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Calendar

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

September

September 12–15, 2011. Asia Pacific Clean Energy Summit & Expo, Hawaii Convention Center, Honolulu, Hawaii, USA. Information: www.ct-si.org/events/APCE2011.

September 14–16, 2011. International Biorefining Conference and Trade Show, Hilton Americas–Houston, Houston, Texas, USA. Information: www.biorefiningconference.com.

September 16–18, 2011. 10th Phospholipid Congress of The International Lecithin and Phospholipid Society (ILPS): Phospholipids—Sources, Processing and Application, Congress Centre "De Doelen," Rotterdam, the Netherlands. Information: e-mail: ilps@lecipro.nl; www.ilps.org/10th%20Congress.htm.

September 18–21, 2011. 9th Euro Fed Lipid Congress, Rotterdam, the Netherlands. Information: email: amoneit@eurofedlipid.org; www.eurofedlipid.org/meetings/rotterdam.

September 18–21, 2011. 12th International Conference on Bioactive Lipids in Cancer, Inflammation and Related Diseases, Westin Hotel, Seattle, Washington, USA. Information: http://bioactivelipidsconf.wayne.edu.

September 20–23, 2011. 7th International Congress of Food Technologists, Biotechnologists, and Nutritionists, Grand Hotel Adriatic, Opatija, Croatia. Information: www.pbncongress2011.hr.

September 21–23, 2011. 7th NIZO Dairy Conference: Flavour and Texture, Innovations in Dairy, Papendal Hotel and Conference Centre, near Arnhem, the Netherlands. Information: www.nizodairyconference.com.

September 22–23, 2011. Biofuels Hall of Fame 2011, Brussels, Belgium. Information: email: dm@greenworldconferences.com; www.greenworldconferences.com.

September 22–23, 2011. US Regulatory Network Meeting, Radisson Plaza-Warwick Hotel, Philadelphia, Pennsylvania, USA. Information: www.leatherheadfood.com/usregnet.

September 22–24, 2011. 3rd International Conference: Oilseeds & Oils 2011, Marriott Istanbul Asia, Istanbul, Turkey. Information: APK-Inform Agency: phone +380 562 320795, +380 56 7265272 (ext. 164); email: ved2@apk-inform.com, ozip@apk-inform.com; www.agrimarket.info/conferences/oo2011.

September 23–25, 2011. Globoil India, Renaissance Mumbai Hotel and Convention Centre, Powai, Mumbai, India. Information: www.globoilindia.com.

September 25–27, 2011. 4th Annual Waste-to-Fuels Conference & Trade Show, Hyatt Regency Mission Bay Spa & Marina, San Diego, California, USA. Information: www.waste-to-fuels.com.

September 26–27, 2011. 24th Canadian Conference on Fats and Oils, University of Alberta, Edmonton, Alberta, Canada. Sponsored by the Canadian Section of the American Oil Chemists' Society and the Faculty of Agricultural, Life & Environmental Sciences at the University of Alberta. Information: email: Disa.Brownfield@ales.ualberta.ca; www.caocs.org.

September 27–28, 2011. International Conference on Oil Palm Biomass 2011: Oil Palm Biomass to Fuel & Energy, Gran Mella Hotel, Jakarta, Indonesia. Information: www.icopb.com.

September 28–29, 2011. Bridge to Food: Protein Technology Innovations, Hotel Casa 400, Amsterdam, the Netherlands.

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September 16–18, 2011. 10th Phospholipid Congress of The International Lecithin and Phospholipid Society (ILPS): Phospholipids—Sources, Processing and Application, Congress Centre "De Doelen," Rotterdam, the Netherlands. Information: e-mail: ilps@lecipro.nl; www.ilps.org/10th%20Congress.htm.

September 26–27, 2011. 24th Canadian Conference on Fats and Oils, University of Alberta, Edmonton, Alberta, Canada. Sponsored by the Canadian Section of the American Oil Chemists' Society and the Faculty of Agricultural, Life & Environmental Sciences at the University of Alberta. Information: email: Disa.Brownfield@ales.ualberta.ca; www.caocs.org.

October 17, 2011. Basics of Edible Oil Processing and Refining—AOCS Short Course, Hilton Cartagena, Cartagena, Colombia. Information: email: meetings@aocs.org; phone: +1 217-693-4821; fax: +1 217-693-4865; www.aocs.org/LACongress.

October 17, 2011. Oilseed Processing and Solvent Extraction—AOCS Short Course, Hilton Cartagena, Cartagena, Colombia. Information: email: meetings@aocs.org; phone: +1 217-693-4821; fax: +1 217-693-4865; www.aocs.org/LACongress.

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October 18, 2011. SODEOPEC: Soaps, Detergents, Oleochemicals, and Personal Care Products—AOCS Short Course, Hilton Cartagena, Cartagena, Colombia. Information: email: meetings@aocs.org; phone: +1 217-693-4821; fax: +1 217-693-4865; www.aocs.org/LACongress.

October 19–21, 2011. 14th Latin American Congress on Fats and Oils, Hotel Cartagena, Cartagena, Colombia. Information: email: meetings@aocs.org; phone: +1 217-693-4821; fax: +1 217-693-4865; www.aocs.org/LACongress.

November 9–11, 2011. AAOCS [Australasian Section of the American Oil Chemists' Society] Biennial Conference: Fats and Oils—Industry, Innovation and Health Perspectives, Sebel Playford Adelaide, Adelaide, SA, Australia. Information: email: matt.miller@plantandfood.co.nz.

April 29–May 2, 2012. 103rd AOCS Annual Meeting & Expo, Long Beach Convention and Entertainment Center, Long Beach, California, USA. Information: phone: +1 217-359-2344; fax: +1 217-351-8091; email: meetings@aocs.org; http://AnnualMeeting.aocs.org.

September 30–October 4, 2012. World Congress on Oleo Science & 29th ISF Conference (JOCS/AOCS/KOCS/ISF Joint Conference), Arkas Sasebo, Nagasaki Prefecture, Japan. Information: www2.convention.co.jp/wcos2012.

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

Information: www.bridge2food.com/ptc2011programme.asp.

September 28–29, 2011. World Biofuels Markets Brazil, São Paulo, Brazil. Information: www.worldbiofuelsmarkets.com/brazil.

September 28–30, 2011. tcbiomass2011, International Conference on Thermochemical Biomass Conversion Science, Westin Chicago River North, Chicago, Illinois, USA. Information: www.gastechnology.org/tcbiomass2011.

September 29–30, 2011. Global Oils and Fats Forum 7, Gaylord National Resort & Convention Center, National Harbor, Maryland, USA. Information: phone: +1 202-333-0661; fax: +1 202-333-0331; www.americanpalmoil.com.

October

October 2–4, 2011. Lipid Metabolic Diseases: Novel Developments in Molecular Pathol-

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ogy and Therapy, University of Cologne, Cologne, Germany. Information: www.zmmk.uni-koeln.de/content/klenk_symposium_2011/online_formular_en/index_eng.html.

October 2–7, 2011. FACSS [Federation of Analytical Chemistry and Spectroscopy Societies] Annual Conference, Grand Sierra Resort, Reno, Nevada, USA. Information: www.facss.org.

October 3–4, 2011. Biofuels International Expo & Conference on Canada, Telus Convention Centre, Calgary, Alberta, Canada. Information: www.biofuelsinternationalexpo.com/canada.

October 5–6, 2011. 7th Practical Short Course: Advanced Oilseed and Oil Processing & Formulation Technology, M,O,C, München, Germany. Information: http://home.scarlet.be/~tpm12374/smartshortcourses/oilprocess7/7thoilprocess.html.

October 5–7, 2011. oils+fats, the International Trade Fair for the Production and Processing of Oils and Fats made from Renewable Resources, M,O,C, Event Center in Munich-Freimann, Germany. Information: www.oils-and-fats.com/en/Home?3.

October 5–7, 2011. Algae Europe, Milan Exhibition Centre, Milan, Italy. Information: www.algaeurope.eu/en_lfm/index_alg.asp.

October 5–7, 2011. Cleaning Products 2011, Washington Marriott Hotel, Washington, DC, USA. Information: www.cleaningproductsconference.com.

October 9–13, 2011. Practical Short Course on Processing and Products of Vegetable Oil/Biodiesel, Food Protein Research & Development Center, Texas A&M University System, College Station, Texas, USA. Information: http://foodprotein.tamu.edu/fatsoils/scvegoil.php.

October 10–13, 2011. 7th International Symposium on Biocatalysis and Agricultural Biotechnology, Kyoto University, Kyoto, Japan. Information: http://epi-b.jp/7isbb.

October 12–13, 2011. American Fats & Oils Association Annual Meeting, Grand Hyatt Hotel, New York. Information: www.americanfatsandoilsassociation.com/node/2183.

October 14–20, 2011. ASA-CSSA-SSSA (American Society of Agronomy-Crop Science Society of America-Soil Science Society of America) 2011 International Annual Meetings, San Antonio, Texas, USA. Information: www.acsmeetings.org.

October 16–19, 2011. AACC [American Association of Cereal Chemistry] Annual Meeting, Palm Springs, California, USA. Information: http://meeting.aaccnet.org.

October 16–20, 2011. International Symposium on Sunflower Genetic Resources, Fantasia Deluxe Hotel, Kuşadası, İzmir, Turkey. Information: www.ttae.gov.tr/symposium.

October 17, 2011. Basics of Edible Oil Processing and Refining—AOCS Short Course, Hilton Cartagena, Cartagena, Colombia. Information: email: meetings@aocs.org; phone: +1 217-693-4821; fax: +1 217-693-4865; www.aocs.org/LACongress.

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October 18–21, 2011. 78th National Renderers Association Convention, The Ritz-Carlton, Tucson, Arizona, USA. Information: http://convention.nationalrenderers.org. ■

IOM panel recommends tripling vitamin D intake:

Panel's conservative approach receives criticism

David Piller

The following article is based on the Hot Topic Symposium, "Vitamin D: New Dietary Intake Recommendations and Emerging Health Effects," and subsequent panel discussion, which took place during the 102nd AOCS Annual Meeting & Expo, held in Cincinnati, Ohio, USA, May 1–4, 2011. The vitamin D panel discussion and video clips can be found at the AOCS Vitamin D resource page: http://tinyurl.com/AOCSmultimedia.

In November 2010, the Food and Nutrition Board of the US Institute of Medicine (IOM) recommended that daily vitamin D consumption should be tripled from a level of 200 International Units (IU) to 600 IU for most adults up to age 70. Although the new recommendation is welcome news for a large portion of the medical community, it still fails to meet the expectations of many who are calling for still higher recommended levels.

In recent years, vitamin D has been touted as a panacea of sorts, with reports claiming its benefits in reducing all manner of chronic conditions from memory loss to cancer. With such a wide range of information being disseminated on vitamin D, the US and Canadian governments requested that the IOM form a panel to revise recommendations on vitamin D intake that have been in effect since 1997. Vitamin D is naturally present in very few foods; rather, vitamin D is produced in skin cells exposed to ultraviolet radiation from the sun. It is added to some foods, though, and is very popular as a dietary supplement.

The IOM panel consisted of 14 scientists who met eight times to review more than 1,000 studies that have been published on the health effects of vitamin D. While it has long been established that vitamin D is essential to maintaining bone strength, many published studies have also linked low vitamin

WAS MOZART VITAMIN D-DEFICIENT?

The cause of the early death at age 35 of composer Wolfgang Amadeus Mozart has been a source of conjecture for more than 200 years. Among the possibilities are poisoning, infection, cardiovascular disease, and renal disease and its complications.

A letter in the journal *Medical Problems of Performing Artists* (*26*:117, 2011) suggests that vitamin D deficiency may have played a role in the many illnesses Mozart suffered during his lifetime as well as his early death. Authors William B. Grant and Stefan Pilz note that he composed mainly at night and so would have slept during the day, causing reduced sunlight-induced vitamin D synthesis. Further, they write: "Mozart died on December 5, 1791, two to three months into the vitamin D winter [in Vienna]. The half-life of 25(OH)D [25-hydroxy vitamin D] in the human body is four to six weeks; his serum 25(OH)D levels would have been very low."

D levels to an increased risk of health problems ranging from heart disease and cancer to depression and cognitive decline. The IOM panel, however, did not find sufficient evidence that vitamin D provided further health benefits, concluding that most published health benefits associated with vitamin D provide "mixed and inconclusive results and could not be considered reliable." The panel therefore based its new recommendations (Table 1) solely on vitamin D levels needed to maintain strong bones.

There have long been concerns that many people have vitamin D levels that are considered deficient. The panel, however, concluded that 97.5% of the population has blood serum concentrations of 25-hydroxy vitamin D above 20 nanograms per milliliter (ng/mL), a level it says is sufficient for bone health.

The new recommendations, which cover the United States and Canada, call for intakes of 600 IU daily for children age 12 months and above through adults age 70 and 800 IU after age 71. The previous adequate intake recommendations were 200 IU per day for infants through age 50, 400 IU per day for ages 51 to 70, and 600 IU per day for those 71 and older. The panel also raised the acceptable upper limit of daily intake to 4,000 IU for adults, from 2,000 previously.

A cautious approach

The recommendations, while earning praise as a step in the right direction, have generated a fair amount of criticism from medical

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TABLE 1. Dietary reference intakes for calcium and vitamin D

	Calcium			Vitamin D		
Life stage group	**Estimated average requirement (mg/day)**	**Recommended dietary allowance (mg/day)**	**Upper level intake (mg/day)**	**Estimated average requirement (IU/day)**	**Recommended dietary allowance (IU/day)**	**Upper level intake (IU/day)**
Infants 0 to 6 months	*	*	1,000	**	**	1,000
Infants 6 to 12 months	*	*	1,500	**	**	1,500
1–3 years old	500	700	2,500	400	600	2,500
4–8 years old	800	1,000	2,500	400	600	3,000
9–13 years old	1,100	1,300	3,000	400	600	4,000
14–18 years old	1,100	1,300	3,000	400	600	4,000
19–30 years old	800	1,000	2,500	400	600	4,000
31–50 years old	800	1,000	2,500	400	600	4,000
51–70 year old males	800	1,000	2,000	400	600	4,000
51–70 year old females	1,000	1,200	2,000	400	600	4,000
>70 years old	1,000	1,200	2,000	400	800	4,000
14–18 years old, pregnant/lactating	1,100	1,300	3,000	400	600	4,000
19–50 years old, pregnant/lactating	800	1,000	2,500	400	600	4,000

*For infants, adequate intake is 200 mg/day for 0 to 6 months of age and 260 mg/day for 6 to 12 months of age.
**For infants, adequate intake is 400 IU/day for 0 to 6 months of age and 400 International Units (IU/day) for 6 to 12 months of age.

VITAMIN D AND CANCER: MUCH HYPE, SOME HOPE

In what seems like a nearly daily occurrence, research studies finding more and better benefits of vitamin D are being reported in the media. Vitamin D's role in fighting cancer is prominent among these. Studies have reported risk reductions for a range of cancers, including colorectal, breast, oral, stomach, and pancreatic.

With so much information coming out, Steven Clinton says, there is a need to analyze the information from the perspective of hard science. Clinton, along with JoAnn Manson from Harvard and Susan Mayne of Yale, did just that in a recent report published in the *New England Journal of Medicine* (*364*:1385–1387, 2011).

The authors acknowledged in the commentary that the enthusiasm generated by these studies is warranted by the "biological plausibility" that vitamin D can reduce the risk of cancer. But the authors, who participated in the exhaustive literature review on the IOM panel, said evidence that vitamin D reduces cancer incidence was inconsistent and inconclusive. In addition, they said, the evidence does not establish a cause-effect relationship.

The problem, according to the authors, is that, to date, there have been no large randomized clinical trials that associated vitamin D with cancer specifi ally. Most of the current evidence has been derived from laboratory studies, ecological correlations, and observational investigations.

"New trials assessing moderate- to high-dose vitamin D supplementation for cancer prevention are in progress and should provide additional information within five to six years," the authors conclude. "Although future research may demonstrate clear benefits of vitamin D related to cancer and other nonskeletal health outcomes, and possibly support higher intake requirements, the existing evidence falls short."

practitioners and organizations for not going far enough. Patsy Brannon, a member of the IOM panel, counters that it was incumbent upon the IOM committee to take a very cautious approach. Brannon, a professor in the division of nutritional sciences at Cornell University (Ithaca, New York, USA), says the evidence from the myriad studies the panel considered simply was not robust enough to make more dramatic recommendations. Even when it came to the one factor where the evidence of a direct link to vitamin D was most compelling—bone health—Brannon says most studies have been done looking at causal effects of vitamin D and not dose response. In addition, most studies examine only one dose, so determining an optimal dosage became a difficult task. "It is a challenge, and it involves scientific judgment," she says. "One of the charges for us in the report was to be clear about what the limits of the evidence were, where the gaps were, and how we were making our decisions based on our judgment."

To determine how much vitamin D is needed, Brannon says the panel first had to determine what level of serum 25-hydroxy vitamin D was necessary to maintain bone health. "The committee had to link bone health outcomes with serum 25-hydroxyvitamin D levels because the limitations in the evidence don't allow us to look just at vitamin D intake *per se*," she explains. "We looked very carefully at outcomes related to skeletal health and we linked 20 ng/mL of 25-hydroxy vitamin D with skeletal health. That was very helpful in helping us determine how much vitamin D you need to consume in order to achieve that level of serum 25-hydroxy vitamin D."

For some practicing physicians, the panel's recommendations are not consistent with the anecdotal evidence from their day-to-day practice. They have seen literature that links deficient vitamin D levels to an increased risk for diseases, including cardiovascular disease, certain types of cancer, autoimmune disease, and many more. In addition, they have observed markedly improved outcomes in their own practice when they test for and prescribe higher levels of vitamin D. Many physicians, in fact, have begun testing their patients' 25-hydroxy vitamin D serum levels as part of their routine physicals.

Steven Clinton, a professor in the Division of Medical Oncology at The Ohio State University (Columbus, USA) and a member of the report's review committee, says the findings in the report do not back up extensive testing. "This committee would not recommend that a vitamin D workup be part of a healthy clinical visit," says Clinton. "On the other hand, if someone is seeing a physician with an illness or a symptom that could be related to vitamin D, that is when it's appropriate to be checking for vitamin D levels."

Clinton points to the committee's recommendation that national standards for vitamin D tests be established. Along with standard tests, the report also calls for agreed-upon normal ranges of serum 25-hydroxy vitamin D based upon the latest scientific evidence.

There remains, though, a large disparity between the anecdotal evidence from the doctor's office and the recommendations of the panel. Many physicians were highly critical of the 600 IU level, saying it should instead be closer to 2,000 IU. Gregory A. Plotnikoff of the Allina Center for Health Care Innovation at Abbott Northwestern Hospital (Minneapolis, Minnesota, USA) sums up the difficulty faced by the IOM panel. Plotnikoff, who is an advocate of much higher levels, sees firsthand the markedly improved outcomes for his patients who suffer from conditions such as chronic pain when he measures for and replenishes vitamin D levels. He also understands, however, that his diagnosis and treatment are not based on hard clinical evidence, but rather on his own clinical judgment. "If we measure (vitamin D levels) and they're low, and we replenish to some given level, does that make a clinical difference? There's a huge missing research component in that regard," he says. "What I need as a physician is very different from what we as a society need for a public health recommendation. And that's where the struggle around the report has come. The mandate of this committee was to be cautious because these are long-lasting recommendations."

The need for further clinical research to determine vitamin D's benefits in conditions beyond bone health is clear. "I would hope that we would have more and well-designed randomized clinical trials to help us know whether there is a causal role with vitamin D and all these intriguing linkages with so many chronic diseases,"

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VITAMIN D 101

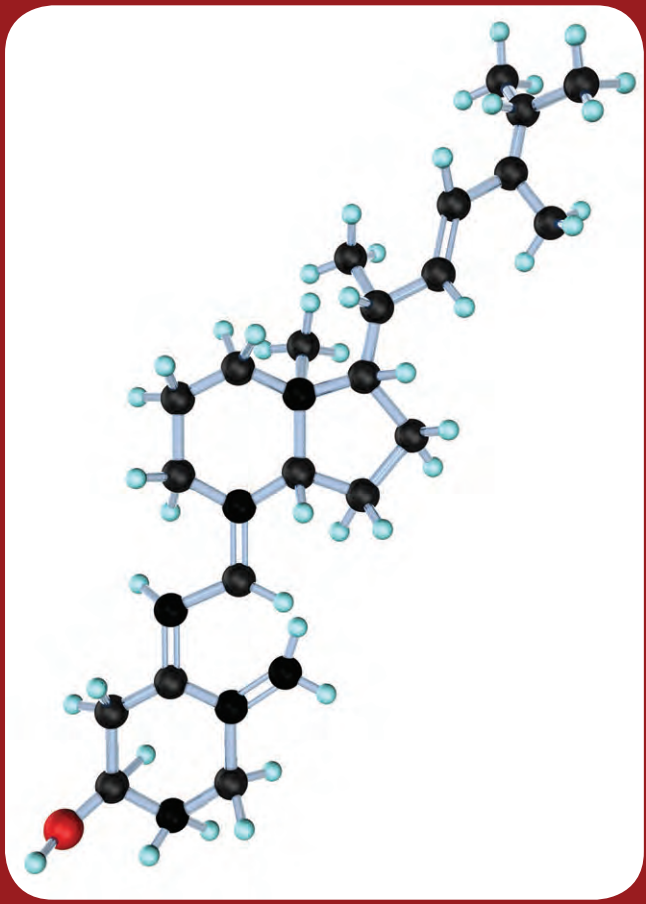
The term vitamin D actually refers to a group of several very closely related fat-soluble compounds that are structurally similar to sterols but function like hormones. In plants, vitamin D is present in the form of ergocalciferol (vitamin D2). In animals, it is present in the form of cholecalciferol (vitamin D3).

According to the University of California at Riverside's Vitamin D homepage (http://vitamind.ucr.edu/chem.html), vitamin D is derived from a steroid, so the structure retains the numbering of its parent compound, cholesterol. Asymmetric centers are designated by using the *R*,*S* notation; the configuration of the double bonds are notated *E* for the German "entgegen" or *trans*, and *Z* for "zuzammen" or *cis*. Thus, the official name of vitamin D3 is 9,10-seco(5*Z*,7*E*)-5,7,10(19)cholestatriene-3b-ol, and the official name of vitamin D2 is 9,10-seco(5*Z*,7*E*)-5,7,10(19),22-ergostatetraene-3b-ol.

Vitamin D3 is produced photochemically when ultraviolet (UV) light from the sun activates a precursor sterol (7-dehydrocholesterol), which is present in the epidermis of most animals. A conjugated double bond system in the B ring of this sterol allows the absorption of light quanta at certain wavelengths in the ultraviolet (UV) range, which initiates a complex series of transformations that ultimately result in vitamin D3. Vitamin D3 is then absorbed in the small intestine, where it binds to plasma alpha 2 globulin and enters the bloodstream. It is then transported to the liver, where it is turned into calcidol [25-hydroxy vitamin D]. Calcidol, in turn, is transported to the kidneys and transformed into the steroid calcitriol, which is excreted into the blood to help regulate calcium in the body.

Meanwhile, tissues other than the kidneys turn calcidiol into calcitriol to help regulate gene expression locally—both inside the cell (autocrine) and surrounding the cell (paracrine). The use of calcitriol by other tissues as an autocrine and paracrine hormone is a relatively new discovery that explains its role in human development as well as its benefits in other illnesses such as diabetes, hypertension, heart disease, autoimmune illnesses, cancer, and, perhaps, mental illness.

According to John Jacob Cannell, executive director of The Vitamin D Council (San Luis Obispo, California, USA), young adult Caucasians produce about 20,000 international units (IU) of vitamin D in their skin within minutes of whole-body, summer sun exposure (see http://faculty.irsc.edu/faculty/jschwartz/Vit%20D.htm). In other words, light skinned individuals could greatly exceed the IOM's vitamin D intake recommendations simply by spending a few minutes outside in their swim suits. Vitamin D3 can also be obtained by eating certain animal foods, such as mackerel, cod, salmon, shrimp, eggs, butter, beef, and chicken livers. Vitamin D2, which is equivalently potent to vitamin D3 in humans and many mammals, but not in birds,



is produced naturally by mushrooms and commercially by the irradiation of the plant sterol ergosterol with UV light.

"We are all waiting for the 900 or so randomized controlled trials that scientists are conducting using vitamin D," Cannell noted in a news release discussing the outcome of one of the first such, albeit small (44 subjects), trials. The study was published in the *American Journal of Clinical Nutrition* (doi:10.3945/ajcn.111.011684).

A research team led by Anastassios Pittas of Tufts Medical Center in Boston, Massachusetts, USA, reported that 2,000 IU/day of vitamin D, given for 12 weeks, significantly improved pancreatic function in mildly overweight adults with prediabetes. Cannell took issue with the "low dose" administered in the study—the Vitamin D Council recommends a daily intake of 5,000 IU—noting that the study intake level "only increased vitamin D levels from 24 to 30 ng/mL." Pancreatic function, however, as measured by changes in the subjects' disposition index, increased by 300 in the vitamin D group but fell by 126 in the placebo group. (Disposition index is a quantitative measure that describes the relationship between β-cell sensitivity and insulin sensitivity.)

"I predict that after most of the randomized controlled trials are out—in another 10 years—the Food and Nutrition Board [of the US Institute of Medicine] will meet again and say, 'Whoops, it should have been 5,000 IU/day all along,'" Cannell wrote. ■

says Brannon. "And I would hope that we would have some sort of fundamental basic science that would help us understand some real key points about vitamin D metabolism."

More evidence is coming

One such study is now under way. The US National Institutes of Health is funding a $20 million study to determine whether vitamin D has benefits other than bone health. The five-year randomized trial, which began in January 2010, is currently recruiting 20,000 men and women over age 60. The aim of the study is to determine whether taking 2,000 IU of vitamin D or marine omega-3 fatty acid (eicosapentaenoic acid + docosahexaenoic acid) supplements reduces the risk for developing cancer, heart disease, and stroke in people who do not have a prior history of these illnesses.

This study and others looking at specific disease states will go a long way in determining whether vitamin D continues to be known as an effective treatment for a host of chronic, and often deadly, diseases. Even the IOM panel members believe there is a distinct possibility it will be proven to be as good as advertised. It is just going to take a little longer for the rigorous science to catch up.

David Piller is a freelance science and health writer based in Cincinnati, Ohio, USA. A professional writer for more than 20 years, he has produced feature articles, web content, marketing communications, and technical documentation for both public and private healthcare organizations.

THE CALCIUM AND VITAMIN D LINK

The IOM recommendations not only include new levels for vitamin D, they also provide new recommendations for daily calcium intake. Some of the highlights include:

- 700 milligrams (mg) for children aged 1 to 3
- 1,200 mg for women 51 and older
- 1,000 mg for men 50 to 70

The panel also noted that teenage girls may not get enough calcium, and that postmenopausal women may get too much, running the risk of kidney stones.

Though the new calcium levels are not receiving the attention (or controversy) of the vitamin D recommendations, the two are inextricably linked. "Calcium is absorbed through two pathways; one that requires vitamin D and one that doesn't," says Connie Weaver, professor and head of the Department of Foods and Nutrition at Purdue University (West Lafayette, Indiana, USA). "You need quite a bit of calcium to only use the pathway that doesn't require vitamin D, and that's beyond what most people take."

An adequate supply of vitamin D is necessary to best utilize calcium. "Calcium and vitamin D are very intimately linked because calcium is a major constituent of bone," says Weaver. "You need to have it absorbed from the diet and transferred to the bone." And, because the body cannot get calcium from a source other than diet or supplements, Weaver says it's vital that people get the recommended amount of calcium, especially in their early years.

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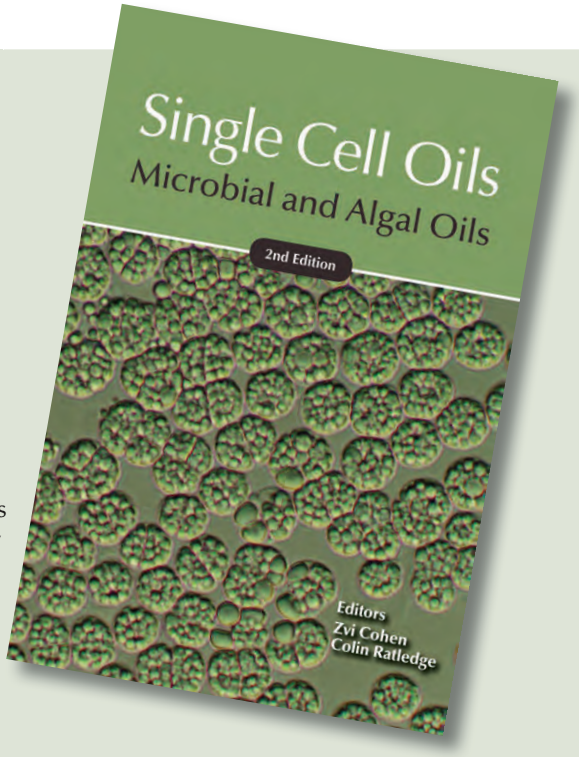

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Zvi Cohen and Colin Ratledge, Editors

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Commercializing algae—challenges and opportunities

Bryan Yeh

Algae continue to be one of the more intriguing opportunities for expanding biofuel production and the food supply, production of specialty chemicals, wastewater treatment, and carbon capture. Although the term "algae" is used broadly to describe many different aquatic organisms—more than 35,000 species are described in literature according to Cheng (2011)—they all have the following attributes:

- Species of algae grow rapidly in a variety of different climates.
- Algae have the ability to produce more biomass per area than any other biomass source.
- Some species of algae are able to yield large volumes of lipids that can be used to produce fuel, food ingredients, or specialty chemicals.
- The primary carbon source for algae is carbon dioxide, and hence they could be part of a carbon recycling strategy.
- Algae are effective in wastewater treatment and can be part of an overall water treatment strategy.

Commercial applications of algae are nascent; however, several applications are mature. These include (Bixler and Porse, 2009):

- Agar: Derived from red algae, approximately 9,600 tons (8,700 metric tons [MT]) a year is used globally for confections, baking, and gels.
- Alginates: Derived from brown algae, approximately 26,500 tons (24,000 MT) a year is used worldwide for food and pharmaceutical applications.
- Carrageenan: Extracted from red algae, approximately 50,000 tons (45,000 MT) a year is used worldwide in the global meat and dairy industry for texturizing and stabilization.
- Nutrition: Two noteworthy applications for algae in nutrition include:
  - Spirulina: Approximately 1,000 tons (900 MT) of this green alga are consumed annually in the United States as a dietary supplement.
  - Docosahexaenoic acid (DHA): Used as an infant formula ingredient, this omega-3 fatty acid is produced using algae in dark fermentation with sugar.
- Pollution control: Algae are often used in synergy with bacteria in facultative ponds to consume nutrients in wastewater treatment facilities.

With the exception of pollution control, current commercial applications for algae are for high-value, limited-volume products. To enable the widespread use of algae for the production of commodities such as fuel or green chemicals, numerous challenges will need to be overcome. These include: (i) the high cost of producing and processing of algae, (ii) advances in the level of technology readiness of algae processing, and (iii) establishment of co-products that enhance the overall value proposition of an end-to-end algae process.

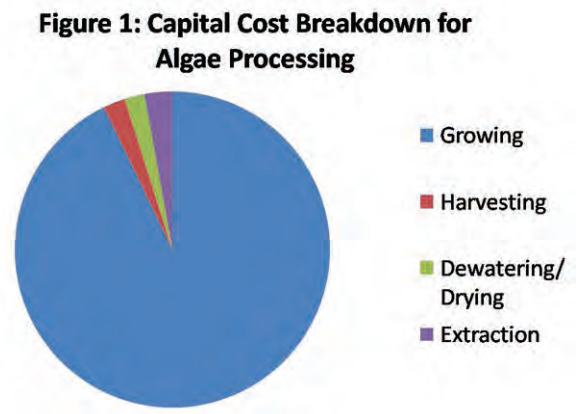

FIG. 1. *Capital cost breakdown for algae processing. Provided by Science Applications International Corporation (SAIC).*

High cost of production and processing

Assume that you are an investor with significant cash. If you want to invest in a soybean processing operation, you have relatively few barriers to entry. You can readily buy soybeans. Alternatively, if you want to grow a certain variety of soybeans, you can easily lease the land to grow the special varieties and harvest the soybeans using well-established practices. Furthermore, the soybeans can be easily processed in established facilities with mature technology. By comparison, if you want to be in the algae business, the first thing you need to do is to invest in the infrastructure to grow the algae. While land area to grow the algae may be available, the ponds or bioreactors and all of the ancillary equipment necessary for growing algae would most certainly need to be built. The establishment of such facilities represents by far the single biggest expense of entering into the algae business.

Based on work by Williams and Laurens (2010), approximately 93% of the total capital cost for producing and processing of algae is in the growing step. The breakdown for capital costs is shown in Figure 1.

As an illustration, assume the following:

- A supply of 100 million gallons (380 million liters) annually of algal oils is needed.
- Forty percent of dry weight of algae is algal oil.
- Open ponds can generate 75 dry MT per hectare-year of algae (Huebeck and Craggs, 2007).
- Photobioreactors can generate 365 MT per hectare-year of algae (Packer, 2009).
- The capital cost for an open pond system is $100,000 per hectare (Benemann, 2009).

information

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- The capital cost for a photobioreactor is $1,000,000 per hectare (Benemann, 2008).

The simple math says that to produce the quantity of oil needed will require an investment of $1.14 billion for open ponds and $2.34 billion for photobioreactors. Assume that we had no processing losses and that we could sell the oil for $100/barrel or $698/MT and we could sell the residual meal for $200/MT. Also assume an operating cost of $120/dry MT of algae. In the case of open ponds, if the investor wishes to obtain an internal rate of return on the project of 32% or a payback of three years, he or she will need to do one of the following:

- Reduce capital costs by $697 million or reduce the cost of the open ponds to $39,000/hectare.
- Increase revenue by an additional $380 million by:
  - Selling the oil for $243/barrel.
  - Selling the residual meal for $865/MT.
  - A combination of the two above.
- Increase the biomass yield to 194 MT per hectare-year.
- Share infrastructure costs with wastewater treatment plant or something similar.

Similarly, to close the business case for photobioreactors, we would have to:

- Reduce capital costs by $1.9 billion or reduce the cost of photobioreactors to $190,000 per hectare.
- Increase revenue by an additional $1.06 billion by:
  - Selling the oil for $445/barrel.
  - Selling the residual meal for $2,271/MT.
  - A combination of the two above.
- Increasing the yield to 1,564 MT per hectare-year will close the case; however, this is theoretically impossible as the maximum based on sunlight availability is 715 MT per hectare-year (Weyer *et al.*, 2010).
- Share infrastructure costs with wastewater treatment plants or something similar.

However, it is also important to note that the numbers used in this exercise are based on very generous assumptions; achieving these rates, yield, and oil content has yet to be proven on a commercial scale. Either way, what is clear is that we need to focus on either high-value products or a drastic reduction in capital costs in order to achieve the economics necessary to encourage investment.

Technology readiness

Although much effort has been placed on developing technology, the techno-economic analysis shown above indicates where priority needs to be placed in terms of technology development. Clearly, it is an iterative exercise that needs to consider products with technology that is reasonably achievable and can be fully integrated from growing to processing. Technology readiness is often described as a combination of the rate at which the technology has been demonstrated and the degree of integration that the technology has with a full end-to-end process (US Department of Energy, 2008). Some noteworthy examples of commercial and demonstration-scale algae technology readiness include:

Commercial:

- Earthrise Nutritionals: 500 tons (450 MT) per year spirulina facility in the Sonoran Desert of California, USA.
- Cyanotech: 400 tons (360 MT) per year spirulina facility in Kona, Hawaii, USA.

Demonstration:

- NIWA (National Institute of Water and Atmospheric Research, Ltd., New Zealand)/Solray Energy: Demonstration in Christchurch, New Zealand (Fig. 2). The facility has five hectares of high-rate algal ponds tied to 2 one-ton-per-day supercritical water conversion plant. (For further information on this technology, see http://tinyurl.com/SC-H2Oconversion).
- Aurora Algae: Demonstration facility on six acres (2.4 hectares) in Karratha, Australia.
- Cellana: Demonstration facility on six acres (2.4 hectares) in Kona, Hawaii.
- Solix: 180,000-liter demonstration facility in Coyote Gulch, Colorado, USA.
- Sapphire Energy: Demonstration facility in Las Cruces, New Mexico, USA.
- Algenol: Demonstration facility in Lee County, Florida, USA.

Co-products

To date, the primary focus for the widespread commercialization of algae has been on the production of biofuels. This raises serious

FIG. 2. *In November 2009, five acres at the 230-acre Christchurch wastewater treatment plant in Bromley, New Zealand, were cordoned off into high-rate algal ponds that are used to make biocrude oil. The demonstration project combines the scientific expertise on advanced wastewater treatment and algal production pond technology with the biocrude oil conversion technology of Solray Energy. Adding CO_2 into the ponds enhances wastewater treatment and doubles algal production. The algae are then collected and pumped into a reactor, where heat and pressure turn the biomass into bio-crude oil—a form easy to convert to a range of conventional fuels.*

challenges, as biofuels, comparatively speaking, are a low-value product in comparison with green chemicals that go into the production of plastics, cosmetics, detergents, functional foods, and other higher-value applications. As shown in the techno-economic analysis earlier, high co-product value is necessary to make acceptable economic returns. However, a common misconception is that the laws of supply and demand do not exist for co-products. One needs to keep in mind that as supply increases, unless the demand increases with supply, the price will fall. To help mitigate this law of economics, focus will need to be on being both the low-cost producer and having a co-product with attributes that have value, but is not easily duplicated.

Conclusions

While the promise of algae provides much motivation for research and investment, a reduction in capital costs, an increase in yield, and an increase in product value, all in combination, are critical for the widespread deployment of algae as a feedstock. Furthermore, demonstrating the technology both at scale and as an integrated process is necessary for commercializing algae. Based on this, it is anticipated that initial operations will focus on high-value products and co-products as a means of generating both cash flow and knowledge. As domain knowledge improves, it can be expected that advances will be made that will enable an improvement in economics that will facilitate the widespread commercialization of algae.

Brian Yeh is an assistant vice president for Science Applications International Corp. (SAIC) and leads the biofuel initiative, food safety, food defense, and food security programs within SAIC. He is based in Oakland, California, USA, and can be reached at yehb@saic.com or +1 510-466-7190.

News & Noteworthy

Briefs

The World Congress on Oleo Science, which originally was to be held in October 2011 in Tokyo, has been rescheduled after the devastating earthquake and tsunami in Japan. The Congress will now be held in Sasebo, which is in the Nagasaki prefecture in southwestern Japan, from September 30–October 4, 2012. The conference is a joint meeting of the Japan Oil Chemists' Society, the American Oil Chemists' Society, the Korean Oil Chemists' Society, and the International Society for Fat Research. Registration will open in March 2012. See http://tinyurl.com/WCOS2012.

■■■

In June 2011, the International Organization for Standardization released ISO 50001:2011, Energy management systems—Requirements with guidance for use. The new standard "is designed to help companies make better use of their energy-consuming assets, evaluate and prioritize the implementation of energy-efficient technology, and promote efficiency throughout the supply chain," according to EnvironmentalLeader.com.

■■■

Stepan Co. (Northfield, Illinois, USA) has acquired the Clarinol®, Marinol® and PinnoThin® product lines of Lipid Nutrition B.V., formerly a part of IOI Loders Croklaan Group. The acquired product lines will be integrated into Stepan's Food and Health Specialties business, which has been renamed Stepan Lipid Nutrition. The company's Maywood, New Jersey, USA, site will continue to handle the central management of the business in concert with a new Stepan Lipid Nutrition office located near Amsterdam.

■■■

German scientists have demonstrated the first example of *in situ* nuclear magnetic resonance (NMR) spectroscopy. The team used a small permanent magnetic array, removing the need for cryogenic cooling. This magnetic array is then connected to a portable NMR spectrometer, which is controlled by a laptop computer. It was used to follow a

CONTINUED ON NEXT PAGE

EU approves food labeling rules

New food-labeling regulations are in place in the European Union after the European Parliament (EP) approved rules aimed at helping consumers make "better informed, healthier [*sic*] choices."

According to a July 6, 2011, news release, the new regulations will require labels "to spell out a food's energy content as well as fat, saturated fat, carbohydrate, sugar, protein, and salt levels, in a way that makes them easy for consumers to read." To this end, such nutritional information must be presented "in a legible tabular form on the packaging, together and in the same field of vision," and "expressed per 100 g or per 100 mL," with the option of expressing values per portion.

Once the legislation is published in the *EU Official Journal*, food companies will have three years to conform to most of the rules. They will have five years to abide by the rules on nutrition values.

The new regulations also mandate allergen labeling for both prepackaged products and nonpackaged foods sold in restaurants or canteens and extend existing country-of-origin labeling laws to fresh meat from pigs, sheep, goats, and poultry. Further, they state that consumers cannot be "misled by the appearance, description, or pictorial presentation of food packaging." In addition, meat and fish consisting of combined meat parts or fish parts must now be labeled "formed meat" or "formed fish," accordingly.

The regulations cover "imitation foods," which the EP defines as "foods that look similar to other foods but are made of different ingredients, such as 'cheese-like' foods made with vegetable products." Manufacturers of such products will be required to state clearly on the front of the pack "in a prominent font size" next to the brand name that an ingredient "that would normally be expected has been replaced."

CODEX ACTS ON GM LABELING

A 20-year struggle among international food safety bodies ended in July 2011 when the Codex Alimentarius Commission (CAC) met in Geneva, Switzerland. At the meeting, regulators approved food-labeling guidance that will allow countries to label genetically modified foods without risking a legal challenge from the World Trade Organization. This is because national measures based on Codex guidance or standards cannot be challenged as a barrier to trade.

CAC was created in 1963 by two agencies of the United Nations—the Food and Agriculture Organization and World Health Organization—and develops international food standards, guidelines, and related texts.

A sign that the decades-long debate over the labeling of foods with genetically modified ingredients was perhaps ending came in May when the Codex Committee on Food Labeling (CCFL) agreed to discontinue its work on definitions related to genetically modified organisms (GMO). Instead, CCFL agreed to develop a compilation of Codex texts relevant to the labeling of foods derived from modern biotechnology.

The contentious issue saw the CCFL divided between countries proposing

CONTINUED ON NEXT PAGE

reaction in a fume hood to demonstrate the new technique and its flexibility. As the reaction proceeded, the mixture was circulated through the magnet using tubing and a peristaltic pump. Different stages of the reaction could be analyzed without having to stop the reaction each time to take a sample to a traditional spectrometer. The work appeared in *Physical Chemistry Chemical Physics* (doi:10.1039/c1cp21180c).

■■■

Cargill (Minneapolis, Minnesota, USA) has opened a new animal feed facility in Efremov, Russia. The facility has the capacity to produce 50,000 metric tons per year of swine and poultry feed products and will operate under the LNB® brand in Russia. The new operation forms part of Cargill's industrial complex in Efremov, some 330 kilometers south of Moscow.

The company also announced that it has opened a new $12.6 million technology and innovation center in Campinas in the state of São Paulo, Brazil. The 20,000-square-meter center features multiple laboratories and will serve customers in the beverage, baking, confectionery, convenience foods, and dairy categories.

■■■

Battelle (Columbus, Ohio, USA) has licensed its technology for creating polyols from soybean oil derivatives used for intermediates in making foams, coatings, and adhesives to Emery OleoChemicals LLC (Cincinnati, Ohio), which will be the exclusive producer of the chemical in North and South America and Western Europe. Polyols are widely used in industry, especially for the production of polyurethanes and polyesters. They can also be used as a starting point for high-performance ester lubricants.

■■■

BioExx Specialty Proteins Ltd. (Toronto, Ontario, Canada) will collaborate with Hormel Foods Corp. and its Century Foods International division to co-develop BioExx canola proteins in various new products. Century will market products such as dietary supplements, weight-loss aids, and nutritional beverages to the sports nutrition industry, according to BioExx.

■■■

South African firm Senwes will enter into a joint venture with the European

CONTINUED ON PAGE 492

process-based GMO labeling and those proposing that GMO should be declared on the label only when they are present in the final product.

The United States has traditionally been opposed to the labeling of GM food, arguing that GM food products on the market have been tested and are safe. Consumers International, an advocacy group based in London, called the change in the US position, by allowing the labeling work to move forward, a "striking reversal," but the Obama administration reportedly disputed that description, saying it remains opposed to mandatory labeling.

"The adopted text confirms that Codex labeling texts developed for foods generally also apply to foods derived from modern biotechnology," an administration official told TheHill.com. "This adopted text clarifies that foods derived from modern biotechnology are not necessarily different from other foods simply due to their method of production."

EUFIC'S UPDATE ON NUTRITION LABELING

The overarching issue of nutrition labeling is the focus of a new report from the European Food Information Council (EUFIC; Brussels, Belgium).

The 86-page "Global Update on Nutrition Labeling" examines the global labeling situation and highlights trends and gaps in knowledge. (For an executive summary of the report, visit http://tinyurl.com/EUFICLabel [pdf].)

The EUFIC report stresses the need for further research to see whether consumers make more healthful food choices over time because of nutrition information placed on food packaging.

"Some research has shown that consumers understand and know how to use accurately various nutrition labels should they choose to do so, but little is known about whether consumers habitually make [more healthful] purchases as a result," said the report.

The report also calls for standardized front-of-pack (FOP) labels: "The prevailing view in countries with mandatory and voluntary labeling alike is that standardized labels are preferable to a multitude of different nutrition labels. There remains broad disagreement, however, on what format is most effective at influencing consumer behavior." The debate over which nutrition labeling format is most effective "will certainly continue in Europe, Asia-Pacific, and the United States for the foreseeable future."

Various labeling schemes can be equally effective in helping consumers identify healthful options, according to research by EUFIC and the Australian Heart Foundation, "yet many groups discussed in this report assert that standardized nutrition labels are imperative," it said.

In the United States, the Food and Drug Administration announced in 2009 its intention to unify a FOP labeling system through new regulation and reduce consumer confusion. The agency also drafted a letter to industry to serve as guidance regarding point-of-purchase food labeling and, along with the Centers for Disease Control and Prevention, commissioned the Institute of Medicine (IOM) to review FOP nutrition rating systems and symbols. The IOM report is expected in 2011.

Record Canadian canola oil export seen

Canadian canola oil exports have more than doubled over the last six years, growing from 900,000 metric tons (MT) in the 2004/05 marketing year to a projected export of 2.34 million metric tons (MMT) in 2010/11. The previous record was an export of 1.819 MMT in 2009/10, according to the Commodity News Service of Canada.

Fully 56% of the Canadian canola oil exports will go to the United States, the report noted.

"They (the United States) are diverting so much of their soy oil, and canola oil is known as a healthier [*sic*] oil because of lower saturated fats, so it is filling that niche in the market," Chris Beckman, oilseed analyst with the market analysis group of Agriculture and Agri-Food Canada in Winnipeg, was quoted as saying.

China is expected to be the second major buyer of Canadian canola oil in the current crop year, with a purchase of 800,000 MT.

trans Fat class settlement

A federal court in California has approved a nonmonetary settlement of a class action alleging that Unilever US, Inc.'s health-related

CONTINUED ON PAGE 492

Sustainability watch

The first shipment of soybeans produced according to the principles of the Round Table on Responsible Soy (RTRS) was purchased in June 2011 by the Initiative for Sustainable Soy, a group of Dutch food, retail, and feed companies. RTRS was established in 2006 and has more than 150 members, including soybean growers, traders, food, and feed manufacturers.

■■■

A free software program (HPLC-EAT) for establishing the environmental profile of liquid chromatography solvents has been developed by a team of scientists from Sweden, Egypt, Denmark, and India. The program considers the environmental, health, and safety issues for all solvents involved in the chromatographic method. It works by calculating a final score for each solvent, enabling the user to compare different solvent combinations. The tool can be combined with another eco-solvent tool to perform life cycle assessments of the waste disposal options of distillation or incineration. HPLC-EAT can be downloaded at www.biotek.lu.se/hplc-eat/. The research appeared in *Green Chemistry* (doi:10.1039/c0gc00667j).

■■■

Archer Daniels Midland Co. (ADM; Decatur, Illinois, USA) has expanded its cacao sustainability program, Socially and Environmentally Responsible Agricultural Practices (SERAP), into Lambandia, South East Sulawesi, Indonesia. The SERAP program provides training and financial incentives to help cacao farmers implement sustainable farming practices. ADM said in a statement that it will collaborate with cooperatives to provide Indonesian farmers with technical training on bean fermentation, quality standards, cooperative management, and market access.

■■■

In late June 2011, smallholders at PT Hindoli, Cargill's oil palm plantation in Palembang, Indonesia, received their first premiums for the certified palm oil they produced. In late 2010, the smallholders were first to be certified under the Roundtable on Sustainable Palm Oil (RSPO) Smallholder Principles & Criteria.

■■■

Two winners of the 2011 US Presidential Green Chemistry Challenge are of particular interest to *inform* readers. The awards were established to recognize and promote innovative chemical technologies that "prevent pollution and have broad applicability in industry" and are given annually by the US Environmental Protection Agency.

The Sherwin-Williams Co. (Cleveland, Ohio, USA) received the Designing Green Chemicals Award for its low-VOC (volatile organic compound), water-based acrylic alkyd paint technology. The paints can be made from recycled soda bottle plastic (polyethylene terephthalate), acrylics, and soybean oil.

Bruce H. Lipshutz of the University of California, Santa Barbara (USA), received the 2011 Academic Award. He designed a surfactant that forms "tiny droplets" in water. Organic chemicals dissolve in these droplets and react efficiently, allowing water to replace organic solvents. According to the Presidential Green Chemistry Challenge Award website (http://tinyurl.com/EPAGreen), the surfactant is called TPGS-750-M and is composed of safe, inexpensive ingredients: tocopherol (vitamin E), succinic acid (an intermediate in cellular respiration), and methoxy polyethylene glycol—a common, degradable hydrophilic group also called MPEG-750.

TPGS-750-M forms nanomicelles in water that are lipophilic on the inside and hydrophilic on the outside. A small amount of the compound is all that is required to spontaneously form 50–100 nm diameter micelles in water to serve as nanoreactors. According to the award announcement, TPGS-750-M is engineered to be the right size to facilitate broadly used organic reactions, such as cross-couplings. Reactants and catalysts dissolve in the micelles, resulting in high concentrations that lead to dramatically increased reaction rates at ambient temperature. No additional energy is required.

Several very common organic reactions that are catalyzed by transition metals can take place within TPGS-750-M micelles in water at room temperature and in high isolated yields. These reactions include ruthenium-catalyzed olefin metatheses (Grubbs), palladium-catalyzed cross-couplings (Suzuki, Heck, and Sonogashira), unsymmetrical aminations, allylic aminations and silylations, and aryl borylations. Even palladium-catalyzed aromatic carbon–hydrogen bond activation to make new carbon–carbon bonds can be done at room temperature, "an extraordinary achievement," the site notes. Product isolation is straightforward; complications such as frothing and foaming associated with other surfactants are not observed. Recycling the surfactant after use is also very efficient: The insoluble product can be recovered by extraction, and the aqueous surfactant is simply reused with negligible loss of activity. Future generations of surfactants may include a catalyst tethered to a surfactant to provide both the "reaction vessel" (the inside of the micelle) and the catalyst to enable the reaction. Tethering catalysts in this way may reduce one-time use of rare-earth minerals as catalysts. ■

division of Bunge (White Plains, New York, USA) to develop grain and oilseed operations in South Africa for both the domestic market and for export to African countries. The transaction is subject to regulatory approvals.

■■■

ChinaDaily.com reported in July that the municipal health authority in Beijing "has launched a crackdown on restaurants' use of illegal cooking oil." All restaurants must retain receipts for cooking oil and make them available for inspection; in addition, the frequency of regular inspections will increase, the article said. "The crackdown follows media reports at the end of June that products sold as edible cooking oil in stores in Beijing, Tianjin, and Hebei province are produced from so-called gutter oil and swill-cooked oil, which are left over from roasting ducks and other uses," the China Daily report continued.

■■■

Elevance Renewable Sciences (Bolingbrook, Illinois, USA) and the Additives business unit of Clariant International Ltd. (Muttenz, Switzerland) are teaming up to produce new renewable additives for plastics. Elevance manufactures specialty chemicals from natural oils using olefin metathesis. The company's ingredients are used in personal care products, detergents, fuels, lubricants, and other specialty chemicals markets. ■

claims for margarine products containing *trans* fats were false and misleading.

The plaintiffs in *Rosen/Red v. Unilever US, Inc.*, Nos. 09-02563, 10-00387 (US District Court, Northern District of California, San Francisco Division, decided June 21, 2011) alleged that the company falsely advertised that its margarine spreads were good for cardiovascular health. Unilever denied any wrongdoing but agreed to reformulate its stick and spread products to remove partially hydrogenated vegetable oils.

A number of excluded, individual claims against the company will not be affected by the settlement.

Advocacy groups seek FDA rule on mercury in seafood

Several consumer protection organizations have filed a citizen petition with the US Food and Drug Administration (FDA), seeking a rulemaking "for labeling and point-of-sale advisories concerning mercury in seafood to minimize methylmercury exposure to women of childbearing age and children." Jane Hightower, a physician who authored *Diagnosis: Mercury—Money, Politics & Poison*, signed the petition, which was also brought on behalf of Earthjustice, the Zero Mercury Working Group, and the Center for Science in the Public Interest.

They seek seafood labeling and point-of-sale advisories that would inform women of childbearing age and parents of young children about (i) "the presence of mercury in certain seafood species," and (ii) "the recommended consumption limits associated with relative mercury content, including the importance of eating 12 ounces (340 grams) of lower-mercury seafood a week." The petition includes proposed warning label alternatives and a chart showing which fish species have the lowest and highest mercury contents.

To access the petition online, visit http://tinyurl.com/MercuryPetition.

After slow start, coconut outlook rises

Production of coconut oil during the second half of 2011 is expected to increase, according to a report in the *Manila Times* newspaper.

Although prospects have improved, the head of the United Coconut Association of the Philippines was quoted as saying that exports likely would still be lower than those in 2010.

Coconut oil exports decreased dramatically in the first five months of 2011, after two consecutive years of growth. Shipments reached 416,618 metric tons (MT) in the January to May period, or 32.4% lower than the 616,529 MT exported in the same period in 2010. In May alone, coconut oil exports fell by 59.6% to 52,948 MT from 2010's 130,921 MT.

The Philippines, which exports about 80% of its production, is the world's largest exporter of coconut oil, the report noted.

Safety of nanoparticles in food crops

With the curtain about to rise on a much-anticipated new era of "nanoagriculture"—using nanotechnology to boost the productivity of plants for food, fuel, and other uses—scientists are reporting a huge gap in knowledge about the effects of nanoparticles on food crops.

Jorge Gardea-Torresdey and colleagues at The University of Texas at El Paso (USA) noted in a recent paper that nanoparticles, which are 1/50,000th the width of a human hair, are used in products ranging from medicines to cosmetics. The particles also could end up in the environment, settling in the soil, especially as fertilizers, growth enhancers, and other nanoagricultural products come to market. Some plants can take up and accumulate nanoparticles. But it is unclear whether this poses a problem for plants or for the animals (such as humans) that eat them. So, the researchers sorted through the scientific literature looking for evidence to settle the safety question.

In the article, the scientists analyzed nearly 100 scientific papers on the effects of different types of nanoparticles on edible plants. They found that the uptake and buildup of nanoparticles vary, depending largely on the type of plant and the size and chemical composition of the nanoparticles. "This literature review has confirmed that knowledge on plant toxicity of [nanomaterials] is at the foundation stage," the article states, noting that the emerging field of nanoecotoxicology is starting to tackle the topic

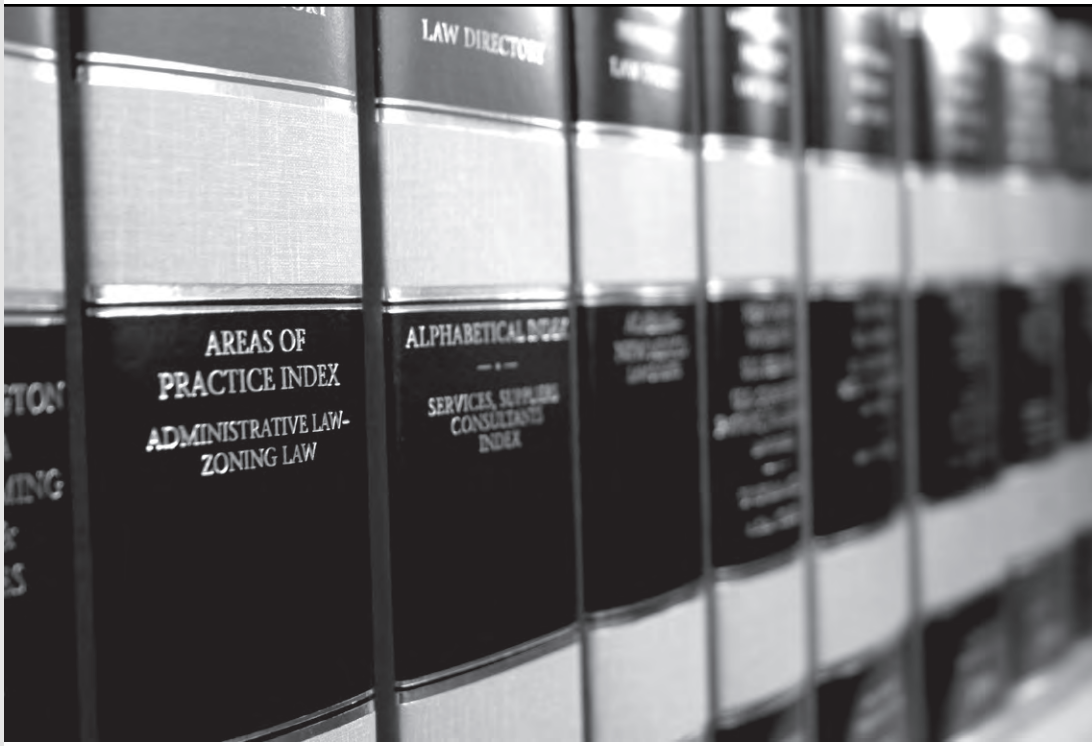
The article appeared in the *Journal of Agricultural and Food Chemistry* (59:3485–3498, 2011).

Flax milk debuts

There is a new entry into the oilseed milk category: Flaxmilk. Made by Flax USA, Inc. of Goodrich, North Dakota, the "milk" delivers 1.1 gram of α-linolenic acid per 8-fluid-ounce (240 milliliters) serving.

The product was introduced in April 2011 into all 2,500 Super Wal-Mart stores in the United States, according to company spokesperson Cathy Callegari. A half-gallon (1.9 liter) container sells for $2.98. ■

Biofuels News



Briefs

At the end of July, Matti Lievonen, managing director of the Finnish government-controlled Neste Oil, said the company had experienced disappointing sales of biodiesel so far in 2011. Growth was anticipated to pick up during the third quarter owing to new European customers, but the company did not expect to make a profit in 2011. The company also announced in July that it was expanding its feedstock base to include jatropha and camelina oils. Palm oil should represent less than half of the company's biofuel feedstock this year.

■■■

Sunoco Inc., a leading manufacturer and marketer of petroleum and petrochemical products, has acquired a license from GreenShift Corp. for the extraction of corn oil from co-products of Sunoco's corn ethanol manufacturing facility in Fulton, New York, USA. The recovered corn oil will be used to manufacture biodiesel and other carbon-neutral products. Sunoco also awarded GreenShift (Alpharetta, Georgia, USA) the construction project to design and install the equipment.

■■■

In July, Elsevier, the provider of scientific, technical, and medical information products and services, announced the introduction of Elsevier Biofuel, an online search and discovery tool that provides biofuel managers and research and development professionals instant access to scientific, industrial, and commercial information. The Elsevier Biofuel tool allows users to drill down to keywords that pinpoint the exact information needed. With the Elsevier Biofuel Tree Thesaurus, research professionals can navigate through more than 900 journals and 800 books, 5.8 million patent documents, enriched with 500,000 domain-specific keywords in the thesaurus. Further production information is available at www.info.elsevier-biofuel.com.

■■■

The International Energy Agency (IEA) estimated that the worlds' nations

CONTINUED ON NEXT PAGE

GENERAL

US EPA proposes standards, volumes

In June the US Environmental Protection Agency (EPA) proposed the 2012 percentage standards for fuel categories that are part of the agency's Renewable Fuel Standard program. The Energy Independence and Security Act (EISA) of 2007 established the annual renewable fuel volume targets, which are slated to increase steadily to an overall level of 36 billion gallons (140 billion liters) in 2022.

To achieve these volumes, EPA calculates a percentage-based standard for the following year. Based on the standard, each refiner, importer, and nonoxygenate blender of gasoline or diesel determines the minimum volume of renewable fuel that it must ensure is used in its transportation fuel.

The proposed 2012 overall volumes and standards are indicated in Table 1, along with 2011 mandates for comparison.

After considering its analysis of market availability, EPA is proposing a cellulosic volume that is lower than the EISA target for 2012 of 500 million gallons. The agency is optimistic, however, that the commercial availability of cellulosic biofuel will continue to grow.

EPA is also proposing a volume requirement of 1.28 billion gallons for biomass-based

TABLE 1. Proposed US Renewable Fuel Standard for 2012, with 2011 mandates for comparison.

	2012		2011
Fuel	Gallons[a]	Standard (%)	Gallons
Biomass-based diesel	1.0 billion	0.91	800 million
Advanced biofuel	2.0 billion	1.21	1.35 billion
Cellulosic biofuel	3.45–12.9 million	0.002–0.010	6.6 million
Total renewable fuels	15.2 billion	9.21	13.95 billion

[a]To convert gallons to liters, multiply by 3.785.

emitted a record 30.6 gigatons (metric) of carbon dioxide in 2010. This exceeded the previous record, set in 2008, by 5%. Emissions in 2009 were slightly below 29 gigatons as a result of the global economic crisis. The IEA said that non-member countries of the Organization of Economic Cooperation and Development—in particular China and India—accounted for the bulk of the increase in 2010.

■■■

Algae isolated from the ancient Roman Baths in Bath, England, may one day serve as a source of renewable biofuels. Algae typically grow well at temperatures around 25°C, according to researchers at the University of Bath, but algae in the Baths have been growing at 46°C (King's Bath) and 39°C (Great Bath) for years. Researchers hope to isolate algae having high oil contents from these warm waters and find ways to grow them in areas unsuited for food production (e.g., deserts, other areas with high temperatures). ■

diesel for 2013. EISA specifies a 1.0 billion gallon minimum volume requirement for that category for 2013 and beyond but also allows EPA to increase the volume requirement after considering a variety of environmental, market, and energy-related factors.

The EPA accepted public comments on the proposed volumes through August 2011. Final volume requirements for 2012 are scheduled to be issued in November.

EU recognizes Roundtable on Sustainable Biofuels

On July 19, the European Union (EU) recognized the standard and certification system of the Roundtable on Sustainable Biofuels (RSB Lausanne, Switzerland) as a way to demonstrate and document compliance with the EU biofuels mandate. Biofuels entering the EU market must demonstrate environmental benefits compared to fossil fuels in order to count toward the mandate established under the Renewable Energy Directive (2009/28/EC). Qualifying biofuels feedstocks must avoid harm to land with high biodiversity value or high carbon stock. In addition, biofuels must demonstrate a 35% saving in greenhouse gas emissions compared to fossil fuels.

The implementing rules of the Renewable Energy Directive include certification under voluntary standards that are recognized by the European Commission (EC), as proof of compliance, in order to facilitate access into the EU market.

"The standard developed and promulgated by the Roundtable on Sustainable Biofuels is implemented by way of our global certification scheme, which ensures that biofuels are produced in an environmentally and socially responsible manner," said RSB Chair Barbara Bramble, senior advisor for the International Climate and Energy Program at the US National Wildlife Federation. "The RSB certification system also provides for biofuel and biomass traceability."

As a result, the RSB applied for and successfully obtained the recognition of the EC, as announced by Commissioner for Energy Günther Oettinger. As of July 19, RSB-certified biofuels have open access to the EU market without further verification of sustainability aspects.

The RSB is a multi-stakeholder initiative, hosted by the Energy Center of Ecole Polytechnique Fédérale de Lausanne, that has developed a global sustainability standard and certification system for biofuel production. The RSB sustainability standard, which defines the requirements to receive certification, represents a global consensus of over 120 organizations including farmers and refiners, regulators, and non-government organizations, and was intentionally designed to ensure the sustainability of biofuels production while streamlining compliance for industry. The list of RSB members is available through the RSB (http://rsb.epfl.ch).

Six other voluntary schemes to ensure the sustainability of biofuels also were approved by the EC on July 19, including Bonsucro and Greenenergy for Brazilian sugarcane, and the Round Table on Responsible Soy Assoc.

Tools for assessing biofuel sustainability

Various biofuels, first hailed as a way to a sustainable energy supply, have since been re-

evaluated owing to their perceived overall negative impact on the environment.

Researchers at Empa, the Swiss Federal Laboratories for Materials Science and Technology, have together with their colleagues at the Swiss Roundtable on Sustainable Biofuels (RSB) and the Hochschule für Technik und Wirtschaft, Berlin, Germany, developed an online tool to assess the sustainability of biofuel production.

The new tool allows users to perform a self-assessment against the Principles and Criteria of the RSB and self-risk assessment. The online tool also calculates greenhouse gas emissions of biofuels for each life-cycle product step, from farming to final distribution. This calculation can be done according to various methodologies. The development of the new tool, which is accessible free of charge at http://buiprojekte.f2.htw-berlin.de:1339, took about two years and was supported by the Swiss State Secretariat for Economic Affairs.

The RSB Standard comprises 12 principles and criteria for sustainable biofuel production, including environmental and social principles such as food security and human and labor rights. By allowing a risk assessment of biofuels product and an evaluation based on the RSB sustainability principles, the tool forms the entry point to RSB sustainability certification.

BIODIESEL

BioVerde to ship biodiesel to Europe

As reported by Bloomberg.com, BioVerde Industria e Comercio de Biocombustiveis SA, based in São Paulo, is presently building Brazil's biggest biodiesel refinery (http://tinyurl.com/Bloomberg-Bioverde). It already has one refinery on line in São Paulo state, in Taubaté, which currently produces 83 million liters per year, and is retrofitting another site in Sorocaba, to produce 400 million liters of biodiesel annually.

The Sorocaba site is expected to go into production by the end of 2011. Once it is fully operational, its output will exceed that of Archer Daniels Midland Co.'s plant in Rondonopolis, which Bloomberg said is currently Brazil's largest single producer of biodiesel, at 344 million liters annually.

The company expects to sell 40% of its output in Europe by 2015. (In 2010, according to Eurostat, the European Union's statistics department, 61% of the 2.3 billion liters of biodiesel its member states imported came from Argentina and almost 26% from Indonesia.) These plans will allow a new outlet for this product, since at present the domestic Brazilian market for biodiesel is saturated. Italy and Spain are expected to be recipients of the first shipments, which the company predicted would begin by the start of the fourth quarter of 2011.

Until now, high freight costs and a strong currency in Brazil have made its biodiesel uncompetitive outside the country. BioVerde contends its exports will be viable because its plants are located near the coast instead of the Brazilian interior, thus lowering transportation costs.

BioVerde is also seeking to enter the market for specialty chemicals produced from renewable sources. BioVerde President Ailton Braga Domingues told Bloomberg the company plans to retrofit a facility in São Paulo state to convert vegetable oils into 100 million liters of chemicals for industrial applications (http://tinyurl.com/Bloomberg-Domingues).

In 2013, BioVerde plans to go public. Meanwhile, the company is funding its investments with its own resources, credit lines, and by selling debt (http://tinyurl.com/Bloomberg-Public). The company plans ultimately to become Brazil's main biodiesel producer after Petrobras, a publicly traded energy company whose major shareholder is the government of Brazil.

Continuous enzymatic biodiesel production

Researchers in France at the CNRS's Centre de Recherches Paul Pascal and the Institut des Sciences Moléculaires in Bordeaux as well as the Laboratoire de Chimie de la Matière Condensée in Paris have developed a novel catalyst that could lead to the continuous production of biodiesel.

Although lipases are particularly efficient and selective in transesterification processes leading to fatty acid methyl esters, their high cost and low conformational stability restrict their industrial use. Rénal Backov and co-workers have developed a way to confine the enzymes irreversibly in porous matrices, allowing good accessibility and enhanced mass transport.

The group had already developed modified silica-based cellular matrices that make it possible to confine lipases. Furthermore, the scientists found they could use unpurified enzymes, a first step in reducing the cost of the biocatalysts. However, the process did not allow continuous biodiesel production.

In *Energy & Environmental Science* (*4*:2840–2844, 2011), Backov and co-workers present their new method, which generates a cellular hybrid biocatalyst *in situ* inside a chromatography column, making it possible to carry out continuous, unidirectional flow synthesis over long periods. They have shown high, practically steady levels of synthesis over a two-month period of time.

ETHANOL

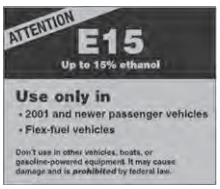


FIG. 1. *Label for US E15 pumps.*

Potential for E15 misfueling

The US Environmental Protection Agency (EPA) has proposed labeling pumps dispensing E15 fuel (15% ethanol + 85% gasoline), which was first approved for use in 2010, with stickers informing purchasers that the fuel is inappropriate for older cars (pre-2001), small machines (e.g., lawnmowers), and some small watercraft (*inform 21*:404, 557, 761, 2010; *22*:118, 141, 2011).

Charles T. Drevna, president of the National Petrochemical & Refiners Assoc., issued the following statement in late June

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in response to the Environmental Protection Agency's E15 misfueling rule: "EPA's decision to rely solely on retail gasoline pump labels to protect consumers from misfueling with gasoline containing 15% ethanol is . . . a terrible miscalculation and terrible news for millions of Americans who will inevitably face costly repair bills after misfueling their cars, trucks, motorcycles, boats, snowmobiles and outdoor power equipment with gasoline containing 15% ethanol." (See Fig. 1.)

He added: "The last time EPA allowed two types of gasoline to be sold side-by-side at retail stations—when leaded gasoline was phased out in the 1970s—EPA's own statistics reported that more than 20% of motorists mistakenly or intentionally misfueled their vehicles. This high rate of misfueling occurred despite the fact that EPA mandated physical barriers—fill pipe restricters on vehicles and smaller nozzles on gasoline retail dispensers—in addition to pump labels."

Ron Lamberty, vice president of market development for the American Coalition for Ethanol, commented on the label in a statement: "It is unfortunate that the 'may cause damage' language was used in the absence of any proof that it might. We've been concerned that the strategy of E15's opponents to provide anecdotal 'spook stories' instead of science, might be successful, and we will need to overcome this to make E15 workable."

What's new with you?

Retiring? Moving? Celebrating an anniversary? Recent promotion? New child? Won an award? AOCS wants to help you spread the good news. Let us know what's going on. Email us and we'll share your news in the next AOCS member newsletter. Contact Nicole Philyaw at nicolep@aocs.org

Calculations, models to improve ethanol yield

Cellulose produced by plants tends to orient itself into a sheet-like network of highly ordered, densely packed molecules. These sheets stack upon themselves and bond together very tightly due to interactions between hydrogen atoms. This arrangement prevents enzymes from directly attacking most of the individual cellulose molecules and isolating the sugar chains within them for subsequent conversion to ethanol.

At present, ethanol can only be extracted in usable quantities if the biomass is pretreated with potentially toxic chemicals in an energy-intensive process.

Researchers at the US Department of Energy's Los Alamos National Laboratory (New Mexico) and the Great Lakes Bioenergy Research Center (Michigan State University, East Lansing, USA) recently described a potential pretreatment method that can make plant cellulose five times more digestible by enzymes that convert it into ethanol. With recent experimental data, the Los Alamos group used state-of-the-art computational methods and molecular modeling to examine how cellulose changes structurally into an intermediate form that can be enzymatically attacked when pretreated with ammonia. They found that the pretreatment reduced the strength of hydrogen bonds in the cellulosic network, leaving it more vulnerable to conversion into sugar by fungi-derived cellulolytic enzymes.

The study appeared in the *Journal of the American Chemical Society* (*133*:11163–11174, 2011). ■

Biofuels in the air

European airlines in particular are ramping up efforts to use biofuels for their commercial flights.

Marguerite Torrey

Commercial airlines with European routes must participate in the European Union's cap-and-trade system for controlling CO_2 emissions as of 2012 (they have been exempt until now). If they exceed limits set by the European Commission, these airlines will have to buy additional permits, taking away from their bottom lines. Thomson Reuters Point Carbon indicated in March that the cost of these permits to airlines in 2012 alone could add up to $1.9 billion (http://tinyurl.com/PointCarbon).

As 2012 approaches, European airlines are ramping up their tests of biofuels, searching for the right fuel for the right plane that will limit their liability for greenhouse gas (GHG) emissions. They are also seeking to ensure that the fuels they choose require no adjustments to aircraft engines or infrastructure. The Paris Air Show was an excellent place to see how solutions to these issues are being developed.

The Paris Air Show

Le Bourget Airport, the general aviation airport for the city of Paris, France, hosted the 49th Paris Air Show in June. The show attracted about 145,000 professional visitors; 2,100 exhibitors showing off their latest technological innovations; and 200,000 members of the public.

Transatlantic fly-ins. Two airplanes made first-ever transatlantic flights into the Air Show powered at least in part by biofuels. A corporate Gulfstream G450 jet, carrying executives from Honeywell UOP, flew nonstop from company headquarters in Morristown, New Jersey, USA, to Paris, landing in about seven hours (Fig. 1). A 50:50 blend of Honeywell-UOP Green Jet Fuel and petroleum-based jet fuel powered one of the two Rolls-Royce engines in the plane. The biofuel was derived from camelina oil that had been grown and harvested by Sustainable Oils (Bozeman, Montana, USA). Based on lifecycle analyses, Honeywell calculated that using green jet fuel on the flight saved approximately 5.5 metric tons of net CO_2 emissions compared with the same flight powered by petroleum-based fuel.

Boeing flew a new 747-8 freighter from Seattle, Washington, across the United States and then on to the Show. Each of its four General Electric GEnx-2B engines was powered by a blend of 15% camelina-based biofuel mixed with 85% traditional kerosene fuel (Jet A). Boeing says the 747-8 freighter is set to enter service with a double digit reduction in carbon emissions. Cargolux of Luxembourg is the freighter's first customer (www.Bloomburg.com, June 24, 2011).

Biofuels at the Show. An entire hall was devoted to "Alternative Aviation Fuels." Companies promoting biofuels at the Show included (http://tinyurl.com/BiofDig-Paris):

FIG. 1. *The Gulfstream G450 jet lands in Paris, France, after flying from New Jersey, USA, on a 50:50 blend of camelina oil-based and petroleum-based jet fuels. Courtesy of Honeywell Aerospace.*

- Altair Fuels, Seattle, Washington, USA
- Amyris, Emeryville, California, USA
- Axens, Rueil-Malmaison, France
- Gevo, Engelwood, Colorado, USA
- Heliae, Gilbert, Arizona, USA
- Lanzatech, Auckland, New Zealand
- Metron Aviation, Dulles, Virginia, USA
- Neste Oil, Espoo, Finland
- Sapphire Energy, San Diego, California, USA
- SkyNRG, Amsterdam, Netherlands
- Solazyme, South San Francisco, California, USA
- Solena, Fort Collins, Colorado, USA
- UOP Honeywell, Morristown, New Jersey, USA
- Verno Systems, Seattle, Washington, USA

Honeywell-UOP touted the reliability of its Green Jet Fuel at the Show. The company has already produced more than 700,000 gallons (2.6 million liters) of hydroprocessed fuel from sustainable, inedible sources such as camelina, jatropha, and algal oils. Camelina oil served as feedstock for 500,000 gallons of that biofuel. Sixteen flights testing the Honeywell fuel have been carried out so far on military and commercial platforms, and in all cases the fuel met specifications for flights without any modification to the aircraft or engines (http://tinyurl.com/HoneywellGreenJet).

Neste Oil showed off its NExBTL renewable aviation fuel, which is based on hydrotreating vegetable and waste oils. The company especially stressed the reduction in GHG emissions possible with its fuel, as well as other air pollutants such as sulfur oxide.

Heliae Development, LLC, an algae technology company, and Azmark Aero Systems (Gilbert, Arizona, USA), a designer and manufacturer of gas turbine engines, announced at the Air Show their

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TABLE 1. Biofuel-powered commercial airlines flying regularly scheduled flights[a]

Airline	Plane(s)	First flight	Fuel source	Fuel feedstock	Roundtrip route	One-way distance (km)
Aeromexico		2012	Honeywell-UOP	Jatropha	Mexico City to San Jose, Costa Rica	1,900
FinnAir	Airbus A319 Airbus A320	July 18, 2011	SkyNRG	Used cooking oil	Amsterdam to Helsinki	1,500
KLM	Boeing 737	September 2011	Dynamic Fuels, as supplied by SkyNRG	Used cooking oil	Amsterdam to Paris	400
Lufthansa	Airbus A321	July 15, 2011	Neste Oil	Jatropha, camelina oil, and/or animal fat	Hamburg to Frankfurt	520
Thomson Airways	Boeing 757	September 2011	Via Sky NRG	Used cooking oil	Birmingham, UK, to Palma de Mallorca, Spain (summer); to Alicante, Spain (winter)	1,500

[a]All but Aeromexico are using a 50:50 blend of biofuel/commercial jet fuel. Aeromexico plans to use a 30:70 blend.

agreement to develop and test algae-derived jet fuels. Azmark's small precision turbine engines are designed primarily for use in military unmanned aerial vehicles. In a company statement, Heliae Chief Executive Officer Dan Simon said, "These smaller engines are unforgiving when it comes to the quality of fuel that they require and we are excited and eager to engineer renewable fuels to meet . . . these rigorous standards." Heliae will begin producing testable quantities of algae-derived jet fuels at its pilot facility in Gilbert during the third quarter of 2011.

Who's already flying with biofuels?

Since 2009, a number of airlines have conducted a number of demonstration flights using biofuels, including Virgin Atlantic, Mexican Interjet, KLM, United Continental, Japan Airlines, Qatar Airways, and Qantas Airways. As 2012 approaches, more are carrying out long-term trials to ensure the fuels they have chosen are good, safe, and sustainable. As shown in Table 1, both Finnair and Lufthansa initiated regularly scheduled commercial flights in July 2011. Tests will be carried out for six–12 months before results are evaluated to determine reliability of the fuel and effects on airplane engines.

KLM and Thomson Airways, a British charter airline, plan to start flying with biofuels on a regular basis in September. Aeromexico will follow in 2012.

© Eroult-Sunlight Image (C. Verrier-Hans-Mokrani)-Fotolia

Who's making plans to fly with biofuels?

Ten airlines—including American Airlines, United Airlines, Air Canada, Alaska Airlines, FedEx, Frontier Airlines, JetBlue Airways, Lufthansa, Southwest Airlines, and US Airways—announced at the Paris Air Show that they had signed letters of intent with Solena (Washington, DC, USA) for future purchase of jet fuel from 2015. The fuel will come from Solena's GreenSky California biomass-to-liquids facility (http://tinyurl.com/FlightGlobal-Paris), which is scheduled to be constructed in Santa Clara County, California, in 2013. The facility will supply the airlines in the San Francisco Bay area with 1,000 barrels a day of jet fuel made from urban and agricultural waste. According to the FlightGlobal article, United Airlines' Managing Director Strategic Sourcing-Fuel Robert Sturtz said the fuel will be divided among the airlines as a "proportional split based on the size of the carrier" and will be burned as a 50:50 blend with traditional kerosene.

The fuel will be trucked from the Solena production plant to airports in San Francisco, Oakland, and San Jose, where the aircraft will be fueled. The plant is being designed to produce annually up to 16 million gallons of neat jet fuel from 550,000 metric tons of waste through the Fischer-Tropsch process. Solena is already working on similar projects with airlines in the United Kingdom and Australia.

For example, British Airways (BA) is developing plans to use London's municipal waste to produce biofuels for use in its aircraft at London City Airport (see *inform* 22:118, 2011). The aim is for this plant to enter production in 2014; if successful, it could provide 2% of BA's entire fuel needs (http://tinyurl.com/BritishAir-biofuel).

Why are airlines only now introducing biofuels commercially?

The brief answer to this question is, the airlines finally have a standard, agreed-upon fuel to use. In mid-June the ASTM International Committee on Petroleum Products and Lubricants, composed of industry, air force, and regulatory stakeholders, unanimously approved the addition of a new bio-derived jet fuel annex to the alternative jet fuel specification D7566-11, Specification for Aviation Turbine Fuel Containing Synthesized Hydrocarbons. The vote to approve concluded the technical review process, and was expected to lead to the final issuance of the revised specification by August 2011. This action could clear the way for "commercial aviation [to use] biofuels without changing aircraft systems or airport fueling infrastructure," said US Federal Aviation Administration Administrator Randy Babbitt.

Once finalized, the new specification will enable use of biofuel blends—composed of up to 50% biofuel generated from feedstocks such as camelina, jatropha, or algae—to power commercial or military flights. Properties and criteria necessary to control the manufacture and quality of "hydroprocessed esters and fatty acids" fuel—formerly referred to as hydrotreated renewable jet or bioderived synthetic paraffinic kerosene—are detailed in the new annex.

Fischer-Tropsch processing was the first pathway to be covered by ASTM's alternative jet fuel specification, in 2009.

How will airlines get enough biofuel?

Adoption of biofuels in aviation has been hampered in part by the lack of reliable supplies in adequate quantities and at competitive prices.

BioJet International Ltd. On July 6, BioJet International Ltd. (Barbados; Santa Barbara, California, USA) announced it was releasing one billion gallons of renewable jet fuel to long-term contracts (http://tinyurl.com/BiojetBillion). This one-time introductory offer was made to the commercial aviation industry on special pricing and terms. Pricing is fixed at $2.97/gallon ($0.78/liter). Alternatively the buyer may elect to index at par with petroleum jet fuel with a $3.50 gallon cap and $2.50/gallon floor.

The company is an international supply-chain integrator for renewable (bio) jet fuel and related products for the aviation and transportation industries.

Biofuel Flightpath. At the Paris Air Show, the European Commission, Airbus, leading European airlines, and European biofuel producers announced a cooperative effort, called Biofuel Flightpath, to produce two million metric tons of sustainably produced biofuel for aviation by 2020.

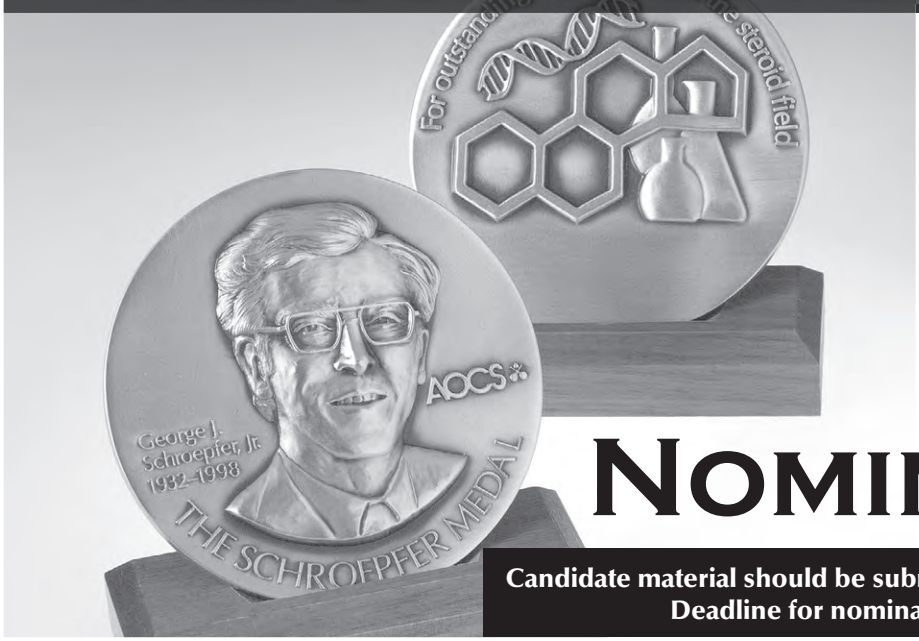
Specific goals include the following:

- Facilitate the development of standards for drop-in biofuels and for their certification;
- Work together with the full supply chain to further develop worldwide accepted sustainability certification;
- Facilitate dedicated aviation biofuel production at a reasonable cost by agreeing to tangible biofuel supply and purchase commitments;
- Promote appropriate legislative measures to ensure the market uptake of paraffinic biofuels by the aviation sector;
- Accelerate research and innovation into advanced biofuel technologies, including algae;
- Establish financing structures to facilitate sustainable biofuel projects; and
- Publicly promote the benefits of replacing kerosene by sustainable biofuels.

A document drafted by an editorial team from the European Commission, the paraffinic biofuel producers, and the aviation sector that summarizes the Biofuel Flightpath is available at http://tinyurl.com/BiofuelFlightpath.

Marguerite Torrey is technical projects editor for inform. *She may be contacted at mtorrey@aocs.org.*

The Schroepfer Medal



Call for Nominations

Candidate material should be submitted by e-mail to awards@aocs.org.
Deadline for nominations: October 15, 2011

The AOCS is accepting nominations for the 2012 Schroepfer Medal. The Schroepfer Medal is sponsored by AOCS and is presented every two years at the AOCS Annual Meeting & Expo. The award, which consists of an honorarium and a medal, was established to honor the memory of George J. Schroepfer, Jr., a leader in the sterol and lipid field for more than 40 years. The award aims to foster Schroepfer's ideals of personal integrity, high scientific standards, perseverance, and a strong spirit of survival, tempered by charm and wit.

The purpose of this award is to recognize scientists who have made significant and distinguished advances in the steroid field. The work may represent a single major achievement or a cumulative body of work. Preference will be given to accomplishments in biochemistry and physiology with biomedical applications and to interdisciplinary research in which rigorous chemical and analytical methods were applied to elucidate the physiological roles of steroids in animals, plants, or microorganisms. However, fundamental advances that are primarily chemical, pharmacological, or analytical will also be considered.

Call for nominations

1. A prospective recipient must agree to be present for the acceptance of the award and must agree to deliver an award address at the 103rd AOCS Annual Meeting & Expo.

2. The award shall be made without regard for national origin, place of residence, race, color, creed, sexual orientation, gender, or religion. Failure of a nominee to receive the award in one year shall not bar him or her from consideration for the award in a subsequent year.

3. Completed nominations should include a 300- to 1000-word summary describing the significance of the nominee's accomplishments in the steroid field, a current curriculum vitae including a full list of publications, and two supporting letters from individuals who are familiar with the nominee's accomplishments. Optionally, the nomination package may also include copies of three publications illustrating the nominee's most important work in the steroid field.

Health & Nutrition News

Chandan Sen in his Ohio State University laboratory. Courtesy of The Ohio State University.

α-Tocotrienol protects against stroke

A form of vitamin E—α-tocotrienol—can trigger production of a protein in the brain that clears toxins from nerve cells, preventing those cells from dying after a stroke, new research shows.

This process is one of three mechanisms identified so far that explains how α-tocotrienol protects brain cells after a stroke, according to Ohio State University (OSU; Columbus, USA) scientists who have studied the nutrient for more than a decade.

These researchers previously reported that the tocotrienol form of vitamin E protects the brain after a stroke by blocking an enzyme from releasing toxic fatty acids and inhibiting activity of a gene that can lead to neuron death (see *inform 21*:151–152, 2010).

Vitamin E occurs naturally in eight different forms, and all of the OSU work has focused on the tocotrienol form, also known as TCT. TCT is not abundant in most Western diets but is available as a nutritional supplement. It is a common component of a typical Southeast Asian diet.

In this new study, the researchers first clarified the role of a protein called MRP1, or multidrug resistance-associated protein 1. This protein clears away intracellular oxidized glutathione, which can cause toxicity and cell death when it builds up in neurons because of the trauma of blocked blood flow associated with a stroke.

The team then determined that TCT taken orally influences production of MRP1 by elevating the activity of genes that make the protein. This appears to occur at the microRNA level; a microRNA is a small segment of RNA that influences a gene's protein-building function.

"This is one of the first studies to provide evidence that a safe nutrient—a vitamin—can alter microRNA biology to produce a favorable disease outcome," said Chandan Sen, professor and vice chair for research in Ohio State's Department of Surgery and senior author of the study. "Here, a natural nutritional product is simultaneously acting on multiple targets to help prevent stroke-induced brain damage. That is a gifted molecule."

The research appears in the journal *Stroke* (doi:10.1161/strokeaha.110.608547).

Briefs

China soon will become No. 1 in the world in yet another category. This time, the record has nothing to do with research and development spending or number of patents. Instead, China will overtake Western Europe in the consumption of EPA- and DHA-rich oils, according to research conducted by market analysts Frost & Sullivan and the Global Organization for EPA and DHA (GOED; Salt Lake City, Utah, USA). The country's consumption currently totals 10,095 metric tons (MT) annually; consumption in Western Europe accounts for 12,284 MT. EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid) are long-chain omega-3 fatty acids with a long list of presumed health benefits, including cardiac health.

■■■

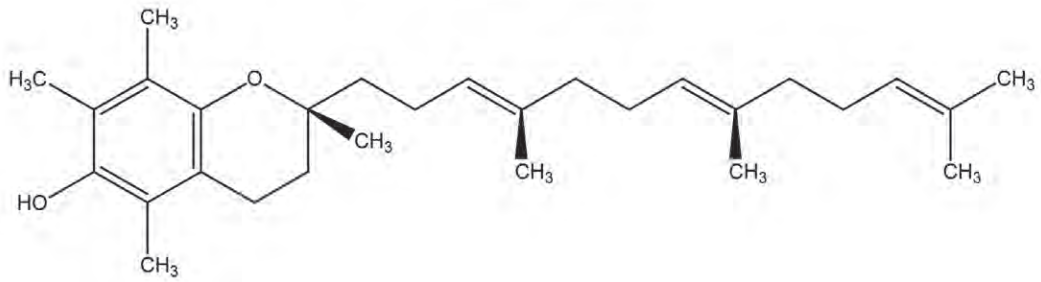
References to omega-3 fatty acids are ubiquitous, whether on product packaging or in the news. Hoping to summarize the current knowledge of fatty acid metabolism and interaction, three Australian researchers from Curtin University in Perth have published a short communication entitled "Omega-3 fatty acids: What consumers need to know" in the journal *Appetite* (*57*:80–83, 2011).

"There is a need for consumers to be educated about the distinctions [among] omega-3 fatty acids. In the interim consumers remain at risk of purchasing premium fortified products and supplements that will not correspond to their desired health outcomes," they write.

■■■

Food Standards Australia New Zealand (FSANZ) has updated its nutrient database to include new information about fat content, fatty acids, iodine, vitamin D, and more. NUTTAB (Nutrient Tables for Use in Australia) is available free of charge on the FSANZ website at www.foodstandards.gov.au in two formats: online as a searchable database or as electronic database files. ■

α-tocotrienol



Over the past decade, Sen has led numerous studies on how the TCT form of vitamin E protects the brain against stroke damage in animal and cell models, and intends eventually to pursue tests of its potential both to prevent and treat strokes in humans. According to the World Health Organization, 15 million people suffer stroke worldwide each year. Of these, five million die and another five million are permanently disabled.

Sen's latest research findings in mice follow the recent US Food and Drug Administration certification of TCT as "Generally Recognized as Safe." The scientists conclude in the paper that even before clinical trials can take place, "TCT may be considered as a preventive nutritional countermeasure for people at high risk for stroke."

To determine the role of MRP1 in protecting brain cells, the researchers compared the effects of an induced stroke in two groups of mice: normal mice and animals that were genetically modified to be deficient in the MRP1 protein.

Both groups of mice showed comparably decreased blood flow in the area of the stroke, but the mice deficient in MRP1 had a larger volume of tissue death than did normal mice.

The mice with the MRP1 deficiency also had a 1.6-times higher level of glutathione disulfide (GSSG), the oxidation product that is cleared by MRP1. The OSU researchers have previously shown that a failure to clear this toxin appears to trigger neuron death in the brain after stroke.

"The protein has the effect of dredging out the toxin," said Sen. "A significant finding in this work is the recognition that MRP1 is a protective factor against stroke. Thanks to tocotrienol, we were able to identify that path."

The presence of GSSG is linked to an excessive amount of glutamate that is released in the brain after a stroke. Glutamate is a neurotransmitter that, in tiny amounts, has important roles in learning and memory. Too much of it triggers a sequence of reactions that lead to the death of brain cells.

This experiment showed for the first time that the loss of MRP1 function impairs the clearance of GSSG, and that MRP1 cells were recruited to the site of the stroke in normal mice, indicating the protein has a protective role in the brain after a stroke.

The researchers searched databases containing genomic data for a microRNA that appeared to have potential to influence production of MRP1. MicroRNA binds to messenger RNA, which contains the actual set of instructions for building proteins. When that connection is made, however, some microRNA downregulates the building of protein from messenger RNA. So an inverse relationship can exist between a microRNA and a protein it controls.

The researchers saw this very relationship in the cell study in which they manipulated the candidate microRNA levels and observed the effects of changing those levels on the presence of the MRP1 protein.

Finally, the researchers compared mice that were treated with TCT supplements or corn oil as a control for 13 weeks before a stroke was induced. The amount of damaged brain tissue was smaller in the mice that received TCT supplementation than in the mice receiving corn oil. In addition, TCT supplementation was associated with a lower level of the candidate microRNA in the damaged brain tissue, as well as an increase in the abundance of MRP1 cells at the stroke site.

"Essentially, what we are showing with mechanistic explanation is that tocotrienol protects neural cells. It is antineurodegenerative," Sen said. "This form of vitamin E helped us identify three major checkpoints in stroke-related neurodegeneration that were not known before we began testing tocotrienols against neurodegeneration." The US National Institutes of Health supported the research.

Fat nontasters more likely to be obese

New research supports the idea that individuals can actually taste the fat in food, and those who cannot may face an increased risk of higher fat intake and obesity.

During a symposium at the 2011 Institute of Food Technologists (IFT) Annual Meeting & Food Expo®, panelists noted that persons primarily detect fat in foods through smell and texture, although studies are increasingly supporting the notion that fat and fatty acids can be tasted.

These studies also show that some individuals cannot taste fat, and that these "nontasters" are associated with genetic variances in the way that they process food. In addition, studies have shown that nontasting individuals who live in an urban setting close to convenience stores and fast food were more likely to ingest a greater amount of fat, and subsequently faced a higher risk of obesity.

"The general perception is that people eat what they like, but this is not always the case," said Kathleen L. Keller of the New York Obesity Research Center at St. Luke's Roosevelt Hospital, and associate professor at Columbia University College of Physicians and Surgeons (New York, USA).

In these people, genetics plays "a key role in coordinating fat preference and selection with the metabolism and storage of this nutrient," said Keller.

As a result, nontasters have "impaired fat perception" and may subconsciously crave fat to compensate for a perceived deficiency, according to Keller. Conversely, individuals who were more sensitive to the taste of fat ingested less.

"A genetic variation in taste affects food and beverage sensations, which affects food and beverage preference and intake," said

Keller. This can influence an individual's risk for cardiovascular disease, obesity, and cancer.

Recent research also links the perception of food having a creamy consistency with higher fat intake and an increased preference for added fats and oils, as well as a lower preference for low-fat dairy products.

"Biological differences in food perception are real and potentially important to food acceptance," said Keller. "Some populations may require alternative approaches or food formulations to achieve optimal acceptance."

Personalized omega-3 advice

People of African descent are much more likely to carry a gene that allows them to elongate long-chain omega-3 fatty acids from medium-chain sources such as flaxseed. That is the good news. The bad news is that the same genetic variant also makes its bearers more vulnerable to ill effects from a preponderance of omega-6 fats, such as increased inflammation from arachidonic acid (20:4n-6).

Such are the hypotheses of two recent papers from the laboratory of Floyd Chilton, director of the Center for Botanical Lipids and Inflammatory Disease Prevention at Wake Forest Baptist Medical Center in Winston-Salem, North Carolina, USA. The studies appeared in *BMC Genetics* (doi:10.1186/1471-2156-12-50) and the *British Journal of Nutrition* (doi:10.1017/S0007114511003230).

Chilton and his team looked at 329 healthy persons along with 395 diabetic patients. They found that the African Americans within the sample groups had much higher serum levels of long-chain omega-6 fatty acids than did those of European descent. They also found that the African American subjects were more likely to carry a gene allowing for efficient conversion of medium-chain fatty acids to long-chain fatty acids, as compared with persons of European ancestry sampled from the same geographic regions.

This work, Chilton told the *Philadelphia Inquirer* newspaper, underscores the importance of more personalized dietary recommendations. "Most recommendations are made based on available information and that comes from one population, typically Caucasian populations," he told the newspaper. "We can't continue to do that. We're too diverse."

Flaxseed no help for hot flashes

Flaxseed does not help women with hot flashes, according to a Phase III clinical trial.

Mean vasomotor symptom scores dropped 33% with flaxseed-spiked fiber bars, but also fell 29% with placebo fiber bars without a significant difference between groups, Sandhya Pruthi of the Mayo Clinic (Rochester, Minnesota, USA) and colleagues found.

Nor did flaxseed hold any quality-of-life advantages for the women in the randomized trial, the group reported at the American Society of Clinical Oncology meeting held in July 2011 in Chicago, Illinois, USA.

"We do have options for women who are not wanting to take hormonal therapies like estrogen and progesterone, especially [if they have] a history of breast cancer," Pruthi told MedPage Today, an online news source.

Flaxseed contains a plant-based form of estrogen and exhibits both agonist and 2nd antagonist effects. A pilot study with flaxseed had shown a 57% reduction in hot flash symptom scores and frequency, the MedPage Today report noted, which now appears to have been a placebo effect.

The study included 188 postmenopausal women randomized to eat a fiber bar daily that contained either 410 milligrams of the active flaxseed lignans or 2 grams of protein as a placebo for six weeks.

Among them, 51% had a history of breast cancer, but no active disease; 15% were on an aromatase inhibitor and 25% on tamoxifen as adjuvant therapy after treatment for breast cancer. None of the subjects was on systemic estrogens or progesterone analogs.

Myth or truth?

So this news item has nothing to do with fats and oils. But it does involve debunking a myth most of us in developed countries accept as fact. Namely, that adults need to drink eight glasses of water a day for optimal health.

Not so, writes Margaret McCartney, a medical doctor from Glasgow, Scotland, in a commentary in the *British Medical Journal* (doi: 10.1136/bmj.d4280).

McCartney notes that a handful of studies have found no evidence of benefit for recommending such levels of hydration.

"There are many organizations with vested interests [such as purveyors of bottled water] who would like to tell doctors and patients what to do," McCartney says. "We should just say no." ■

Call for Nominations

Stephen S. Chang Award

The Stephen S. Chang Award recognition shall consist of a jade galloping horse symbolizing the award and an honorarium. The late Stephen S. Chang, an AOCS past president, and his wife, Lucy D. Chang, sponsor the award.

The Award

The Stephen S. Chang Award recognizes a scientist, technologist, or engineer who has made significant and distinguished accomplishments in basic research that must have been utilized by industries for the development or improvement of products related to lipids. The awardee may be recognized for either one major breakthrough or an accumulation of publications.

A prospective recipient must agree to be present for acceptance of the award and to deliver an award address at the 103rd AOCS Annual Meeting & Expo. The award is made without regard for national origin, place of residence, race, color, creed, or gender.

Nomination Procedures

Nominations for the 2012 award must be submitted before October 15, 2011.

Candidate material should be sent to the AOCS Awards Program at awards@aocs.org.

The suggestions listed below may be helpful to nominators in addressing the mandatory criteria of industrial utilization.

1. Documentation of the application of research
   a. Patents received, licensing arrangements
   b. Specific examples of industrial use
2. Documentation for the development or improvement of products related to lipids
   a. Listing of new products, manufacturers, sales history
   b. Manufacturers' testimonials regarding product improvement resulting from their direct utilization of the basic research in specific products with comparative figures on sales or consumer acceptance

The nomination must include a letter from the nominator, at least three supporting letters, the nominee's curriculum vitae, and a list of major relevant publications, including patents.

www.aocs.org/goto/awards

Biotechnology News

Briefs

Pioneer Hi-Bred announced in June the opening of its third corn research center in Germany, in the town of Langenbach, district of Freising in Bavaria. The center will employ five full-time positions and additional seasonal staff. The new facility should speed product development by expanding the silage testing network and adding additional biogas testing plots across Bavaria. Pioneer also operates a fourth research center in Germany, which is dedicated to oilseed rape product development. On June 22, Pioneer also announced the opening of its new research center in Lipetsk, Russia, which will be devoted to studies on early-maturing corn, sunflower, and oilseed rape.

■■■

Monsanto Co. (St. Louis, Missouri, USA) and San Diego, California-based Sapphire Energy have entered a multi-year collaboration. Under their agreement, Monsanto and Sapphire will cooperate on algae-based research projects, and Monsanto will make an equity investment in Sapphire. Sapphire's expertise and technology for isolating algal traits is being used to discover genes that could be applied to crops such as soybeans, cotton, and corn, particularly in the fields of yield and stress, with the purpose of increasing yields.

■■■

Kenya's cabinet approved the importation of genetically modified (GM) corn in July. The announced intentions are to increase food security and alleviate the ongoing food shortages the country has experienced for the past several years. The move makes Kenya the first country in the region to allow GM crops into the

CONTINUED ON NEXT PAGE

Genetic crop modifications affect monarch butterflies?

An article by Andrew Pollack in *The New York Times* on July 11 pointed out that the genetic modification of corn and soybeans creating resistance to the herbicide glyphosate (brand name Roundup) allows farmers in the Midwest of the United States to spray the herbicide to eliminate weeds, including milkweed (*Asclepias* spp.).

But milkweed is the plant on which migratory monarch butterflies (*Danaus plexippus*) prefer to lay their eggs. The caterpillars dine on milkweed leaves as they grow, then pupate and emerge as adult butterflies. Chip Taylor, an insect ecologist at the University of Kansas (Lawrence, USA), contends that the expanding use of genetically modified crops is threatening monarchs by destroying their milkweed habitat. He told the *Times*, "This milkweed has disappeared from at least 100 million acres [40 million hectares] of . . . row crops. Your milkweed is virtually gone."

Taylor and his co-workers contend in an article in *Insect Conservation and Diversity* (doi: 10.1111/j.1752-4598.2011.00142.x) that a drop over the past 17 years in the area occupied by monarchs overwintering in central Mexico is evidence of a decline in monarch populations. That is, the amount of land in Mexico occupied by the butterflies is an indication of their population size. Besides loss of milkweed owing to the use of Roundup, the study suggests other causes of the decline may be illegal logging at the Mexican wintering sites, severe weather, and loss of milkweed resulting from land development. While the drop in monarch butterfly numbers was statistically significant, no data were presented verifying that genetically engineered crops are causing the decline.

On the other hand, Andrew Davis, of the University of Georgia (Athens, USA) reported that autumn monitoring at two stations (Cape May, New Jersey, and Peninsula Point, Michigan) for 15 and 19 years, respectively, revealed no significant linear trend in average monarch butterfly numbers counted over time (*Insect Conservation and Diversity*, doi: 10.1111/j.1752-4598.2011.00158.x).

Robert Hartzler, an agronomist at Iowa State University (Ames, USA) found common milkweed (*A. syriaca*) on only 8% of the corn and soybean fields surveyed in Iowa in 2009, down from 51% in 1999 (*Crop Protection 29*:1542–1544, 2010). He was unable to pinpoint the impact of the decline of milkweed on monarch populations, however.

It may be instructive that researchers from Cornell University (Ithaca, New York, USA) reported in the May 20, 1999, issue of *Nature* that monarch caterpillars could

market for human consumption. The grain is expected to be milled at the point where it enters the country and to be transported as flour. In this way the seeds themselves would have limited opportunity to get into the market. The Kenyan government has stipulated that all flour produced from GM corn must be clearly labeled as such. (See article on GM labeling in *inform 22*:489–490, 2011.) Whether millers will comply is not yet known.

■■■

Jing X. Kang of Harvard Medical School (Boston, Massachusetts, USA) has suggested that climate change will lead to changes in the world's ecosystems and decreased levels of phytoplankton in the world's oceans (*Biotechnol. Adv. 29*:388–390, 2011). As a consequence, the availability of omega-3 fatty acids for the human diet will be reduced. Kang suggests that other methods of obtaining humans' omega-3 fatty acid quotas must be developed, such as algal-derived docosahexaenoic acid (Martek/DSM) and eicosapentaenoic acid (Aurora Algae), and genetic engineering of animals and plants to convert omega-6 fatty acids, which are abundant, to long-chain omega-3 polyunsaturated fatty acids.

■■■

Class-action suits filed in the US states of California and New York contend that ConAgra Foods Inc. misled the public by labeling its Wesson cooking oils "100% Natural" and "Pure," despite the fact they were derived from genetically modified plants and organisms. Reuters news agency (July 6) reported that the suits seek millions of dollars in refunds for recent purchasers of ConAgra's Wesson oil line, as well as prohibition of the company from making these claims. The complaints allege the oils are not 100% natural because they contain ingredients from "unnatural" genetically modified plants, defined by the World Health Organization as "organisms in which the genetic material has been altered in a way that does not occur naturally." ■

be killed by eating milkweed onto which researchers had dusted pollen from *Bt* corn. Subsequent research found that caterpillars were unlikely to be exposed to lethal amounts of *Bt* corn pollen under field conditions.

Meanwhile, perhaps Midwestern gardeners could be encouraged to plant milkweed in their flowerbeds as a refuge for monarchs.

Protests against genetically engineered salmon

AquaBounty Technologies (Waltham, Massachusetts, USA) has applied to the US Food and Drug Administration (FDA) to grow genetically engineered Atlantic salmon in Panama for importation into the United States, with plans eventually to grow the fish there. On July 15, 2011, a letter to FDA Commissioner Margaret Hamburg signed by eight US senators, including Alaska's two senators, Mark Begich and Lisa Murkowski, asked the agency to cease the approval process for AquaBounty Technologies' AquAdvantage Salmon.

In June, according to *The New York Times* (http://tinyurl.com/NYTimes-GMsalmon), fewer than a dozen members of the US House of Representatives voted in a voice vote to attach an amendment offered by Reps. Lynn Woolsey (Democrat-California.) and Don Young (Republican-Alaska) to the agriculture spending bill to ban the FDA from spending any funds on genetically engineered salmon approvals beginning in the next financial year. At press time the agriculture spending bill had not yet come up for a final vote.

According to Foodnavigator-usa.com (http://tinyurl.com/Atlantic-Pacific-Salmon), AquAdvantage Atlantic salmon (*Salmo salar*) contain a gene from the faster-growing Pacific chinook salmon (*Onchorhyncus tsawytscha*), enabling them to mature twice as quickly while using 25% less food.

In a statement, Begich said, "FDA hasn't considered all of the potential negative impacts of genetically altered fish and the strong opposition in Congress to approving something that could decimate wild salmon populations. . . . Recent scientific evidence shows that if genetically modified salmon escape, they could successfully breed with wild stocks, potentially destroying the genetic adaptations that have allowed fish to thrive for millennia. Alaska wild salmon is abundant and sustainable. We don't need [genetically modified fish] threatening our fish populations and the coastal communities that rely on them."

Ronald L. Stotish, president and chief executive officer of AquaBounty Technologies, said in a statement, "The US FDA has conducted a rigorous 15-year review of thousands of pages of data and has concluded that these fish are exactly the same as any other Atlantic salmon and therefore are safe for consumption. In addition, the fish will be sterile and required to be grown in self-contained inland tanks, posing no threat to the environment. Finally, the United Nations reports that the wild-caught fisheries are severely stressed, with major food species potentially extinct by 2050, yet the demand for fish protein is exploding worldwide. America currently imports more than 97% of the Atlantic salmon consumed here, while a handful of senators willfully ignore science-based research widely available to the public."

Stotish continued, "It would be a dangerous precedent to react to a handful of legislators' misinformed paranoia. The real waste of tax-payer dollars would be to abandon the important American principle of science-based regulation, responding instead to economic protectionist fears or subjective and emotional judgments."

As of May, lawmakers in four US states—California, Oregon, Vermont, and Alaska—were considering legislation requiring that genetically modified fish be labeled as such in commercial channels. Ten other states are contemplating a requirement that all foods made from genetically modified ingredients disclose that information on the label (see *inform 22*:419, 2011).

Bayer CropScience to pay $750 million to end lawsuits

In early July, Bayer Crop Science (Research Triangle Park, North Carolina, USA) agreed to a settlement for claims involving about 11,000 US rice farmers. Their complaint was that genetically modified rice had tainted their crops, destroying their export value. Farmers involved in the lawsuits grew rice in Texas, Louisiana, Missouri, Arkansas, and Mississippi.

The contamination issue arose in August 2006, when the US Department of Agriculture found trace amounts of Bayer's experimental LibertyLink strain of rice in US long-grain rice. (The LibertyLink gene modification allows the Liberty herbicide to be sprayed on weeds without killing the rice plants.) Within four days, according to Bloomberg.com (http://tinyurl.com/

Bloomberg-GMrice), US rice growers lost about $150 million on the futures market, according to the complaint. About half of the US rice crop is exported; exports fell as buyers in the European Union, Japan, Russia, and other countries quit buying US rice or else awaited the results of laborious testing of the grain for the presence of the LibertyLink trait.

One of the lawyers for the complainants, William Chaney, of Looper, Reed & McGraw (Dallas, Texas) was quoted in the El Campo, Texas, *Leader-Times* newspaper (http://tinyurl.com/ElCampo-GMrice) as saying the contamination likely originated "at experimental fields grown at Louisiana State University's rice research station, in and around Crowley, Louisiana." A *Fortune* summary of the story that appeared in July 2007 said, "The LSU fields appear to be among the very few places—if not the only one—where the Liberty Link rice was grown in proximity to fields where Cheniere and CL131 seeds were also being developed." Cheniere and CL131 are foundation seeds of the US long-grain rice industry (http://tinyurl.com/Fortune-GMrice).

Bloomberg said that for the $750 million to be paid out, growers representing at least 85% of the US long-grain rice planted between 2006 and 2009 must agree to participate in the settlement. If the 85% participation threshold is not met, Bayer has the right to walk away from the settlement or adjust its terms. In a company statement, Bayer CropScience said it regards "the inclusion of all long-grain rice growers in the settlement program, whether they have a lawsuit or not, to be crucial to demonstrating the company's long-term commitment to rice."

GM material in European feed and food imports

Feed. The European Union (EU) adopted rules on June 24 that permit the importation of animal feeds containing traces of genetically modified (GM) materials. The decision was made in an effort to ensure a steady supply of feed for the import-dependent group of countries. According to the EU website (http://tinyurl.com/GM-in-feed), "The regulation . . . addresses the current uncertainty EU operators face when placing on the market feed products imported from third countries."

Additionally, "the regulation sets out a technical zero [level of contamination] at the level of 0.1%, which corresponds to the lowest level of GM material that is considered by the EU Reference Laboratory for the validation of quantitative methods." The EU and its trading partners, backed by industry, argue the 0.1% threshold will prevent further disruptions to supply, as occurred in 2008 and 2009 when soybean and soy meal shipments to Europe from the United States were blocked because traces of unapproved GM corn were found in some cargoes.

The new rules do not apply to domestic crops, however, nor to the importation of commodities destined for human food. Furthermore, "trace amounts" of GM materials are being allowed, not actual crops or feed ingredients grown from GM varieties. With today's sensitive testing technology, it is not practicable to deliver cargo ships and containers—devoted to delivering raw commodities and feed ingredients—that have been cleaned sufficiently to remove the possibility of contamination of materials that may have been present from previous shipments.

Global traders point out that separating global grain supplies into those destined for humans and those for animals is impractical.

Food. Richard Werran, managing director of the nonGM certification body, CERT ID Europe (www.cert-id.eu) told FoodNavigator.com, "Everybody in the food business knows that food and feed chains are not separated or segregated, they overlap. It is not unusual for a food ingredients manufacturer to source feed-grade raw materials to produce food additives and ingredients" (http://tinyurl.com/GMFeedRules).

FoodDrinkEurope, an EU industry association, said in a July 15 statement, "Like feed producers, food producers are dependent on raw material imports and are therefore confronted with very comparable challenges to feed producers. While this Regulation [allowing trace amounts of GMO in imported feeds] represents a first step in an obvious direction, a necessary second step is that the scope of the legislation needs to be extended to include food as a matter of urgency" (http://tinyurl.com/FoodDrinkEurope).

The FoodDrinkEurope statement continued, "Given the current 'zero tolerance' policy in the EU for low-level presence—in food—of GM crops that are not yet approved in the EU, this presents a major problem for manufacturers in the EU who import conventional soybeans for use in food production. The new Regulation, however, foresees a solution for feed only which is not sustainable."

According to Reuters news agency, "This is the first time that Europe's food industry as a whole has called for a tolerance threshold for unapproved GM material in imports destined for human consumption" (http://tinyurl.com/ReutersJuly15). ■

Welcome New Members

AOCS Since 1909
Your Global Fats and Oils Connection

The AOCS is proud to welcome our newest members*.

*New and reinstated members joined from April 1, 2011 through June 30, 2011.

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Fatimah Hanim Ahmad Zain, Malaysian Palm Oil Board
Hungsun Ahn, Sungskyunkwan University
Ahmed S. Al Sakini, Oklahoma State University
Shaymaa Al Sharqi, Oklahoma State University
Laith F. Al-Obaidi, Oklahoma State University
Juan J. Alba, Universidad de Zaragoza
Lora A. Allen, Archer Daniels Midland Co
Majid Anvari, M Anvari Enterprises Inc
Mert Arca, Pennsylvania State University
Brian Argo, Brian Argo & Assoc
Leila Asghari, Azad University
David Ashley, Milliken & Co
Jamie G. Ayton, NSW Dept of Primary Industries
Debbie Back, Procter & Gamble Co
Muhammad N. Baig
Dattatreya Banavara, Mead Johnson Nutrition
David Barr, Bruker BioSpin Corp
Elitza Barzakova, West Africa Trade Hub
Darren M. Bates, Cavitus Pty Ltd
Christelle Bayrasy, CIRAD UMR IATE
Garlon J. Beckwith, Mid Continent Labs Inc
Jamison Bell, Hanover College
Fumiaki Beppu, Hokkaido University
Jonathan Berger, Teth Beth Food Ind Ltd
Josh Bergman, Bunge North America Inc
Jean-Baptiste Bezelgues, Nestle USA
Krishnadath Bhaggan, IOI Loders Croklaan BV
Mrittika Bhattacharya, IIT Kharagpur
Meir Bittner, Sun Oils Ltd
Thomas J. Boerth, Aquatrols
Brandon Bogusz, Rutgers University
Matthew K. Boling, Virginia Polytech Inst & State University
Jeffrey Bonn, Church & Dwight Co Inc
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Fabienne Bossard, Cargill Europe
Mustapha Boukeroucha, SPA COGB la Belle
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Carlos H. Bueno, SIA Ltda
Dianne Bukowski, American Lecithin Co
Theodore Busch, Solae LLC
Eduardo Caballero, BASF Corp
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Claudio Ariel Cassino, Terminal 6
Pascale Champagne, Queens University
Anni Chang, Martek Biosciences Corp / DSM
Chris Chang, SGS
Yao Hung Chao
Soumitra Chatterjee, Burdwan University
Gary Childers, Procter & Gamble Co
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Mathieu Dubois, Nestle Research Centre
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AOCS CORPORATE MEMBER

People News/ Inside AOCS

Ma named business director of Cognis' QTA

Ma

Cognis Corp. (Cincinnati, Ohio, USA) appointed **Kanming Ma** as business director of its QTA business group in June. Ma joined Cognis at the inception of the Quality Traits Analysis business in 2001. The QTA System provides quality analysis using infrared spectroscopy. All analyses can be conducted using a single drop of product, with no sample preparation or use of chemical reagents. Results are available within two minutes. Since its 2006 launch, the QTA System has conducted about two million biodiesel tests for its customers.

Ma is the vice chairperson of the analytical division of the American Oil Chemists' Society and technical committee member of GOED, the Global Organization for EPA/DHA [eicosapentaenoic acid/docosahexaenoic acid], which is headquartered in Salt Lake City, Utah, USA.

USDA-ARS announces annual awards

On June 15 the US Department of Agriculture-Agricultural Research Service (USDA-ARS) announced the winners of various awards that it presents annually. Among the awards of interest to AOCS members are the recognition of Area Senior Research Scientist **Thomas E. Carter Jr.**, of the ARS Soybean and Nitrogen Fixation Research Unit, Raleigh, North Carolina, for pioneering research on genetic diversity in soybean breeding and the development of the first high-yielding, drought-tolerant soybean germplasm.

An Area Early Career Research Scientist Award went to AOCS member **Helen L. Ngo** of the ARS Sustainable Biofuels and Co-Products Research Unit, Eastern Regional Research Center (ERRC), Wyndmoor, Pennsylvania, for research in the development of novel catalysts and catalytic processes for the conversion of fats and oils into biobased products and biofuels.

An award for superior technology transfer achievement went to The Winter Barley team, based at the ERRC, for developing and transferring technology that promotes energy independence and the rural economy by providing assistance to the mid-Atlantic winter barley ethanol industry. AOCS members **Kevin Hicks**, **David Johnston**, and **Robert Moreau** were three of the 12 team members from ERRC, as well as industry partners from Genencor International, Osage Bio Energy, Virginia Tech University, Virginia Crop Improvement Association, and Brann Farms.

Vick retires, Kemp named interim

William (Bill) Kemp will be the interim research leader for the US Department of Agriculture-Agricultural Research Service (USDA-ARS) Sunflower Research Unit as a result of the retirement of the existing research leader and AOCS member **Brady Vick**. Kemp is presently the center director for the Red River Valley Agricultural Research Center, which is located in Fargo, North Dakota. He joined the USDA-ARS in 1984 as a research entomologist with appointments at Bozeman and Sidney, Montana. Kemp became Center director at Fargo in 2005.

Bilbrey new CEO for Hershey Co.

Hershey Co., the chocolate company headquartered in Hershey, Pennsylvania, USA, promoted **John Bilbrey** to be chief executive officer of the company in mid-June. He was also named to the board of directors. He replaced **David West**, who left Hershey to lead Del Monte Foods Co. (San Francisco, California, USA). According to Bloomberg news service (http://tinyurl.com/Bilbrey-Hershey), Bilbrey is tasked with pushing Hershey further into emerging countries such as China to fuel sales growth.

Euromonitor, as cited by Bloomberg, reports that Hershey has 7% of the global chocolate market, less than half of the market share of Kraft (Northfield, Illinois, USA) and Mars (McLean, Virginia, USA).

Bilbrey joined Hershey Co. in 2003 from Mission Foods (Irving, Texas, USA), where he served as senior vice president. Before joining Mission Foods, he was president and chief executive officer, Danone Waters of North America, Inc. (Los Angeles, California). Additionally, he spent 22 years at The Procter & Gamble Co. (Cincinnati, Ohio, USA), where he began his career as a sales representative.

Richard joins Stratas Foods

Stratas Foods LLC (Memphis, Tennessee, USA) announced the appointment of **Ray Richard** as senior vice president, risk management and procurement, in mid-June. He comes to the position with more than 30 years of experience in these areas in the edible oil industry, most recently with Ventura Foods, LLC in Brea, California (USA). Richard is currently a member of the advisory board for the Institute of Shortening and Edible Oils and second vice president of the National Institute of Oilseed Products.

Stratas Foods is a joint venture of Archer Daniels Midland Co. (Decatur, Illinois, USA) and ACH Food Co. (a subsidiary of Associated British Foods). Stratas serves companies in the food service, food manufacturing, and retail channels.

Changes at ACI

The American Cleaning Institute (ACI; Washington, DC, USA) announced new members of its board of directors on June 17. **Robert Margevich**, who is president and managing director of AkzoNobel Surface Chemistry (Chicago, Illinois), and **Benno Dorer**, senior vice president–cleaning division, The Clorox Co. (Oakland, California), were elected to fill out the terms of former directors **Frank Sherman**, AkzoNobel, and **Larry Peiros**, Clorox, which run through January 2012.

Sherman and Peiros are assuming new duties within their companies.

Also, **Kathleen Stanton** has been named ACI director for technical and regulatory affairs. She has previously served as

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IN MEMORIAM

C. LOUIS KINGSBAKER, JR.

Kingsbaker

AOCS emeritus member C. Louis Kingsbaker Jr., of Atlanta, Georgia, USA, and formerly of Pittsburgh, Pennsylvania, died on April 29, 2011.

Kingsbaker joined AOCS in 1963. He served for many years as chair of the Technical Committee of AOCS, the predecessor of the current Processing Division, which he was instrumental in founding. In that capacity, he developed programs to educate AOCS members in the techniques of oilseed preparation and extraction. He was especially well known for his expertise in improving solvent extraction safety. In 2006 Kingsbaker received the AOCS Award of Merit at the AOCS Annual Meeting & Expo in St. Louis, Missouri.

From 1981 until his retirement, Kingsbaker was the principal of C.L. Kingsbaker, Inc., a consulting company offering services to the vegetable oil industry and processors of specialty materials utilizing solvent extraction with both flammable solvents and high-pressure solvent technology. In that position, he gained international recognition for his knowledge and expertise in solvent safety and served as an expert witness in a number of instances.

He was chair of the National Fire Protection Association (NFPA) Committee 36: Standard for Solvent Extraction Plants for 14 years and a member of that committee for 35 years. NFPA 36 is used throughout the world to provide safety standards and methods for the solvent extraction operations that are used to produce crude vegetable oil. In many places it is incorporated by reference into local laws to provide compliance guidance.

In an instructive summary that illustrated his thought processes, Kingsbaker discussed his investigations of three especially serious oil plant incidents in a *Journal of the American Oil Chemists' Society* article (*60*:197A–199A, 1983). The first took place at the Quincy Soybean Co. (Illinois, USA) in September 1966, involving a hexane fire and three separate explosions. The second took place at the Delta Cotton Oil Co. (Jackson, Mississippi, USA) in March 1982, also with three explosions. On this occasion, there were injuries as well as two fatalities.

The third, which Kingsbaker termed the most violent and damaging hexane explosion on record up to that time, occurred in Louisville, Kentucky (USA) in February 1981. Hexane discharged from the Ralston Purina soybean plant during startup after a mechanical breakdown of equipment entered the city sewer system. The solvent (as much as 68,000 liters) detonated about two kilometers downstream from the solvent plant and set off 15–20 additional explosions. Kingsbaker wrote: "About 10 km of the Louisville sewer system was destroyed, as were highways, roads, homes, and businesses. Some areas of Louisville did not have sewage services for a year. . . . The explosion was in the sewer system 10 m below ground. Roads above the blasts were buckled, craters 8 m in diameter were formed, pavements were destroyed and pieces of concrete were thrust into the air causing a great deal of damage."

Kingsbaker received his B.S. in chemical engineering from Carnegie Mellon University in 1948 and worked as a chemical process design engineer for Dravo Corp. (Blaw-Knox Co.) and DeSmet USA before becoming an independent consultant.

He is survived by his wife, Suzanne. He was the father of two children and grandfather of three.

CHARLES HAROLD FISHER

Fisher

The oldest member of AOCS, Charles Harold "Hap" Fisher, died on May 13, 2011, in Roanoke, Virginia, USA, at the age of 104 years.

Fisher was born November 20, 1906, in Hiawatha, West Virginia, USA, and received a B.S. in chemistry from Roanoke College (Roanoke, Virginia) in 1928 while earning money by playing tenor banjo in a small jazz band. He received an M.S. and Ph.D. in chemistry under R.C. Fuson at the University of Illinois at Urbana-Champaign in 1929 and 1932, respectively. He then worked as a chemistry instructor at Harvard University under Louis F. Fieser, followed by fi e years with the US Bureau of Mines.

In 1940 Fisher became head of the Organic Acids Section of the new US Department of Agriculture (USDA) Eastern Regional Research Laboratory (ERRL) in Philadelphia (Wyndmoor), Pennsylvania, and, in 1946, the Carbohydrate Research Division of ERRL. In 1950, he was appointed director of the USDA's Southern Regional Research Laboratory (SRRL) in New Orleans, Louisiana, plus six satellite laboratories in the southern United States. During his 22 years with SRRL, the Laboratory (now Center) developed an international reputation for research on the chemistry and processing of southern products such as cotton, cottonseed, peanuts, sugar cane, pine gum, tung oil, and citrus.

By the time Fisher retired from the SRRL, his name had appeared as inventor or co-inventor on 72 patents, including polyacrylates, flame-resistant cotton, wash-wear and durable-press cottons, frozen orange juice, and plasticizers from vegetable oils.

Fisher retired to Roanoke, Virginia, and resumed his association with the College as an adjunct research professor. In 1990 he helped establish a seminar program in the Chemistry Department that brings in about 25 speakers a year to this school of about 2,100 students. He also prodded the Chemistry Department to initiate a student research program and started a fund that pays stipends to students doing summer chemistry research. As Gail Steehler, a faculty member in the department, said, "Student research required instruments, sparked grant activity, and had a positive effect on every aspect of our program." She added, "The Chemistry Department and College as a whole really benefited far more than Hap did from this association. We got a source of inspiration and support." He retired—a second time—from Roanoke College on the occasion of his 100th birthday.

As well as writing patents, Fisher had over 200 publications. Retirement did not stop his interest in chemistry. His last refereed paper in the *Journal of the American Oil Chemists' Society* (*82*:771–773) appeared in 2005, when he was 98 years old.

Fisher is survived by his third wife, Elizabeth, (he outlived his first two wives), a brother, a sister, and many nieces and nephews.

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GEORGE ANTHONY KOPAS

George A. Kopas, owner of Pacific Salad Oil Co. (San Francisco, California, USA), died on May 15, 2011, at the age of 88. He is survived by one son and two grandchildren; his wife, Marian, and another son preceded him in death.

A veteran of World War II, Kopas completed his B.S. in chemistry at the University of California-Berkeley in 1947. He then entered the oil industry with Pacific Vegetable Oil Corp. (PVO; Richmond, California) as an analytical, control, and research chemist. In the early 1950s, PVO undertook to develop a safflower production industry in the United States, and Kopas was an integral part of the effort. Dissension within PVO led in 1968 to the formation of Agricom International, which continued to promote safflower. In 1980 the principal employees of Agricom moved to Oilseeds International, Ltd., where Kopas served as vice president. The history of these events is detailed in *Safflower*, a 1996 publication of AOCS Press by Joseph R. Smith.

Kopas' interest in new oilseeds was not confined to safflower. Under his direction, PVO was an active participant in the first commercial trial run on prepress-solvent extraction of crambe oil (*Journal of the American Oil Chemists' Society 42*:550A–554A, 1965).

Several US patents were granted to Kopas, including one on a process for preparing feed from undecorticated oil-free safflowerseed residue. Another described a method of degumming vegetable oil to produce an improved, degummed oil and gum with improved storage and other properties.

Besides being a 50-year member of AOCS, Kopas was also active in the International Oil Mill Superintendents Assoc.

Stanton

associate director of scientific affairs at ACI. Stanton joined ACI (then the Soaps and Detergents Assoc.) in 2002. Besides her work on green chemistry, she manages global consortia on high production volume chemicals, manages research on the environmental effects of major cleaning product ingredients, and works with the oleochemical industry to promote innovation in new uses of oleochemicals.

Ahmad becomes RSC Fellow

Ahmad

AOCS member **Moghis Ahmad** has been admitted as a Fellow of the Royal Society of Chemistry. He is being recognized for his contributions to chemistry, including research for the improvement and development of products of industrial importance and lipid-based products for drug delivery.

Ahmad currently is vice president at Jina Pharmaceuticals Inc., Libertyville, Illinois, USA. He has been an active member of AOCS for more than 30 years and is the immediate past chairperson of the Phospholipid Division (2009–2011). ■

Book Review

Nonthermal Processing Technologies for Food
Howard Q. Zhang, Gustavo V. Barbosa-Cánovas, V.M. Balasubramaniam, C. Patrick Dunne, Daniel F. Farkas, and James T.C. Yuan (eds.)
Wiley-Blackwell, 2011, 672 pages
ISBN 978-0-8138-1668-5, $279.95

William E. Artz

Several nonthermal process technologies are discussed (high pressure, ultrasound, pulsed and radio-frequency electric fields, oscillating magnetic fields, irradiation, pulsed ultraviolet [UV] light, nonthermal plasma, ozone, chlorine dioxide, supercritical fluid CO_2, electrolyzed oxidizing water, and bacteriocins, as well as combinations of some of the selected processes).

Several chapters discuss the mathematical basis for these processes, but the high-level engineering and mathematical coverage is limited. There is much greater emphasis on the description of these technologies. The text is well referenced, and readers who wish in-depth material on the engineering and mathematical bases for these processes will find the appropriate references cited in the textbook. The text includes the scientific research published on the technology, as well as numerous examples of successful incorporation of this technology in the marketplace.

There are chapters discussing process efficacy; in particular, the microbial reductions and enzyme inactivation that can be achieved with these processes. In addition, the important sensory parameters that drive product acceptance and sales are discussed in several chapters and chapter sections. There are chapters and chapter sections on the costs and business hurdles to implementing and using this technology, along with the concerns of the food industry and suggestions on how to approach this. The research arm of the US military has been a leader in implementing new food technologies, and there is a chapter on this in the text. The chapters written by regulatory agency scientists provide additional and very important contributions to the book, as well. The regulatory scientists have provided insight that will be helpful in terms of process approval and industry implementation.

The text consists of five main sections. The first section, entitled "Physical Processes" and consisting of 10 chapters, focuses primarily on high-pressure processing, and it ends with two chapters on ultrasonic processing. The chapters are generally very well written and are by leading scientists in the field. The number of references for each chapter varies widely, from two to more than 100.

The section begins with two excellent chapters basic concepts of nonthermal physical processing, followed by chapters on commercialization, microbial inactivation, and sensory aspects. There are two excellent ancillary chapters (meat and various case studies), as well.

The second section is entitled "Electromagnetic Processes," which covers pulsed electric fields, radio-frequency electric fields, oscillating magnetic fields, irradiation, pulsed UV light, and nonthermal plasma. Applications for both liquid and solid foods (e.g., meat and vegetables) and their effects on a variety of microbial pathogens are discussed. One subject area emphasized in particular is pulsed electric fields, and there are excellent chapters on processing basics, engineering aspects, equipment design, plus an interesting case study of this technology. The remaining chapters cover newer or perhaps less-studied technologies. The chapters are well referenced, with from 25 to ~100 references.

Section 3 is on other nonthermal processes, with an emphasis on reactive chemicals—including ozone, chlorine dioxide, electrolyzed oxidizing water, and dense phase carbon dioxide—that have various efficacies in terms of microbial inactivation. Ozone, which has been studied extensively, is covered well in three separate chapters with more than 100 references. Although the other topics are covered much more briefly, a nice introduction to the respective topics is provided in those chapters.

Section 4 is short, covering combination processes, such as combinations of novel technologies, the use of bacteriocins, and antimicrobial packaging. The chapters are well referenced, with 35 to more than 200 references.

"Driving Forces," the final section, is very interesting. The authors of the chapters provide excellent discussion on topics that are often only superficially considered by the scientific community that is developing new processing technologies, but these topics are of critical importance to the food processing industry and must be considered in depth for the processes that can be implemented commercially. These forces include topics such as consumer perceptions of the new technologies, sensory issues, nutritional implications of the product composition, industrial evaluation methodologies, technology transfer, risk management, and regulatory perspectives. It is a great addition to the textbook.

The book would be a good text for an advanced food processing course. It should be in the library of any food processing company considering the use of any new processing technology. It is also recommended for those beginning or involved in research on advanced food processing technologies. There are approximately 75 contributing authors, so the majority of experts actively involved in this subject area are represented in the text.

William Artz is a faculty member at the University of Illinois at Urbana-Champaign (USA) with approximately 25 years of experience in lipid chemistry and lipid analysis research. He can be reached at wartz@illinois.edu.

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Extracts & Distillates

Antioxidants in foods: state of the science important to the food industry

Finley, J.W., *et al.*, *J. Agric. Food Chem. 59*:6837–6846, 2011.

Antioxidant foods and ingredients are an important component of the food industry. In the past, antioxidants were used primarily to control oxidation and retard spoilage, but today many are used because of putative health benefits. However, the traditional message that oxidative stress, which involves the production of reactive oxygen species (ROS), is the basis for chronic diseases and aging is being reexamined. Accumulating evidence suggests that ROS exert essential metabolic functions and that removal of too many ROS can upset cell signaling pathways and actually increase the risk of chronic disease. It is imperative that the food industry be aware of progress in this field to present the science relative to foods in a forthright and clear manner. This may mean reexamining the health implications of adding large amounts of antioxidants to foods.

Replacing fossil oil with fresh oil—with what and for what?

Carlsson, A S., *et al.*, *Eur. J. Lipid Sci. Technol. 113*:812–831, 2011.

Industrial chemicals and materials are currently derived mainly from fossil-based raw materials, which are declining in availability, increasing in price, and are a major source of undesirable greenhouse gas emissions. Plant oils have the potential to provide functionally equivalent, renewable, and environmentally friendly replacements for these finite fossil-based raw materials, provided that their composition can be matched to end-use requirements and that they can be produced on sufficient scale to meet current and growing industrial demands. Replacement of 40% of the fossil oil used in the chemical industry with renewable plant oils, while ensuring that growing demand for food oils is also met, will require a trebling of global plant oil production from current levels of around 139 million metric tons (MT) to over 400 MT annually. Realization of this potential will rely on application of plant biotechnology to (i) tailor plant oils to have high purity (preferably >90%) of single desirable fatty acids, (ii) introduce unusual fatty acids that have specialty end-use functionalities, and (iii) increase plant oil production capacity by increased oil content in current oil crops, and conversion of other high biomass crops into oil-accumulating crops. This review outlines recent progress and future challenges in each of these areas.

Hydroxy fatty acid synthesis and lipid gene expression during seed development in *Lesquerella fendleri*

Chen, G.Q., J. Lin, and C. Lub, *Ind. Crops Prod. 34*:1286–1292, 2011.

Lesquerella fendleri is a developing oilseed crop in the United States. The seed oil of *L. fendleri* is rich in lesquerolic acid (14-hydroxy-eicos-*cis*-11-enoic acid: 20:1OH), a hydroxy fatty acid (HFA) with potential uses in industrial materials. Although the synthesis pathway of HFA is extensively studied, the regulatory mechanism underlying synthesis and accumulation of 20:1OH is largely unknown. In this study, we investigated the fatty acid composition and lipid gene expression pattern in developing seeds of *L. fendleri*, from 7 days after pollination (DAP) to desiccation (49 DAP). The results showed that accumulation of 20:1OH started at 21 DAP, increased quickly between 21 and 35 DAP and reached a plateau, about 50–55% of total lipids, at 35–49 DAP. In addition, two other HFA, ricinoleic (12-hydroxy-octadec-*cis*-9-enoic acid: 18:1OH) and auricolic (14-hydroxy-eicos-*cis*-11,17-enoic acid: 20:2OH) acids, were present at low levels during various stages of seed development. Ricinoleic acid could be detected as early as 14 DAP whereas 20:2OH began to accumulate at 21 DAP or later. Using real-time polymerase chain reaction, we quantified the transcript level of three lipid genes: LFAH12 (bifunctional oleate 12-hydroxylase:desaturase), LfKCS3 (3-keto-acyl-CoA synthase), and LfFen1 (oleate 12-desaturase). While all of these genes displayed a bell-shaped expression pattern with a peak at 35 DAP and a sharp decline at 42–49 DAP, they had different expression levels during early seed development and maximum inductions. Based on the defined time course of seed development, the relationship between gene expression and HFA accumulation is discussed.

On the future of "omics:" lipidomics

Griffiths, W.J., *et al.*, *J. Inher. Metab. Dis. 34*:583–592, 2011.

Following in the wake of the genomic and proteomic revolutions, new fields of "omics" research are emerging. The metabolome provides the natural complement to the genome and proteome; however, the extreme physicochemical diversity of the metabolome leads to a subdivision of metabolites into compounds soluble in aqueous solutions or those soluble in organic solvents. A complete molecular and quantitative investigation of the latter when isolated from tissue, fluid, or cells constitutes lipidomics. Like proteomics, lipidomics is a subject that is both technology driven and technology driving, with the primary technologies being mass spectrometry, with or without on-line chromatography, and computer-assisted data analysis. In this paper we will examine the underlying fundamentals of different lipidomic experimental approaches including the "shotgun" and "top-down" global approaches, and the more targeted liquid chromatography– or gas chromatography–mass spectrometry approaches. Application of these approaches to the identification of in-born errors of metabolism will be discussed.

A new high-performance liquid chromatographic method with evaporative light scattering detector for the analysis of phospholipids. Application to Iberian pig subcutaneous fat

Narvaez-Rivas, M., *et al.*, *J. Chromatogr. A 1218*:3453–3458, 2011.

A new method for the analysis of phospholipids by normal-phase high-pressure liquid chromatography (HPLC) using a silica column is described. Addition of ammonia and triethylamine to a gradient based on chloroform/methanol/water promoted a good and rapid separation of phospholipid classes (20 min run). The use of an evaporative light-scattering detector permitted an accurate analysis of a mixture of phospholipids. Calibration curves were linear within different range for each phospholipid class. The limit of detection and limit of quantification obtained were below 0.03 and 0.05 mg kg^{-1} for all cases, respectively. Besides, a new method for the separation of phospholipids from total lipids before HPLC analysis by a solid-phase extraction (SPE) with Si cartridges has been developed. This

methodology gave a good recovery ranging from 97 to 117%. The method was validated with a standard mixture of phospholipids. This method has been applied to characterize the phospholipid fraction of subcutaneous fat from Iberian pig. Cardiolipin, phosphatidylethanolamine, phosphatidylinositol, phosphatidylserine, phosphatidylcholine, and sphingomyelin have been described for first time in these samples. The fatty acid composition of the different phospholipid classes and their HPLC electrospray ionization mass spectrometry have been used for characterizing the molecular species present in each one.

An ultraperformance liquid chromatography method for the normal-phase separation of lipids

McLaren, D.G., *et al., Anal. Biochem. 414*:266–272, 2011.

An ultraperformance liquid chromatography method using normal-phase solvents, a silica column, and evaporative light-scattering detection is presented. The method is based on a quaternary gradient profile and is capable of resolving the major neutral and polar lipids present in plasma and animal tissue in under 5 min., with a total cycle time of 11 min. Limits of quantification for seven different lipid classes were on the order of 200 ng of material on column, which enables an accurate analysis from as little as 20 μL of plasma or 50 mg of tissue for typical samples. Intraday and interday precision for the determination of the major lipid classes in human plasma ranged from 3.6 to 10.5% coefficient of variation with a variability in retention time of less than 6%. The utility of the method is demonstrated through the separation and quantification of lipids in mouse plasma, liver, and heart tissue.

Role of lipid rafts in liver health and disease

Dolganiuc, A., *World J. Gastroenterol. 17*:2520–2535, 2011.

Liver diseases are an increasingly common cause of morbidity and mortality. New approaches for investigation of mechanisms of liver diseases and identification of therapeutic targets are emergent. Lipid rafts (LRs) are specialized domains of cellular membranes that are enriched in saturated lipids. They are small, mobile, and are key components of cellular architecture, protein partition to cellular membranes, and signaling events. LRs have been identified in the membranes of all liver cells, parenchymal and non-parenchymal. More importantly, LRs are active participants in multiple physiological and pathological conditions in individual types of liver cells. This article aims to review experimentally based evidence with regard to LRs in the liver, from the perspective of the liver as a whole organ composed of a multitude of cell types. We have gathered up-to-date information related to the role of LRs in individual types of liver cells, in liver health and diseases, and identified the possibilities of LR-dependent therapeutic targets in liver diseases.

The role of lipid droplets in metabolic disease in rodents and humans

Greenberg, A.S., *et al., J. Clin. Invest. 121*:2102–2110, 2011.

Lipid droplets (LDs) are intracellular organelles that store neutral lipids within cells. Over the last two decades there has been a dramatic growth in our understanding of LD biology and, in parallel, our understanding of the role of LDs in health and disease. In its simplest form, the LD regulates the storage and hydrolysis of neutral lipids, including triacylglycerol and/or cholesterol esters. It is becoming increasingly evident that alterations in the regulation of LD physiology and metabolism influence the risk of developing metabolic diseases such as diabetes. In this review we provide an update on the role of LD-associated proteins and LDs in metabolic disease.

Sphingolipids: agents provocateurs in the pathogenesis of insulin resistance

Lipina, C., and H.S. Hundal, *Diabetologia 54*:1596–1607, 2011.

Obesity is a major risk factor for a variety of chronic diseases, including diabetes mellitus, and comorbidities such as cardiovascular disorders. Despite recommended alterations in lifestyle, including physical activity and energy restriction, being the foundation of any anti-obesity therapy, this approach has so far proved to be of little success in tackling this major public health concern. Because of this, alternative means of tackling this problem are currently being investigated, including pharmacotherapeutic intervention. Consequently, much attention has been directed toward elucidating the molecular mechanisms underlying the development of insulin resistance. This review discusses some of these potential mechanisms, with particular focus on the involvement of the sphingolipid ceramide. Various factors associated with obesity, such as saturated fatty acids and inflammatory cytokines, promote the synthesis of ceramide and other intermediates. Furthermore, studies performed in cultured cells and *in vivo* associate these sphingolipids with impaired insulin action. In light of this, we provide an account of the research investigating how pharmacological inhibition or genetic manipulation of enzymes involved in regulating sphingolipid synthesis can attenuate the insulin-desensitizing effects of these obesity-related factors. By doing so, we outline potential therapeutic targets that may prove useful in the treatment of metabolic disorders.

Human tear fluid lipidome: from composition to function

Rantamaki, A.H., *et al., PLoS One 6*:e19553, 2011.

We have explored human aqueous tear fluid lipidome with an emphasis to identify the major lipids. We also address the physiological significance of the lipidome. The tears were analyzed using thin-layer chromatographic, enzymatic, and mass spectrometric techniques. To emphasize the physiological aspect of the lipidome, we modeled the spreading of the nonpolar tear fluid lipids at air-water interface in macroscopic scale with olive oil and egg yolk phosphatidylcholine. Based on enzymatic analysis, the respective concentrations of choline-containing lipids, triglycerides, and cholesteryl esters were 48 ± 14, 10 ± 0, and 21 ± 18 μM. Ultra-performance liquid chromatography quadrupole time-of-flight mass spectrometry analysis showed that phosphatidylcholine and phosphatidylethanolamine were the two most common polar lipids comprising 88 ± 6% of all identified lipids. Triglycerides were the only nonpolar lipids detected in mass spectrometric analysis, i.e., no cholesteryl or wax esters were identified. The spreading experiments show that the presence of polar lipids is an absolute necessity for a proper spreading of nonpolar tear fluid lipids. We provide evidence that polar lipids are the most common lipid species. Furthermore, we provide a physiological rationale for the observed lipid composition. The results open insights into the functional role of lipids in the tear fluid and also aid in providing new means to understand and treat diseases of the ocular surface.

A sensitive and specific LC-MS/MS method for rapid diagnosis of Niemann-Pick C1 disease from human plasma

Jiang, X.T., *et al.*, *J. Lipid Res.* *52*:1435–1445, 2011.

Niemann-Pick type C1 (NPC1) disease is a rare, progressively fatal neurodegenerative disease for which there are no FDA (US Food and Drug Administration)-approved therapies. A major barrier to developing new therapies for this disorder has been the lack of a sensitive and noninvasive diagnostic test. Recently, we demonstrated that two cholesterol oxidation products, specifically cholestane-3β,5α,6β-triol (3β,5α,6β-triol) and 7-ketocholesterol (7-KC), were markedly increased in the plasma of human NPC1 subjects, suggesting a role for these oxysterols in diagnosis of NPC1 disease and evaluation of therapeutics in clinical trials. In the present study, we describe the development of a sensitive and specific LC-MS/MS [liquid chromatography-tandem mass spectroscopy] method for quantifying 3β,5α,6β-triol and 7-KC human plasma after derivatization with N,N-dimethylglycine. We show that dimethylglycine derivatization successfully enhanced the ionization and fragmentation of 3β,5α,6β-triol and 7-KC for mass spectrometric detection of the oxysterol species in human plasma. The oxysterol dimethylglycinates were resolved with high sensitivity and selectivity, and enabled accurate quantification of 3β,5α,6β-triol and 7-KC concentrations in human plasma. The LC-MS/MS assay was able to discriminate with high sensitivity and specificity between control and NPC1 subjects, and offers for the first time a noninvasive, rapid, and highly sensitive method for diagnosis of NPC1 disease.

Comparative lipidomics profiling of human atherosclerotic plaques

Stegemann, C., *et al.*, *Circ. Cardiovasc. Genet.* *4*:232–242, 2011.

Background: We sought to perform a systematic lipid analysis of atherosclerotic plaques using emerging mass spectrometry techniques. Methods and Results: A chip-based robotic nanoelectrospray platform interfaced to a triple quadrupole mass spectrometer was adapted to analyze lipids in tissue sections and extracts from human endarterectomy specimens by shotgun lipidomics. Eighteen scans for different lipid classes

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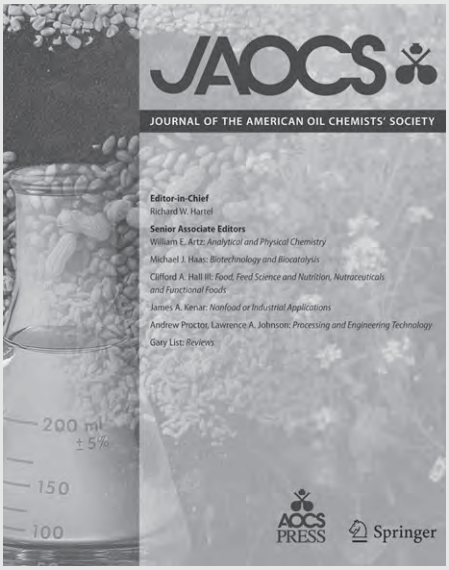

Journal of the American Oil Chemists' Society (August)

- Crystallization of fats: influence of minor components and additives (review), Smith, K.W., K. Bhaggan, G. Talbot, and K.F. van Malssen
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- Crystallization and polymorphism of 1,3-acyl-palmitoyl-*rac*-glycerols, Craven, R.J., and R.W. Lencki
- Binary phase behavior of diacid 1,3-diacylglycerols, Craven, R.J., and R.W. Lencki
- Changes in the content of phenolic compounds in flaxseed oil during development, Herchi, W., F. Sakouhi, D. Arráez-Román, A. Segura-Carretero, S. Boukhchina, H. Kallel, and A. Fernández-Gutierrez
- Bidirectional conversion between 3-monochloro-1,2-propanediol and glycidol in course of the procedure of DGF standard methods, Kaze, N., H. Sato, H. Yamamoto, and Y. Watanabe
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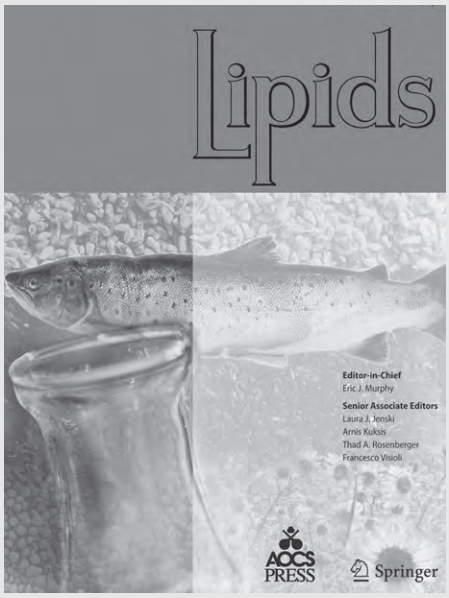
- Purification of stearidonic acid from modified soybean oil by argentation silica gel column chromatography, Kleiner-Shuhler, L., L. Vázquez, and C.C. Akoh
- Release of omega-3 fatty acids by the hydrolysis of fish oil catalyzed by lipases immobilized on hydrophobic supports, Fernández-Lorente, G., L. Betancor, A.V. Carrascosa, and J.M. Guisán
- Investigating some physicochemical properties and fatty acid composition of native black mulberry (*Morus nigra* L.) seed oil, Gecgel, U., S.D. Velioglu, and H M. Velioglu
- Extraction of fatty acids from *Boletus edulis* by subcritical and supercritical carbon dioxide, Vidović, S., I. Mujić, Z. Zeković, Ž. Lepojević, S. Milošević, and S. Jokić
- Oxidative stability of cashew oils from raw and roasted nuts, Chandrasekara, N., and F. Shahidi
- Substrate pretreatment can reduce the alcohol requirement during biodiesel production via *in situ* transesterification, Haas, M.J., and K.M. Wagner
- Synthesis and characterization of corn oil polyhydroxy fatty acids designed as additive agent for many applications, Harry-O'kuru, R.E., A. Mohamed, J. Xu, and B.K. Sharma
- Effect of extended surfactant structure on interfacial tension and microemulsion formation with triglycerides, Phan, T.T., C. Attaphong, and D.A. Sabatini
- Epoxidizable fatty amide–phenol conjugates, Zerkowski, J.A., and M.J. Haas
- Preparation of fat-liquor based on jojoba oil under phase transfer catalysis, Nashy, E.-S.H.A., M.G. Megahed, and M.A. Abd EL-Ghaffar
- Regeneration and reutilization of oil-laden spent bleaching clay via in situ transesterification and calcination, Boey, P., S. Ganesan, and G.P. Maniam
- Performance of nanofiltration membranes for solvent purification in the oil industry, Darvishmanesh, S., T. Robberecht, P. Luis, J. Degrève, and B. Van der Bruggen
- Phase equilibrium measurements of sacha inchi oil (*Plukenetia volubilis*) and CO_2 at high pressures, do Prado, I.M., W.M. Giufrida, V.H. Alvarez, V.F. Cabral, S. Quispe-Condori, M.D.A. Saldaña, and L. Cardozo-Filho

- Comments on the use of fatty acid methyl esters of linseed and castor oil as biodiesel, Iyer, R.

Lipids (August)

- Increased elongase 6 and Δ9-desaturase activity are associated with n-7 and n-9 fatty acid changes in cystic fibrosis, Thomsen, K.F., M. Laposata, S.W. Njoroge, O.C. Umunakwe, W. Katrangi, and A.C. Seegmiller
- Tetradecylthioacetic acid increases hepatic mitochondrial β-oxidation and alters fatty acid composition in a mouse model of chronic inflammation, Burri, L., B. Bjørndal, H. Wergedahl, K. Berge, P. Bohov, A. Svardal, and R.K. Berge
- Identification of diacylglycerol acyltransferase inhibitors from *Rosa centifolia* petals, Kondo, H., K. Hashizume, Y. Shibuya, T. Hase, and T. Murase
- Glycosidic bond cleavage is not required for phytosteryl glycoside-induced reduction of cholesterol absorption in mice, Lin, X., L. Ma, R.A. Moreau, and R.E. Ostlund
- Is the fatty acid composition of freshwater zoobenthic invertebrates controlled by phylogenetic or trophic factors? Makhutova, O.N., N.N. Sushchik, M.I. Gladyshev, A.V. Ageev, E.G. Pryanichnikova, and G.S. Kalachova
- Characteristics of fatty acid composition of the deep-sea vent crab, *Shinkaia crosnieri* Baba and Williams, Saito, H.
- Dietary fish oil supplements increase tissue n-3 fatty acid composition and expression of delta-6 desaturase and elongase-2 in jade tiger hybrid abalone, Mateos, H.T., P.A. Lewandowski , and X.Q. Su
- Development of a fish cell culture model to investigate the impact of fish oil replacement on lipid peroxidation, Gregory, M.K., H.W. King, P.A. Bain, R.A. Gibson, D.R. Tocher, and K.A. Schuller
- Hydrophilic interaction liquid chromatography: ESI–MS/MS of plasmalogen phospholipids from *Pectinatus* bacterium, Řezanka, T., L. Siristova, D. Matoulková , and K. Sigler
- Non-polar lipid components of human cerumen, Stránský, K., I. Valterová, E. Kofroňová, K. Urbanová, M. Zarevúcka, and Z. Wimmer



- Dietary guar gum reduces lymph flow and diminishes lipid transport in thoracic duct-cannulated rats, Shirouchi, B., S. Kawamura, R. Matsuoka, S. Baba, K. Nagata, S. Shiratake, H. Tomoyori, K. Imaizumi, and M. Sato

plus additional scans for fatty acids resulted in the detection of 150 lipid species from 9 different classes of which 24 were detected in endarterectomies only. Further analyses focused on plaques from symptomatic and asymptomatic patients and stable vs. unstable regions within the same lesion. Polyunsaturated cholesteryl esters with long-chain fatty acids and certain sphingomyelin species showed the greatest relative enrichment in plaques compared to plasma and formed part of a lipid signature for vulnerable and stable plaque areas in a systems-wide network analysis. In principal component analyses, the combination of lipid species across different classes provided a better separation of stable and unstable areas than individual lipid classes. Conclusions: This comprehensive analysis of plaque lipids demonstrates the potential of lipidomics for unraveling the lipid heterogeneity within atherosclerotic lesions.

Biodiesel production with microalgae as feedstock: from strains to biodiesel

Gong, Y.M., and M.L. Jiang, *Biotechnol. Letts.* 33:12691284, 2011.

Due to negative environmental influence and limited availability, petroleum-derived fuels need to be replaced by renewable biofuels. Biodiesel has attracted intensive attention as an important biofuel. Microalgae have numerous advantages for biodiesel production over many terrestrial plants. There are a series of consecutive processes for biodiesel production with microalgae as feedstock, including selection of adequate microalgal strains, mass culture, cell harvesting, oil extraction, and transesterification. To reduce the overall production cost, technology development and process optimization are necessary. Genetic engineering also plays an important role in manipulating lipid biosynthesis in microalgae. Many approaches, such as sequestering carbon dioxide from industrial plants for the carbon source, using wastewater for the nutrient supply, and maximizing the values of by-products, have shown a potential for cost reduction. This review provides a brief overview of the process of biodiesel production with microalgae as feedstock. The methods associated with this process (e.g., lipid determination, mass culture, oil extraction) are also compared and discussed. ■

Patents

Published Patents

Aqueous polyurethane dispersions made from hydroxymethyl containing polyester polyols derived from fatty acids

Bhattacharjee, D., *et al.*, Dow Global Technologies LLC, US7928161, April 19, 2011

Polymer dispersions are prepared by reaction of a polyisocyanate and a hydroxylmethyl containing polyester polyol derived from a fatty acid to form a prepolymer, dispersing the prepolymer in an aqueous phase and then curing the prepolymer to form solid particle particles. The prepolymers can be prepared having isocyanate, hydroxyl, or a variety of other reactive functional groups. The dispersions are useful in a variety of coating, sealant, adhesive and elastomer applications.

Methods for improving low-temperature properties of biodiesel fuel

Roby, S.H., and G. Zhou, Chevron USA Inc., US7931703, April 26, 2011

The present invention is generally directed to novel biodiesel fuel compositions having enhanced low-temperature properties. The present invention is additionally directed to methods (i.e., processes) for making such enhanced biodiesel fuels by improving the low-temperature properties of ester-based biodiesel fuels via *in situ* enhancement and/or additive enhancement.

Pesticidal/ovicidal composition and pesticidal/ovicidal method

Arimoto, Y., Riken, US7931911, April 26, 2011

A pesticidal/ovicidal composition comprising: (i) 50–97.9 parts by mass of a triglyceride containing not less than 50% of oleic acid as a fatty acid component; (ii) 0.1–20 parts by mass of a cationic surface active agent; and (iii) 2–30 parts by mass of a glycerin derivative, and a pesticidal/ovicidal method using the same. The composition according to the invention has not only a pesticidal activity but also an ovicidal activity on crop pests, and provides a safe and high pesticidal/ovicidal effect.

Polypeptide having Δ5 desaturating activity, polynucleotide coding for the polypeptide, and use thereof

Fukuzawa, H., *et al.*, Suntory Holdings Limited, US7928294, April 19, 2011

The present invention relates to a polypeptide having a Δ5 fatty acid desaturation activity and a polynucleotide encoding the polypeptide as well as use thereof. For example, the present invention relates to a polypeptide, comprising (i) the amino acid sequence represented by SEQ ID NO: 2; or (ii) the amino acid sequence in which one or more amino acids are substituted, deleted, inserted, or added in the amino acid sequence represented by SEQ ID NO: 2, and having the Δ5 fatty acid desaturation activity; an antibody capable of binding to this polypeptide; a polynucleotide encoding the polypeptide; a vector comprising this polynucleotide; a cell or transformant introduced with the polynucleotide; a method of producing a fatty acid using the cell, and so on.

Liquid developer and image forming apparatus

Akioka, K., and K. Ikuma, Seiko Epson Corp., US7932009, April 26, 2011

A liquid developer includes toner particles formed of a resin material and a coloring agent, and an insulation liquid in which the toner particles are dispersed, the insulation liquid containing ester-exchange oil obtained by an ester-exchange reaction of linseed oil and at least one of semidrying oil and nondrying oil. It is preferred that the insulation liquid further contains fatty acid monoester. Further, it is preferred that the amount of the fatty acid monoester contained in the insulation liquid is in the range of 5 to 50 wt%.

High eicosapentaenoic acid producing strains of *Yarrowia lipolytica*

Damude, H.G., *et al.*, E.I. du Pont de Nemours and Co., US7932077, April 26, 2011

Engineered strains of the oleaginous yeast *Yarrowia lipolytica* capable of producing greater than 25% eicosapentaenoic acid (EPA; an ω-3 polyunsaturated fatty acid) in the total oil fraction are described. These strains comprise various chimeric genes expressing heterologous desaturases, elongases, and acyltransferases and optionally comprise various native desaturase and acyltransferase knockouts to enable synthesis and high accumulation of EPA. Production host cells are claimed, as are methods for producing EPA within said host cells.

Aqueous compositions with polyvalent metal ions and dispersed polymers

Eichman, H.J., and A.W. Kohr, Rohm and Haas Co., US7932313, April 26, 2011

There is provided a composition comprising (i) at least one aqueous polymer dispersion, wherein said polymer is formed from a monomer mix comprising one or more carboxylic acid functional monomers; (ii) at least one swelling agent; and (iii) at least one polyvalent metal ion; wherein said composition is formed by a process comprising the step of forming a preliminary admixture of said dispersion (i) with some or all of said swelling agent (ii), wherein the ratio of equivalents of polyvalent metal ions in said preliminary admixture to equivalents of carboxylic acid functional groups in said preliminary admixture is 0.25 or less.

Plant cyclopropane fatty acid synthase genes, proteins, and uses thereof

Bao, X., *et al.*, Board of Trustees of Michigan State University, US7932433, April 26, 2011

Cyclopropane fatty acid synthase genes and polypeptides are described. Plants are transformed with such genes to produce such polypeptides.

Method for reducing free fatty acid content of biodiesel feedstock

Kozyuk, O.V., and M. Brett, Arisdyne Systems, Inc., US7935157, May 3, 2011

A method comprising applying controlled flow cavitation apparatuses and holding tanks to a pretreatment process in order to reduce the free fatty acid content of a biodiesel feedstock. A feedstock comprising a high content of free fatty acids can be passed through controlled flow cavitation apparatuses and holding tanks at a velocity capable of generating hydrodynamic cavitation zones and subsequent dwell times where the free fatty acid content can be reduced to below 2%.

Papermaking method using one or more quaternized dialkanolamine fatty acid ester compounds to control opacity and paper product made thereby

Brogdon, B.N., *et al.*, Kemira Chemicals, Inc., US7935222, May 3, 2011

A method for making an opacity relevant grade paper or paperboard product, such as a communication type paper used for printing and writing applications, utilizes an effective amount of quaternized alkanolamine fatty acid ester compounds as an opacification aid to control the optical properties of the paper or paperboard product as a wet-end additive to a papermaking operation. Using the quaternized alkanolamine fatty acid ester compound can improve the opacity of the paper or paperboard product, maintain the opacity of the paper while reducing the use of other opacification aids, such as inorganic fillers and/or pigments, and allow for a reduction in paper grammage without a compromise in opacity. The improvements in paper optical properties are achieved without adversely affecting other characteristics of the paper product such as bulk value, tensile strength, tear index, and the like.

Method of effecting lysis of acid-fast bacteria and method of performing gene amplification or detection therewith

Kamata, T., and Y. Izumizawa, ARKRAY, Inc., US7935483, May 3, 2011

A method of effecting lysis of acid-fast bacteria, comprising heating acid-fast bacteria in a liquid containing a nonionic surfactant at a temperature of below the boiling point of the liquid. This method enables accomplishing secure lysis of acid-fast bacteria in a simple manner within a short period of time without the use of

special apparatus and agent and enables extracting genes. The heating is preferably conducted at 96°C for 10 min. As the nonionic surfactant, use can be made of a d-sorbitol fatty acid ester, a polyoxyethylene glycol sorbitan alkyl ester, a polyoxyethylene glycol *p-t*-octylphenyl ether or the like. The pH value of the liquid is preferably 8, and the liquid preferably contains EDTA [ethylenediamine tetraacetic acid]. It is also preferred that before the heating, the acid-fast bacteria be treated with lipase.

Polymer binder for electrochemical device comprising multiply stacked electrochemical cells

Kim, B.Y., *et al.*, LG Chem, Ltd., US7935442, May 3, 2011

Disclosed is an electrochemical device which comprises: (I) a binder comprising polymer particles obtained from the polymerization of: (i) 20–70 parts by weight of a (meth)acrylic acid ester monomer; (ii) 20–60 parts by weight of a vinyl monomer; and (iii) 0.01–30 parts by weight of an unsaturated carboxylic acid monomer based on 100 parts by weight of a binder polymer; and (II) electrochemical cells stacked multiply by using the binder wherein the binder allows electrode active material particles in an electrode to be fixed and interconnected among themselves and between the electrode active material and a collector and the electrode and a separator that is in contact with the electrode are bonded to each other by way of hot fusion. The binder is also disclosed. The binder has excellent adhesion and thermal bonding characteristics and thus is useful for an electrochemical device comprising multiply stacked electrochemical cells and can improve the overall quality of a battery.

Non-corrosive cleaning compositions for removing etch residues

Leon, V.G., *et al.*, Fujifilm Electronic Materials USA, Inc., US7935665, May 3, 2011

A non-corrosive cleaning composition that is aqueous-based, non-hazardous and will not harm the environment and is useful primarily for removing both fresh and aged plasma etch residues from a substrate. The composition comprises (i) water; and (ii) a synergistic combination of at least one tricarboxylic acid and at least one carboxylic acid. Preferably, at least one carboxylic acid has a pK_a value ranging from 3 to 6. Also, a method for removing etch residues from a substrate. The method includes the steps of (i) providing a substrate with etch residue; and (ii) contacting the substrate with a cleaning composition comprising water; and a synergistic combination of at least one tricarboxylic acid and at least one carboxylic acid.

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.

Fuzzy canola

J.K. (Jim) Daun

J.K. (Jim) Daun has been involved with canola/rapeseed for decades and told all about it in a lecture at the 102nd AOCS Annual Meeting & Expo, May 1–4, 2011, in Cincinnati, Ohio, USA. There, he became the 51st recipient of the Alton E. Bailey Award, given first by the AOCS North Central Section in 1959 and now granted by the USA Section.

In the late 1930s, rapeseed was about the only oilseed aside from flax that would grow on the northern Canadian prairies. Bert Craig, former head of the National Research Council's (NRC) Prairie Regional Laboratory and a father of the Canadian rapeseed industry, said: "The only trouble with the crop was the oil was no good and the meal was no good." Canada's entry into World War II in 1939, however, gave this unpromising crop a boost as the oil from this seed was needed because its high levels of erucic acid made it ideal as a lubricant for steam engines, not only on the railways but also in Canada's rapidly growing Navy.

The limited production during the war continued afterward, with product being processed at two retrofitted soybean plants in southern Manitoba and central Saskatchewan. Increases in production were slow but steady, and by 1970, almost 1 million metric tons were being produced. The oil was used in salad oils, shortenings, and margarines, but at just about that time, researchers, based on some early nutritional studies with rats, began to question whether high levels of erucic acid in edible oils were safe. In addition, rapeseed meal, although a good source of protein for animal feed, had high levels of glucosinolates—compounds that hydrolyze on ingestion to form antinutritional compounds—which hampered the use of rapeseed meal in animal rations.

During the 1950s and 1960s, researchers at Agriculture Canada (now Agriculture and Agri-Food Canada; AAFC) and NRC laboratories in Saskatoon worked on the rapeseed problem. NRC researchers, under the direction of Bert Craig, carried out pioneering work in the area of gas chromatography and developed methods for rapidly testing rapeseeds for erucic acid. They also developed reasonably rapid methods for determining glucosinolates. AAFC researchers, under the direction of Keith Downey, studied the genetics of erucic acid inheritance and found lines of rapeseed with low levels of erucic acid. A functional variety was released in 1968. At the same time, Jan Krzymanski, a visiting scientist from Poland at the Saskatoon laboratory, found a line of rapeseed in his collection that had low levels of glucosinolates.

Therefore, when erucic acid was recognized as being nutritionally undesirable at the International Rapeseed Congress held at Ste-Adèle, Québec, in 1970, researchers were ready to move to lines of low-erucic acid rapeseed (LEAR). This exciting period in the history of canola occurred just as I was starting my M.Sc. degree in the rapeseed research laboratory at the University of Manitoba.

The conversion to LEAR took place relatively smoothly, beginning in 1972 (Fig. 1). At the same time, a race was started to see who would produce the first agronomically suitable double-low rapeseed (i.e., low in both glucosinolates and erucic acid). Researchers at the University of Manitoba, under the direction of Baldur Stefansson, won the race in 1975 with the release and registration of the first double-low rapeseed, *Brassica napus* (Tower).

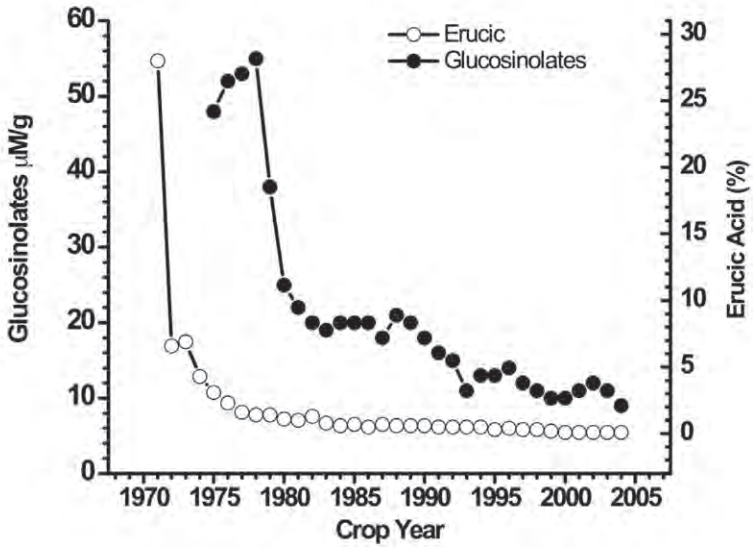


FIG. 1. *Average levels of glucosinolates and erucic acid in Canadian canola and rapeseed crops, 1971–2010.*

Since rapeseed cultivation in Canada at the time included approximately equal proportions of *B. napus* and *B. rapa*, it was not possible to complete the conversion to double-low until a double-low type of *B. rapa* was developed. In 1980, researchers from the AAFC laboratory in Saskatoon released the first double-low *B. rapa* variety (Candle), and the conversion to double-zero was completed by about 1982 (Fig. 1).

The Canadian oilseed industry then met and decided the commodity needed a new name, and came up with "canola." The name was copyright-protected because the industry did not want to repeat the problem that arose when the name Canbra was proposed for low-erucic acid rapeseed oil. Unfortunately, one of the Canadian processors changed its name to Canbra, making it difficult for other processors. Low-erucic acid oil is still sometimes referred to as canbra oil, especially in Europe.

Canola was quickly accepted as a name for the new commodity, especially in Canada, Japan, the United States, and Australia. Europe was slower to develop both LEAR and double-zero varieties as it is not possible there to produce more than one cycle of the predominant winter type per year in breeding programs, whereas two or even three cycles of spring-type crops can be grown. There is still some resistance to adopting the designation "canola" in Europe.

What is canola?

But just what is canola, other than the second-most produced oilseed in the world?

I took the title for this talk from the mathematical term "fuzzy logic," meaning reasoning that is approximate rather than precisely deduced. While this is not strictly applicable here, it is a useful analogy. Canola is complex and just what it is may, on occasion, be open to question.

The fuzziness starts right at the species level. While most oilseeds are drawn from a single species, both rapeseed and its offspring, canola, come from many species. Canola, at present, is restricted to two species—*B. napus* and *B. rapa*—although canola-quality *B. juncea* is in commercial production and there have been significant advances in the development of canola-quality *Sinapis alba* and *B. carinata*.

Information surrounding the name canola is also fuzzy. Wikipedia, in an otherwise useful article, states that the word "canola" was derived in 1978 from "Canadian oil, low acid." This is untrue. The word canola has no hidden meaning except possibly "Canadian Oil." The origin of the word obviously was influenced by "Mazola," the ACH Foods brand name for corn (maize) oil. Canola was registered as a trademark in 1978 by the Western Canadian Oilseed Crushers' Association. Control of the term was transferred in 1980 to the Rapeseed Association of Canada, which changed its name to the Canola Council of Canada the same year.

There is even fuzziness about the nutritional properties of canola oil and meal. Rapeseed oil with very high levels of erucic acid has been used as a food in Asia for at least 4,000 years and in Europe for at least 500 years. Concern about the nutritional action of erucic acid started with findings in the early 1950s by a Canadian scientist, Ken Carroll. After further concerns about erucic acid and heart health in 1970—coupled with the greatly increased use of rapeseed oil in Canada—the Canadian industry was able to move to low-erucic acid lines quickly. The fuzziness continued with Health Canada's ongoing concern about the safety of the new oil. The concerns were set to rest in the late 1970s when it was established that the line of rats studied was more to blame than the oil. This research was integral in the documentation presented to the US Food and Drug Administration (FDA) in order to gain Generally Recognized As Safe status for canola oil.

Once it was accepted in the United States, canola oil went on to become a nutritional star. The low level of saturated fat, coupled with a high level of oleic acid and a favorable ratio of linoleic to α-linolenic acid, led the American Heart Association and the American Dietetic Association to recommend canola oil as a healthful oil in the 1980s. In 2006, the FDA ruled that canola oil was eligible to bear a qualified health claim regarding its ability to reduce the risk of cardiovascular disease.

Despite this, the Internet continues to provide misleading information about the safety of canola oil. Snopes.com offers an email that has been circulating since 2001. Among the "facts" cited are:

- Rapeseed oil is poisonous to living things and is an excellent insect repellent.
- When rapeseed oil was removed from animal feed, scrapie and mad cow disease (bovine spongiform encephalopathy) disappeared.

The glucosinolate challenge

When the decision to remove glucosinolates from canola was made, scientists believed there were only a few aliphatic-based glucosinolates in the seed. The most predominant of these was progoitrin, whose

isothiocyanate hydrolysis product rapidly cyclized to form an oxidolidenethione, a potent antithyroid agent.

One of the more exciting periods of my career came in late 1976, when I was contacted by the then Rapeseed Association of Canada to comment on and then confirm reports from Hilmer Sørensen in Denmark that there was a new glucosinolate found in rapeseeds, this time with an indolyl R-group. By using thin-layer chromatography techniques from my Ph.D. work, I was able to detect some indolyl-containing glucosinolate bands from extracts of double-zero rapeseed. This was also confirmed by my colleague, Ian MacGregor, working in Saskatoon. These indolyl glucosinolates were a problem since their quantitative analysis was difficult using the techniques commonly available at the time. They accounted for about 10 micromoles of glucosinolates beyond the 30 micromoles given in the legal definition in Canadian food legislation. The fuzziness of the glucosinolate situation increased when it was discovered that this particular set of glucosinolates appears to have health benefits.

Even the definition of canola suffered from fuzziness. I was asked by the Rapeseed Association early in 1978 to comment on the proposed definition of canola. This definition read in part that canola "shall be the seed of the species *Brassica napus* or *Brassica campestris*, the oil component of which seed contains less than 5% erucic acid and the solid component of which seed contains less than 3 milligrams of glucosinolate per gram of solid (GLC Method-MacGregor)."

I immediately saw the problem with the definition of glucosinolates. First of all, the 3 milligrams referred not to glucosinolates but to glucosinolate hydrolysis products, and second, the "GLC Method-MacGregor" didn't exist in a published form. It was an in-house method used by the breeding program in Saskatoon.

The proposed definition was discussed in detail at an international workshop on rapeseed analysis held in Winnipeg in 1980. As a result of these discussions, the definition was modified in 1982 to read "…the solid component of which seed contains less than 30 micromoles of any one or any mixture of 3-butenyl glucosinolates, 4-pentenyl glucosinolate, 2-hydroxy-3-butenyl glucosinolate, and 2-hydroxy-4-pentenyl glucosinolate per gram of air dry, oil free solid (GLC Method of the Canadian Grain Commission [CGC])."

The new definition had the advantage of naming the glucosinolates to be considered in the definition; it measured them as micromoles, removing any error due to molecular weight differences, and also referred to a method that the CGC had published in collaboration with MacGregor and after ring-testing in Canadian laboratories.

Even the fatty acid profile is fuzzy. Currently in Canada, four varieties with different fatty acid profiles are in production. None of these can be readily differentiated on delivery, and it is necessary that at least the HEAR crops be grown under identity-preserved or closed-loop contracts.

In conclusion, I would like to reiterate that canola and rapeseed have many forms and compositions, each of which has its strong points and uses. The multiple uses of the oil and meal are valuable, but since the seed cannot easily be visually differentiated, there is a problem with keeping the seed segregated. Nonetheless, canola has become the second-leading oilseed in the world based on these very multiple-use capabilities, and it will continue to provide consumers with exactly the type of oil they need.

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***Eddie L. Baldwin, Helen Cianciolo, Howard Payne*:** Gas Chromatography, *trans* Fatty Acid Content, Solid Fat by NMR, Edible Fat

Testing Services (Sabah) Sdn. Bhd
1st Floor, Lot 1, BLK N
Bandar Ramai Ramai
Sandakan Sabah 90712
Malaysia
+60 89 210431
***Kong Khim Chong*:** Palm Oil

Thai Vegetable Oil
149 Ratchadapisek Rd.
(Thapra-Taksin)

CONTINUED ON PAGE 536

2011

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MEMBERSHIP APPLICATION

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❑ Biotechnology	$10	❑ Phospholipid	$20	❑ Canadian	$15	❑ USA	FREE
❑ Edible Applications	$15	❑ Processing	$10	❑ European	$10		
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AOCS: Your international forum for fats, oils, proteins, surfactants, and detergents.
This Code has been adopted by 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 _____

Each year the AOCS and its component groups present awards to recognize accomplishments by individuals in the realm of fats, oil, and related materials.

CALL FOR NO

A. Richard Baldwin Distinguished Service

This is the Society's highest service award. It recognizes long-term, distinguished service to AOCS in positions of significant responsibility.

Nature of the Award: $2,000, a travel-and-expense allowance, and a plaque provided by Cargill.

Deadline: November 1

AOCS Award of Merit

This award recognizes productive service to AOCS: leadership in committee activities; service that has advanced the Society's prestige, standing, or interests; and, service not otherwise specifically recognized.

Nature of the Award: A plaque.

Deadline: November 1

AOCS Fellow

The status of Fellow is awarded to members of AOCS whose achievements in science entitle them to exceptionally important recognition or to those who have rendered unusually important service to the Society or to the profession.

Nature of the Award: Fellow membership status and a plaque.

Deadline: December 1

CALL FOR NOMINATIONS

Each award has its own specific and unique nomination requirements. For award consideration, it is essential that all paperwork be complete and received at AOCS by the nomination deadline. Self-nominations are welcomed and encouraged. Please refer to the website for the nomination requirements and submission deadlines.

ELECTRONIC SUBMISSIONS ONLY!

AOCS is accepting nomination material only by electronic communication. Window based programs (WORD) and PDF material emailed to AOCS must include the award name and candidate name in the email subject line.

Supelco/Nicholas Pelick-AOCS Research Award

This award recognizes outstanding original research of fats, oils, lipid chemistry, or biochemistry. The recipient must have published the research results in high-quality technical papers regarding fats, oils, lipid chemistry, or biochemistry.

Nature of the Award: $10,000 honorarium, a travel-and-expense allowance, and a plaque. The award is sponsored by Supelco, a subsidiary of Sigma Aldrich Corp, and Nicholas Pelick, past president of AOCS.

Deadline: November 1

Stephen S. Chang Award

This award recognizes a scientist, technologist, or engineer whose distinguished accomplishments in basic research have been used by industries for the improvement or development of products related to lipids.

Nature of the Award: An honorarium and a jade horse, provided by the Stephen and Lucy Chang endowed fund.

Deadline: October 15

AOCS Young Scientist Research Award

This award recognizes a young scientist who has made a significant and substantial research contribution in one of the areas represented by the Divisions of AOCS.

Nature of the Award: $1,000 honorarium, a plaque, and a travel-and-expense allowance provided by the International Food Science Center A/S.

Deadline: November 1

The Schroepfer Medal

Originated by colleagues of George Schroepfer, this award recognizes a scientist who has made significant and distinguished advances in the steroid field. The work may represent a single major achievement or an accumulation of data.

Nature of the Award: An honorarium and a bronze medal.

Deadline: October 15

ACI/NBB Glycerine Innovation Award

The Industrial Oil Products Division initiated this award to recognize outstanding achievement for research in new applications for glycerine with particular emphasis on commercial viability.

Nature of the Award: $5,000 honorarium and a plaque provided by the American Cleaning Institute and the National Biodiesel Board.

Deadline: November 1

Biotechnology Division Lifetime Achievement Award

The Biotechnology Division initiated this award to recognize an individual who has made significant and meritorious lifetime achievements in areas of interest to the Biotechnology Division.

Nature of the Award: $3,500 honorarium and a plaque.

Deadline: November 1

USB Industrial Uses of Soybean Oil Award

The Industrial Oil Products Division initiated this award to recognize outstanding research into new industrial applications or uses for soybean oil.

Nature of the Award: $3,000 honorarium and a plaque provided by the United Soybean Board.

Deadline: December 1

Samuel Rosen Memorial Award

Milton Rosen and the Surfactants and Detergents Division initiated this award to recognize a surfactant chemist for significant advancement or application of surfactant chemistry principles.

Nature of the Award: $2,000 honorarium and a plaque.

Deadline: November 1

OMINATIONS

Award recipients range from longtime AOCS members who have spent years in their specialties to graduate students who are just beginning their careers.

Herbert J. Dutton Award

The Analytical Division initiated this award to recognize an individual who has made significant contributions to the analysis of fats and oils and related products or whose work has resulted in major advances in the understanding of processes utilized in the fats and oils industry.

Nature of the Award: $1,000 honorarium and a plaque.

Deadline: November 1

Timothy L. Mounts Award

The Edible Applications Technology Division initiated this award to recognize research relating to the science and technology of edible oils or derivatives in food products, which may be basic or applied in nature.

Nature of the Award: $500 honorarium and a plaque provided by Bunge North America.

Deadline: November 1

Ralph Holman Lifetime Achievement Award

The Health and Nutrition Division established the award to annnually recognize an individual who has made significant contributions to the Division's field of interest, or whose work has resulted in major adances in health and nutrition.

Nature of the Award: $500 honorarium, a travel-and-expense allowance, and a signed print.

Deadline: November 1

Alton E. Bailey Award

This award is supported by the USA Section and recognizes research and/or service in the fields of fats and oils and related disciplines.

Nature of the Award: An honorarium and a plaque.

Deadline: November 1

Thomas H. Smouse Fellowship Award

This award was established by the Archer Daniels Midland Foundation and the family and friends of Thomas H. Smouse. The purpose of this graduate fellowship is to encourage and support outstanding research by recognizing a graduate student pursuing an M.S. and/or Ph.D. degree in a field of study consistent with the areas of interest of AOCS.

Nature of the Award: The Fellowship level is up to $15,000 ($10,000 Fellowship, $5,000 for travel and research expenditures related to the student's graduate program).

Deadline: February 1

Ralph H. Potts Memorial Fellowship

This award recognizes a graduate student working in the field of chemistry of fats and oils and their derivatives. Qualifying research will involve fatty acids and their derivatives, such as long-chain alcohols, amines, and other nitrogen compounds.

Nature of the Award: $2,000 honorarium, a plaque, and travel-and-expense allowance. The award is supported by AkzoNobel, Inc.

Deadline: October 15

Honored Student Award

This award recognizes graduate students in any area of fats and lipids. To receive the award, a candidate must remain a registered graduate student and must not have received a graduate degree or have begun career employment prior to the Society's Annual Meeting.

Nature of the Award: Travel-and-expense allowance to attend and present a lecture at the Society's Annual Meeting.

Deadline: October 15

Kalustian and Manuchehr Eijadi Awards

Each award recognizes outstanding merit and performance of one Honored Student award recipient and includes an honorarium of $1,000.

Hans Kaunitz Award

This award is supported by the USA Section and encourages studies in the sciences relating to fats, oils, and detergent technology. This award is open to graduate students within the geographical boundaries of the USA Section.

Nature of the Award: $1,000 honorarium, travel-and-expense allowance, and a certificate.

Deadline: February 1

AOCS Division Awards for Students

These awards recognize students at any institution of higher learning, who are studying and doing research towards an advanced degree in fats, oils, proteins, lipids, surfactants, detergents, and related materials.

The following student awards are currently being offered by these AOCS Divisions:

- Analytical Division Student Award
- Biotechnology Student Excellence Award
- Edible Applications Technology Division Student Award
- Health and Nutrition Division Student Excellence Award
- Industrial Oil Products Division Student Award
- Processing Division Student Excellence Award
- Protein and Co-Products Division Student Poster competition
- Surfactants and Detergents Division Student Travel Award

Nature of the Award: Awards can consist of $100 to $500 and a certificate.

Deadline: Varies from October 15 to January 15

The award recipient must agree to attend the AOCS Annual Meeting & Expo and present an award address.

The AOCS Annual Meeting & Expo will be held in Long Beach, California, USA from April 29–May 2, 2012.

AOCS Awards contact ➤ **Email:** awards@aocs.org • **Web:** www.aocs.org/goto/awards

AOCS Technical Services update

Catherine Watkins

The heart of the AOCS mission lies in providing technical support to industry, government, and academia. Each year at the AOCS Annual Meeting & Expo (AM&E), numerous committees meet to move current projects forward. Following are notes from the committee meetings held May 1–4 at the AM&E in Cincinnati, Ohio, USA.

Technical Steering Committee (TSC)

Meeting chair: Len Sidisky, Supelco Inc., Bellefonte, Pennsylvania, USA

The TSC reviews the technical activities and services provided by AOCS, ensuring that they meet the needs of AOCS and its members. Therefore, the TSC oversees the work of all of the committees mentioned below.

Exam Board

The new chair of the Exam Board, Chris Dayton of Bunge Ltd., reported that the data from Approved Chemists and Certified Labs were still being calculated.

Laboratory Proficiency Program Committee

Chair: John Hancock, Federation of Oils, Seeds, and Fats Associations International (FOSFA), London, UK

The Laboratory Proficiency Program (LPP) Committee held its meeting by conference call on April 15, 2011, LPP Committee Chair John Hancock reported. There were more attendees than in the past, when the committee got together at the AM&E, and plans are to continue meeting telephonically.

Hancock also raised the issue of some of the historic LPP series—such as cottonseed, mixed seeds, and milk—with low participation. After discussion, the participants agreed that providing such series is an important part of the AOCS mission; the AOCS Marketing Department will conduct a survey to obtain more information about how to increase participation.

The committee also discussed possible new series, including aflatoxin in pistachio and almond, algal oils, and an olive oil sensory panel series.

Uniform Methods Committee

Chair: Mark Collison, Archer Daniels Midland Co. (ADM), Decatur, Illinois, USA

The Uniform Methods Committee (UMC) made two important decisions. The committee discussed the *in situ* fatty acid methylation method and approved the separation of Ce 1k-07 into two methods: alkaline and acid/alkaline.

The UMC also approved a proposal regarding nitrogen-to-protein conversion factors brought to it by the Seed and Meal Subcommittee. As a result of the decision, all instances of nitrogen-to-protein conversion factors in the *Official Methods and Recommended Practices of the AOCS, 6th Edition*, will be changed to:

Calculation: $N \times 6.25 = P$

Nitrogen content × 6.25 is the accepted conversion factor for calculating protein content of oilseeds and oilseed byproducts.

The *2011 AOCS Methods Additions and Revisions*, scheduled to be published in the third quarter of 2011, will reflect these changes. The publication should be available this month; check the AOCS Store (www.aocs.org/store) for more information.

AOCS Technical Director Richard Cantrill reported on AOCS' activities involving international standard-setting bodies such as the Codex Alimentarius Commission (CAC) and International Organization for Standardization (ISO). AOCS participates in several subcommittees (SC) of ISO technical committees (TC). Among these are ISO/TC 34/SC 2 and 11 (Oilseeds and Oils and Fats), as well as ISO/TC 34 and SC 17 (Food Products and Food Safety Managements Systems).

ISO/TC 34/SC 2 and 11 met in Madrid, Spain, at the beginning of April 2011. Several items were assigned to AOCS, such as the provision of Ce 1-62 and Ce 1h-05 to ISO in ISO format. (These are methods for determining fatty acid composition by packed column gas chromatography and direct methylation of lipids in foods for the determination of total fat, saturated, *cis*-monounsaturated, *cis*-polyunsaturated, and *trans* fatty acids by gas chromatography. In addition, Cantrill is in the process of revising the ISO oilseed sampling document, 542, with the SC 2 electronic Working Group.

Cantrill is also secretary of Subcommittee 16 of TC 34 (Molecular Biomarker Analysis); AOCS Technical Specialist Gina Clapper is secretary of the US Technical Advisory Group. The subcommittee is working to revise the old standards regarding genetically modified organisms to bring them in line with current techniques. Cantrill reported that the subcommittee will focus in the future on creating general standards for DNA and protein analysis.

SC 16 will meet in late October 2011 in plenary in Washington, DC, USA. For more information about participating, contact Clapper at ginac@aocs.org.

Cantrill also reported on his work with the CAC Committee on Fats and Oils (CCFO). The committee's 2011 meeting was in Malaysia in June; previous cargoes and olive oil were the major topics discussed. CCFO also moved a new work item on fish oil standards forward to the Commission; CAC approved the work item at its meeting in July 2011.

Other votes taken by UMC included acceptance of additions and revisions to Ck 2-09 (Determination of Various Properties of Biodiesel by the QTA® System Method).

USB/AOCS Soybean Quality Traits (SQT) Program Committee

Program Manager: Amy Johnson, AOCS, Denver, Colorado, USA

The United Soybean Board funds the SQT Program and provides the infrastructure for the generation of reliable analytical results at all levels of the soybean industry by establishing industrywide acceptance of analytical methods and protocols and their implementation under internationally accepted quality management standards.

The meeting began with a review of SQT projects, including the Analytical Standards Program (ASP) and the NIR Applicability Study. ASP is a proficiency testing program that now includes four series: whole soybean wet chemistry, soybean meal wet chemistry, whole soybean near-infrared (NIR) spectroscopy, and soybean meal NIR.

AOCS Project Manager Amy Johnson reported that the 2010 NIR Applicability Study is complete. Protocols developed for the study will be applied to modified oleic acid soybeans as soon as the beans are available (presumably in 2012).

SQT also has a number of continuing method development projects. These include a reference method for low-phytate soybeans, as well as amino acid and sugar studies. For more information about participating in any of the programs, contact Amy Johnson at amyj@aocs.org.

Expert Panel on Olive Oil

Paul Miller, president of the Australian Olive Association, discussed recent work on the use of ultraviolet (UV) absorbance, diacylglycerol ratios, and pheophytin/pyropheophytin (PPP) ratios in screening for old olive oils, oils presently labeled extra-virgin, and oils that have lost their flavor and might have detectable defects when presented to a sensory panel. He proposed that limits could be set for these parameters that would reduce the need for sensory panels to taste most "good" oils and allow panels instead to concentrate on defective or old olive oils. The presentation stimulated a lengthy discussion on whether analytical methods could be used to tell the age of oils and whether the ratios mentioned above were valid parameters. Further discussion around the use of instrumental methods to replace some sensory testing was also the subject of lively debate. Most contentious was the position that grades of oil cannot be determined by instrumental methods because they may give rise to the detection of "false positives."

AOCS Technical Director Richard Cantrill reported that the Canadian Food Inspection Agency lab has joined the AOCS proficiency testing series for olive oil. He also reported that in light of the need by industry for sensory analysis of olive oil and the IOC requirement for panels to have national government recognition, AOCS is considering a request to administer an olive oil sensory panel proficiency scheme. Should prospective participants agree to receipt of four samples sent four times per year, and taking into account the need for duplicate samples and shipping to the furthest destinations, the annual subscription price would be approximately $800.

Expert Panel on Process Contaminants

AOCS continues to support the oils and fats industry as it works to mitigate process contaminants such as esters of both 3-MCPD (3-monochloropropane-1,2-diol) and glycidol in vegetable oils and finished foods. Resources include a web-based information center (http://tinyurl.com/ProcessContaminants). There, visitors will find references, notes from all meetings of the Expert Panel, and presentations from the symposium on the topic given on May 3 at the 102nd AOCS Annual Meeting & Expo in Cincinnati, Ohio, USA (see http://tinyurl.com/AOCSMay2011).

Although the AOCS Expert Panel had decided to proceed only with direct methods, the Panel continues to follow developments in indirect methodology. Further, at the May 2011 meeting, the Panel agreed that AOCS should initiate comparative studies using samples of known contaminant composition. To discuss the design and conduct of this type of study, a small working group was established. The group will develop a timetable and a plan of action, and report at the next meeting of the Panel. That meeting will be during the Euro Fed Lipid conference in Rotterdam in September 2011. [At press time, details had not yet been made final.]

Direct methods. The paper from Archer Daniels Midland Co. (ADM; Decatur, Illinois, USA) detailing its direct liquid chromatography time-of-flight mass spectrometry method for the detection of esters of 3-MCPD was published in December 2010 in the *Journal of the American Oil Chemists' Society* (*JAOCS*) and made freely available from Springer online (http://tinyurl.com/Direct3-MCPD). Because it is a relatively difficult method and simpler methods may arise, AOCS will not move it forward as an official AOCS method.

Hiroki Shiro of Kao Corp. presented a direct method for 3-MCPD ester analysis. Using mono- and di-ester standards synthesized in Kao's laboratory, the response was linear and sensitive. However, the technique was not reproducible with oil samples. Shiro reported that the technique had not been applied to 2-MCPD esters. Synthesis of all possible isomers is required for full identification of native contaminants, he said.

Kao Corp. has published three papers on the development of a direct method for determination of glycidyl esters. The JOCS/AOCS proposed method incorporates all the refinements made in the publications. A draft of the proposed method is progressing through the AOCS methods development process as AOCS Recommended Practice Cd 28-10.

A second direct method developed by ADM for glycidyl ester analysis that does not involve sample clean-up by solid-phase extraction and that may be suitable for process control was presented in the symposium on May 3. The method was published online in *JAOCS* and is available for download at http://tinyurl.com/DirectGE.

For information about participating in any of the projects overseen by AOCS Technical Services, contact Richard Cantrill at technical@aocs.org.

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

FIG. 1. *Polyurethane varnish made from canola oil (~50% renewables), applied to pine (upper) and hemlock (lower) spindles. Photo by Jonathan Curtis.*

From biofuels to biofoams

Crystal Snyder

When the 24th Canadian Conference on Fats and Oils opens in Edmonton later this month, one of the meeting's highlights will be a panel discussion on the future of lipid-based biofuels and industrial chemicals. Although biofuels have garnered much of the media spotlight, researchers at the University of Alberta are demonstrating that there are many other promising industrial uses of vegetable oils.

Jonathan Curtis, associate professor in the Department of Agricultural, Food and Nutritional Science at the University of Alberta (Edmonton), leads the Lipid Chemistry Group (LCG), which focuses on developing industrial products from canola and other seed oils common to Western Canada. The group has developed techniques for producing biobased foams, resins, and adhesives using polyhydroxyl compounds (polyols) derived from canola oil as an alternative to those conventionally made from petroleum or more recently from soybean oil.

Polyols are a key ingredient in the production of polyurethanes, which are used to manufacture a variety of plastic and foam materials. Lipids can be functionalized by oxidation of double bonds using well-known processes such as epoxidation or ozonolysis. Further reactions with simple molecules, sourced from renewable resources, then give rise to complex mixtures of monomeric and oligomeric polyol structures. Using canola oil as the main raw material, the LCG is investigating several processes for producing polyols covering a range of molecular weights and hydroxyl numbers. This is necessary because no single polyol is suitable for all polyurethane applications.

One promising application of the canola polyol is in polyurethane coatings such as

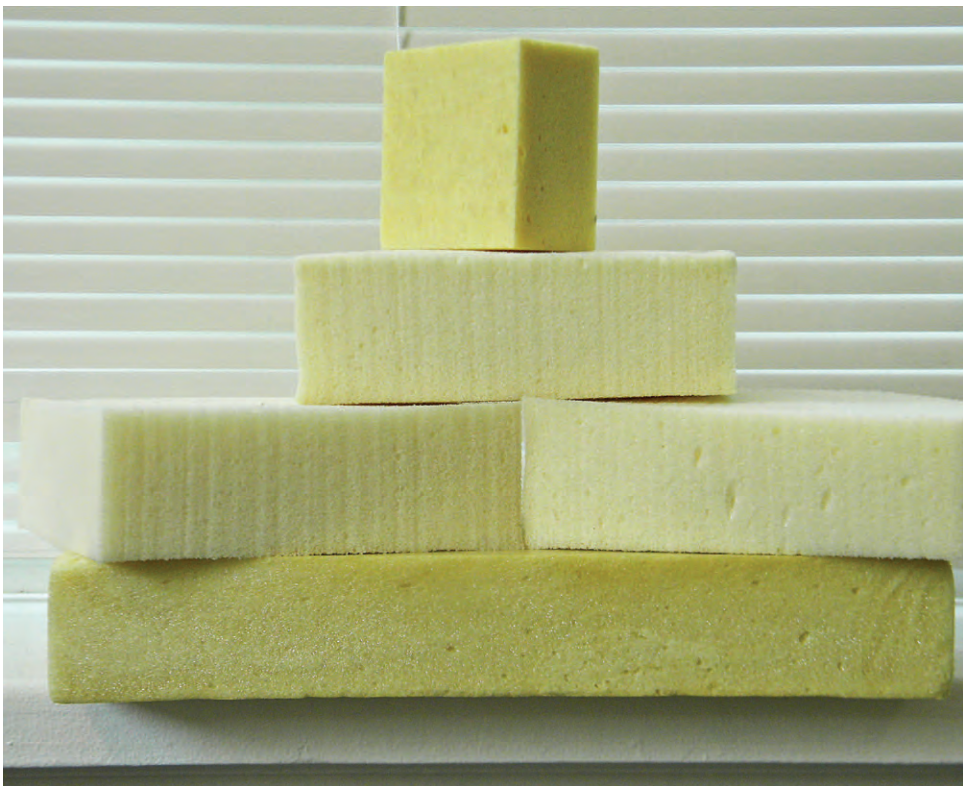

FIG. 2. *Rigid polyurethane foam (top and bottom layers, darker colored, ~50% renewables) and flexible polyurethane foam (middle layers, lighter colored, ~15% renewables) prepared by Lipid Chemistry Group research associate Xiaohua Kong and Tekle Technical Services Inc.; Edmonton, Alberta, Canada) using canola polyols. Photo by Jonathan Curtis.*

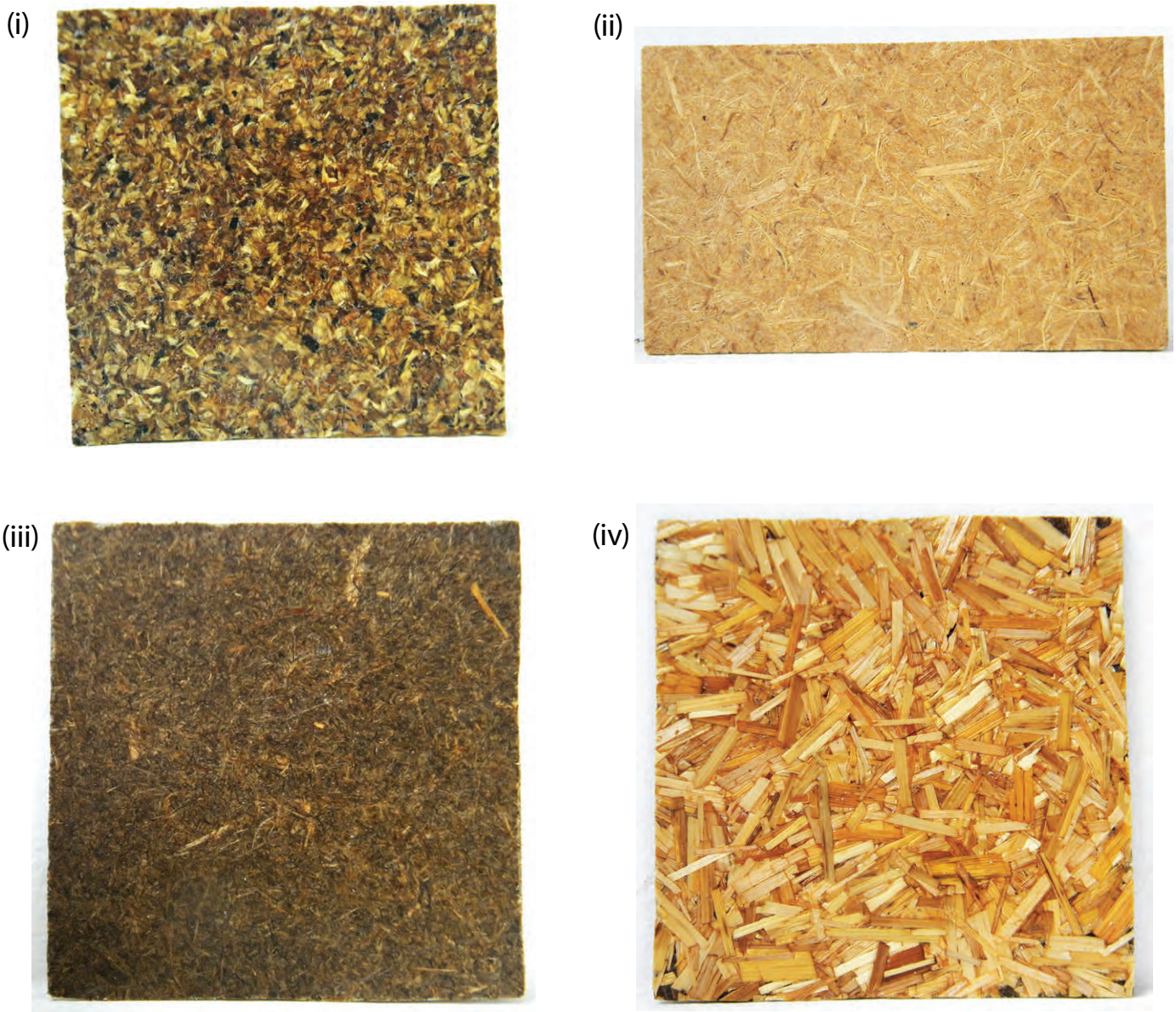

FIG. 3. *Biocomposite boards prepared by LCG research associate Tolibjon Omonov and TTS from (i) softwood chips, (ii) cedar fibers, (iii) flax fibers and (iv) straw using a canola epoxy resin system (~85% renewables). For abbreviations see Fig. 2. Photo by Jonathan Curtis.*

wood varnish, which can be made with 100% biobased polyol content (Fig. 1). The group has also produced a series of polyurethane foam materials containing canola polyols, some in combination with conventional polyols (Fig. 2). The foams vary in rigidity from soft, sponge-like foams that could be used for cushioning materials to rigid structural foams that could be used for insulation. "Although we can replace 100% of the conventional polyol content in rigid foams with canola polyol, this is a bigger challenge in flexible foams where much lower amounts of bio-polyols are currently used, both by us and by commercial manufacturers," Curtis says. These materials have attracted considerable interest from industry; Curtis is currently working with Edmonton-based Tekle Technical Services Inc. (TTS) to develop and test the foams for use in structural insulating panels. Another company, The Woodbridge Group (Ontario, Canada), is testing the foams for automotive applications.

In addition to the polyol work, LCG is developing canola-based thermosetting epoxy resins that could be used in the production of biocomposite materials. Conventional thermoset resins not only are produced from nonrenewable petrochemicals but also require the use of formaldehyde and other chemicals that pose potential environmental and toxicological concerns. The canola-based resin represents a promising alternative for manufacturing boards containing renewable fibers (Fig. 3).

While much of the research in the United States has focused on soybean oil as a feedstock for polyol production, canola oil is an obvious focus for Western Canada. Other oils common to Western Canada, including flax and mustard, have also been tested by the group as feedstocks for polyol production with each yielding polyols with different properties. Although the fatty acid profile of the feedstock has an impact on the functional

Value-added oilseeds and industrial applications

In addition to the Lipid Chemistry Group, the Department of Agricultural, Food and Nutritional Science at the University of Alberta is home to several other large-scale research programs focusing on value-added oilseeds and industrial applications of lipids.

The **Alberta Innovates Bio Solutions Phytola Centre** was opened in January 2011 and is led by AOCS member Randall Weselake. Building on the success of the Bioactive Oils Program (also led by Weselake), Phytola brings together multidisciplinary expertise from across Western Canada and emphasizes collaboration with industry to solve specific market needs. Phytola's research platform spans four strategic areas: increasing seed oil content in canola, developing bioactive oils for human and animal nutrition, developing industrial oils, and advancing technologies for oilseed improvement. Weselake is also participating in the international consortium, Industrial Crops producing added-value Oils for Novel chemicals (ICON), a collaboration involving 25 members from 11 countries, working to develop oilseed crops producing biolubricants.

The Biorefining Conversions Network (BCN) is a provincially funded initiative that supports research in the areas of biorefining and biomass conversion technologies. The BCN has established a multidisciplinary program with four core research themes: biomass pre-processing and biological, chemical, and thermal conversions. The BCN has developed a pyrolysis technology for conversion of lipid feedstocks to valuable hydrocarbon products ranging from lubricating oils, solvents, and light gases to alternative fuel sources. Current research objectives are to optimize the technology within a custom-designed continuous reactor system and to establish methodology for fractionation and analysis of product streams. Plans for a pilot-scale facility based on the pyrolysis technology are well under way, and there is significant interest in the development of a commercial production facility in Alberta.

(*Sidebar article produced with input from Ange Scott, Research Manager, BCN.*)

*inform*ation

- Fobert, P.R., M.A. Smith, J. Zou, E.M. Mietkiewska, W.A. Keller and D.C. Taylor, Developing Canadian seed oils as industrial feedstocks, *Biofuels, Bioproducts & Biorefining 2*:206–214 (2008).
- Lu, C., J.A. Napier, T.E. Clemente, and E.B. Cahoon, New frontiers in oilseed biotechnology: meeting the global demand for vegetable oils for food, feed, biofuel, and industrial applications, *Curr. Opin. Biotechnol. 22*:252–259 (2011).
- Maher, K.D., and D.C. Bressler, Pyrolysis of triglyceride materials for the production of renewable fuels and chemicals, *Bioresour. Technol. 98*:2351–2368 (2007).

properties of the resulting polyols, it is not a strict predictor of polyol performance. "Fatty acid composition is necessary but not sufficient," Curtis explains. "Other factors such as the distribution of triglyceride species and other compounds also have an influence, so it's largely an empirical process."

An analytical chemist, Curtis also works on advancing methods for the analysis of lipids in support of the biomaterials program and in areas of relevance to food and agriculture. At the 2011 AOCS Annual Meeting & Expo in Cincinnati, his student, Sabiqah Tuan Anuar, presented a liquid chromatography/mass spectrometry technique for monitoring the epoxidation of vegetable oils. By studying the formation and disappearance of epoxide intermediates, they have gained insight into the reaction kinetics. Such methods assist the team in process development and in defining the acceptable profiles of epoxidized oils.

"The current interest in producing materials and chemical intermediates from renewable resources presents many new opportunities for the fats and oils industries which have already been doing this for many years," Curtis says.

AOCS member Crystal Snyder is a writer and a lab manager at the University of Alberta. She can be reached at crystal.snyder@ualberta.ca.

APPROVED CHEMISTS (CONTINUED FROM PAGE 528)

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***Paul C. Thionville, Shani Jolly, Andre Thionville, Boyce Butler*:**
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***Thomas P. Mawhinney*:**
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Call for Papers

103rd AOCS Annual Meeting & Expo

April 20–May 2, 2012
Long Beach Convention Center
Long Beach, California, USA

Call for Papers is now open.

The meeting program will feature invited presentations by leading experts, volunteer oral presentations, and volunteer poster presentations.

Session organizers are now accepting abstract submissions for oral and poster presentations.

Key Focus Areas

The following areas have been identified by the AOCS Program Committee, based on survey results from the 2011 Annual Meeting registration brochure recipients:

- Biobased Fuels (including alternatives and processing issues)
- Sustainability (including "green" technology, life cycle and energy issues)
- Functional Lipids (including structure, application, fundamentals, and health implications)
- Omega-3s (including lipid oxidation, nutrition, antioxidants and shelf-life issues)
- Surfactants and Detergents (including analysis, methodology, and analytical issues)

It is **not** mandatory to develop a presentation addressing one of these areas, and divisions are **not** required to include them in their programming. However, these focus areas are worthy of consideration due to their current impact within the oils and fats community.

Submit Now

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Full submission guidelines available online.

Deadline: October 3, 2011

Sessions fill early—don't miss the opportunity to present your research to colleagues.