wishing an up-to-date set to purchase the basic book and many annual sets of additions and revisions.

Electronic delivery of the sixth edition will be improved because all components of the book will be stored in a database. This also will facilitate future revisions.

C.B. Cluff was chairman of the Uniform Methods subcommittee that produced the first book of methods in 1928. W.H.

nial logo.

Socializing and talking informally are an important tradition at AOCS meetings. David Wesson once wrote in the society's journal that when members, who would be very circumspect about their operations during formal sessions, gathered in a cocktail lounge at the end of the day, they tended to speak frankly.

The candid evening discussions would reveal that most had been pursuing similar paths to solving the same problems. The informal sharing helped move the industry along, Wesson said.

In Orlando, when the final technical paper has ended and the final committee meeting is over, it's very likely that somewhere in a bar at Rosen Shingle Creek, you'll find AOCS members discussing what lies ahead.

Such discussions have been an AOCS tradition since May 20, 1909, when nine cottonseed product analysts gathered at the Jockey Club in Memphis, Tennessee, and decided to form a new organization.

Some things never change.

Happy Birthday, AOCS!

George Willhite, who prepared this series of articles as AOCS' centennial historian, retired from AOCS in 2002 after 27 years as a member of its publications staff. He is an honorary member of AOCS. He can be contacted via e-mail at: willhite@aocs.org.

Irwin succeeded Cluff and headed the Committee on Revisions of Methods until his death in 1937, when J.T.R. Andrews took over. In the early 1940s AOCS decided to completely revise the methods book.

V.C. Mehlenbacher undertook this task and became the official editor for the methods book in 1945. There have been six others editors: T.H. Hopper (1950–58), E.M. Sallee (1958–71), W.E. Link (1971–78), R.O. Walker (1978–83), R.C. Walker (1983–87), and David Firestone (1987–present).

The 1946 edition was printed on 6- by 9-inch paper, which remained that size until the fifth edition in 1989, when the methods were printed on letter-size paper.

Frank Smalley was appointed chairman of the Uniform Methods Committee when the Society of Cotton Products Analysts set up a formal organization in 1910. Records indicate G. Worthen Agee served as chairman in 1913–14, with Smalley resuming the chairmanship until his death in 1921. F.B. Porter succeeded Smalley, serving until 1926, when founding president Felix Paquin became chairman, serving until 1929. J.J. Vollertsen then became chairman, retiring in 1946. AOCS records list 10 chairpersons during the past 60 years: J.T.R. Andrews, R.R. King, D.L. Henry, E.M. Sallee, W.E. Link, D. Firestones, T.H. Smouse, J. Snyder, C. Dayton, and M. Kennedy. Janet Snyder has been the only female chairperson.

The first three committees that AOCS established were for administration, membership, and methods. Methods have remained at the center of AOCS activities for one hundred years.

President's Profile: Ian C. Purtle

In January 2009, inform *published a brief biography of Ian C. Purtle as part of the information supplied to AOCS members regarding candidates for the Governing Board of AOCS. Purtle will take office as president at the AOCS Annual Meeting & Expo in Orlando.* inform *invited him to provide further details about himself and his relationship with AOCS, and he supplied the following.*

Incoming AOCS President Ian Purtle and his wife, Ann.

I was born in a small country town called Albury, New South Wales, Australia. Albury is on the Murray River, one of the longest rivers in the world, and within sight of the Snowy Mountains that feed it. Together with the Darling and Murrumbidgee River basins, which feed into the Murray River, this area west of the Snowy Mountains was the traditional agricultural heart of Australia's wheat and wool industries.

I grew up on a small mixed farm until I was 15, when my father became ill and we sold the farm and moved into town. My high school days were spent at the Albury High School, where I liked to play tennis, squash, and golf. It was also there that I met Ann, who later became my wife.

It was about the time that my parents sold the farm that I decided I really wanted to see more of the world than just a small country town. I enjoyed learning languages and was fortunate that math and science came to me rather easily.

I won a Commonwealth Scholarship from my high school results, which gave me the freedom to study whatever I chose. I decided to study electrical engineering because I was curious about how radio, television, and telephones worked. So I left home at 17 to attend the University of New South Wales (UNSW) in Sydney. I never did go back to live in Albury, although I visit pretty much annually to maintain family contacts.

My wife, Ann, and I married in 1967 after I graduated from UNSW, and moved to Sydney, where I was working for the Australian government-run telecommunications system. Ann was born in Holland and had migrated to Australia with her parents in 1950, in the aftermath of World War II. She had not seen any of her extended family since 1950 and was eager to do so. Hence, after we had both worked for four years following my graduation, we decided to spend a year in Europe, with a particular focus on meeting her extended family, including grandparents.

It was while we were in Amsterdam at the beginning of 1972 that I first connected with Cargill, which has a large import grain elevator and soybean plant in the Amsterdam Harbor. Cargill had aspirations of expanding its oilseed crushing and refining business around the world, including Australia. I was offered a technical traineeship and a "free" return ticket to Australia for both my wife and myself after my traineeship.

We moved back to Australia in February 1974, to an even smaller town than Albury called Narrabri on the Namoi River in New South Wales. Narrabri was, at the time, in the middle of an emerging irrigated cotton-growing area. We converted the plant that Cargill had bought there—in the space of two short years—from a full-press cottonseed plant to a pre-press solvent extraction plant with a miscella refinery and coal-fired boiler capable of crushing and refining virtually any oilseed. What an amazing and challenging experience!

The chemist at that Narrabri plant was a man named Steve Lambert, who was an AOCS member. He had his decades-long collection of AOCS journals neatly stored in chronological order on a long shelf in his laboratory built specifically for the purpose. I spent every spare moment reading his "AOCS library," trying to learn about this new (for me) business for which I had become responsible.

I must have passed the "Cargill test," because in February 1977, after only three years in Narrabri, I was asked to return to Amsterdam to manage all the technical aspects of Cargill's Benelux oilseeds operations. There, I followed in the footsteps of Guillaume Bastiaens, who moved to Minneapolis in 1981 after establishing Cargill's Wet Milling business in Bergen-Op-Zoom and Tilbury.

I became actively involved in AOCS after the Maastricht meeting in 1986. I think I have attended every AOCS annual meeting since then.

Cargill asked us to move to Minneapolis in September 1987, where I continued to play an increasing role in the operations and engineering component of Cargill's rapidly expanding global oilseeds business. The emphasis of my role in oilseeds changed in 1998 to focus more on technology development and less on day-to-day operations. As the cost of energy has increased so significantly over the past decade, more of my work has been focused on energy conservation, biofuels, and bio-industrial substitutes for petroleum-derived products.

Ann and I are now "empty nesters" as our children are grown and have left home. Ann works part-time at Talbot's, a woman's clothing store. She likes fashion and loves to be with people and advise them on clothing and accessories. She very much enjoys the camaraderie of working with the team at "her store." Our three children—Tania, Michael, and Jason—were all born in Holland. Tania was born just before we moved to Narrabri and the two boys were born after we went back to Holland.

I very much look forward to the opportunity of serving as your president in this, the centennial year, of AOCS. It is a great honor to have been elected to this position. The AOCS brand has global appeal that we need to recognize and harness. AOCS has survived a tough realignment of its finances over the last five years as many of the industries and organizations on whom we depend for support have consolidated and globalized. Given the current credit crunch and its potential consequences, we need to be alert to any further changes that may impact AOCS finances. I believe that I have both the global perspective and the business experience to help AOCS to continue to be successful going forward into its next century.

However, we all need to pull together to make this happen. I look forward to your personal and corporate support for AOCS this year and for many more years to come. We have a great staff, led by Jean Wills, who have demonstrated their commitment to AOCS and their ability to get things done. Let us make this 100th-year celebration one to remember.

News & Noteworthy

Oil Crops Outlook released

Use of soybean oil in the United States is decreasing faster than its production is declining, according to the Economic Research Service (ERS) of the US Department of Agriculture (USDA).

December 2008 ending stocks of soybean oil rose to 2.66 billion pounds (roughly 1.2 billion kg) from 2.54 billion in November 2008, the ERS noted in the February 11, 2009, *Oil Crops Outlook* report. "In particular, there are more pessimistic prospects for US exports of soybean oil. Through January 29, US export sales commitments were down nearly 60% from a year ago," report authors Mark Ash, Erik Dohlman, and Kelsey Wittenberger said. Sales to North Africa, which surged in 2007/08, are off sharply in 2009. The region is substituting significantly more imports of sunflowerseed oil from Ukraine.

In addition, soybean oil imports by Mexico (customarily the top market for US exports) are also quite weak, the report said. US soybean oil exports for 2008/09 are forecast 250 million pounds lower this month at 1.5 billion, which is almost half of last year's 2.9 billion pounds. Likewise, 2008/09 domestic consumption of soybean oil is forecast 250 million pounds lower this month at 17.6 billion pounds.

A dimmer outlook for use in methyl esters (biodiesel) reduced the total by 200 million pounds to 2.9 billion pounds and below the 2007/08 use of 2.981 billion pounds. Both economics and policy are working against US commerce in biodiesel, the ERS report said. Despite lower costs for soybean oil, the decline in diesel fuel prices has been even steeper, leading producers to substitute cheaper feedstocks such as tallow. Industry overcapacity also has kept feedstock costs up at a generally unprofitable level.

The complete report is available at http://usda.mannlib.cornell.edu/usda/current/OCS/OCS-02-11-2009.pdf.

India's vegetable oil imports rise

The Solvent Extractors' Association of India (SEAI) reports that India's imports of vegetable oils increased sharply in the first quarter of the marketing year (November 2008–January 2009) because of a sharp

Briefs

High-linolenic acid flaxseed oil manufactured by Polar Foods, Inc. of Fisher Branch, Manitoba, Canada, has received GRAS (Generally Recognized as Safe) status from the US Food and Drug Administration. The oil may be used in beverages, puddings, fillings, processed vegetables and fruits and their juices, grain products, chewing gum, soups, cereals, candies, and baked goods. Polar Foods provided the following specifications for its high-linolenic flaxseed oil: -linolenic acid (ALA) (68–73%), linoleic acid (9–12%), oleic acid (9–14%), stearic acid (2–6%), palmitic acid (3–6%), lead (not more than 0.1 mg/kg), and cyanoglucosides (not more than 2 mg/kg).

■■■

India's Centre for Science and the Environment told the *Financial Times* newspaper in February that all brands of vanaspati (fully or partially hydrogenated cooking oil made primarily from palm oil) used in Indian households contain a very high percentage of *trans* fatty acids (TFA). The levels were in the 23% range; the lowest TFA levels (3.7%) were found in one brand of butter and ghee (clarified butter).

■■■

Indonesia has lifted its moratorium on the use of peatland forests by palm oil companies, a senior Agriculture Ministry official told the Associated Press (AP) news service in February. The government will start issuing permits immediately in areas that meet certain criteria on the depth of the peat, mineral quality, and other issues, Ahmad Manggabarani was quoted as saying. The moratorium had been in place since December 2007. ■

drop in international prices and anticipation of the imposition of import duties by the Indian Government. "This [increase] has adversely affected the . . . domestic industry during the peak crushing season," SEAI said.

The import of vegetable oils during January 2009 reached 912,342 metric tons (MT), which SEAI said was the greatest amount ever since 1994. In addition, imports of edible oil nearly doubled in the first quarter to almost 2.1 million metric tons (MMT), compared with approximately 1.1 MMT tons for the same period of the previous year.

Sunflower oil is gaining market share from soybean oil, SEAI noted, thanks in part to the 20% duty on soybean oil. In addition, January 2009 was the first time since the 2002/2003 marketing year that rapeseed oil was imported. Finally, SEAI said the import of nonedible oils during the first quarter was reported at 94,160 MT, compared with 164,738 MT during the same quarter the previous year.

Catalyst avoids *trans* formation

University of California-Riverside (USA) chemists have designed a catalyst that allows hydrogenated oils to be made while minimizing the production of *trans* fatty acids (TFA).

In their experiments, the researchers, led by Professor of Chemistry Francisco Zaera, used platinum, a common industrial catalyst. By controlling the shape of the platinum particles, the Zaera group was able to make the catalyst more selective.

Catalytic selectivity refers to the ability of a catalyst to select a specific pathway from among many possible chemical reactions. In the case of the researchers' experiments, selectivity refers to the production of partially hydrogenated fats without the production of TFA.

Zaera's lab found that the platinum catalyst performed most selectively when its particles assumed tetrahedral shapes, with the atoms arranged in a hexagonal honeycomb lattice. Particles with these shapes allow for the preservation of the harmless *cis* configuration in the hydrogenated fats. Other lattices, the researchers found, favor the production of *trans* fats.

Platinum catalysts such as those used by the Zaera group are considered heterogeneous because they exist in a different phase (solid) from the reactants (liquid or gas). Compared with homogeneous catalysts, where the catalyst is in the same phase (liquid) as the reactants, heterogeneous catalysts have the advantages of easy preparation, handling, separation from the reaction mixture, reuse, high stability, and low cost.

But their main disadvantage is that, unlike homogeneous catalysts, which tend to be molecular, heterogeneous catalysts must be dispersed as small particles in a high surface-area support in order to optimize their use. This typically results in catalysts with surfaces of ill-defined structures.

The research by Zaera and his colleagues is a breakthrough, they said, because it shows for the first time that it is possible to achieve selectivity with heterogeneous catalysts like platinum by controlling the structure of their surfaces.

"The more control we can exert on how we prepare catalysts, the more we can control the catalytic selectivity of a particular chemical process," Zaera said. "Our work shows that it is possible to make heterogeneous catalysts that afford us more control on selectivity. This opens the door, we hope, for chemists to think about achieving selectivity for other reactions via the design of specific heterogeneous catalysts with specific shapes."

Zaera explained that heterogeneous catalysts tend to be more practical in terms of manipulation, but are harder to control.

"Our paper shows that, thanks to new advances in nanoscience, sophisticated and highly selective heterogeneous catalysts can be made by controlling their structures," he added. "In this sense, our paper changes the paradigm of heterogeneous catalysis. These catalysts can now compete more closely with homogeneous catalysts, which industry traditionally uses for reactions that require high selectivity such as those involved in the manufacture of medicines or other fine chemicals."

The article appeared in *Nature Materials* (*8*:132–138, 2009).

AOCS member companies partner with Bill & Melinda Gates Foundation

Cacao and cashew farmers in sub-Saharan Africa will benefit from two projects that will be funded by a consortium of manufacturers in tandem with the Bill & Melinda Gates Foundation.

The foundation announced in February that it will give $23 million to the World Cocoa Foundation and $25 million to the German development organization Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH, along with $42 million in cash and in-kind contributions from private industry.

"These projects will help farmers

CONTINUED ON PAGE 214

Cacao pod.

Acquisitions/ mergers/JVs

Danisco (Copenhagen, Denmark) has formed a strategic partnership with microcrystalline cellulose (MCC) manufacturer **Mingtai** in Taiwan. The partnership not only allows Danisco to market Grindsted MCC, but also allows the two parties to develop new products. MCC is derived from specially produced wood pulp. It provides a fat-like mouthfeel and is therefore used to replace fat in a number of emulsified products such as mayonnaise, creamy dressings, processed cheese, and desserts. The estimated global market for MCC is approximately $87.6 million, according to Danisco.

■■■

Thar Instruments (Pittsburgh, Pennsylvania, USA), a manufacturer of supercritical fluid chromatography systems for separating, isolating, and quantifying chemicals, has been acquired by **Waters Corp.** (Milford, Connecticut, USA), the companies announced in February.

Commodities

CACAO/CHOCOLATE

Colombia's **Grupo Nacional de Chocolates** said in January 2009 that it will buy Mexican chocolate manufacturer **Nutresa** for $95 million. The transaction was expected to close in February 2009.

CANOLA/RAPESEED

Ukraine is expected to produce about 2.8 MMT of rapeseed in marketing year 2008/09, which is an increase of 753,000 MT from the previous year. According to preliminary data from the Ministry of Agrarian Policy of Ukraine that was reported by Biz.Liga.Net, an online news source, the area under cultivation for winter rapeseed will amount to 1.5 million hectares; the total area under cultivation for rape crops will account for 20% of all oil-bearing crops.

COTTONSEED

Monsanto Co. (St. Louis, Missouri, USA) has created the Cotton Community, a new website designed to encourage farmer-to-farmer exchanges on topics such as variety performance and agronomic practices. More information is available at www.CottonCommunity.com.

OLIVE

Compulsory country-of-origin labeling for virgin and extra virgin olive oil has been approved by the **European Commission** (EC) and will be effective beginning July 1, 2009. Oils originating from just one country will, according to the EC, "carry the name of the Member State, or of the third country or of the Community." Blends will be labeled either "blend of Community olive oils," "blend of non-Community olive oils," "blend of Community and non-Community olive oils," or the equivalent. In addition, certain terms such as "fruity," "green," "mature," "mild," and "well-balanced"—which have been defined by the **International Olive Council**—may also be used on virgin and extra virgin olive oil labels for oils complying with the definitions.

PALM AND PALM KERNEL

The **Malaysian Palm Oil Board** (MPOB) will help Pakistan's edible oil refiners increase their yields by 94% during the next five years. The deal stipulates that the MPOB will send its technical experts every year in May or June to train Pakistani process engineers in edible oil refineries. The memorandum of understanding was signed in February by **Pakistani Edible Oil Refiners Association** Chairman Muhammad Hanif and MPOB Country Manager Esa Bin Mansoor.

PEANUT (GROUNDNUT)

New technology developed by **Agricultural Research Service** scientists at the **US Department of Agriculture's National Peanut Research Laboratory** in Dawson, Georgia, may help the peanut industry grade peanuts faster and more accurately. For more information, see www.ars.usda.gov/is/pr/2009/090202.htm

New ventures

Construction has begun on a facility utilizing supercritical fluid extraction technology developed by **MOR Supercritical, LLC**, of Allentown, Pennsylvania, USA, with completion expected in the third quarter of 2009. The plant, which will have a capacity of 15 MT/day, will be operated as a toll processing facility for nutraceuticals and other specialty products. The facility will also provide scale-up data for MOR's first commercial plants, which are expected to be offered in initial volumes of up to 300 MT/day. The plant is located in Lehigh Valley, Pennsylvania.

■■■

Barry Callebaut AG, a manufacturer of cocoa and chocolate products based in Zurich, Switzerland, has opened a new chocolate factory in Monterrey, Mexico. With an annual production capacity of around 100,000 MT, the $40 million factory is Barry Callebaut's third-largest chocolate factory worldwide. Capacity utilization at the plant is expected to reach 60–70% by the end of fiscal year 2009/10. Full capacity is expected to be reached within five years.

■■■

Martek Biosciences Corp. (Columbia, Maryland, USA) has entered into a license agreement with **General Mills** (Minneapolis, Minnesota, USA) concerning a patented microencapsulation technology. Developed by General Mills, this technology is anticipated to enhance Martek's ability to produce high-quality, cost-

CONTINUED ON PAGE 214

effective DHA (docosahexaenoic acid) powders for certain food applications, particularly products with long shelf lives and applications with sensory and formulation challenges. Under the terms of the agreement, Martek is granted a perpetual and generally exclusive license, with respect to third parties, to the General Mills technology for use with DHA and other polyunsaturated fatty acids. General Mills retains the right to this technology for its own use and exclusively for all uses within some of its core businesses.

R&D

International Flavors and Fragrances (IFF) has opened its Shanghai Creative Center in China in order to better respond to "fast-growing demand" from its Asian customers, the company said in February.

■■■

The i-SPEC® Q 100 Handheld Biodiesel Analyzer, which was developed by **Paradigm Sensors, LLC**, of Milwaukee, Wisconsin, USA, was honored by *R&D Magazine* as one of the most technologically significant products of 2008. The i-SPEC™ Q 100 technology was developed at Milwaukee's Marquette University College of Engineering under the direction of Martin Seitz, professor of electrical and computer engineering and director of the university's Center for Materials Science Technology.

See *inform 19*:24, 2008, for more information about the analyzer. ■

improve the quality and quantity of their crops and provide them with reliable opportunities to sell their crops so they can build better lives for themselves and their families," a foundation spokesperson said.

Cacao is West Africa's largest agricultural export, accounting for 70% of the world's supply. Approximately 2 million West African smallholder farming households rely on cacao production for a significant portion of their income. Administered by the World Cocoa Foundation, the Gates foundation project will be implemented by a number of nongovernmental organizations and other partners.

The cacao project aims to increase farming household incomes through improved farmer knowledge and productivity, better crop quality and diversification, as well as improved supply-chain efficiencies. The five-year project will reach approximately 200,000 smallholder cacao farming households in Cameroon, Côte d'Ivoire, Ghana, Liberia, and Nigeria and aims to help farmers double their incomes. The project will complement the broader efforts of the World Cocoa Foundation, which works in partnership with its industry members to ensure cacao cultivation is sustainable and delivers greater benefits to the farmers who grow it.

Financial and in-kind contributions for the cacao project come from major branded manufacturers The Hershey Co., Kraft Foods, and Mars, Inc.; cacao processors Archer Daniels Midland Co., Barry Callebaut, Blommer Chocolate Co., and Cargill; and supply chain managers and allied industries Armajaro, Ecom-Agrocacao, Olam International Ltd., and Starbucks Coffee Co.

"[Cacao] has the potential to deliver significant improvements in income as well as in family and community well-being across rural West and Central Africa," said Bill Guyton, president of the World Cocoa Foundation. "Delivering on this promise, however, requires sustained and innovative investment in educating farmers, diversifying the crops they grow, improving their marketing efficiency, and the involvement of companies working together. This new partnership with the Bill & Melinda Gates Foundation represents a major step forward in these areas, opening the door to a much brighter future for hundreds of thousands of farm families in the region."

Africa is responsible for about one-third of the world's cashew crop. However, a lack of cashew processing facilities in Africa has created major market inefficiencies and denies Africans the economic benefits that accompany jobs in the cashew processing sector.

The cashew project aims to improve the quality of raw cashew nut cultivation, increase farmer productivity, improve linkages between smallholder farmers and the marketplace, build African processing capacity, and promote a sustainable global market for African cashews. The project's goal is to help 150,000 smallholder cashew farming households in Benin, Burkina Faso, Côte d'Ivoire, Ghana, and Mozambique increase their incomes by 50% by 2012.

GTZ will lead the cashew project with assistance from the African Cashew Alliance (ACA), FairMatch Support, and TechnoServe. Financial support, in-kind contributions, and other support for the cashew project come from supply chain managers and processors Global Trading Agency BV (GTA) and Olam International Ltd.; branded manufacturers Intersnack Group GmbH & Co. KG, and Kraft Foods; retailer Costco Wholesale Corp.; equipment manufacturer Oltremare; and other contributors.

Awareness of *trans* fatty acids increases

Awareness of *trans* fatty acids (TFA) by US consumers increased during a one-year period to 92% in 2007 from 84% in 2006, according to US researchers at the University of Colorado-Denver, Pennsylvania State University (State College), Tufts University (Boston), Albert Einstein College of Medicine (Bronx, New York) and the American Heart Association.

In a study of 1,000 adults, the researchers found consumer awareness of TFA reached awareness levels similar to the 93% awareness level of saturated fats. The number of people who made behavior changes, such as buying food products because they show "zero *trans* fat" on labels or packages, rose to 37% from 32% in 2006.

Despite the gain in consumer awareness, the study found that only 21% of respondents could name three food sources of TFA. While this was still an increase over the 17% who could name three sources in 2006, 46% of the respondents could not name any sources of TFA on their own.

The study appeared in the *Journal of the American Dietetic Association* (*109*:288–296, 2009). ■

Briefs

Great Plains–The Camelina Company (Cincinnati, Ohio, USA) announced in early February that the US Food and Drug Administration had approved the inclusion of camelina meal in rations for broiler chickens, thus allowing Great Plains to state that camelina has GRAS (generally regarded as safe) status. According to the company press release, camelina already is used in feed mixtures for beef cattle and hogs. The company anticipates that, as the market for camelina-based biofuel expands, additional revenue opportunities for the by-product meal will attract more growers interested in planting the crop. Besides a high meal content of protein and vitamin E, camelina meal is a source of omega-3 fatty acids, which enhance the growth of chickens and become an integral component of the meat, making it healthier for human consumption.

■■■

Kokomo, Indiana, USA, population about 46,000, and Fowler, Colorado, USA, population about 1,500, are initiating their own production of biodiesel. Kokomo will collect used cooking oils from participating restaurants in the community and make "K-Fuel," to be used and marketed locally. This project grew out of the city's effort to answer the question, "What can we do with our city's waste?" Fowler is already generating 100 gallons of biodiesel daily from waste cooking oil produced in the area. Municipalities and the agricultural community initially were the projected customers, but plans are being made for a service station to sell biodiesel to the general public. The biology and chemistry departments at Colorado State University-Pueblo provided expertise to Fowler for this project.

■■■

Sheikh Mohamed Al-Najimi, member of the Saudi Islamic Jurisprudence Academy, warned that Saudi and Muslim youth studying abroad could violate prohibitions of their religion by using ethanol or other fuel that contains ethanol to fuel their cars.

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Biofuels News

BIODIESEL

National biodiesel mandates

The Canadian government will require a 2% renewable content in diesel and heating oil by 2012. In advance of the national mandate, the province of Manitoba has announced plans to mandate the use of biodiesel blended fuel within the province in 2010. Alberta and British Columbia also plan to establish the use of biodiesel in 2010. Final implementation of the national mandate depends on resolving questions regarding safe handling and storage of biodiesel.

Malaysia mandated the blending of 5% palm oil with diesel (B5) starting in February 2009, to be phased in to the domestic fuel market starting with government vehicles. The goal is to increase demand for locally produced palm oil. It is estimated an additional 500,000 metric tons of palm oil could be used annually for biodiesel manufacture.

Mission NewEnergy Ltd. declares profit

Focused on developing jatropha as a profitable crop, Mission NewEnergy Ltd. (Perth, Australia) announced in February that it had achieved its first profit in financial year 2008 and expects to do so again in 2009. At present the company has substantially sold out the production for 2009 of its 100,000 metric-tons-per-year (MT/yr) refinery at Kuantan Port in Malaysia to a major global oil and biofuels player, according to *Asia Business News* (Feb. 2, 2009). A second plant located next to the first, with a capacity of 250,000 MT/yr, should be commissioned by March 2009. These plants are initially using crude palm oil as feedstock.

However, at the heart of the operations of Mission NewEnergy are commercial-scale jatropha plantations. Mission entered the jatropha business in 2006 and anticipates its first commercial quantity of crude jatropha oil in calendar year 2009. As of December 2008 the company controlled 354,000 acres (143,000 hectares) of jatro-

Islam prohibits all kinds of dealings with alcohol including buying, selling, carrying, serving, drinking, and manufacturing it. Najimi warned that use of ethanol or ethanol blends would violate the prohibition since, as quoted by Al Arabiya News Channel (headquartered in Dubai, United Arab Emirates), they are "basically made up of alcohol." He also added that his statement was not an official fatwa, but rather a personal opinion that needed to be studied by the relevant religious bodies.

■■■

Praj Industries, a well-known Indian company in the business of biofuels and breweries, opened a cellulosic ethanol pilot plant called Praj Matrix at its research and development center near Pune. They have already successfully demonstrated production of ethanol from corncobs and sugarcane bagasse. According to Pramod Chaudhari, chairman of Praj, the cellulosic ethanol pilot plant at their facilities is "perhaps the only one of its kind on this side of the hemisphere," as reported by BioFuelsBusiness.com (Feb. 10, 2009).

■■■

Bharat Renewable Energy, a joint venture with Bharat Petroleum Corporation Ltd. (Mumbai), Nandan Biomatrix (Hyderabad), and Shapoorji Pallonji & Co. (Mumbai), announced it will invest Rs 2,131 crore ($438 million) to construct 10 refineries and 200 jatropha oil extraction units in the Kanpur Jhansi, Laltpur, Chitrakoot, and Sultanpur districts (Uttar Pradesh). The combined biodiesel capacity will be 270 million gallons (1 million kiloliters) per year by 2015.

■■■

Major Japanese manufacturers announced in mid-February that they were setting up a research organization to develop next-generation cellulose-derived biofuels at a comparatively low cost. Consortium members include Nippon Oil Corporation, Toyota Motor Corporation, Mitsubishi Heavy Industries, Toray Industries Inc., Kajima Corporation, and Sapporo Engineering Ltd. (a subsidiary of Sapporo Breweries). The goal of the consortium is to produce 250,000 kiloliters of bioethanol by March 2014, and to produce bioethanol at a cost of $0.437 per liter by 2015. ■

pha plantations, and it anticipated expansion to more than 550,000 acres (223,000 hectares) in 2009. It expects to receive its first commercial quantities of crude jatropha oil in 2009 and predicted its jatropha business in India would be cashflow positive in the first quarter of 2009.

Biodiesel moving by pipeline in 2009

Kinder Morgan Energy Partners announced in early February that it would be moving fuel blended with 5% biodiesel (B5) by pipeline across the southern part of the United States in 2009. The company made this decision based on tests carried out in October 2008 in which they moved 20,000 barrels of the blended fuel in the Plantation oil products pipeline from Mississippi to South Carolina (see *inform 19*:803, 2008).

Emily Mir Thompson, spokesperson for Kinder, told Reuters that the fuel blends would be shipped along portions of the line that carry gasoline and diesel fuel. Doing so will avert any potential contamination of biodiesel in jet fuel by "trailback."

India's trains accelerate adoption of biodiesel

In 2002, Indian Railways, which is operated by the state, was approaching bankruptcy, in part because of bills for diesel to fuel the trains. To achieve greater economies, the company looked for substitutes for diesel, particularly biodiesel made from oil extracted from jatropha seeds. This plant grows wild in the country and has no use for food because of the toxicity of the oil.

Now Indian Railways is producing about 1,000 liters of biodiesel daily at its own plant in Perambur. Feedstocks include oil from jatropha plants growing in the right-of-way beside the train tracks and used cooking oil from hotels and restaurants, according to a January 30 article by Jon Evans in the *Biofuels, Bioproducts & Biorefining* newsletter (www.biofpr.com/details/featurse/142561/All-aboard.html). This volume replaces about 10% of petrodiesel in many of its locomotives.

Indian Railways plans to sponsor the cultivation of many more jatropha plants and to establish a network of biodiesel plants, with a goal of producing 53,000 gallons (200,000 liters) of fuel annually.

The Indian government has also joined the effort to produce more biodiesel from jatropha. Despite early resistance of farmers to planting jatropha, owing to fears about its profitability, 350,000 hectares are being developed as jatropha plantations, and biodiesel plants are being constructed, for example, by Naturol, Tree Oils India, and Southern Online Bio Technologies, all of which are in Hyderabad, Andhra Pradesh.

The government of India is also setting mandates for the use of biofuels. In 2007 the mandate was for 5%, and in 2008, 10%. The mandate is scheduled to reach 20% by 2017. Domestic production of biofuel is being encouraged.

Renewable diesels perform in Canadian cold

Alberta Renewable Diesel Demonstration (ARDD), Canada's largest cold-weather study of renewable diesel fuels (see *inform 19*:98, 2008), announced in early February that it had successfully shown that low levels of renewable diesel blends could be used in a range of Canadian climatic conditions.

The ARDD involved laboratory testing, followed by real-world use of renewable diesel blends by Alberta trucking fleets. The on-road demonstration, which ran from December 2007 to September 2008, put renewable diesel fuels on the road in 59 long-haul commercial vehicles across Alberta. During winter months, two types of 2% renewable diesel blends were used: fatty acid methyl ester (FAME) and hydrogenated-derived renewable diesel (HDRD). During spring and summer, 5% blends of HDRD and FAME (comprising 75% canola methyl ester and 25% tallow methyl ester) were dispensed.

Over the span of the demonstration, the ARDD dispensed over 1.6 million liters of blended fuel: 245,000 liters of B2 and 400,000 liters of 2% HDRD in winter, and 540,000 liters of B5 (mixed feedstock FAME) and 425 000 liters of 5% HDRD in spring/summer. No stalls or loss of business was experienced across the fleet while running on blended fuel.

The ARDD final report concluded that it is possible to create, dispense, and use low level blends of renewable diesel fuels (both FAME and HDRD) in Canada's cold climates using existing distribution and commercial infrastructure. The entire report can be downloaded from http://www.renewablediesel.ca.

Quality assurance for biodiesel filling stations discontinued

For many years Germany led the world in the number of filling stations selling 100% biodiesel (B100). The Arbeitsgemeinschaft Qualitätsmanagement Biodiesel e.V. (AGQM; Association for Quality Diesel) estimates there were 1,900 stations selling biodiesel until 2008, or one in nine filling stations.

Now, according to an AGQM poll among it 437 licensees, only 88 firms are still interested in selling biodiesel, representing 250 out of a total of 1,200 filling stations.

The AGQM as well as other industry associations attributes this development to the "disproportionately high taxation on biodiesel." Consequently the executive committee of AGQM decided to discontinue the quality assurance at the level of biodiesel filling stations at the end of January.

Conversion of food wastes to biofuels

Renewable BioSystems LLC of Fairfield, New Jersey, USA has licensed the North American rights to manufacture and market a new technology from Agritec Systems Ltd. (Great Longstone, Derbyshire, England) that processes 2–15 metric tons per hour of virtually any type of organic waste (e.g., food processing and supermarket waste, offal from meat processing, dissolved air flotation sludge, fish residuals) into separate streams of oil, water, and solids.

Waste material enters the oil extraction machine and is macerated to a uniform slurry. The latter is steam heated in a kettle, then cooked in an inline cooker. The product is then separated in a three-phase decanter centrifuge into oil, solids, and wastewater, which are sent to separate receiving/storage tanks.

The oil extraction machine has applications in all types of food plants, especially those producing waste streams with large percentages of oil, such as poultry or pastry; and it also can be used by livestock processors, composters, oil seed crushers, renderers, algae producers, and at landfills.

The technology was demonstrated successfully in 2007 at a Cranswick Fine Foods pork processing facility in Hull, England. Cranswick is now producing oil at a rate of 18% of offal processed. The company sells the high-quality oil directly to a Brocklesby (a biodiesel processor in East Yorkshire) facility.

This oil extraction technology not only will create an alternate feedstock for biodiesel but also will enable food manufacturers to lessen their waste streams and profit from them. RBL estimates the energy costs of extracting the oil with this machine are only 20% that of traditional rendering.

EU proposes tariffs on US biodiesel

The European Commission approved plans to impose temporary anti-dumping and anti-subsidy duties on imports of biodiesel from the United States for a four-month period starting March 13, 2009, during which time investigation and contacts with stakeholders will proceed. Anti-subsidy duties will be €211.20–€237.00 per metric ton, and €23.60–€208.20 per metric ton for the anti-dumping measures. At the end of the four months, the Commission will make a final recommendation to member states of the European Union on whether to impose so-called definitive duties in this case. If imposed these would normally last for five years.

Duties will apply to B99 (a blend of 99% biodiesel and 1% petroleum diesel). In the United States, this fuel receives a $1-a-gallon tax credit from the federal government. European governments contend that this tax credit is an unfair subsidy and accounts for the 40% growth of US imports to Europe in 2008 compared with 2007. The purpose of the duty is to stem the bankrupting of biodiesel manufacturing in Europe.

Companies likely to be affected include Archer Daniels Midland (Decatur, Illinois), Cargill (Wayzata, Minnesota), Imperium Renewables (Seattle, Washington), Peter Cremer North America (Cincinnati, Ohio), and World Energy Alternatives (Boston, Massachusetts).

GENERAL

UK raises target for biofuels

United Kingdom Transport Minister Lord Adonis announced on January 28 that suppliers will be required to obtain 3.25% of their fuels from sources such as palm oil and sugar for 2009–2010. The government had initially discussed setting a limit of 3%, but decided to adopt the higher limit because of a legal loophole that allowed less renewable fuel to be supplied than intended.

Lord Adonis also said biobutanol and renewable diesel would be classified as renewable fuels under the Renewable Transport Fuel Obligation (RTFO), which was introduced in 2005 and became effective in April 2008. The purpose of the RTFO is to ensure that fuels are derived from sustainable renewable sources and that carbon emissions from transportation are decreased.

US Air Force seeks more fuel alternatives

Commercial air carriers are not the only ones seeking to use biofuels. The US Air Force (USAF) is working to certify two 50% biofuel blends, as well as the coal- and gas-based synthetic fuels that are already in development. In the second quarter of 2009 the USAF plans to issue a request for proposals for two biofuels. The overall goal of the USAF is to meet half of its domestic fuel needs by 2016 with domestically produced alternative fuels that produce no more harm to the environment than conventional petroleum.

The present plan is that the entire USAF fleet will use 50% Fischer-Tropsch blends by 2011, but ideally the service wants to introduce as many JP8 jet fuel supplements as possible so as not to rely on one source of alternative fuels, according to *Flight International*'s February 10 interview with Jeff Braun, USAF Alternative Fuels Certification Office director.

For alternative fuels to meet USAF requirements, (i) their chemical composition and performance must be that of JP8 jet fuel, and (ii) they must be both sustainable and scaleable.

For testing, 160,000–200,000 gallons (600,000–760,000 liters) of each candidate fuel will be needed, depending on what aircraft type is used for testing. *Flight International* indicated the Boeing C-17 is likely to be at least one of the aircraft types used.

The USAF hopes to start the certification process in 2009.

New biofuels from North Dakota oilseed crops

The Energy & Environmental Research Center (EERC) at the University of North Dakota (Grand Forks, USA) is collaborating with Tesoro Companies, Inc. of San Antonio, Texas (USA), in a $1 million project to produce renewable fuels from crambe and other oilseed crops. Half of the money is coming from the North Dakota Industrial Commission, and half from the US Department of Defense.

Crambe (*Crambe abyssinica*), a member of the Brassicaceae family, is a drought-tolerant oilseed crop with demonstrated viability throughout western North Dakota and the surrounding region. The oil produced from its seeds is not used for food. The plant costs less to plant, fertilize and grow than other oilseeds such as soybeans and canola.

Biodiesel tested for home heating in the UK

About 30 properties, including homes and a primary and a secondary school, in the small town of Reepham in Norfolk, United Kingdom, are taking part in a 12-month trial in which renewable heating oil is used for warmth and hot water. The University of East Anglia (UEA), Norwich, is heading the study

Fuel blends being trialed are equal to or lower in carbon footprint than natural gas.

The project is designed to demonstrate that every aspect of fuel supply and boiler operation is compatible with renewable biodiesel, and to help the oil heating industry define clear standards for the use and supply of renewable heating oil.

According to the UEA, Jeremy Hawksley, director general of OFTEC (Oil Firing Technical Association), said, "Having a liquid biofuel that is interchangeable with domestic heating oil means that around 1.9 million households in the UK and Ireland will be able to use renewable technology to heat their homes, with very few modifications to their existing heating systems."

Mandates pending for biodiesel in US heating systems

In July 2008, the state of Massachusetts passed legislation mandating a B2 blend (98% petrodiesel, 2% biodiesel) for its heating oil supply by 2010 and B5 by 2013. In January 2009, New York City was on the verge of enacting a similar law that would initially require the use of B5, eventually ramping up to B20.

About 20 states, mostly on the mid-Atlantic and New England coasts, consume up to 10 billion gallons (38 million kiloliters) of heating oil annually, according to the National OilHeat Research Alliance (www.nora-oilheat.org). Thus, a national mandate for use of B5 could create demand for about 500 million gallons (1.9 million kiloliters) of biodiesel.

Unlike the processes for synthesizing biodiesel and ethanol, the EERC technologies convert crop oils to renewable fuels that are essentially indistinguishable from their petroleum-derived counterparts.

ETHANOL

UL says 20% ethanol too high

The governor of the state of Minnesota (USA), Tim Pawlenty, has urged the state to increase its mandate for the inclusion of ethanol in transportation fuel from the present 10% to 20%. However, in January Underwriter Laboratories (UL), an independent, not-for-profit product safety certification organization, said that most service-station pumps are not certified to dispense fuels containing more than 10% ethanol (E10). Minnesota is the only state so far to mandate ethanol levels above 10%. Thus, the UL announcement has a major influence on plans to have the 20% level take effect in Minnesota by 2013.

The ethanol industry would like to see the 10% level increased. Otherwise, it will soon hit "the blending wall," or the production of the maximum amount of ethanol needed to meet the federally mandated Renewable Fuel Standard of 7.5 billion gallons for ethanol inclusion by 2012.

In reaction to the UL statement, the American Coalition for Ethanol (ACE; Sioux Falls, South Dakota, USA) wrote to UL asking why UL had changed its position regarding the ability of standard gasoline pumps to handle blends of ethanol up to 15%. The ACE letter argues that the "UL 87" standard covering the use of ethanol in standard gasoline pumps clearly approved "gasoline/ethanol blends up to 15% ethanol."

UL subsequently revised its position. According to a UL statement on February 19, "UL determined that there is no significant incremental risk of damage between E10 and fuels with a maximum of 15% ethanol. This conclusion was reached after careful examination of the effects of varying levels of ethanol on component," said John Dregnenberg, Consumer Affairs manager for UL. "We will continue to evaluate test and field findings, as well as the scientific literature, as it becomes available and make this information available to AHJs [Authorities Having Jurisdiction]."

The statement also indicated that using equipment certified to UL 87 to dispense ethanol blends with a maximum ethanol content of 15% should not result in critical safety concerns, but dispensers pumping this higher percentage of ethanol should be monitored for degradation of metals and materials (e.g., plastics, elastomers, and composites) used in the dispensing system.

Ethanol to replace 1/3 of gasoline by 2030

An in-depth study by Sandia National Laboratories and General Motors Corp. has found that plant and forestry waste and dedicated energy crops could sustainably replace nearly a third of gasoline use by the year 2030.

The goal of the *90 Billion Gallon Biofuel Deployment Study* was to assess whether and how a large volume of cellulosic biofuel could be sustainably produced, assuming technical and scientific progress continues at expected rates. The study was conducted over a period of nine months.

The *90 Billion Gallon Study* assumes 75 billion gallons (284 million kiloliters) would be ethanol made from nonfood cellulosic feedstocks and 15 billion gallons (57 million kiloliters) from corn-based ethanol. The study examines four sources of biofuels: agricultural residue, such as corn stover and wheat straw; forest residue; dedicated energy crops, including switchgrass; and short rotation woody crops, such as willow and poplar trees. It also considers the costs of producing, harvesting, storing, and transporting these sources to newly built biorefineries.

Sandia researchers determined that 21 billion gallons (79 million kiloliters) of cellulosic ethanol could be produced per year by 2022 without displacing current crops. The Renewable Fuels Standard, part of the 2007 Energy Independence and Security Act, calls for ramping up biofuels production to 36 billion gallons (136 million kiloliters) a year by 2022.

The *90 Billion Gallon Study*, which focused only on starch-based and cellulosic ethanol, found that an increase to 90 billion gallons (340 million kiloliters) of ethanol could be sustainably achieved by 2030 within real-world economic and environmental parameters. ■

Briefs

The consumption of soy food may lower the risk of colorectal cancer—cancer of the colon or rectum—in postmenopausal women, according to a study that appeared in the *American Journal of Clinical Nutrition* (*89*:577–583, 2009). Scientists prospectively examined 68,412 women aged 40–70, all of whom were free of cancer and diabetes at the beginning of the study. Usual soy food intake was assessed at baseline (1997–2000) and reassessed during the first follow-up (2000–2002) through in-person interviews with a validated food frequency questionnaire. The researchers identified 321 colorectal cancer cases after participants were monitored for an average of 6.4 years. After adjustment for potential confounding factors, total soy food intake was inversely associated with colorectal cancer risk. In fact, women who consumed at least 10 grams of soy protein daily were one-third less likely to develop colorectal cancer compared to women who consumed little soy. This inverse association was primarily confined to postmenopausal women.

■■■

Eating fewer calories may result in better memory, according to a small study of 50 men and women aged 50–72 who ranged from normal weight to overweight. Members of one group ate food they normally ate but were instructed to cut their calories by 30%, primarily by eating smaller portions, said study leader Agnes Flöel of the University of Münster in Germany. Members of a second group kept their calories the same but were instructed to increase their consumption of unsaturated fat by 20%. A third group made no dietary changes. The subjects were advised by dietitians but monitored their own eating over three months. Then they took tests involving word memorization. The calorie-restricted group on average exhibited a 20% improvement in memory performance. The other groups showed no significant change. The research appeared in *The Proceedings of the National Academy of Sciences* (*106*:1255–1260, 2009). ■

Health & Nutrition

New work on omega-3 fatty acids

Diets rich in omega-3 fatty acids protect the liver from damage caused by obesity and the insulin resistance it provokes, according to a study in mice published online in the *Federation of the American Societies for Experimental Biology Journal* (doi:10.1096/fj.08-125674).

"Our study shows for the first time that lipids called protectins and resolvins derived from omega-3 fatty acids can actually reduce the instance of liver complications, such as hepatic steatosis and insulin resistance, in obese people," said Joan Claria, a professor from the University of Barcelona (Spain) and one of the researchers involved in the work.

The scientists found that two types of oxygenated metabolites derived from eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA)—protectins and resolvins—were the cause of the protective effect. To reach this conclusion, the team studied four groups of mice with a gene altered to make them obese and diabetic. One group of mice was fed an omega-3-rich diet for five weeks; another was fed a control diet for a similar period. Both diets contained an equivalent amount of fat (8.4% fat by weight), but in the omega-3 diet, 6% of the total fat content was provided by omega-3 polyunsaturated fatty acids. A third group of mice was injected with DHA every 12 hours for four days, and a fourth group was injected with resolvin E1 every 24 hours for four days. After five weeks, blood serum and liver samples from the test mice were examined. The mice given the omega-3-rich diet exhibited less hepatic inflammation and improved insulin tolerance. This apparently was due to the formation of protectins and resolvins from omega-3 fatty acids.

"Doctors are always looking for simple and easy ways to counter the harmful effects of obesity, and the great thing about this study is that the information can be used at dinner tonight," said Gerald Weissmann, editor-in-chief of *The FASEB Journal*.

In related work, scientists from the Columbia University Medical Center (CUMC) in New York (USA) looked at the effect of a diet rich in fish oils on the accumulation of fat in the aorta, the main artery leaving the heart.

A CUMC research team led by Richard J. Deckelbaum, director of the Columbia Institute of Human Nutrition, has found that the beneficial actions of fish oil that block cholesterol buildup in arteries are found even at high fat intakes.

The study was conducted in three separate populations of mice: one that was fed a balanced diet, one that was fed a diet resembling a Western diet high in saturated fat, and a third that was fed a diet rich in omega-3 fatty acids from fish.

Researchers in Deckelbaum's laboratory found that the fatty acids contained in fish oil markedly inhibit the entry of low-density lipoprotein (LDL) cholesterol into arteries and, as a result, much less cholesterol collected in these vessels. The scientists found that a lower level of arterial LDL was related to the ability of omega-3 fatty acids to decrease lipoprotein lipase, an enzyme that traps LDL in the arterial wall.

The study appeared online ahead of print in *Arteriosclerosis, Thrombosis and Vascular Biology* (doi:10.1161/ATVBAHA.108.182287) and was supported in part by grants from the National Institutes of Health.

Brain assesses fat content of food based on image alone

The human brain may predict the energy and fat content of food simply by looking at its picture, a study published in *Neuroimage (44:*967–974, 2009) suggests.

The study was a collaborative project among scientists at the Centre Hospitalier Universitaire Vaudois (CHUV), the University of Lausanne, the Centre d'Imagerie Biomédicale (CIBM), and the Nestlé Research Center, in Lausanne, Switzerland. It was led by Ulrike Toepel.

In the study, healthy adults were asked to look at images of foods and nonfoods while their brain activity was measured using electroencephalography (EEG). Unknown to the participants, the food images were also subdivided into high-fat and low-fat food categories.

Within 200 milliseconds of seeing the pictures, subjects' brains rapidly distinguished between the high- and low-fat foods. EEG results revealed that the regions of the brain typically associated with decision-making and reward assessment responded more strongly to high-fat foods than low-fat foods. The authors propose that reward properties, such as a food's energy and fat content, are analyzed rapidly and in parallel with the brain regions involved in categorization and decision-making.

Gene variants affecting blood fats identified

Common variations in DNA that are linked to imbalances in concentrations of blood lipids have been identified in new genetic sites by a team of scientists led by Sekar Kathiresan of the Massachusetts General Hospital in Boston (USA). The research team also included senior author and nutrigenomics expert Jose Ordovas of the Jean Mayer US Department of Agriculture (USDA) Human Nutrition Research Center on Aging at Tufts University, also in Boston.

The work furthers understanding of the genetic underpinnings of dyslipidemia, which is characterized by overproduction of low-density lipoprotein (LDL, or "bad" cholesterol) and triglycerides, and underproduction of high-density lipoprotein (HDL, or "good" cholesterol).

"The researchers first examined data from seven genome-wide association studies," said Rosalie Marion Bliss, a USDA spokesperson. "Together, these studies provided more than 2.6 million DNA markers, called single nucleotide polymorphisms, or SNPs, from 19,840 individuals. These SNPs were then tested for associations with lipoprotein traits."

Data from the first part of the study confirmed previously reported findings: "Variants among eight earlier identified SNPs once again were associated with lipid levels," Bliss noted. "The Stage 1 analysis also uncovered 25 other DNA areas, or loci, of interest."

For the second part of the research, the scientists genotyped SNPs in 20,623 individuals from five other studies, and looked again at the 25 new loci. In a combined analysis, SNPs at 30 loci were associated with all three blood lipids.

"While each of the 30 loci conferred a modest effect individually, the analysis suggests that the more lipid-risk variants found in one individual, the higher his or her association with dyslipidemia," Bliss said. "Together, the 30 sites explain a significant percentage of the genetic contribution to lipid levels among individuals." More DNA sequence variants could be identified with larger samples and improved statistical power for gene discovery, according to the authors.

Recent EFSA actions

A review of the safety of milk proteins such as β-casein A1 and A2—the most common proteins in cow's milk—has deemed them to be safe and found no reason for a formal risk assessment to be conducted by the European Food Safety Authority (EFSA). The agency concluded in February that "a cause and effect relationship is not established between the dietary intake of BCM7 (β-casomorphin-7), related peptides, or their possible protein precursors and non-communicable diseases." A summary of the review is available at www.efsa.europa.eu.

EFSA also looked at the safety of the lipid extract from *Euphausia superba* (Antartic krill, NKO™) as a novel food ingredient, finding that it is safe under specified conditions of use. NKO manufacturer Neptune Technologies & Bioressources has also gained EU PARNUTS (foods for particular nutritional uses) approval which, combined with the Novel Foods approval, means Neptune's NKO ingredient can be formulated into dietary supplements, functional foods, diet meal replacements, and dietary foods for special medical purposes.

In another ruling, EFSA approved a health claim submitted by Mead Johnson Nutritionals in France linking infant eye health and DHA (docosahexaenoic acid) consumption. The ruling comes several months after Martek Biosciences of Columbia, Maryland, USA, failed to gain approval for a similar claim involving DHA and ARA (arachidonic acid). Both reports can be found at www.efsa.europa.eu. ■


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People News/ Inside AOCS

Win a free registration to the 2010 Annual Meeting

You could be the lucky person who wins the drawing for a free registration to the 101st AOCS Annual Meeting & Expo in Phoenix, Arizona, USA, May 16–19, 2010.

How? Simply take a minute to jot down some suggestions for *inform* magazine article topics, then e-mail them to *inform* Associate Editor Catherine Watkins at cwatkins@aocs.org. Or, if you are attending the upcoming 100th Annual Meeting & Expo in Orlando on May 3–6, 2009, fill out and submit an entry form there. Forms will be available at the *inform* display near the registration desk. However you enter, though, the winner will be announced in July.

Please be as specific as possible. For example, "mechanisms of γ-tocopherol action" is more helpful in article planning than just "γ-tocopherol." This is your chance to tell us what emerging topics both inside and outside of your field you would like to read about in future issues of *inform* magazine. And if you might be interested in becoming a contributing editor or member of the advisory board, be sure to let us know.

Trivedi regional director for Chemithon

Chemithon Enterprises Inc., a multinational technology and engineering company based in Seattle, Washington, USA, has appointed **Sanjay Trivedi** as regional director in charge of strategic planning and market development for Chemithon technology. Trivedi heads Chemithon operations in Asia, the Middle East, and Africa.

Chemithon pioneered sulfonation technologies in 1954 and developed processes for control of particulate emissions from coal-based thermal processes in 1973. They have recently added oleochemicals, alkoxylation and hydrogenation technologies. The company has manufacturing capabilities at Seattle, Silvassa (India), and Singapore, and pilot plant and research and development capabilities at Seattle and Silvassa.

Robinson hired by National Biodiesel Board

The National Biodiesel Board, a nonprofit trade association headquartered in Jefferson City, Missouri, USA, announced that **Jessica Robinson** has been named senior communications specialist. She has been charged with enhancing the organization's communications efforts in promoting the benefits of biodiesel. She has been involved in the communications industry for more than a decade, most recently as press secretary for Missouri Governor Matt Blunt.

GOED announces new officers

GOED, the Global Organization for EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid) recently announced their officers for their 2009 fiscal year. **Baldur Hjaltason** (EPAX, Lysaker, Norway) is now secretary of the organization and **Olav Sandnes** (Marine Nutriceuticals, Mount Bethel, Pennsylvania, USA) is a member of the board of directors; both are AOCS members. Chairman is Philip C. Fass, vice chairman is David Shannon (Croda Health Care, Edison, New Jersey, USA), and Jan Haakonsen (Denomega, Boulder, Colorado, USA) is treasurer.

GOED is a global trade association dedicated to growing and protecting the market for omega-3 fatty acids, including EPA and DHA.

Hagen promoted to sales director

As of January 1, 2009, AOCS member **Robert W. Hagen** became sales director for Graham Corporation. He has been with the company for 30 years, working in its New York, Houston, and California offices.

Graham designs and builds vacuum and heat transfer equipment for process industries and is a worldwide leader in vacuum technology. Principal markets for Graham's equipment are the chemical, petrochemical, and petroleum refining industries as well as refrigeration, desalination, and food processing. Hagen's duties with the company have included lecturing on Graham vacuum and heat transfer equipment.

Madden now managing director of Blackmer

Tom Madden has been promoted to the position of managing director for Blackmer, a Pump Solutions Group, a subsidiary of Dover Corporation, located in Grand Rapids, Michigan, USA. He has been with Blackmer for more than 30 years as a member of its manufacturing management team. In 1997 he was named chief financial officer of the company.

Blackmer is a leader in the manufacture and supply of sliding-vane process and transfer pumps and reciprocating gas compressors for a wide array of industries.

ARS scientists honored

The Agricultural Research Service (ARS) of the US Department of Agriculture presented a number of honors to its scientists in February.

AOCS member **Kevin B. Hicks**, ARS Crop Conversion Science and Engineering Research Unit, Wyndmoor, Pennsylvania, was recognized for outstanding research accomplishments and outstanding leadership during the past 20 years. His research has included aqueous and enzymatic extraction of corn oil, development of renewable fuels, and analytical methods development.

Benjamin F. Matthews, ARS Soybean Genomics and Improvement Research Unit in Beltsville, Maryland, was honored for outstanding research accomplishments, scientific leadership, and sustained support of fellow scientists and scientists of the future. Matthews' research has concentrated on identifying soybean genes that are important in the resistance to the soybean cyst nematode and soybean rust.

An Area Early Career Research Scientist Award went to **Scott R. Bean**, of the ARS Grain Quality and Structure Research Unit, Manhattan, Kansas, for outstanding independent and collaborative research contributions to solving industry problems resulting in new and more efficient uses of sorghum. One of his research projects concerns the development of sorghum lipids as nutraceuticals.

Alejandro P. Rooney, a member of the ARS Microbial Genomics and Bioprocessing Research Unit in Peoria, Illinois, also received an Area Early Career Research Scientist Award for excellence in research on the genetics of agriculturally important organisms. He has been investigating how to produce large volumes of high-value bioproducts from glycerol and has reported success in using the fungus *Mortierella* to convert glycerol to the essential fatty acids arachidonic acid and dihomo-γ-linolenic acid.

List recognized

The Illinois Heartland section of the American Chemical Society selected **Gary List** as the 2009 Chemist of the Year. List retired from the US Department of Agriculture National Center for Agricultural Utilization Research, Peoria, Illinois, in October 2007 and is presently active as a consultant.

The award was presented to List at the section meeting on March 5.

In Memoriam

THOMAS WRIGHT

Thomas Wright died in his native Denison, Texas, USA on February 28, 2009, at the age of 71. He is survived by his wife of 50 years, Nancy Carolyn Wright, a daughter, three grandsons, and several brothers and sisters.

Wright's first job was with Griffin Wholesale Grocery, which later became Griffin Manufacturing, a well-known food manufacturer in the southern United States. After a stint on active duty with the National Guard, he worked full time for the Safeway Stores Inc. soybean oil processing plant in Denison while attending Southeastern State University in Durant, Oklahoma, part time. There he earned a bachelor's degree in science.

Subsequently Wright worked for a time as plant manager for the Safeway beverage plant in Garland, Texas, then returned to the Denison oil processing plant. When the Safeway plant sold, it became Conway Oil, and Wright stayed on for several years as processing manager. He then moved to Anderson Clayton as project engineer in Sherman, Texas; Kraft Foods in Memphis, Tennessee, where he was in the engineering department; AGP; and then Owensboro Grain in Owensboro, Kentucky, where he was quality manager. When he retired, Wright returned to Denison, and for a time worked with AOCS member Walter Farr as a consultant in starting new oil processing plants.

Farr, who knew Wright for over 30 years, held him in high esteem. Farr described Wright as "the best-qualified quality manager in the industry." He added that, "because he also had a lot of manufacturing background," Wright was particularly skilled at problem-solving when issues that developed out in the plant affected product quality.

PAUL A. WILKS JR.

Paul Wilks, an innovator in the infrared (IR) analysis marketplace, died October 11, 2008, in Lebanon, New Hampshire, USA at the age of 81.

He earned a B.S. in engineering from Harvard University in 1944 and joined Perkin-Elmer Corp. that same year. He helped to create Perkin-Elmer's analytical instrument division and to develop and introduce its first IR spectrophotometer. After several years, he left Perkin-Elmer to found his own company, and through the years founded four additional companies, all specializing in instruments and accessories based on IR spectroscopy. Founded in 1995, his Wilks Enterprise, Inc. (South Norwalk, Connecticut) produces analyzers for such applications as determining oil/grease in water and biofuels measurements.

He is survived by two children and six grandchildren; his wife and a son preceded him in death.

Bader recognized at Pittcon

On March 8 the Chemical Heritage Foundation presented the eighth annual Pittcon Heritage Award to **Alfred Bader**, founder of the Aldrich Chemical Company.

This award recognizes outstanding individuals whose entrepreneurial careers have shaped the instrumentation community, inspired achievement, promoted public understanding of the modern instrumentation sciences, and highlighted the role of analytical chemistry in world economies.

Aldrich Chemical Company, later known as the Sigma-Aldrich Corporation, is one of the world's leading suppliers of research chemicals. During Bader's tenure at the firm, from 1951 to 1991, he oversaw the assembly of a huge library of rare chemicals—numbering nearly 50,000—in addition to thousands of more commonly used chemicals. The company's annual catalog was widely recognized for featuring a red "A" on the binding and a reproduction of fine art on the cover. ■

The AOCS Job Fair

May 3–10, 2009

Combining the traditional Annual Meeting Career Placement Center with the online services powered by JobTarget

AOCS — Your Global Fats and Oils Connection — Since 1909

JOBTARGET

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- Post job openings or resumes May 3–10 at **NO CHARGE**.
- Visit the Job Fair booth located near the meeting registration desk. Designated computers will be available for the career services.
- Space is available for potential interviews. Stop by the Information Desk for more details.

Not attending the Annual Meeting?

You can still take advantage of the AOCS Job Fair!

- From May 3–10, post job openings for only $25.00.
- Job seekers can post resumes and search the top quality career opportunities at no charge.*

Visit our website http://www.aocs.org/member/jobcent

for more information on the Job Fair and the year round access to the best employment opportunities in the fats and oils industry.

*This applies throughout the year.

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2009 AOCS Since 1909 Your Global Fats and Oils Connection

MEMBERSHIP APPLICATION

09INF

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❑ Dr. ❑ Mr. ❑ Ms. ❑ Mrs. ❑ Prof. ***Please print or type. All applicants must sign the Code of Ethics.***

Last Name/Family Name ____________ First Name ____________ Middle Initial ____________

Firm/Institution ____________

Position/Title ____________

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Business Phone ____________ Fax ____________ Previously an AOCS student member? ❑ Yes ❑ No

E-mail ____________ Expected Graduation Date ____________

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$ ____________

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❑ Student*	❑ $ 0	❑ N/A

Membership dues include a monthly subscription to inform. Active membership is "individual" and is not transferable. Membership year is from January 1 through December 31, 2009.

*Complimentary student membership includes free access to online *inform* only. Student membership applies to full-time graduate students working no more than 50% time in professional work, excluding academic assistantships/fellowships. A professor must confirm these conditions every year, in writing.

OPTIONAL TECHNICAL PUBLICATIONS

$ ____________

JAOCS	❑ $150
Lipids	❑ $150
Journal of Surfactants and Detergents	❑ $150

These prices apply only with membership and include print and online versions and shipping/handling.

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❑ Send an invoice for payment. (Memberships are not active until payment is received.)
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AOCS: Your international forum for fats, oils, proteins, surfactants, and detergents.
This Code has been adopted by the AOCS to define the rules of professional conduct for its members. As a condition of membership, it shall be signed by each applicant.
AOCS Code of Ethics • Chemistry and its application by scientists, engineers, and technologists have for their prime objective the advancement of science and benefit of mankind. Accordingly, the Society expects each member: 1) to be familiar with the purpose and objectives of the Society as expressed in its Articles of Incorporation; to promote its aim actively; and to strive for self-improvement in said member's profession; 2) to present conduct that at all times reflects dignity upon the profession of chemistry and engineering; 3) to use every honorable means to elevate the standards of the profession and extend its sphere of usefulness; 4) to keep inviolate any confidence that may be entrusted to said member in such member's professional capacity; 5) to refuse participation in questionable enterprises and to refuse to engage in any occupation that is contrary to law or the public welfare; 6) to guard against unwarranted insinuations that reflect upon the character or integrity of other chemists and engineers.

I hereby subscribe to the above Code of Ethics. Signature of Applicant ____________

AOCS Foundation unveils plans for 100th AOCS Annual Meeting & Expo

Amy Lydic

The AOCS Foundation has planned many exciting activities for this year's Annual Meeting & Expo (AM&E) in Orlando, Florida, USA. In addition to our regular annual plans such as the Silent Auction, the Foundation is also proudly introducing a new hands-on program for the registrants. This article details the Foundation's plans during the AM&E. We are confident that the meeting will be a great opportunity for registrants to witness and be part of the Foundation's commitment to advancing the AOCS mission.

NEW THIS YEAR: THE COMPUTER LAB

For the first time, the AOCS Foundation is proud to present The Computer Lab, located in the Cyber Lounge inside the Expo Hall. There, staff will be on hand at various times to offer short sessions on the many AOCS electronic products and services, such as AOCS Connect, eLearning, Job Target, managing your membership, accessing online journals, methods online, and more. Visit The Computer Lab and make sure you capitalize on your affiliation with AOCS by participating in one or more of these short sessions.

CREATE YOUR ITINERARY AND ABSTRACT SEARCH

Computer kiosks will again be available near the registration desk, at which you can build your AM&E itinerary by choosing from among all the sessions and committee meetings to create your own personalized schedule. With more than 600 technical papers being presented, you will want to use this feature to know exactly when and where you need and want to be during the meeting.

Also returning for a second year is the abstract search station, which will be located near the registration desk. This tool is ideal for looking at abstracts, choosing presentations to attend, and identifying authors and presenters.

FUTURE OF THE AOCS FOUNDATION

The AOCS Foundation will have a booth at the AM&E. The booth will showcase our large group of donors and how their contributions have resulted in programs and products for our constituents. We look forward to meeting and speaking with the registrants about the Foundation's mission and how important gifts are to our mutual success.

Items in this year's Silent Auction include this Artichokes painting by Rita Hansen, donated by Mikrolab Aarhus.

The Foundation Campaign for Technology will wrap up in 2009 and we are nearing the goal of $500,000. Programs such as The Computer Lab, Create Your Itinerary, and Abstract Search are being showcased at this meeting thanks to the Campaign's donors. We are confident that we can reach the $500,000 goal if everyone who benefits from their affiliation with AOCS makes a gift.

Following the end of the Campaign for Technology, the AOCS Foundation will turn its attention to the sustainability of our world's resources as well as the sustainability of AOCS as an organization on which you depend. The AOCS legacy is strong as evidenced by its 100 years of existence. Since 1909, many of our members and constituents have been responsible for important advancements in fats, oils, and related materials that have led to:

- The alleviation of world hunger through better nutrition,
- The creation of renewable fuels and energy sources,
- The development of oilseeds with increased yields and quality,

- The improvement of the environmental impact of oilseed processing, and
- The development of more efficient uses of by-products from processing

The Foundation has given its support to the Hot Topic session entitled "Sustainability as the Foundation for the Future in Fats and Oils/Feeding the World," scheduled during the 100th AM&E on Tuesday, May 5, 2009, at 9:15 a.m. Sustainability is becoming a major challenge to the companies AOCS serves and the Foundation is committed to supporting AOCS' continuing efforts to provide the tools you need to address this concern.

BE A PART OF IT!

Even if your plans don't include participation at the 100th AOCS Annual Meeting & Expo, the Foundation still needs you to be successful. Take a moment to consider how being a part of AOCS has improved your career and professional opportunities and then join the Foundation in ensuring the future of AOCS. For more information or to make your gift online, visit www.aocs.org/found.

Amy Lydic is the AOCS Foundation development manager and can be reached by phone (+1-217-693-4807) or e-mail (amyl@aocs.org).

14th Annual Foundation Student Common Interest Group Silent Auction

The Silent Auction, a signature event at the AM&E, will open for bidding in the Expo Hall during the Opening Mixer on Sunday night. Bidding on items will close on Tuesday evening and winning bidders will be able to take their items home with them.

Another item featured in the Silent Auction is this Supelco SP-2560 Capillary Column, donated by Supelco, Inc.

Each year, a wide variety of items are donated for the auction including handmade crafts, art, logo items, and electronics, and the competition to provide the winning bid is very exciting.

To date, the auction has raised more than $41,000 to support student programs such as fellowships and the Honored Student Award. You won't want to miss this opportunity to support our students as you network, and possibly go home with a one-of-a-kind prize. Visit www.aocs.org/found/auction.cfm to preview photos of items already received for the auction.

Book Review

Trans *Fatty Acids*
Albert Dijkstra, Richard Hamilton, and Wolf Hamm (eds.)
Wiley-Blackwell, 2007
240 pages
ISBN 978-1-4051-5691-2, $185.99

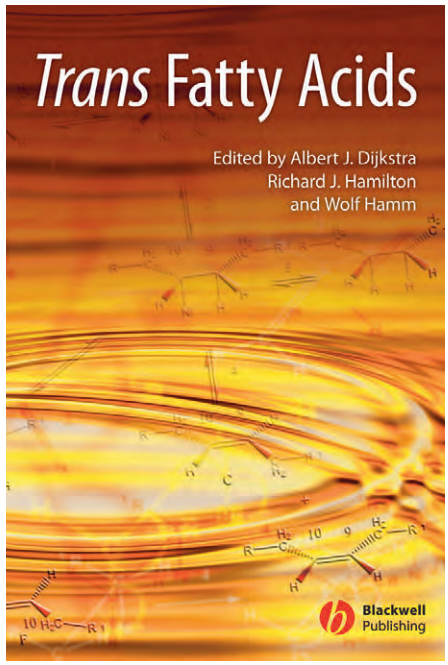
Carmen Soto Maldonado

At present, there seem to be relatively few books dedicated exclusively to *trans* fatty acids (TFA) where the primary theme is the examination of their effect on human health. However, it is a relevant and timely topic in light of recent regulatory changes in the United States as well as the large amount of research published on the subject during the past 20 years. Our understanding of lipid biochemistry and the effect of dietary lipids on health and illness, particularly chronic diseases, has advanced remarkably during that time.

Contained within the nine chapters of this text is a concise description of the physical and chemical characteristics of TFA, a discussion of their impact on health, techniques for their analysis, and strategies to reduce their presence in processed foods.

Trans *Fatty Acids* is an interesting read for undergraduates as well as a useful reference for graduate students, industry researchers, and academicians. The writing style is friendly, easy to understand, and the book contains a variety of data sets and examples, although there are a few typographical errors. Each chapter contains a large number of current references, providing a nice overview of the evolution of the research done on TFA, and demonstrating the extensive combined experience of the authors on the subject.

In Chapter 1, Richard Hamilton examines different types of fatty acids, with a primary emphasis on TFA and their biosynthesis and properties, as well as the



advantages of the consumption of specific isomers (*cis* and *trans*). The information is displayed in an instructive format and is particularly useful for those researchers beginning work on fatty acids.

An important point about TFA is the effect of epidemiological changes on health. In the second chapter, substantial data are provided on sources of TFA, their distribution in various food products, and the consumption patterns and daily intakes of men and women from several countries. The nutritional aspects of the changes that have occurred during the last 30–40 years are included in the evaluation. It is interesting to note that there are differences in the effects of natural TFAs versus those introduced via fat/oil processing, which are considered the most adverse in terms of human health.

Chapter 3 is atypical for the text, in that the chapter focuses on a group of TFA that have beneficial health effects: conjugated linoleic acid (CLA). This chapter has an interesting review on the effect of CLA on human health and repercussions in the prevention or treatment of diseases such as cancer, diabetes, and immune function, among others.

The chapter on TFA analysis is well written. It includes an overview of the alternatives available for TFA detection. An in-depth discussion of the chromatographic techniques available is included. In addition, important details with respect to isomer resolution are included, such as the type and flow of carrier gas. The chapter incorporates a variety of chromatograms.

Chapter 5 provides the reader with information on the industrial uses of TFAs and the strategies used to minimize TFA during processing. A brief but instructive section on the effect of processes such as hydrogenation, fractionation, blending, and esterification on the TFA and saturated fat content in end products is included.

A particularly interesting analysis of the fat/oil hydrogenation process and its relation to TFA generation is presented in Chapter 6, which was written by Beers, Arianz, and Okonek. The chapter covers all of the important aspects of hydrogenation, including reaction mechanisms, as well as an example evaluation of industrial process characteristics on TFA formation. The analysis of variables for the control and production of products low in TFA is also included. Other processes that affect the composition of processed fat and oils, such as fractionation and interesterification, provide interesting alternatives to hydrogenation. In addition, the authors discuss new development in low-*trans* hydrogenation that allows for the production of a product low in TFA with the desired end-product quality and functionality.

Chapters 8 and 9 are particularly useful to industrial engineers, as well as those in the scientific community, who desire an improved understanding of the applications side of fat/oil processing and the processing required to obtain solid fats, with and without producing TFA in the product. The hydrogenation process has been particularly important for the production of margarines, fats for baking, and chocolate substitutes, to optimize the taste and the physical attributes of those food products. The final chapter discusses the methods available to obtain equivalent products without the production of TFA.

Carmen Soto Maldonado is a biochemical engineer with an M.S. and a Ph.D. in engineering with an emphasis in biochemical engineering. She works at the Centro Regional de Estudios en Alimentos Saludables, which is associated with the Catholic University of Valparaiso in Chile. She has been conducting research in fats and oils for approximately 10 years. She can be reached at carmen-soto@creas.cl.

Patents

Published Patents

Process for producing concentrate of unsaturated fatty acid

Uehara, H., and others, Nisshin OilliO Group Ltd., 10/21/2008, US7439377B2

An easy and inexpensive process by which a concentrate of a given unsaturated fatty acid can be obtained from a mixture that has conventionally been difficult to concentrate. The process, which is for producing a concentrate of a desired isomer (a) from a mixture (A) selected from the group consisting of a mixture comprising at least two isomers of a C_{16} or higher conjugated unsaturated fatty acid and a mixture comprising at least two *cis*-isomers of a C_{16} or higher unsaturated fatty acid having a *cis*-double bond, is characterized by comprising: a step in which the mixture (A) is mixed with at least one C_{4-14} saturated fatty acid (B) to obtain a mixture solution containing the isomer (a) dissolved therein; a crystallization step in which either crystals rich in the isomer (a) or crystals poor in the isomer (a) are precipitated from the mixture solution; and a solid-liquid separation step for obtaining the crystals rich in the isomer (a) or for obtaining a solution rich in the isomer (a) by removing the crystals poor in the isomer (a).

Environmentally benign anti-icing or deicing fluids employing industrial streams comprising hydroxycarboxylic acid salts and/or other effective deicing/anti-icing agents

Sapienza, R., and others, MLI Associates LLC, 10/28/2008, US7442322B2

The present invention provides novel deicing and anti-icing compositions and methods based on by-product of off-specification materials from biodegradable and renewable sources and which also can be used in a variety of other services.

Aroma-producing compositions for foods

Gaonkar, A.G., and C.J. Ludwig, Kraft Foods Holdings Inc., 10/28/2008, US7442399B2

An improved aroma-producing composition is provided that is shelf stable and allows controlled release of a desired aroma from the composition, and also food products treated with the aroma-producing composition. The aroma-producing composition is a homogenous one-phase system, which includes an aroma-producing material, and a fat-containing composition, which includes a medium-chain fatty acid triglyceride and fat or lipid having a melting point greater than the medium-chain fatty acid triglyceride. The aroma-producing composition can be heated to induce and boost aroma release from the aroma-producing composition at an opportune time, such as when a food product treated with the aroma-producing composition is preheated by microwave heating immediately before it is consumed.

Phospholipid-based powders for drug delivery

Weers, J., and others, 10/28/2008, US7442388B2

Phospholipid-based powders for drug delivery applications are disclosed. The powders comprise a polyvalent cation in an amount effective to increase the gel-to-liquid crystal transition temperature of the particle compared with particles without the polyvalent cation. The powders are hollow and porous and are preferably administered via inhalation.

Method for producing symmetric triglycerides

Negishi, S., and others, Nisshin OilliO Group Ltd., 10/28/2008, US7442531B2

A method for producing symmetric triglycerides, which comprises the steps of reacting a medium-chain fatty acid triglyceride with a long-chain fatty acid triglyceride in the presence of an enzyme or a chemical catalyst to conduct random transesterification reaction and thereby to obtain a reaction product containing a triglyceride composed of a medium-chain fatty acid and a long-chain fatty acid as the constituting fatty acids in the step of the first reaction; transesterifying the reaction product with an alcohol monoester of the medium-chain fatty acid in the presence of an *sn*-1,3-position-specific enzyme in the step of the second reaction; and then taking the alcohol monoester of the medium-chain fatty acid and the alcohol monoester of the long-chain fatty acid from the reaction product obtained in the step of the second reaction to obtain the symmetric triglyceride composed of the medium-chain fatty acids at the *sn*-1,3 positions and the long-chain fatty acid at the *sn*-2 position. According to this method, highly pure symmetric triglycerides comprising a medium-chain fatty acid at *sn*-1 and -3 positions and a long-chain fatty acid at *sn*-2 position can be industrially efficiently produced.

Patent Applications

Method for preparing fatty acid esters of natural origin functionalized by oxidation for use as fluxing oils for bitumen

Deneuvillers, C., and L.C. Hoang, Colas SA, 10/16/2008, US20080250975A1

A method for preparing a fluxing oil, having an iodine number ranging from 50 to 200, based on fatty substances of natural origin having been chemically functionalized by oxidation, includes the steps of: (i) providing a fatty substance or a mixture of fatty substances of natural origin, (ii) subjecting the fatty substance or the mixture of fatty substances of natural origin to at least one trans-

CONTINUED ON NEXT PAGE

esterification or esterification reaction by at least one alkanol or mono-alcohol, (iii) subjecting the compound or mixture of compounds obtained at step (ii) to at least one chemical functionalization reaction by oxidation introducing at least one functional group selected from carboxylic acid, epoxy, peroxide, aldehyde, ether, ester, alcohol, and ketone groups, and (iv) collecting the fluxing oil.

Wax mixture based on partial glycerides and pentaerythritol esters

Goget, C., and others, c/o Synnestvedt & Lechner LLP, 10/9/2008, US20080249192A1

A wax mixture containing esters of at least one of pentaerythritol, dipentaerythritol, a tripentaerythritol, and partial glycerides and a self-emulsifying base containing the wax mixture and an emulsifier that can be a nonionic emulsifier, anionic emulsifier, and mixtures of the emulsifiers with an HLB (hydrophilic-lipophilic balance) value of at least 10.

Soy-based coating

Behr, J., Biopreserve LLC, 10/16/2008, US20080250976A1

A soy-based coating of the invention is provided for coating materials. The coating includes a soy ester component for effecting penetration of the coating into a coated material. A soy-derived long oil acts as a binder to bind the soy ester to material structures within the coated material. The coating also includes a soy dispersed pigment and a cobalt-free primary drier that acts as a catalyst for surface drying of a combination of the pigment and the soy-derived long oil. A secondary drier is provided to promote partial drying of the soy-derived long oil while allowing the oil to retain slight viscosity within the coated material. A dispersing agent provides a consistent flow of the soy-dispersed pigment to the surface of a substrate of the coated material. The soy-dispersed pigment allows drying in combination with the soy ester.

Vegetable protein adhesive compositions

Trocino, F., Heartland Resource Technologies LLC, 10/16/2008, US20080255333A1

Vegetable protein-based adhesive compositions and methods for preparing them are provided. The adhesives are prepared by copolymerizing hydrolyzed vegetable protein that has been functionalized with methylol groups and one or more co-monomers also having methylol functional groups. Preferred hydrolyzed vegetable proteins include hydrolyzed soy protein obtained from soy meal.

Biodiesel candle

Jones, A., c/o Intellectual Property/Technology Law, 10/23/2008, US20080256844A1

A candle formed of a composition comprising biodiesel. The candle composition may include fatty alcohols, e.g., cetyl alcohol and cetearyl alcohol, in mixture with the biodiesel, to constitute a candle composition that can be burned in a wicked or wickless form. The composition of biodiesel and fatty alcohols may include dyes and/or fragrances, to provide a candle article that is environmentally benign and of low cost.

Process for preparing glyceryl carbonate

Schmitt, B., and others, Evonik Roehm GmbH, 10/16/2008, US20080255372A1

The present invention relates to a process for preparing highly pure glyceryl carbonate by transesterifying dialkyl carbonates or cyclic carbonates in the presence of a basic catalyst.

Application of crude glycerin for improved livestock production

Cecava, M., and others, Archer Daniels Midland Co., 10/23/2008, US20080260896A1

Methods for using or incorporating glycerin in animal feeds are disclosed. Animal feeds including the glycerin are also disclosed, as well as methods of feeding such animal feeds to animals.

Intermolecular compounds of fatty acid triglycerides

Arimoto, S., and others, Nisshin OilliO Group Ltd., 10/23/2008, US20080260931A1

There are provided an intermolecular compound of (i) di-saturated medium-chain fatty acids mono-saturated long-chain fatty acid triglyceride and (ii) 1,3-di-saturated long-chain fatty acids 2-mono-unsaturated long-chain fatty acid triglyceride, of which a long spacing value by X-ray diffraction is 65% or more, and foods containing the intermolecular compound. The intermolecular compound can be used as a part of fats and oils that constitute foods. Due to formation of the intermolecular compound, the fats and oils containing large amounts of symmetric triglycerides such as cocoa butter and those containing medium-chain fatty acids do not form separate crystals and therefore can maintain a smooth texture and prevent blooming.

Stabilized vegetable oils and methods of making same

Higgins, N., and J. Stults, Bunge Oils Inc., 10/23/2008, US20080262255A1

A method for modifying ethylenic unsaturation in a triglyceride. One or more unsaturated fatty acyl moieties present in the triglyceride are substituted with a lactone or ketone moiety via an electron acceptor-mediated reaction. The resulting reaction products are useful, for example, as lubricants, metalworking fluids, mold release agents, hydraulic fluids, or dielectric fluids, or as components of lubricants, metalworking fluids, mold release agents,

Patent information is compiled by Scott Bloomer, a registered US patent agent with Archer Daniels Midland Co., Decatur, Illinois, USA. Contact him at scott_bloomer@admworld.com.

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SFC-Automation Hardware:

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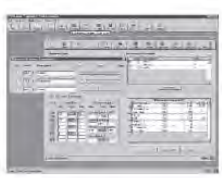

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Peak-O-mat

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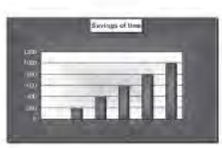

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Extracts & Distillates

The concentration of tocols from rice bran oil deodorizer distillate using solvent

Ko, S.-N., S.-M. Lee, and I.-H. Kim, *Eur. J. Lipid Sci. Technol. 110*:914–919, 2008.

Tocols (tocopherols + tocotrienols) have been concentrated efficiently from rice bran oil (RBO) deodorizer distillate using solvent at low temperature. The levels of total tocols, total tocopherols, and total tocotrienols in RBO deodorizer distillate (starting material) were 31.5, 14.9, and 16.6 mg/g, respectively. Nine different solvents were tested, and acetonitrile was selected as the optimal solvent for concentrating tocols from the RBO deodorizer distillate. There was a significant ($p < 0.05$) increase in the tocol level of the liquid fractions with decreasing temperature, for incubation temperatures up to −20°C. In addition, significant differences ($p < 0.05$) were observed in the relative percentages of α-tocopherol, γ-tocopherol, α-tocotrienol, and γ-tocotrienol between the raw sample and liquid fractions obtained at different temperatures using acetonitrile as the solvent. The concentration of the tocols from the RBO deodorizer distillate was temperature dependent, and a maximum of 89.9 mg/g was attained in the liquid fraction at −40°C. The relative percentage of tocotrienol homologs in the liquid fraction obtained at −40°C was approximately 80%. With acetonitrile as the solvent, the optimal temperature for concentrating the tocols from RBO deodorizer distillate was −20°C when yield was considered.

Oxidative stability of sunflower oil bodies

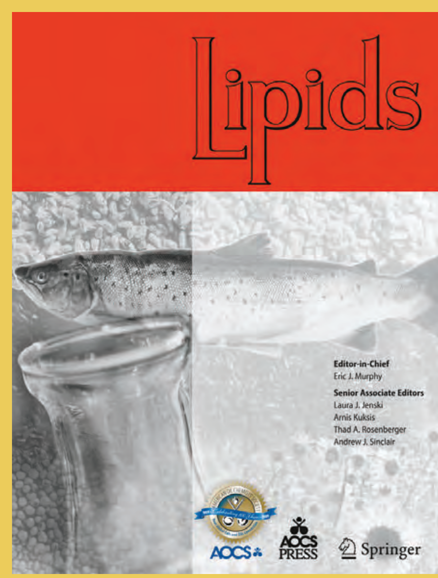
Fisk, I.D., D.A. White, M. Lad, and D.A. Gray, *Eur. J. Lipid Sci. Technol. 110*:962–968, 2008.

This study investigates the oxidative stability of sunflower oil body suspensions (10 wt% lipid). Two washed suspensions of oil bodies were evaluated over 8 days at three temperatures (5, 25, and 45°C) against three comparable sunflower

AOCS Journals

Journal of the American Oil Chemists' Society (March)

- Determination of coenzyme Q_9 and Q_{10} in developing palm fruits, Ng, M.H., Y.M. Choo, A.N. Ma, C.H. Chuah, and M.A. Hashim
- The crystal and molecular structure of dianhydrogossypol, Talipov, S.A., A.A. Mamadrakhimov, Z.G. Tiljakov, M.K. Dowd, B.T. Ibragimov, and M.T. Xonkeldieva
- *In-situ* X-ray studies of cocoa butter droplets undergoing simulated spray freezing, Pore, M., H.H. Seah, J.W.H. Glover, D.J. Holmes, M.L. Johns, D.I. Wilson, and G.D. Moggridge
- Fatty acid desaturation and elongation reactions of *Trichoderma* sp. 1-OH-2-3, Ando, A., J. Ogawa, S. Kishino, T. Ito, N. Shirasaka, E. Sakuradani, K. Yokozeki, and S. Shimizu
- Chemometric characterization and classification of selected freshwater and marine fishes from Turkey based on their fatty acid profiles, Diraman, H., and H. Dibeklioglu
- Oxidation stability of virgin olive oils from some important cultivars in east Mediterranean area in Turkey, Kıralan, M., A. Bayrak, and M.T. Özkaya
- Formation of toxic α,β-unsaturated 4-hydroxy-aldehydes in thermally oxidized fatty acid methyl esters, Han, I.H., and A.S. Csallany
- Synthesis and characterization of the different soy-based polyols by ring opening of epoxidized soybean oil with methanol, 1,2-ethanediol and 1,2-propanediol, Dai, H., L. Yang, B. Lin, C. Wang, and G. Shi
- Sources of methyl ester yield reduction in methanolysis of recycled vegetable oil, Fröhlich, A., and B. Rice
- Counter-current carbon dioxide purification of partially deacylated sunflower oil, Eller, F.J., S.L. Taylor, J.A. Laszlo, D.L. Compton, and J.A. Teel
- Two-stage countercurrent enzyme-assisted aqueous extraction processing of oil and protein from soybeans, de Moura, J.M.L.N., and L.A. Johnson
- Effect of temperature, modified atmosphere and ethylene during olive storage on quality and bitterness level of the oil, Yousfi, K., J.A. Cayuela, and J.M. García
- Polymorphic behavior of structured fats including stearic acid and ω-3 polyunsaturated fatty acids, Sato, K., T. Kigawa, S. Ueno, N. Gotoh, and S. Wada



Lipids (March)

- Comparative analysis of brain lipids in mice, cats, and humans with Sandhoff disease, Baek, R.C., D.R. Martin, N.R. Cox, and T.N. Seyfried

CONTINUED ON NEXT PAGE

- On the substrate binding of linoleate 9-lipoxygenases, Andreou, A.-Z., E. Hornung, S. Kunze, S. Rosahl, and I. Feussner
- Uptake and incorporation of pinolenic acid reduces n-6 polyunsaturated fatty acid and downstream prostaglandin formation in murine macrophage, Chuang, L.-T., P.-J. Tsai, C.-L. Lee, and Y.-S. Huang
- Protective effects of EPA and deleterious effects of DHA on eNOS activity in Ea hy 926 cultured with lysophosphatidylcholine, Tardivel, S., A. Gousset-Dupont, V. Robert, M.-L. Pourci, A. Grynberg, and B. Lacour
- Early dissimilar fates of liver eicosapentaenoic acid in rats fed liposomes or fish oil and gene expression related to lipid metabolism, Cansell, M.S., A. Battin, P. Degrace, J. Gresti, P. Clouet, and N. Combe
- Inhibitory effect of conjugated α-linolenic acid from bifidobacteria of intestinal origin on SW480 cancer cells, Coakley, M., S. Banni, M.C. Johnson, S. Mills, R. Devery, G. Fitzgerald, R.P. Ross, and C. Stanton
- Evaluating the *trans* fatty acid, CLA, PUFA, and erucic acid diversity in human milk from five regions in China, Li, J., Y. Fan, Z. Zhang, H. Yu, Y. An, J.K.G. Kramer, and Z. Deng
- Phytosterol intake and dietary fat reduction are independent and additive in their ability to reduce plasma LDL cholesterol, Chen, S.C., J.T. Judd, M. Kramer, G.W. Meijer, B.A. Clevidence, and D.J. Baer
- Shapes and coiling of mixed phospholipid vesicles, Paredes-Quijada, G., H. Aranda-Espinoza, and A. Maldonado
- Structures of the ceramides from porcine palatal stratum corneum, Hill, J.R., and P.W. Wertz

oil emulsions stabilized with dodecyltrimethylammonium bromide (DTAB), polyoxyethylene-sorbitan monolaurate (Tween 20), and sodium dodecyl sulfate (SDS) (17 mM). The development of oxidation was monitored by measuring the presence of lipid hydroperoxides and the formation of hexanal. Lipid hydroperoxide concentrations in the DTAB, SDS, and Tween 20 emulsions were consistently higher than in the oil body suspensions; furthermore, hexanal formation was not detected in the oil body emulsions, whereas hexanal was present in the headspace of the formulated emulsions. The reasons for the extended resistance to oxidation of the oil body suspensions are hypothesized to be due to the presence of residual seed proteins in the continuous phase and the presence of a strongly stabilized lipid-water interface.

Comparison between charged aerosol detection and light scattering detection for the analysis of *Leishmania* membrane phospholipids

Ramos, R.G., D. Libong, M. Rakotomanga, K. Gaudin, P.M. Loiseau, and P. Chaminade, *J. Chromatogr. A 1209*:88–94, 2008.

The performance of charged aerosol detection (CAD) was compared with evaporative light-scattering detection (ELSD) for the analysis of *Leishmania* membrane phospholipid (PL) classes by NP-HPLC (normal-phase high-performance liquid chromatography). In both methods, a PVA-Sil column was used for the determination of the major *Leishmania* membrane PL, phosphatidic acid, phosphatidylglycerol, cardiolipin, phosphatidylinositol, phosphatidylethathanolamine, phosphatidylserine, lysophosphatidylethanolamine, phosphatidylcholine, sphingomyelin, and lysophosphatidylcholine in the same analysis. Although the response of both detection methods can be fitted to a power function, CAD response can also be described by a linear model with determination coefficients (R^2) ranging from 0.993 to 0.998 for an injected mass of 30 ng to 20.00 µg. CAD appeared to be directly proportional when a restricted range was used and it was found to be more sensitive at lowest mass range than ELSD. With HPLC-ELSD the limits of detection (LOD) were between 71 and 1195 ng and the limits of quantification (LOQ) were between 215 and 3622 ng. With HPLC-CAD, the LOD were between 15 and 249 ng whereas the LOQ were between 45 and 707 ng. The accuracy of the methods ranged from 62.8 to 115.8% and from 58.4 to 110.5% for ELSD and CAD, respectively. The HPLC-CAD method is suitable to assess the influence of miltefosine on the composition of *Leishmania* membrane phospholipids.

Improved method for fatty acid analysis in herbage based on direct transesterification followed by solid-phase extraction

Alves, S.P., A.R.J. Cabrita, A.J.M. Fonseca, and R.J.B. Bessa, *J. Chromatogr. A 1209*:212–219, 2008.

Direct transesterification (DT) and solvent extraction with acidic or basic derivatization procedure for fatty acid (FA) analysis in herbage were compared. The highest total FA, α-linolenic and linoleic acid contents were obtained with DT. However, DT also produced the highest amount of interfering compounds, identified as phytadienes and sugar derivative products, which may co-elute with FA. An additional step based on solid-phase extraction to produce clean samples was proposed. This procedure is simple and gives good recoveries for the FA-fortified samples. Additionally, structural characterization of 16:1 *trans*-3 was conducted by covalent adduct chemical ionization tandem mass spectrometry.

Creating a fatty acid methyl ester database for lipid profiling in a single drop of human blood using high resolution capillary gas chromatography and mass spectrometry

Bicalho, B., F. David, K. Rumplel, E. Kindt, and P. Sandra, *J. Chromatogr. A 1211*:120–128, 2008.

Capillary gas chromatography (CGC) in combination with mass spectrometry (MS) was optimized for the separation and detection of the fatty acids occurring in the lipid fraction of blood. A fingertip blood sample (*ca*. 50 µL) was transesterified into the methyl esters and analyzed on a 100 m × 0.25 mm inside diameter column coated with a biscyanopropyl polysiloxane (HP-88) stationary phase. The method was retention time locked. Programmed temperature vaporization injection in the solvent-venting mode was applied to minimize the sample size, while maintaining high sensitivity. The total analysis time was *ca*. 60 min. Retention times and both electron impact and positive chemical ionization mass spectrometry were combined to elucidate the fatty acids according to alkyl chain, degree of unsaturation, and position of the double bonds. By using extracted ion chromatograms, about 100 fatty acids and related compounds were detected in blood samples and most of them were identified. This work resulted in a very large fatty acid methyl esters database, containing retention time and mass spectral information that will be applied to metabolomic studies.

Quantitative determination of epoxy acids, keto acids, and hydroxy acids formed in fats and oils at frying temperatures

Marmesat, S., J. Velasco, and M.C. Dobarganes, *J. Chromatogr. A 1211*:129–134, 2008.

A method based on derivatization to fatty acid methyl esters and gas chromatography (GC) is proposed for the quantitative analysis of hydroxy acids, keto acids, and epoxy acids in fats and oils. Isolation of the analytes by solid-phase extraction is proposed to prevent analytical interferences caused by non-altered fatty acids naturally occurring in oils. In addition, hydrogenation is required before the GC analysis to improve repeatability. The analytical method was applied to thermoxidized samples of high-linoleic sunflower oil, high-oleic sunflower oil, and high-palmitic sunflower oil. Results showed total levels of these compounds in the order of mg/g of oil in samples with contents of polar compounds ranging from 6.7 to 25.7%. The compounds analyzed constituted major fractions of the oxidized fatty acids.

Estolides: From structure and function to structured and functionalized

Zerkowski, J.A., *Lipid Technol. 20*:253–256, 2008.

Oligomeric fatty acid esters, known as estolides, have been studied for close to a century. It has only been in the last few years, however, that efficient methods for preparing estolides have been developed that also allow some control over their molecular structures. By varying the biobased feedstocks and reaction conditions, the functional properties, particularly those geared toward lubrication, can be modified. More recently, synthetic advances have permitted stepwise construction of estolides with functional groups (hydrophilic or reactive) positioned at specific sites within the chain.

Monounsaturated fat and vascular function

Stanley, J.C., *Lipid Technol. 20*:257–258, 2008.

Dietary intervention trials are cause-effect studies with the disadvantage of measuring disease risk factor end points as opposed to disease end points. One approach toward overcoming this disadvantage is to use a measure of vascular function as an end point. There are two dietary strategies for lowering the intake of saturated fat. One is to replace the saturated fat with monounsaturated fat and the other is to replace it with carbohydrate. It is difficult to decide from the results of intervention trials with disease risk factor end points which of these strategies is better for health. After allowance has been made for defects in design, measurements of vascular function suggest that replacing saturated fat with monounsaturated fat is better for the cardiovascular system.

Phytosterols in wheat genotypes in the HEALTHGRAIN diversity screen

Nurmi, T., L. Nyström, M. Edelmann, A.-M. Lampi, and V. Piironen, *J. Agric. Food Chem. 56*:9710–9715, 2008.

The phytosterol contents of 130 winter wheat, 20 spring wheat, 10 durum wheat, 5 spelt, 5 einkorn, and 5 emmer wheat genotypes, grown at the same location in the same year, were analyzed with gas chromatography. Considerable variation was observed in total phytosterol contents in all wheat types. The total sterol contents ranged from 670 to 959 µg/g of dm [dry matter] in winter wheat and from 797 to 949 µg/g of dm in spring wheat. The highest sterol contents were found in spelt, durum wheat, and einkorn wheat. The proportions of the main phytosterols also varied substantially among the different genotypes. The most abundant phytosterol in all wheat genotypes was sitosterol (40–61% of total sterols), whereas the highest variation was seen in total stanols (7–31% of total sterols). The comprehensive data set produced in this study constitutes a valuable basis for plant breeding and selection of phytosterol-rich genotypes.

Tocopherols and tocotrienols in wheat genotypes in the HEALTHGRAIN diversity screen

Lampi, A.-M., T. Nurmi, V. Ollilainen, and V. Piironen, *J. Agric. Food Chem. 56*:9716–9721, 2008.

Tocopherol and tocotrienol compositions were studied in 175 genotypes of different wheat types grown under similar conditions to screen for natural diversity. The main focus was on bread wheats, including 130 and 20 winter and spring types, respectively. The average total content of tocopherols and tocotrienols was 49.4 µg/g of dm [dry matter], with a range of 27.6–79.7 µg/g of dm, indicating a 2.9-fold variation among genotypes. β-Tocotrienol and α-tocopherol were the major vitamers, and in general there were more tocotrienols than tocopherols. In the early cultivated forms of wheat the proportion of tocotrienols was especially high, at ≥62.5%. In conclusion, there was a large variation in total tocopherol and tocotrienol contents in bread wheats and this, along with the high proportions of tocotrienols in other types of wheat, demonstrates the great genetic potential of genotypes to be exploited by plant breeders.

Carotenoid bioaccessibility from whole grain and degermed maize meal products

Kean, E.G., B.R. Hamaker, and M.G. Ferruzzi, *J. Agric. Food Chem. 56*:9918–9926, 2008.

Although yellow maize (*Zea mays*) fractions and products are a source of dietary carotenoids, only limited information is available on the bioavailability of these pigments from maize-based foods. To better understand the distribution and bioavailability of carotenoid pigments from yellow maize (*Z. mays*) products, commercial milled maize fractions were screened for carotenoid content as were model foods including extruded puff, bread, and wet cooked porridge. Carotenoid content of maize fractions ranged from a low of 1.77–6.50 mg/kg in yellow maize bran to 12.04–17.94 mg/kg in yellow corn meal (YCM). Lutein and zeaxanthin were major carotenoid species in maize milled fractions, accounting for ~70% of total carotenoid content. Following screening, carotenoid bioaccessibility was assessed from model foods using a simulated three-stage *in vitro* digestion process designed to measure transfer of carotenoids from the food matrix to bile salt lipid micelles (micellarization). Micellarization efficiency of xanthophylls was similar from YCM extruded puff and bread (63 and 69%), but lower from YCM porridge (48%). Xanthophyll micellarization from whole yellow corn meal products was highest in bread (85%) and similar in extruded puff and porridge (46 and 47%). For extruded puffs and breads, β-carotene micellarization was 10–23%, but higher in porridge (40–63%), indicating that wet cooking may positively influence bioaccessibility of apolar carotenes. The results suggest that maize-based food products are good dietary sources of bioaccessible carotenoids and that specific food preparation methods may influence the relative bioaccessibility of individual carotenoid species.

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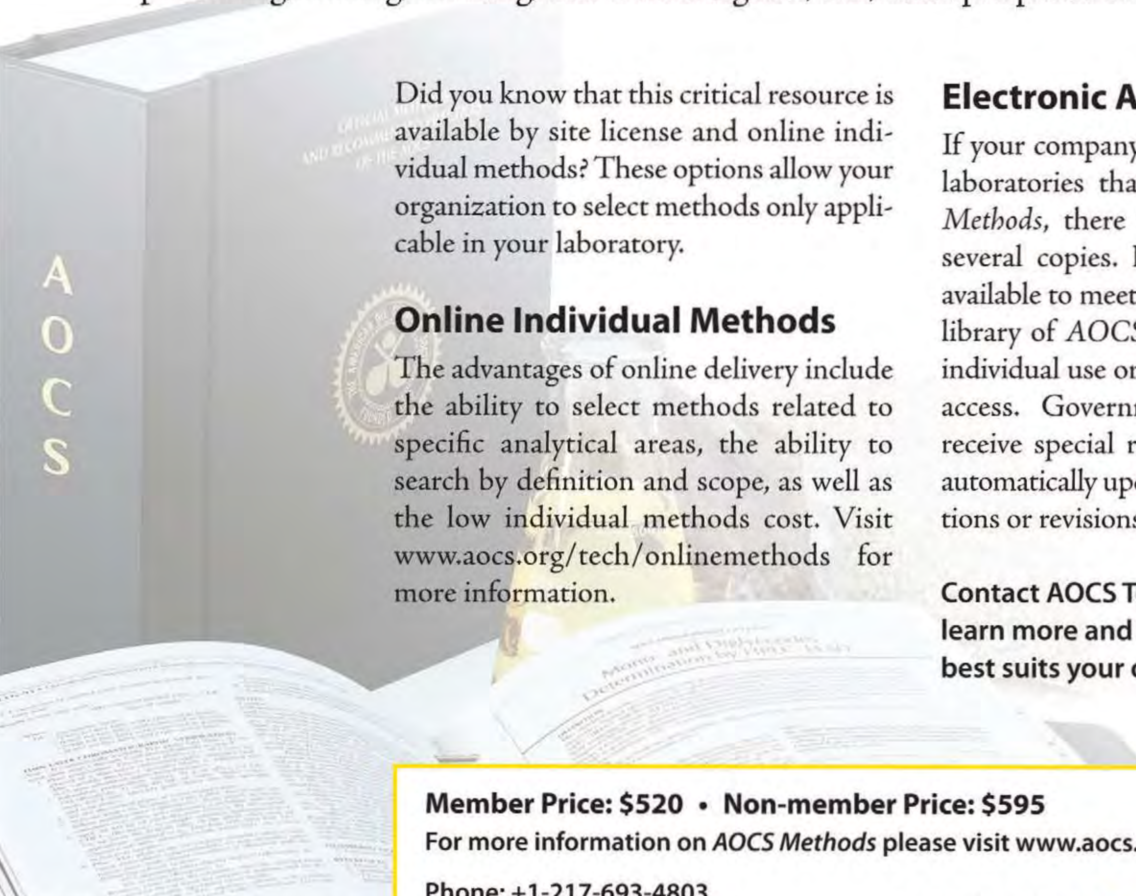

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TECHNICAL SERVICES AOCS

Revisiting electronics recycling

Joe Endres

My December 2008 ITS article dealt with options for recycling. Tony Yates of the Dallas Group of America, Inc., (Jeffersonville, Indiana, USA) e-mailed me with some recycling options that are common in his area. I would like to share them with you.

In his area, the office-supply store Staples accepts up to three printer ink cartridges each day. A $3.00 credit is placed in a Staples Rewards account for each cartridge recycled. When the total value of the Rewards account tops $10, a check is issued that can be used on any Staples purchase. Office Depot accepts up to three ink cartridges each day and immediately gives $3 off of any purchase for each cartridge. Epson and Canon cartridges are usually not recycled because they are only ink tanks and do not have the fresh print heads that come with HP, Lexmark, and Dell cartridges.

He also noted that his local Radio Shack accepts nickel cadmium and nickel metal hydride batteries for recycling. Tony also noted that TVs, VCRs, DVD players, computer monitors, CPUs, printers, and other electronic components can be recycled, but generally require a fee. I do not know of anyone who accepts these electronics for recycle without charging a small fee (a fact that I hope would not deter anyone from recycling).

■■■

Tall tales first traveled by word of mouth. Later, they traveled by telephone. Now they zip around the world at the speed of the Internet. Here is a tall tale that I read about in my local paper sometime back. It sounded like

CONTINUED ON PAGE 255

Meet Thu Nguyen

Thu Nguyen, a 2008 Honored Student and the recipient of the 2008 Manuchehr (Manny) Eijadi Award, has been winning awards from AOCS for years. A Ph.D. student of AOCS member David Sabatini at the University of Oklahoma, Nguyen received the Student Travel Award from the Surfactants and Detergents Division in 2007. On top of that, Nguyen was just named the 2009 recipient of the Ralph H. Potts Memorial Fellowship Award

"As a freshman in chemical engineering at the University of Oklahoma in 2000–2001," she remembers, "I learned about the field of surfactant research from a friend of mine who was working in this area. She advised me to contact John Scamehorn to learn more about opportunities for conducting research in the surfactant field. Fortunately, Dr. Scamehorn gave me the opportunity to do undergraduate research in his laboratory."

Nguyen's undergraduate research gave her the chance to learn more about surfactants in other applications such as pharmaceuticals and food and cleaning systems. Then, after completing her junior year, David Sabatini—also an AOCS member—recruited Nguyen to work with his Ph.D. student, Edgar Acosta, on formulating microemulsions with surfactants in pharmaceutical applications. (Acosta currently is a professor at the University of Toronto in Ontario, Canada.)

"I was amazed," she reports, "when I first saw how microemulsion formulations changed from water-in-oil to oil-in-water types and vice versa when a formulation variable was changed. Therefore, after receiving my bachelor's degree, I decided to do Ph.D. work under the supervision of Dr. Sabatini so that I could explore further the field of surfactants and their applications."

As environmental regulations become increasingly strict the world over, the use of environmentally friendly substances plays a more important role in most research areas, Nguyen notes. In the research she presented at the 2008 AOCS Annual Meeting & Expo, she studied the microemulsion formulation of a wide range of oils such as limonene, isopropyl myristate, hexadecane, and vegetable oils using biosurfactants and biorenewable surfactants to replace synthetic surfactants.

"These environmentally friendly microemulsion systems are potential substitutes for organic solvents in vegetable oil extraction and as solvent delivery systems for pharmaceutical applications and cosmetics," she says.

Nguyen anticipates receiving her Ph.D. in December 2009 and hopes to continue working in the field of surfactants, either in industrial research and development or in academia. Her husband is pursuing a Ph.D. in petroleum engineering. The couple has a two-year-old son, Binh-Minh ("sunrise"), "who makes us laugh every day after work," she reports. ■

AOCS 2009 award recipients

Outstanding accomplishments and service by individuals from around the world will be recognized during the 100th AOCS Annual Meeting & Expo to be held May 3–6 in Orlando, Florida, USA. The following list includes awards for whom recipients had been named by the deadline for this issue of *inform*.

SOCIETY AWARDS

Award of Merit

GEORGE U. LIEPA, Eastern Michigan University, USA

The AOCS Award of Merit is presented for productive leadership service to AOCS that has advanced the prestige, standing, or interests of AOCS, and for services not otherwise specifically recognized.

AOCS Fellows

Fellows are selected for exceptional recognition for achievements in science as well as for unusually important service to AOCS or to their profession.

PHILIP A. BOLLHEIMER, Bollheimer & Associates, Inc., USA

JOHN P. CHERRY, USDA Eastern Regional Research Center, USA

ROBERT A. MOREAU, USDA Eastern Regional Research Center, USA

RAGNAR OHLSON, retired, Sweden

KATHLEEN WARNER, USDA National Center for Agriculture Utilization Research, USA

AOCS Young Scientist Research Award

KEN D. STARK, University of Waterloo, Canada

The AOCS Young Scientist Research Award recognizes a young scientist who has made a significant and substantial research contribution in one of the disciplines represented by AOCS Divisions. The award is sponsored by Vijay K.S. Shukla and the International Food Science Centre A/S of Denmark.

AOCS Corporate Achievement Award

BUNGE OILS, USA

The AOCS Corporate Achievement Award was established to recognize industry achievement for an outstanding process, product, or contribution that has made the greatest impact on its industry segment. Bunge Oils is recognized for creative and innovative research and development leading to the introduction of healthier food oils into the marketplace.

SCIENTIFIC AWARDS

Supelco/Nicholas Pelick–AOCS Research Award

THOMAS A. FOGLIA, USDA Eastern Regional Research Center, USA

The Supelco/Nicholas Pelick–AOCS Research Award is for accomplishment of outstanding original research in fats, oils, lipid chemistry, or biochemistry, the results of which have been presented through publication of technical papers. The award is funded by Supelco Inc., a subsidiary of Sigma-Aldrich, and Nicholas Pelick, an AOCS past president.

Stephen S. Chang Award

NISSIM GARTI, The University of Jerusalem, Israel

The Stephen S. Chang Award recognizes a scientist, technologist, or engineer who has made decisive accomplishments in basic research for the improvement or development of products related to lipids. The award was established by former AOCS President Stephen S. Chang and his wife, Lucy, for individuals who have made significant contributions through a single breakthrough or through an accumulation of publications.

SECTION AWARD

Alton E. Bailey Award

ALBERT DIJKSTRA, Consultant, France

The North Central Chapter of the USA Section established this award to recognize outstanding research and exceptional service in the field of lipids and associated products. The medal commemorates Alton E. Bailey's great contributions to the field of fats and oils as a researcher, as an author of several standard books in the field, and as a leader in the work of the Society.

DIVISION AWARDS

Analytical Division: Herbert J. Dutton Award

JIANN–TSYH (KEN) LIN, USDA Western Regional Research Center, USA

The award is presented for significant contribution to the analysis of fats and oils or to improvement in the understanding of the processes used in the fats and oils industries. The award is named for Herbert J. Dutton, a longtime research leader at the US Department of Agriculture facility in Peoria, Illinois, USA.

Biotechnology Division: Lifetime Achievement Award

CASIMIR C. AKOH, The University of Georgia, USA

The award is for lifetime outstanding performance and meritorious contributions to an area of interest to the AOCS Biotechnology Division. This year, the award is sponsored by Novozymes A/S.

Edible Applications & Technology Division: Timothy L. Mounts Award

KOEN DEWETTINCK, Ghent University, Belgium

The award is for either basic or applied research accomplishments relating to the science, technology, or application of edible oils in food products. It memorializes the former AOCS president, who was a distinguished research scientist with the US Department of Agriculture.

Industrial Oil Products Division: SDA/NBB Glycerine Innovation Award



ZORAN S. PETROVIC, IVAN J. JAVNI, and **MIHAIL IONESCU,** Pittsburg State University, USA

The SDA/NBB Glycerine Innovation Award, sponsored by The Soap and Detergent Association and the National Biodiesel Board, is presented by the AOCS Industrial Products Division to recognize achievements in research relating to new applications for glycerine, particularly those with commercial viability.

USB Industrial Uses of Soybean Oil Award

THOMAS A. FOGLIA, USDA Eastern Regional Research Center, USA

This award is for outstanding research into new industrial applications or uses for soybean oil. The United Soybean Board's New Uses Committee sponsors the award to encourage and recognize such research.

Lipid Oxidation and Quality Division: Edwin Frankel Best Paper Award

Autoxidation of Conjugated Linoleic Acid Methyl Ester in the Presence of α-Tocopherol: the Hydroperoxide Pathway (*Lipids 43*:599–610)


TAINA I. PAJUNEN, MIKAEL P. JOHANSSON (not pictured), **TAPIO HASE** (not pictured), and **ANU HOPIA;** University of Helsinki, Finland

The Lipid Oxidation and Quality Division Best Paper Award recognize the best paper relating to lipid oxidation or lipid quality published during the previous year by AOCS Press.

Phospholipid Division: Best Paper Award


Effect of Dietary Omega 3 Phosphatidylcholine on Obesity-Related Disorders in Obese Otsuka Long-Evans Tokushima Fatty Rats (*Journal of Agricultural and Food Chemistry 55*: 7170–7176, 2007).

BUNGO SHIROUCHI[1], **KOJI NAGAO**[1], **NAO INOUE**[1] (not pictured), **TAKESHI OHKUBO**[2] (not pictured),

HIDEHIKO HIBINO[2] (not pictured), and **TERUYOSHI YANAGITA**[1]; [1]Saga University, Japan, and [2]NOF Co., Ltd., Japan.

The Phospholipid Division Best Paper Award recognizes an outstanding paper related to phospholipids published during the previous year.

Protein and Co-Products Division: ADM Best Paper Award

Chemistry/Nutrition

Antioxidant and Antithrombotic Activities of Rapeseed Peptides (*JAOCS 85*: 521–527, 2008)

SHAO BING ZHANG, ZHANG WANG, and **SHI YING XU;** Jiangnan University, People's Republic of China

Engineering/Technology

Protein Subunit Composition Effects on the Thermal Denaturation at Different Stages During the Soy Protein Isolate Processing and Gelation Profiles of Soy Protein Isolates (*JAOCS 85*:581–590, 2008)

EDUARDA M. BAINY[1,2], **SUSAN M. TOSH**[1] (left), **MILENA CORREDIG**[2], **LORNA WOODROW**[1], and **VAINO POYSA**[1]; [1]Agriculture and Agri-Food Canada, Canada, and [2]University of Guelph, Canada.

The ADM/Protein and Co-Products Division Best Paper Awards are presented annually for the outstanding paper related to protein and co-products appearing in an AOCS publication during the previous year.

Surfactants and Detergents Division: Samuel Rosen Memorial Award

MICHAEL F. COX, Consultant, USA

The award recognizes a significant advance in, or application of, the principles of surfactant chemistry by a chemist working in the industry. The award is sponsored by Milton Rosen in honor of his father, Samuel, who worked as an industrial chemist on the formulation of printing inks for more than four decades.

The Soap and Detergent Association (SDA) Award

The Characteristic Curvature of Ionic Surfactants (*JSD 11*:145–158, 2008)

EDGAR J. ACOSTA, JESSICA SH. YUAN, and **ARTI SH. BHAKTA,** University of Toronto, Canada

The SDA Award is presented annually to the authors of the best technical paper published during the preceding year in the *Journal of Surfactants and Detergents*. The award is sponsored by The Soap and Detergent Association.

STUDENT RECOGNITION AWARDS

Thomas H. Smouse Memorial Fellowship

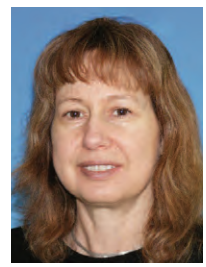
THRANDUR HELGASON, University of Iceland, Iceland

The Archer Daniels Midland Foundation, the AOCS, the AOCS Foundation, and the family and friends of Thomas Smouse have established and assisted in funding a fellowship program designed to encourage and support outstanding graduate research in a field of study consistent with the areas of interest to the AOCS.

Honored Students

IDIT AMAR–YULI, The Hebrew University of Jerusalem, Israel

YOUNG–HEE CHO, University of Massachusetts, USA



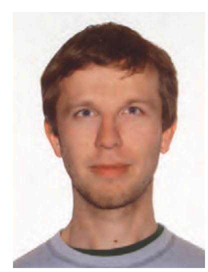
RIVKA EFRAT, The Hebrew University of Jerusalem, Israel

JOSE A. GERDE, Iowa State University, USA

THRANDUR HELGASON, University of Iceland, Iceland

C. ERIC HODGMAN, Purdue University, USA

BENA–MARIE LUE, University of Aarhus, Denmark



BERNHARD A. SEIFRIED, University of Alberta, Canada

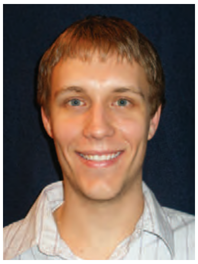
MEGAN TIPPETTS, Utah State University, USA

CHIBUIKE UDENIGWE, University of Manitoba, Canada

EROEN VEREECKEN, Ghent University, Belgium

THADDAO WARAHO, University of Massachusetts, USA

Manuchehr (Manny) Eijadi Award



C. ERIC HODGMAN, Purdue University, USA

The Eijadi Award recognizes outstanding merit and performance by an AOCS Honored Student. The award, established by Mr. Eijadi, is intended to help the recipient finance his or her studies.

Peter and Clare Kalustian Award

JOSE A. GERDE, Iowa State University, USA

The Kalustian Award recognizes outstanding merit and performance by an AOCS Honored Student. The award is supported by the Kalustian estate.

Ralph H. Potts Memorial Fellowship Award

THU T. NGUYEN, The University of Oklahoma, USA

The Ralph H. Potts Award is presented annually to a graduate student working in the chemistry of fats and oils and their derivatives. The award is sponsored by AkzoNobel to memorialize Ralph Potts, a pioneer in research on industrial uses of fatty acids.

Analytical Division Student Award

GERARD DUMANCAS, Oklahoma State University, USA

RAHULKUMAR LALL, University of Arkansas, USA

The award recognizes outstanding graduate students who are presenting their work related to lipid analytical chemistry during the AOCS Annual Meeting & Expo.

Biotechnology Division Student Paper Award

VLADIMIRA HANUSOVA, Slovak University of Technology, Slovak Republic

ASHANTY PINA-RODRIGUEZ, The University of Georgia, USA

XUE–MEI ZHU (not pictured), Chungnam National University, Republic of Korea

This division award is for an outstanding paper in the field of biotechnology presented by a student during the AOCS Annual Meeting & Expo.

Edible Applications Division Student Excellence Award

VANESSA CASTELO BRANCO, Universidade Federal do Rio de Janeiro, Brazil

The award recognizes an outstanding graduate student who is doing research toward an advanced degree related to the division's area of interest.

Health & Nutrition Division Student Excellence Award

JOHN MIKLAVCIC, University of Alberta, Canada

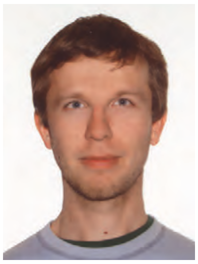
This award recognizes the outstanding merit and performance of student who is doing research in the field of health and nutrition.

Industrial Oil Products Division Student Award

SWAPNIL ROHIDAS JADHAV, City College of New York, USA

The award is presented to an outstanding graduate student in the division's fields of interest who is working toward an advanced degree.

Processing Division Student Excellence Award



BERNHARD A. SEIFRIED, University of Alberta, Canada

The award recognizes a graduate student for presenting an outstanding paper related to the processing industry during the AOCS Annual Meeting & Expo.

Hans Kaunitz Award

SUNGWHAN OH, Harvard Medical School, USA.

The award recognizes the outstanding performance and merit of a graduate student within the geographical boundaries of the Northeast Chapter of the US Section of the AOCS.

CONTINUED FROM PAGE 249

it was true. It was published in my local paper, and reporters always get their facts correct! Right?

Well, the story is about two well-known celebrities, Lee Marvin (Hollywood actor) and Bob Keeshan (of TV's *Captain Kangaroo* fame). Both served in the US Marines in World War II. This part is true. Both fought in the battle for Iwo Jima. Lee Marvin was wounded in this battle, and Bob Keeshan was the one who tended to Lee Marvin's wound and got him back to safety. This is not true. Lee Marvin was wounded, but in the battle for Saipan, which occurred before Iwo Jima. Bob Keeshan enlisted late in World War II and really never saw battle. It is a good story, but not true. It is no surprise that stories like this one are created, inflated, and perpetuated.

It is because of such stories that David P. Mikkelson and his wife, Barbara, co-founded Snopes.com at www.snopes.com. Snopes is one of the most widely respected fact-checking sites on the Internet. Many stories are not necessarily concocted to be misleading but to enhance the significance of a person, event, or thing. It seems like a good idea to do some checking, and Snopes.com is a place to start.

There are other fact-checking websites worth investigating. To find out if a computer virus or security issue is genuine, go to Vmyths.com (http://vmyths.com), and slay a hoax at Hoax-Slayer.com (www.hoax-slayer.com).

Joe Endres is a regular contributor to inform *and may be contacted by e-mail at jgendres@embarqmail.com or by phone at +1-260-625-3616.*

Biolubricants: A global overview

Lou A.T. Honary

About 30 years ago Europeans commercialized biolubricants, in the form of hydraulic oils and chainsaw lubricants. These products were manufactured from renewable resources such as rapeseed oil, not from fossil sources (petroleum). Lubricants such as these had been used previously, during the World Wars and at times of petroleum shortages, but otherwise had not been used routinely.

One brand of rapeseed-based hydraulic oil found its way in the 1980s from Europe to the United States under a Mobil brand name, Environmentally Aware Lubricant EAL 224H, with some success. The 1990s saw serious efforts by US companies to follow the European lead in anticipation of pending governmental mandates and rising pressure for more environmental regulations. Most notable were companies such as The Lubrizol Corporation, of Wickliffe, Ohio, that invested significant amounts of research and development resources to create a series of highly effective additive components or packages from high-oleic sunflower oils. Deere & Company (Moline, Illinois), in cooperation with The Lubrizol Corporation, created the first tractor hydraulic fluid, which was based on high-oleic canola oils.

Also, through funding from the Iowa Soybean Association, the University of Northern Iowa's National Ag-Based Lubricants Center (UNI-NABL) was established in 1991, resulting in the development and patenting of the first soybean oil-based tractor hydraulic fluid. During the 1990s, there was a significant amount of activity and publication expounding the benefits of biolubricants at scientific and trade shows and at standard-setting organizations, including the American Society for Testing and Materials (ASTM) and the American Oil Chemists' Society (AOCS).

For several years, ASTM was bogged down with attempts to define the term "biodegradability," because that was the main focus of these products. This resulted in serious delays in developing standards. Furthermore, the emphasis on environmental friendliness meant that less emphasis was placed on the economics of these products, and sometimes, on the performance. As a result, the initial products either were too expensive, had performance shortcomings, or both. Nevertheless, these products found some niche markets. By the end of the 1990s, however, most US companies had reduced or eliminated their green projects.

Research continued, however, in academic and governmental research laboratories or in projects funded by agricultural groups, such as state and national soybean associations. The UNI-NABL continued to grow, and through support from the US Department of Agriculture (USDA) and US Department of Energy it expanded its operation to create vegetable oil-based lubricants and greases. Since its inception in 1991, UNI-NABL has commercialized over 30 industrial lubricants and greases based on soybean oils. During this time, the USDA introduced the term "biobased" and initiated a labeling program requiring federal purchasers to buy products labeled as biobased.

OLD TECHNOLOGY

The initial technology for biobased lubricants—primarily referred to as biodegradable lubricants—was based on vegetable oils that had been subjected to minor chemical treatments and in which performance-enhancing additives were included. Since vegetable oils generally face inherent challenges when it comes to industrial lubricant applications, their initial use required more serious modification. Soybean oil, for example, shows a significant lack of oxidation stability, with an oil stability index (OSI) value of about seven hours. In one case, this oil was partially hydrogenated

Some of the *alternative industrial crops with potential applications as biolubricants. From left to right, seed of the castor bean plant;* Cuphea *in bloom (photo by Keith Weller, courtesy USDA, ARS); safflower (courtesy Cognis); fruits of the jatropha shrub (courtesy Bayer CropScience); lesquerella (photo by Jack Dykinga, courtesy USDA, ARS).*

to improve its oxidation stability and then winterized to improve its pour point performance (Honary, 1999). Addition of hydraulic oil additive packages, antioxidants, and pour point depressants resulted in hydraulic oils capable of performing in high-performance hydraulic systems.

Perhaps the most important development for US biobased lubricants was the introduction of high-oleic soybeans by the DuPont Corporation (Wilmington, Delaware, USA) in the early 1990s. The oil of this genetically enhanced soybean had a fatty acid profile considerably superior to conventional soybean oils. Genetic modification of seeds allows changes to the fatty makeup of the seed oil that would take longer to make through the natural selection process. The oil from the high-oleic soybeans, for example, had oleic acid contents of greater than 80% and linolenic content of less than 3% as compared with 20% oleic and 8% linolenic content, respectively, for typical commodity soybeans. Originally designed for frying applications, this oil showed an OSI value of 192, or a stability about 27 times higher than conventional soybean oils. This characteristic helped in the creation of a number of highly successful lubricants and greases. The physicochemical as well as performance differences between conventional soybean oils and high-oleic soybean oils are presented in Table 1. The Lubrizol Corporation built its additive and lubricants technology based on high-oleic and ultra-high-oleic sunflower oils. For many industrial lubricants applications, high-oleic soybean oil, sunflower oil, and canola oils are still base oils of choice today.

CURRENT TECHNOLOGY

Although high-oleic oils, for the most part, solved the problem of vegetable oils' lack of oxidative stability, many of these products required mixing with other [often synthetic] oils to improve their pour point performance. Still, achieving the cold temperature per-

TABLE 1. Viscosity, viscosity index, and pour points of selected oils and identical hydraulic fluids utilizing soybean oil- and mineral oil-based fluids.

Description	ASTM D 6749 pour point (°C)	ASTM D 445 viscosity @ 40°C	ASTM D 445 viscosity @ 100°C	ASTM D 2270 viscosity index
High-oleic soy oil	–16	31.19	8.424	200
Crude conventional soy	–6	31.69	7.589	222
Mineral oil–ISO VG 100	–50	20.58	3.684	28
Mineral oil–ISO VG 500	–32	96.21	9.040	53
Mineral oil blend of 57%/43% (of ISO VG 100 and 500, respectively)		37.95	5.295	53
Hydraulic fluid with crude conventional soy		32.26	7.592	217
Hydraulic fluid with high oleic soy		39.14	8.412	199
Hydraulic fluid with mineral oil blend		25.24	4.248	46

formance for lubricants used outdoors required mixing in of various expensive esters, which sometimes negatively affect the elastomeric compatibility of the final product. As a result, there have been many recent developments, including the creation of chemically modified vegetable oils, that (i) allow for flexibility in the use of any vegetable oil as a base input and (ii) improve performance both for oxidation and cold temperature.

The chemical modification of vegetable oils to improve their performance for frying and for industrial use is not new. One of the soybean oil-based tractor hydraulic fluids developed in the United States was based on partially hydrogenated soybean oil that had reasonable oxidation stability and that was further winterized to help with the pour point performance. This oil, in fatty acid profile and in many other properties, is similar to common winterized salad-quality oils. Of course, additional additives such as antioxidants and pour point depressants were needed to formulate and meet the requirements of hydraulic oils. Today, chemical modifications are created with the industrial or automotive lubricants in mind, not frying stability needed in food applications. This focus has resulted in significant strides in creating products that are more flexible in their raw materials input as well as in showing oxidation stability and cold temperature performance far superior to what is possible by mixing and by using pour point depressants. These new modification methods are promising and are opening the opportunity to go beyond industrial lubricants and test products for automotive lubricants such as engine oils.

Estolides are one example of these new chemical modification techniques. A patent by Steven Cermak and colleagues describes the creation of estolides for industrial and automotive lubricants (US patent number 6316649). An example of a process for synthesizing estolides from coco-canola as provided by Cermak is presented in Figure 1.

The estolides are created by "chemically connecting different unsaturated fatty acids (FA). These are the building blocks of high-oleic oils, such as sunflowers, canola, and lesquerella" (Suszkiw, 2006). Using only the FA components, USDA researchers produced "branched chains of either saturated or unsaturated oleic estolides whose performance in various tests rivaled that of mineral oil-based lubes. These estolides showed pour points down to –22°F (–30°C) for the unsaturated oleic estolides and –40°F (–40°C) for the saturated ones; and oxidative breakdown of 200 and 400 minutes in rotating bomb oxidation tests (RBOT) (200 minutes for a comparable mineral engine oil" (Suszkiw, 2006)

The *Journal of Synthetic Lubrication* has published numerous papers on synthetic esters. Some of these complex esters may be made via the reaction of a polyol, dicarboxylic acid, and monoalcohol as an end-capping agent. Key structural features of these esters and the basic structure of the alkoxy group from the end-capping monoalcohols are presented in Figure 2.

FUTURE TECHNOLOGY

The popularity of biofuels over the last few years has resulted in a significant investment of public and private capital for the development of alternative crop oils. Although different in end use, many of the industrial crops and special processes developed for biofuels have applications in biobased lubricants as well.

Additionally, the attention given to the negative health effects of *trans* fats has re-invigorated the development by companies such as DuPont and Monsanto of special varieties of oilseeds such as low-linolenic and high-oleic soybean oils.

The Association for Advancement of Industrial Crops has a list of several alternative industrial crops on which members of its oil crop division are working. Most noteworthy are cuphea, camelina, canola, castor, lesquerella, peanut, and pennycress. Camelina has already reached the commercial production stage; and reasonably large acreages are currently being produced in nontraditional oilseed regions of the western United States.

UNI-NABL recently entered into a multidisciplinary research network lead by AOCS member company Linnaeus Plant Sciences. The Industrial Oil Seed Network is supported with a $3 million grant from Agriculture Canada and brings together tribologists, molecular biologists, agronomists, and experts in greenhouse gas analysis to work together for the first time to increase market penetration of biobased lubricants. The goal is to develop crops with improved oil profiles for specific industrial applications.

Over the last 30 years, the commercial viability and economic and technical performance of biobased lubricants have been established. Because of the demand for petroleum and the attention to the carbon footprint of industrial products, there will be continued development and enhancement of biobased products. The future technologies will encompass the old fatty acids; the newer genetically enhanced high-oleic varieties; and the more sophisticated, economical, chemically modified, high-functioning esters derived from an ever-growing variety of raw materials. These developments will not completely replace the use of petroleum for industrial and automotive lubricants, but they will achieve increasing levels of market penetration and capture a significant portion of those lucrative markets.

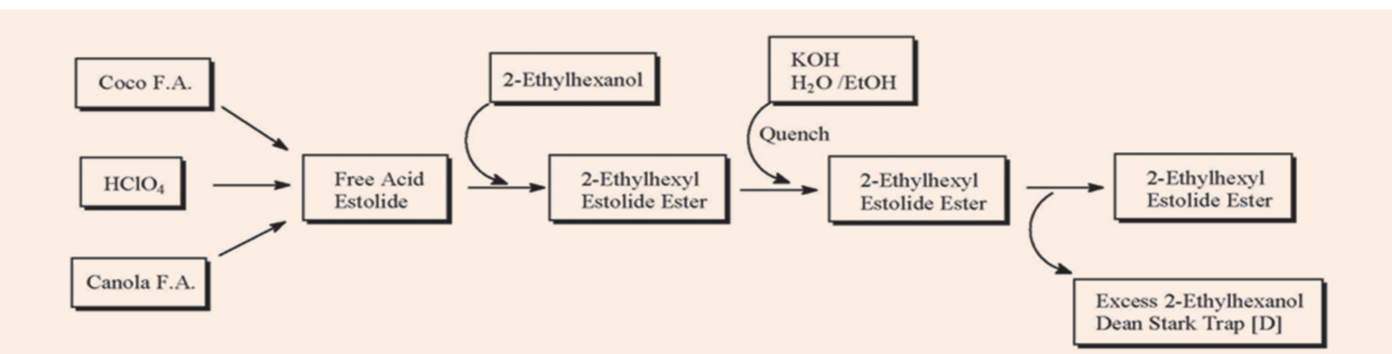


FIG. 1. *An example of a process for synthesizing estolides. F.A., fatty acid. Used with permission.*

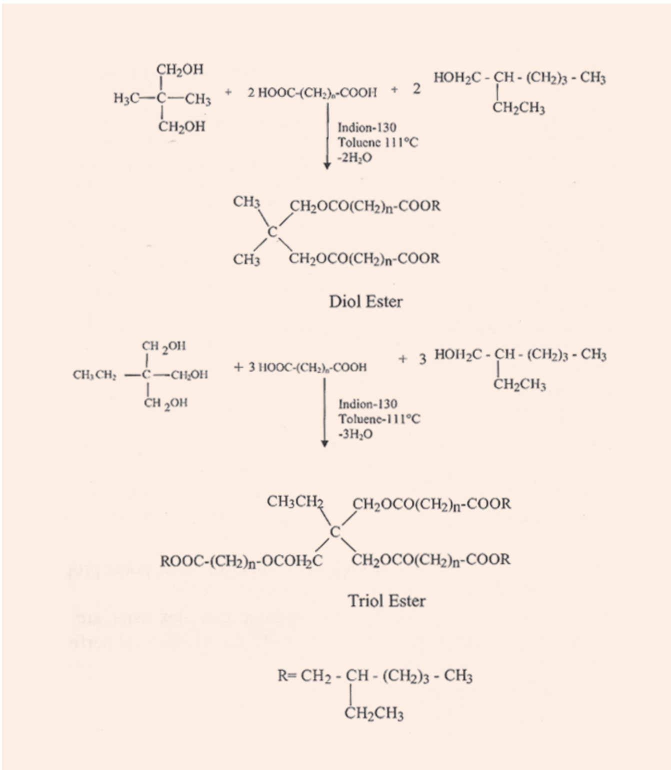


FIG. 2. *Key structural features of these complex esters and basic structure of alkoxy group from the end-capping monoalcohols. Source: Nagendramma and Kaul (2008).*

*inform*ation

For further reading:

- Cermak, S.C., and T.A. Isbell, Estolides—The Next Bio-Based Functional Fluid, *inform 15*:515–517 (2004).
- Honary, L.A., Soybean Based Hydraulic Fluid, U.S. Patent 5,972,855 (1999).
- Nagendramma, P., and S. Kaul, Study of Synthetic Complex Esters as Automotive Gear Lubricants, *J. Synth. Lubr. 25*:131–136 (2008).
- Suszkiw, J., Scientists Develop New Crankcase Lube From Plants, 2006. US Department of Agriculture Agricultural Resource Service. www.ars.usda.gov/is/pr/2006/060615.htm

Lou A.T. Honary is a professor and the founding director of the National Ag-Based Lubricants (NABL) Center at the University of Northern Iowa, Cedar Falls (USA) where he is the Pioneer Hi-Bred International Professor of Innovation. Honary has written numerous publications in the area of bio-based lubricants and is authoring a book on this subject. He holds eight US patents or joint patents for his work with soybean-based industrial lubricants and transformer fluids. He may be contacted by e-mail at Lou.honary@uni.edu.

Interview: Hector Carlos Autino

The president of AOCS' Latin American Section offers a fats and oils perspective from the region

Eduardo Dubinsky

Hector Carlos Autino, president of AOCS' Latin American Section

Q. Tell us briefly about your background in the oils and fats industry.

A. From 1962 to 1978 I carried out different activities for Swift Company in the city of Rosario, Argentina, including working in the position of chemical lab analyst and heading the Edible and Nonedible Fats Rendering Area.

In 1978, I became production manager at the plant in San Jerónimo Sud currently owned by Bunge, about 35 kilometers (km) to the west of Rosario. My first responsibilities involved construction of that plant. I also participated in the plant's startup, and its multiple modifications, always in search of increased production capacity as well as operational efficiency. My activities at that facility continued until 2001. At that time, Bunge purchased the industrial and port complex that had belonged to the Swiss André Group, and I was transferred to that site as the plant's operations manager, remaining in the position until 2005. During that period, I took part in and authored many changes that made possible the complex's 8,000 metric tons (MT)/day crushing capacity, which helped it become one of the most efficient facilities in the country. The plant has GMP [Good Manufacturing Practice] B12 and ISO 9000 certifications, in addition to other management tools related to safety and environmental issues, which include TPM [total productive maintenance]-Kaizen.

From 2005 to the present, I have performed corporate tasks for Bunge at a global level. I have been in charge of many design and modification projects for different Bunge plants around the world, including Spain, Italy, India, China, Russia, Ukraine, Poland, and Brazil. Currently I am in charge of the construction of the new industrial plant that the company is building in the city of Ramallo, in the province of Buenos Aires, with a projected 5,000 MT/day crushing capacity.

Q. Briefly describe the growth of the Argentine oil industry.

A. The Argentine oil industry has shown a dramatic expansion, directly related to the growth that the country has experienced in the last 30 years. Argentina is the world's third-largest soybean producer and the world's largest soybean oil and meal exporter; it also holds key positions in the production of sunflower, peanut, and other oilseeds. This has caused the exponential growth of crushing capacity since 1980, currently above 150,000 MT/day, i.e., 45 million metric tons (MMT) per year.

Consequently, many Argentine facilities are the largest in their type at global level. Cargill, Bunge, Dreyfuss, Molinos, AGD, Nidera, Vicentín, and Buyatti are among the main actors within the industry. For example, there are facilities having a crushing capacity of 20,000 MT/day. All plants have a high level of automation and state-of-the-art technology that makes them highly competitive and allows them to export to countless countries around the world (using the port complexes that are mainly located on the Paraná River). These complexes are highly efficient and capable of loading a Panamax vessel with 45,000 MT in only 24 hours. The complex is supported by an important waterway that is dredged and maintained to allow navigation of those vessels entering the Paraná River from the Río de la Plata and then back to the sea to reach countless international destinations.

The recent appearance of biofuels has positioned Argentina as an outstanding producer of biodiesel, with production that increased from 150,000 to 1,500,000 MT/year in less than two years; and this turns us into large exporters of renewable fuel, providing added value to our primary production.

Q. How do you see the current situation and the future for the oils and fats industry in Argentina?

A. Because of its industrial development and despite the world's economic crisis, Argentina will continue to export its agro-industrial production thanks to its high level of competitiveness. In addition, production diversity and the recent appearance of biofuels offer new tools for our country to efficiently defend its business. Although we are currently immersed in an unfavorable context, with economic turbulence at domestic and international levels, it is expected that such deviations will gradually cease, allowing Argentina to get back on course and to maintain the position of a strong and reliable food exporter based on the country's successful agro-industry.

Q. Considering all the traveling you do for your company, and its developments in other parts of the world, how do you compare the levels that Argentina has attained in its professional and research levels with the rest of the globe?

A. Argentina has especially promoted the introduction of technology into its agroindustry, whose growth requires well-trained professionals and specialists. This was possible thanks to the effort and enterprising spirit of the companies that strongly committed their assets to growth, coupled with the improvement of their human resources. Universities and technical schools also contributed, according to their abilities, to make this come true.

Today, Argentina has model facilities absolutely comparable with the best of their type at global level, and with high-level professional human resources, which are part of the converging aspects that promote the aforementioned growth and the success of our management.

Q. How significant was, and is, the appearance of ASAGA (Asociación Argentina de Grasas y Aceites) for our oils and fats specialty?

A. ASAGA was founded in 1989, spurred by the need to have an association that could bring together Argentinian technical people and professionals who were willing to work selflessly to spread the technical and scientific aspects of the specialty in question. From 1989 to date, ASAGA has organized more than 150 theoretical-practical courses to train and improve the knowledge of the individuals that work in the industries within our area; it has organized three Latin American congresses and is launching the organization of a fourth congress for 2009. In 1990, *A&G* magazine was created, and with a quarterly print run of 2,000 copies, *A&G* is the most important publication of its type in Latin America and among Spanish publications.

The association has developed and continues to develop numerous agreements with universities to achieve new and innovative contributions. The agreement signed with UCEL, the University of the Latin American Educational Center in Rosario, may be the most important one because it has promoted the installation of a small-scale pilot plant for oils and fats processing, as well as establishing a university technical degree and a master's, with specialization in edible oils and fats, for technical people and professionals in that educational center.

Because of facts like that, ASAGA's contribution has been, and continues to be, invaluable, and this can be confirmed and assessed by the entire industry, not only at a local level, but also at global level.

For myself, I can say that I have been and continue to be uninterruptedly linked to the association. I have been a part of the governing board and its president for a two-year period; from the beginning I have held the position of *pro bono* director of the official *A&G* publication. I have also been a lecturer at numerous training and congress events organized by ASAGA, and I feel strongly identified with this association, for which I hold a very special feeling.

Q. How do you manage to perform the multiplicity of tasks that you carry out—industrial manager for Bunge, *A&G* director, coordinator in the ASAGA-UCEL agreement, LA-AOCS president, and coordinator for the Latin American Congress—in such an efficient manner while still contributing to a large number of the relevant issues pertaining to ASAGA?

A. When one loves what he does, and feels identified and committed to his company and his colleagues, there is always time for doing things, although I must say that this takes up leisure and family time; luckily my wife and my children have always been supportive of my work, and this not only invigorates my spirit, but also gives me the strength to carry out work that cannot be declined. With the sole exception of my position at Bunge, the rest of my activity is *pro bono* and this reflects my spirit of being helpful to my colleagues with the intention of giving back all the esteem and contributions they have granted me throughout my professional career within this industry.

Look for part two of this interview in next month's issue of *inform*.

Eduardo Dubinsky, of Eng.E.Dubinsky & Assoc.–Technical Consultants (Buenos Aries, Argentina), is a contributing editor to inform *magazine. E-mail him at edubinsky@ciudad.com.ar.*

Raw material sources for the long-chain omega-3 market: Trends and sustainability. Part 2.

Editor's note: This paper is an update of a presentation delivered at the 99th AOCS Annual Meeting & Expo in Seattle, Washington, USA, May 19, 2008. The first part of this article appeared in the March 2009 issue of inform.

Anthony P. Bimbo

NUTRACEUTICAL (OMEGA-3) FISH OILS

A recent report from the Global Organization for EPA and DHA (GOED 2008, where EPA is eicosapentaenoic acid and DHA is docosahexaenoic acid) indicates that the omega-3 market has reached $13 billion. Actually, about $180 million covers raw materials, $1.28 billion covers refined oils and concentrates, and $13.1 billion covers consumer products. The structure of the omega-3 fish oil market is somewhat complex, with many companies and many joint ventures and/or strategic alliances involved at various layers within the industry. This structure is shown in Figure 1 (Bimbo 2007).

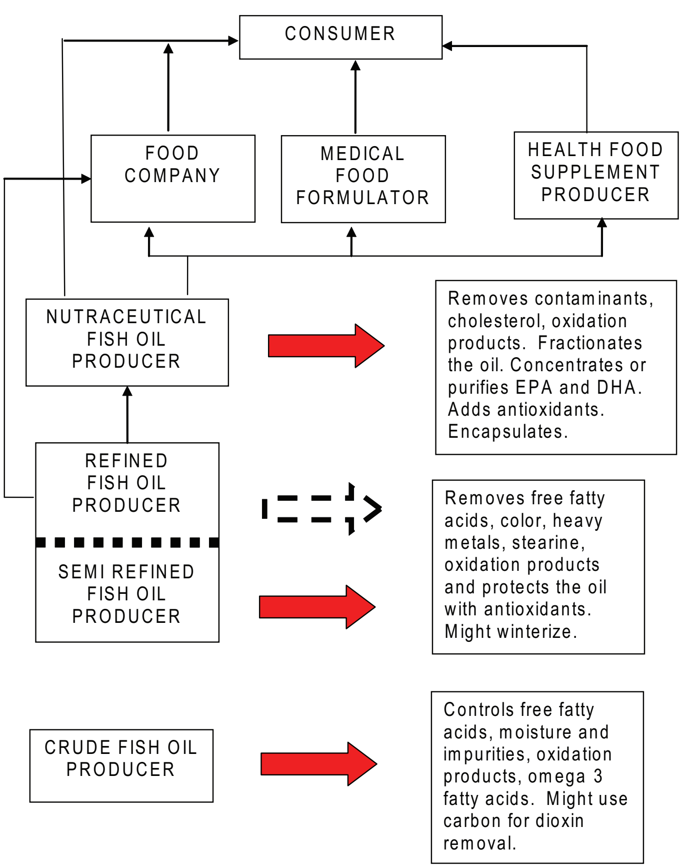


FIG. 1. *Fish oil omega-3 market structure. Reprinted with permission from* Long Chain Omega-3 Specialty Oils *(Bimbo 2007).*

The base of the market is the producer of crude fish oil. Every producer wants to be involved in this market, seduced by the $13 billion pie, but only a few have the patience, stamina, and financial support to pursue it. Most of the nutraceutical fish oil producers are large chemical or nutritional oil companies that have installed expensive processing facilities to produce a final food- or pharmaceutical-grade fish oil. Unfortunately their plants are relatively small and not suited for removal of the macro impurities in the crude oil. That job is left to the semi-refined and refined fish oil producers who generally are capable of degumming; alkali refining; carbon, silica, and clay bleaching; and possibly winterizing. There is some overlap between the semi-refiner and the refiner, and there might also be some overlap between the refiner and the nutraceutical fish oil producer. There are also strategic alliances and joint ventures along the way. Companies in the middle of the chain want to lock up the basic raw materials at the bottom of the chain. Generally the finishing steps in the process involve the removal of the micro impurities and contaminants as well as the concentration or purification of the omega-3 fatty acids. All of these processing steps produce a large volume of by-products, which must be disposed of or utilized.

Figures 2 and 3 outline the processing steps involved in the production of these types of oils. These previously appeared in a 1998 *INFORM* article (Bimbo 1998) but still have relevance. There might be other processing steps, for example enzymatic processes, but these are generally proprietary and not disclosed.

OTHER SOURCES OF OMEGA-3 OILS

In addition to the traditional sources of the omega-3-desirable fish oils, there are other sources either just entering the marketplace or in the pipeline. These other sources are much more expensive than fish oil but are now of interest as the price of fish oil skyrocketed during 2006–2008 and then retreated. Figure 4 shows the historic run-up in the price of crude fish oil C&F [cost and freight] Rotterdam.

First of all, to put things into perspective, the fish oil price peak in 1998 during the major El Niño event was unprecedented. Before that, fish oil was always the least expensive commodity oil available because it required much more processing to make it similar to vegetable oils. The El Niño event reduced global production by almost 50%, which pushed the price up, but the price returned to traditional levels after El Niño. The relatively rapid rise in prices since about 2000 coincides with aquaculture growth and has provided an incentive for consumers of fish oil across all markets to pursue other sources. The rise in price over the last few years probably reflects greater interest from the omega-3 market, plus the general run-up and decline in the price of all commodities. These high prices have also provided incentives for companies to produce fish oils and other marine oils from additional sources that had previously been burned or simply discarded.

About 33 million metric tons (MMT) of fish and by-products go to fishmeal and oil production, but only about 17 MMT are in the "desirable" category from an omega-3 perspective. If we assume an average 5% fish oil yield, then 33 MMT of fish would yield about 1.65 MMT of fish oil, and 17 MMT of "desirable" fish would yield about 850,000 metric tons (MT) of "desirable" fish oil. But the global production of all fish oil averages about 1 MMT per year, so potentially an additional 650,000 MT of fish oil could be produced that is presently probably being discarded along with the by-products. Alaska, for example, catches about 53% of the US catch, or about 4.4 MMT of fish. Since most of the fish are lean fish, we might assume that 46% would be waste and that waste might yield 2% fish oil. In that scenario, Alaska potentially could produce 40.5 thousand MT of fish oil. Current data for Alaska are somewhat confusing, but it shows that the state produces somewhere between 15,000 and 30,000 MT. Most of this oil would come from pollock and wild Alaska salmon, oils that are not in the "desirable" category at this time but might be if selected batches could be isolated.

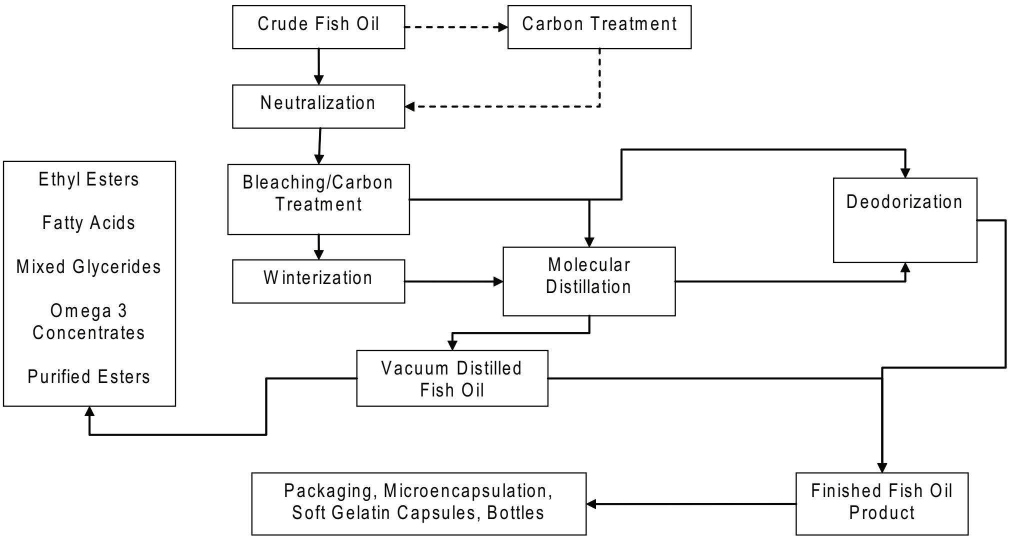


FIG. 2. *Production of food-grade fish oils. Reprinted from* INFORM *1998 (Bimbo 1998).*

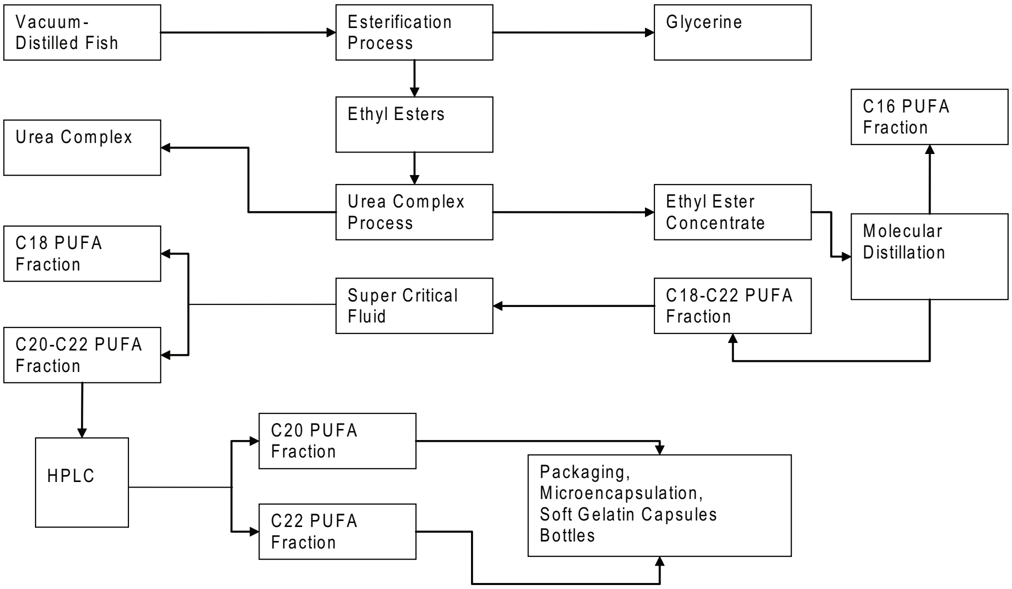


FIG. 3. *Production of pharmaceutical grade fish oil products. Abbreviations: PUFA, polyunsaturated fatty acids; HPLC, high-performance liquid chromatography. Reprinted from* INFORM *1998 (Bimbo 1998).*

Another example is tuna. About 5.4 MMT of various tuna species are landed globally each year. If we assume 50% waste and a 1% oil yield, there is a potential for about 27,000 MT of a very "desirable" tuna oil. Actual production figures for tuna oil are not generally available, but undisclosed sources put the figure at not more than 5,000–7,500 MT per year. The oil is generally burned or used for industrial purposes (water-proofing wooden fishing boats, for example). The general interest in tuna oil and the markedly higher fish oil prices have generated interest in recovering this oil.

One of the new products on the market is krill oil. This oil is different from the traditional fish oils because it contains three active components: omega-3 fatty acids, phospholipids, and astaxanthin. Krill are the main food for a variety of sea creatures including whales, seals, sea birds, penguins, squid, and fish. Nicol and Endo (1997) estimated that these predators consume between 150 and 300 MMT per year. The Antarctic krill are protected by treaty, and quotas have been established for their capture. Because of the general interest in omega-3 fatty acids, a number of new modern capture vessels are being or have been constructed to capture them. Krill decompose very quickly, so the current thinking is either to dry them aboard the vessel and bring the powder back to a land-based plant for oil extraction or to enzymatically digest the krill and then separate the oil. The current Convention on the Conservation of Antarctic Marine Living Resources treaty allows 6.55 MMT to be caught in the major statistical areas (www.ccamlr.org/pu/e/e_pubs/cm/07-08/toc.htm), but the average catch over the last 10 years has been about 120,000 MT (FAO, 2009). Krill have a

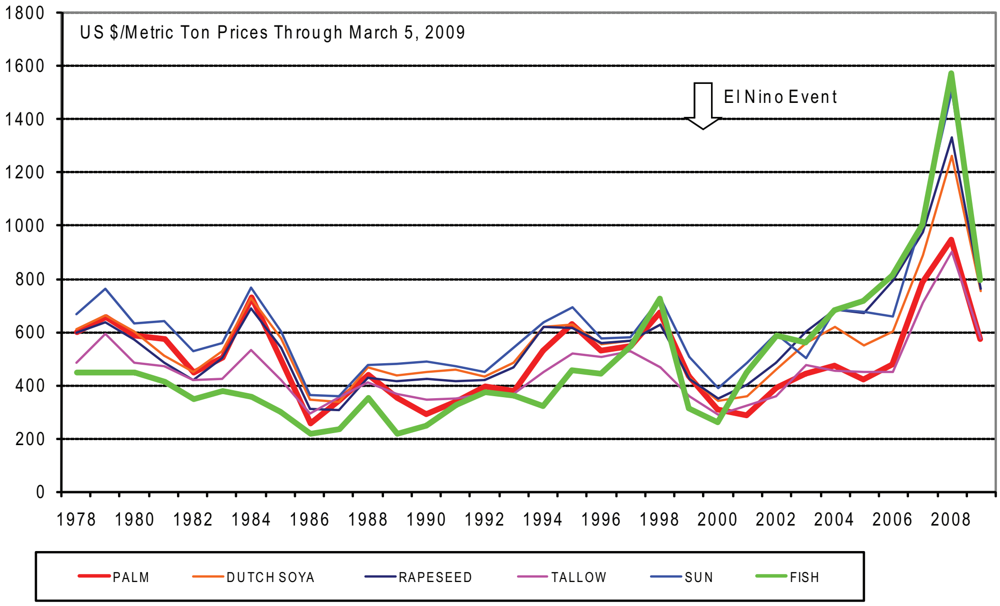


FIG. 4. *World prices of selected edible fats and oils. Source:* Oil World 1970–2008, *ISTA Mielke GmbH, Hamburg, Germany, Internet: www.oilworld.de.*

very low oil content. If we assume that they contain 3% oil, and all the current krill catch is processed to produce oil, then about 3,600 MT of krill oil are potentially available. If the entire treaty volume were to be caught (6.55 MMT) and processed to make the oil, then there would be an unrealistic potential for about 197,000 MT of krill oil. This is unrealistic because that level of catch would probably trigger a major environmentalist outcry and never be permitted. The Antarctic krill fishery has just entered the Marine Stewardship Council certification process, so it will be interesting to see how this progresses.

Much has been written about the single-cell oils (SCO; marine algae, fungi, yeasts). Many groups have developed banks of cultures of organisms that are capable of producing cells with a high oil content and a very high DHA content. The advantages of these oils include simple fatty acid profiles, freedom from environmental issues, and a high concentration of the specific fatty acid wanted. The disadvantages include high cost, limited production capacity, and potential adverse public perception (Wynn and Ratledge, 2007). SCO that are rich in DHA and arachidonic acid have been produced. In 2008, a European company announced the availability of a single-cell algal oil with both EPA and DHA in a ratio of about 3.6 DHA to 1 EPA, almost the same as tuna oil. Work also continues in other areas, and perhaps a genetically modified (GM) yeast might one day produce an EPA-rich SCO product. Ratledge (2004) estimated that 650 MT of SCO was produced in 2003, so today the figure might be closer to 2 thousand MT. Since the oil must be extracted from the biomass with hexane, other lipid compounds are also extracted as well, and the oil must be refined. There is also the issue of disposal of the spent biomass, and today several companies are selling it for pet foods, designer egg (hen) feeds, and aquaculture feeds.

A potential spinoff from the biofuels development work going on around the world is the production of algal oils. There are many companies and institutions evaluating different marine algae. The effort is directed toward finding organisms that will produce high levels of oil, which will increase yields and improve the economics. It is not out of the realm of possibility that someone will come across an organism that produces high levels of omega-3 fatty acids and perhaps more EPA than DHA.

GM oilseeds, another potential source of omega-3 fatty acids, are on the horizon and perhaps 3–5 years away. Companies such as Monsanto (high stearidonic acid soybean oil), Syngenta AG, DuPont, Dow Agrosciences, Arcadia Biosciences Inc. (high γ-linolenic acid safflower oil), Bayer Crop Science, and BASF (canola and rapeseed oils) are working in this area. The main issue with these oils is whether they will be accepted in food products and whether foods containing them must be labeled as GMO (GM organism) products.

Look for part three of this article in the May issue of inform.

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*inform*ation

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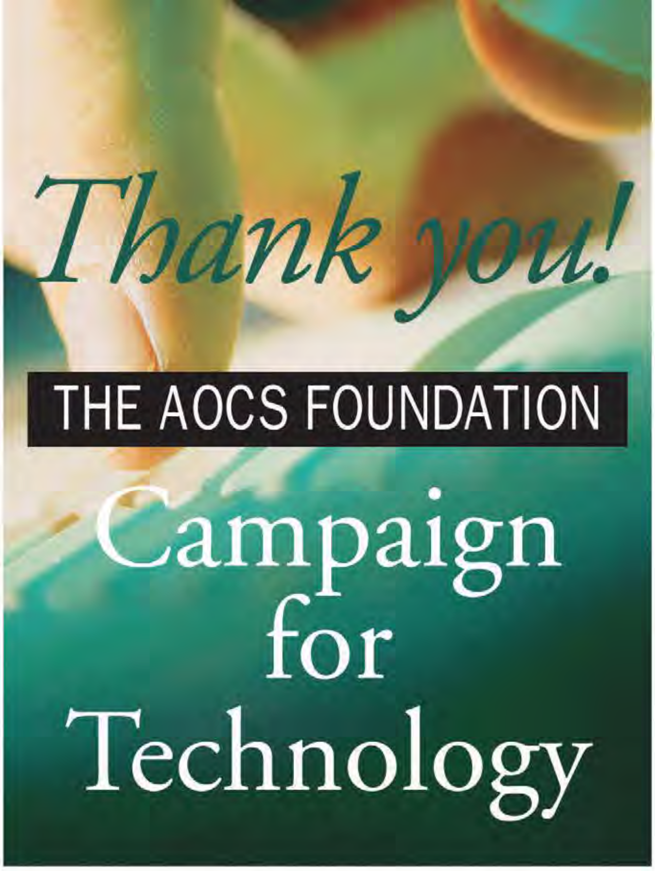

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Meeting roundup

Safflower: Unexploited potential and world adaptability

Sue Knights

In a global context, safflower is a minor crop, but two very disparate issues facing the world may provide an opportunity for a renewed interest in the crop. First, rising global temperatures place potential production constraints on winter oilseed crops and create an opportunity for increased production of safflower, which is well recognized for its greater tolerance to heat stress than competing winter oilseed crops. Second, the growing global incidence of human obesity, partly due to excessive consumption of saturated fats, can be tackled by the replacement of unhealthful cooking oils with healthful ones. Safflower, low in saturated fats, is one such possibility.

Issues such as these were addressed in the 7th International Safflower Conference held at Wagga Wagga, Australia, November 3–6, 2008. Underwritten by the Australian Oilseeds Federation, the conference had in attendance nearly 100 delegates, representing the United States, Canada, Turkey, Spain, Germany, Lebanon, Italy, Iran, India, Mexico, Chile, Japan, New Zealand, and Australia.

Safflower has a long history as a cultivated crop, dating back to ancient China and to pharaonic Egypt where extracts of the flowers were used to dye fabric. In Egypt extracts were also used as a ceremonial ointment in religious ceremonies and in anointing mummies prior to binding. Over time, safflower has been used as an industrial oil in paints and varnishes, and as a healthful oil for human consumption; the seeds are also used as bird feed. It has also been used as a medicinal plant, where preparations from safflower petals are known to have numerous health benefits including reducing hypertension and improving blood flow. Research linking health and diet has increased the demand for safflower oil as it has the highest polyunsaturated/saturated ratios of any oil available.

Delegates from the 7th International Safflower Conference, held at Wagga Wagga, Australia, visiting a field trial at the Murrumbidgee Demonstration Farm in southern New South Wales.

Lorin DeBonte, from Cargill (Minneapolis, Minnesota, USA), eloquently set the global scene for renewed interest in safflower in a keynote address at the conference. He pointed out that more than 6 billion people rely on food grown on only 11% of the global land. He argued that, with the limited supply of additional, highly productive lands, some increase in food production must inevitably occur in arid areas, where safflower may be suited. We have already seen, over the last 10 years, 6% of the global agricultural expansion occurring in arid lands.

DeBonte listed a range of threats to sustainable agriculture on a world scale. Among those he listed were depletion of productive soils; demand for crops for both biofuels and food; intensive agricultural production, leading to increasing disease and insect pressure; narrowing of genetic diversity in the major crops; and a changing environment, with the increasing prevalence of drought and warmer climates.

He proposed that safflower, as an oil crop that is more drought-hardy than canola, could play a role in this changing world context, but that it requires an integrated approach from a wide array of people—plant breeders, geneticists, biotechnologists, agronomists, biochemists, molecular biologists, environmentalists, food scientists, and business leaders in agriculture—who need to work together to build and sustain the food supply for the generations ahead.

The keynote marketing address from Nitin Kathuria, from Marico, India, illustrated the health benefits of safflower oil and the role it could play in the healthful diets of nations that are facing rising obesity rates. He emphasized the importance of developing a value chain for the production and marketing of safflower, using the example of Marico as a case study.

Sujatha Murali, from the Directorate of Oilseeds Research (Hyderabad, India), reviewed advances in safflower biotechnology. She emphasized that safflower is now riding the "third wave" of crop improvement in terms of its use as a crop platform for medical and industrial products, but without the proportional investment in the

Attendees from 11 countries visited the 4th International Symposium on Biocatalysis and Biotechnology in Taipei, Taiwan. The event coincided with a meeting of the Asian Section of AOCS.

New Asian Section of AOCS meets in conjunction with the 4th International Symposium on Biocatalysis and Biotechnology

Jean Wills

The 4th International Symposium on Biocatalysis and Biotechnology (ISBB) took place in Taipei, Taiwan, at the end of last year (November 19–21, 2008). The meeting was organized by AOCS members Ching T. Hou, lead scientist, US Department of Agriculture, Agricultural Research Service, National Center for Agricultural Utilization Research (USDA, ARS, NCAUR; Peoria, Illinois, USA), and Yung-Sheng (Vic) Huang, chair professor and vice president of National Chung Hsing University, Department of Food Science and Biotechnology (Taichung, Taiwan).

The speaker list, made up of representatives from fats and oils organizations worldwide, included AOCS President Casimir Akoh, distinguished research professor, University of Georgia (Athens, USA). Altogether, more than 500 attendees from 11 countries networked to share technical and professional information.

The ISBB has recently established itself as an organization after four years of hosting meetings and publishing the papers of those meetings in book form. Their future plans include publication of a journal within Elsevier's *Journal of New Biotechnology*. The goal is to produce the first offering this spring.

Both meeting organizers have also been instrumental in bringing together representatives from Japan, Korea, Taiwan, Malaysia, and India to establish the Asian Section of AOCS. Board meetings of both groups were held in conjunction with ISBB.

The Section discussed a rotation of meetings in tandem with the ISBB meetings, which would mean a meeting in Taiwan in 2009, in Korea with the Korean Society of Food Science and Technology (KoSFoST) and the Korean Food Science group in 2010, and in Japan with the Japan Oil Chemists' Society (JOCS) in 2011. They will meet twice in 2009, once at the 100th AOCS Annual Meeting & Expo, and in the fall in Taiwan.

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"first" and "second" waves of agronomic and quality traits. This is the case in Australia where, in view of the increasing need to move away from finite petroleum-based resources, there is now considerable interest in expressing unusual fatty acids (UFA) in oilseed crops to provide renewable raw materials for industry.

This "crop biofactory" concept is being actively explored in Australia by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) in partnership with the Grains Research and Development Corporation (GRDC; Kingston, ACT), under its Crop Biofactories Initiative (CBI). CBI has cloned several genes, from a range of species, involved in the synthesis of UFA with either unique positional desaturation or acetylenation or having epoxy or hydroxy functional groups at various positions in the chain. It is now developing technologies to engineer high-level synthesis and accumulation of these UFAs in transgenic oilseeds, including safflower. Allan Green from CSIRO presented an informative update on this research.

Nandini Nimbkar, Nimbkar Agricultural Research Institute (Phaltan, Maharashtra, India), concluded in her presentation that safflower can be grown quite successfully under rainfed, as opposed to irrigated, conditions with relatively low-cost inputs. However, its exact geographic and cropping systems niche needs to be determined, she said. She also illustrated the importance of considering higher-value markets for the crop, such as the use of the petals for medicinal and nutritional benefits.

John Gilbert, Adams Grain Company (Arbuckle, California, USA), illustrated that safflower is used as a rotational crop in many cropping systems around the world, including rotations with rice, tomato, wheat, corn, sunflowerseed, and alfalfa. Safflower helps soil structure by opening up compacted ground with its deep tap root system. From sandy to clay soils, it helps to break up hard pans and compaction layers caused by machinery, and it will dry out wet soils causing cracking and aeration. As such, it is often the first crop of choice in reclaiming soil or breaking new cropping ground. Although considered a winter crop, safflower can be a viable summer crop with low input and water needs. Climate change may present opportunities for safflower as an oilseed as it can return a yield on less rainfall where the other major oilseed crops

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such as canola, sunflower, and soybeans will fail.

Key presentations by Australian researchers Nick Wachsmann (Longerenong College, Victoria) and Robert Norton (The University of Melbourne) highlighted fundamental issues that need to be addressed in the safflower industry value chain in Australia. These included the need for new varieties, more extensive evaluation, and the provision of independent market information.

Further papers presented information on the agronomy of safflower in different environments and cropping systems, progress in breeding new varieties of safflower, progress in safflower biotechnology, and alternative end uses for safflower including hay and silage.

A message often repeated throughout the conference was the fact that safflower research is scattered around the globe and there is an immediate need for determining regional and international priorities and forming core work groups, as in other crops, for tapping the unexploited potential of safflower.

Conference sponsors included Devexco International, GRDC, Cargill, Goodman Fielder, Adams Australia, Twynam Agricultural Group, Cootamundra Oilseeds, CSIRO, Keith Seeds, Wagga Wagga City Council, Genstat, and the EH Graham Centre. Copies of the proceedings are available from www.australianoilseeds.com. The 8th International Safflower Conference is scheduled to be held in India in 2011.

Sue Knights, of S.E. Knights Consulting (Horsham, Victoria, Australia), served as conference chairman for the 7th International Safflower Conference. She can be contacted at sknights@vic.chariot.net.au.

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