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Departments and Information

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

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Calendar

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

January

January 29–February 3, 2012. Feeds and Pet Food Extrusion, College Station, Texas, USA. Information: http://foodprotein.tamu.edu/extrusion/ShortCourses/feeds/scfeedspet.php.

January 29–February 3, 2012. Genetic and Molecular Basis of Obesity and Body Weight Regulation, Santa Fe Community Convention Center, Santa Fe, New Mexico, USA. Information: www.keystonesymposia.org/Meetings/ViewMeetings.cfm?MeetingID=1171.

February

February 5–8, 2012. National Biodiesel Conference & Expo 2012, Orlando, Florida, USA. Information: www.biodieselconference.org/2012.

February 7–8, 2012. 2nd Annual Municipal Solid Waste to Biofuels Summit, Chicago, Illinois, USA. Information: www.renewablewaste.com/biofuels.

February 18, 2012. Global Castor Conference, Ahmedabad, Gujarat, India. Information: www.seaofindia.com.

February 23–24, 2012. US Department of Agriculture Agricultural Outlook Forum, Arlington, Virginia, USA. Information: www.usda.gov/oce/forum.

February 26–March 2, 2012. ApoE, Alzheimer's and Lipoprotein Biology, Keystone Resort, Keystone, Colorado, USA. Information: www.keystonesymposia.org/Meetings/ViewMeetings.cfm?MeetingID=1182.

February 27–29, 2012. Institute of Food Technology/ Latin American and Caribbean Association of Food Science and Technology Food Science and Innovation Conference, Guadalajaro, Mexico. Information: www.ift.org/innovation.

February 27–March 1, 2012. 18th International Sunflower Conference, Mar del Plata and Balcarce, Argentina. Information: www.asagir.org.ar/asagir2008/congresos-eng.asp.

March

March 4–6, 2012. Grain Elevator and Processing Society Exchange, Minneapolis, Minnesota, USA. Information: www.geaps.com.

March 6–9, 2012. 2012 DEUEL Conference on Lipids, Palm Springs, California, USA. Information: www.deuelconference.org.

March 11–16, 2012. Principles and Practice of Cosmetic Science, Bournemouth, UK. Information: www.scs.org.uk/principles-and-practice.

March 11–16, 2012. Pittcon 2012 Conference & Expo, Orlando, Florida, USA. Information: www.pittcon.org.

March 13–15, 2012. World Biofuels Markets Congress & Exhibition, Rotterdam, Netherlands. Information: www.worldbiofuelsmarkets.com.

Corrections

The October cover feature on soy and breast cancer erroneously listed author Catherine Watkins' daily consumption of vitamin D3 at 600 International Units (IU). The figure should have been 6,000 IU. We regret the error and are grateful to the reader who rightly questioned how only 600 IU/day could raise serum blood levels of 25-hydroxyvitamin D—the metabolite measured to assess vitamin D3 deficiency—above 40 ng/mL.

Index to advertisers

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AOCS Meeting Watch

April 29–May 2, 2012. 103rd AOCS Annual Meeting & Expo, Long Beach Convention and Entertainment Center, Long Beach, California, USA. Information: phone: +1 217-693-4821; fax: +1 217-693-4865; 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.

October 29–31, 2012. Singapore 2012: World Conference on Fabric and Home Care, Shangri-La Hotel, Singapore. Information: email: meetings@aocs.org; phone: +1 217-693-4821; fax: +1 217-693-4865; email: meetings@aocs.org; http://singapore.aocs.org.

April 28–May 1, 2013. 104th AOCS Annual Meeting & Expo, Palais des congrès de Montréal, Montréal, Québec, Canada. Information: phone: +1 217-693-4821; fax: +1 217-693-4865; email: meetings@aocs.org; www.aocs.org/meetings.

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

March 14–16, 2012. GLOBE 2012 Business Environment Event—Conference and Trade Fair, Vancouver, Canada. Information: 2012.globeseries.com.

March 15–16, 2012. Home and Personal Care Ingredients Congress India, Bombay Exhibition Centre, Mumbai, India. Information: www.hpci-congress.com.

March 18–20, 2012. 5th Workshop on Fats and Oils as Renewable Feedstock for the Chemical Industry, Karlsruhe Institute of Technology, Karlsruhe, Germany. Information: http://abiosus.org/kit-workshop-2012.html.

March 25–26, 2012. Global Castorworld 2012, Jaipur, India. Information: www.jatrophabiodiesel.org.

March 25–29, 2012. 243rd American Chemical Society National Meeting and Exposition, San Diego, California. Information: www.acs.org.

March 25–29, 2012. XVI International Symposium on Atherosclerosis, Sydney Convention and Exhibition Centre Darling Harbour, Sydney, Australia. Information: www.isa2012.com.

April

April 1–3, 2012. 80th Oil Mill Operators Short Course. Wichita, Kansas, USA. Information: Rich Clough, phone: +1 979-862-2262; fax: +1 979-845-2744; email: rclough@tamu.edu; http://foodprotein.tamu.edu.

April 14–16, 2012. The 13th International Exhibition on Surfactant & Detergent, Shanghai, China. Information: www.iesdexpo.com or yihanexpo@vip.sina.com.

April 17–19, 2012. Food Safety Summit Expo and Conference, Washington DC Convention Center, Washington, DC, USA. Information: www.foodsafetysummit.com.

April 21–25, 2012. American Society for Biochemistry and Molecular Biology Annual Meeting, San Diego, California, USA. Information: www.asbmb.org/Meetings_01/2012mtg/2012Annualmtghome.aspx.

April 22–24, 2012. Hydrocolloid Conference, Westin Hotel, Valencia, Spain. Information: email: dseisun@hydrocolloid.com.

April 25–28, 2012. 2nd World Congress of Bioenergy-2012, Xi'an, China. Information: www.bitlifesciences.com/wcbe2012.

April 29–May 2, 2012. 103rd AOCS Annual Meeting & Expo, Long Beach Convention and Entertainment Center, Long Beach, California, USA. Information: phone: +1 217-693-4821; fax: +1 217-693-4865; email: meetings@aocs.org; http://AnnualMeeting.aocs.org.

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Website www.kaltimex-energy.com

May

May 6–10, 2012. Society of Tribologists and Lubrication Engineers Annual Meeting & Exhibition, Renaissance Grand & America's Center, St. Louis, Missouri, USA. Information: Merle Hedland at +1 630-428-2133 or mhedland@stle.org; www.stle.org.

May 7–8, 2012. LIPID MAPS Annual Meeting, La Jolla, California, USA. Information: www.lipidmaps.org/meetings.

May 14–16, 2012. United Nations Conference on Sustainable Development (Earth Summit 2012/Rio+20), Rio de Janeiro, Brazil. Information: www.earthsummit2012.org.

May 14–18, 2012. 11th International Hydrocolloids Conference, Whistler Center for Carbohydrate Research, Stewart Center, Purdue University, West Lafayette, Indiana, USA. Information: www.international-hydrocolloids-conference.com.

May 16–19, 2012. 2nd International Symposium on Microbial Lipids, Bern, Switzerland. Information: www.eurofedlipid.org/meetings/bern2012.

May 23–24, 2012 Home and Personal Care Ingredients Exhibition and Conference, Istanbul, Turkey. Information: www.hpci-congress.com.

May 26–30, 2012. 10th Congress of the International Society for the Study of Fatty Acids and Lipids (ISSFAL), Westin Bayshore Hotel, Vancouver, British Columbia, Canada. Information: www.issfal.org/conferences/vancouver-2012.

May 29–31, 2012. Metabolism, Diet and Disease 2012, Washington, DC, USA. Information: www.amiando.com/metabolism-diet-and-disease.html.

May 3031, 2012. Cosmetic Science: The Good, the Bad and the Beautiful, Trinity College, Dublin, Ireland. Information: www.scs.org.uk/symposium-2012.

June

June 18–20, 2012. 16th Annual Green Chemistry & Engineering, Washington, DC, USA. Information: http://acswebcontent.acs.org/gcande.

June 18–21, 2012. BIO (Biotechnology Industry Organization) International Convention, Boston, Massachusetts, USA. Information: http://convention.bio.org.

June 18–22, 2012. ACHEMA, Frankfurt am Main, Germany. Information: www.achema.de/index.php?selectedArea=1&selectedItem=1&spkz=E.

June 21-22, 2012. Science and Technology of Food Emulsions, London, UK. Information: www.soci.org/General-Pages/Display-Event?EventCode=OF114.

June 25–29, 2012. Institute of Food Technologists' Annual Meeting and Expo, Las Vegas, Nevada, USA. Information: www.ift.org.

August

August 19–23, 2012. 244th American Chemical Society National Meeting & Exposition, Philadelphia, Pennsylvania, USA. Information: www.acs.org.

August 19–23, 2012. 16th World Congress of Food Science and Technology, Salvador, Brazil. Information: www.iufost2012.org.br/ingles.

September

September 23–26, 2012. 10th Euro Fed Lipid Congress, Auditorium Maximum of the Jagiellonian University, Kraków, Poland. Information: www.eurofedlipid.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.

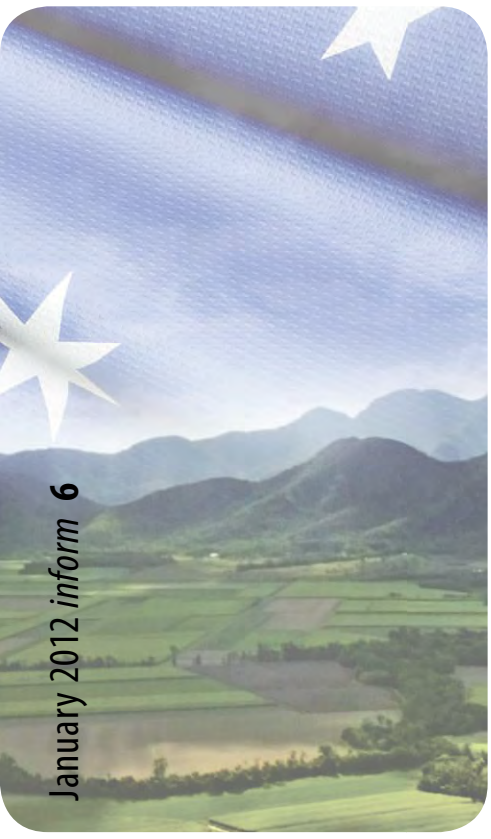
October

October 29–31, 2012. Singapore 2012: World Conference on Fabric and Home Care, Shangri-La Hotel, Singapore. Information: email: meetings@aocs.org; phone: +1 217-693-4821; fax: +1 217-693-4865; email: meetings@aocs.org; http://singapore.aocs.org. ■

Oilseed production, AUSSIE STYLE

For more than a century, Australian farmers have defined themselves as wheat farmers who include oilseeds in their rotation. Today, farmers are redefining themselves as oilseed farmers who include wheat in their rotation. For a country that produces more than 20 million metric tons (MMT) of wheat, this is a significant change—especially when oilseeds represent just over 10% of wheat volume.

Nick Goddard
Nick Goddard is executive director of the Australian Oilseeds Federation. He can be contacted at nick_goddard@australianoilseeds.com.



The growth in oilseeds production since the 1980s can be attributed to the hard work of Australian researchers and publicly funded breeding programs. In spite of a history in linseed, sunflower, and soybean production, it is canola (rapeseed) that today constitutes the mainstay of the Australian oilseed industry. Rapeseed varieties were introduced in the early 1960s, but the oil was high in erucic acid, the meal was high in glucosinolates, and the varieties were susceptible to the fungal disease blackleg (*Leptosphaeria maculans*). By the late 1970s, extensive breeding work resulted in varieties that delivered canola-quality oil and meal and stronger resistance to blackleg. By the 1980s, canola was beginning to gain a foothold in agricultural rotations, and the name "canola" was becoming known by the public with the first canola-branded cooking oil launched in 1988, followed soon by a canola margarine.

Today, canola constitutes well over two-thirds of the Australian oilseed crop. It is grown in all states and territories (Fig. 1) and is expected to produce a record harvest in 2011/12 of more than 2.6 MMT. Favorable yields and oil levels this season, underpinned by a solid price base, are leading growers already to plan for larger canola plantings next season, despite the fact that harvesting is only just underway for the current season.

Exports underpin the Australian industry

With a modest local consumption of 600,000–700,000 metric tons, export is a major focus, with Australia invariably being the number two or three canola exporter in the world (Fig. 2). Canada consistently retains the No. 1 position.

The seemingly insatiable demand for canola by the European biodiesel market is currently producing a lucrative market for Australian exporters. Despite challenges arising from the European Union's (EU) Renewable Energy Directive, which requires growers and exporters of canola destined for EU biofuel to be certified as "sustainable," Europe will retain its position as the No. 1 export destination for Australian canola for the coming season.

Although canola holds the dominant position, the second most-widely produced and exported oilseed crop, cottonseed, is also a significant contributor to Australian oilseed

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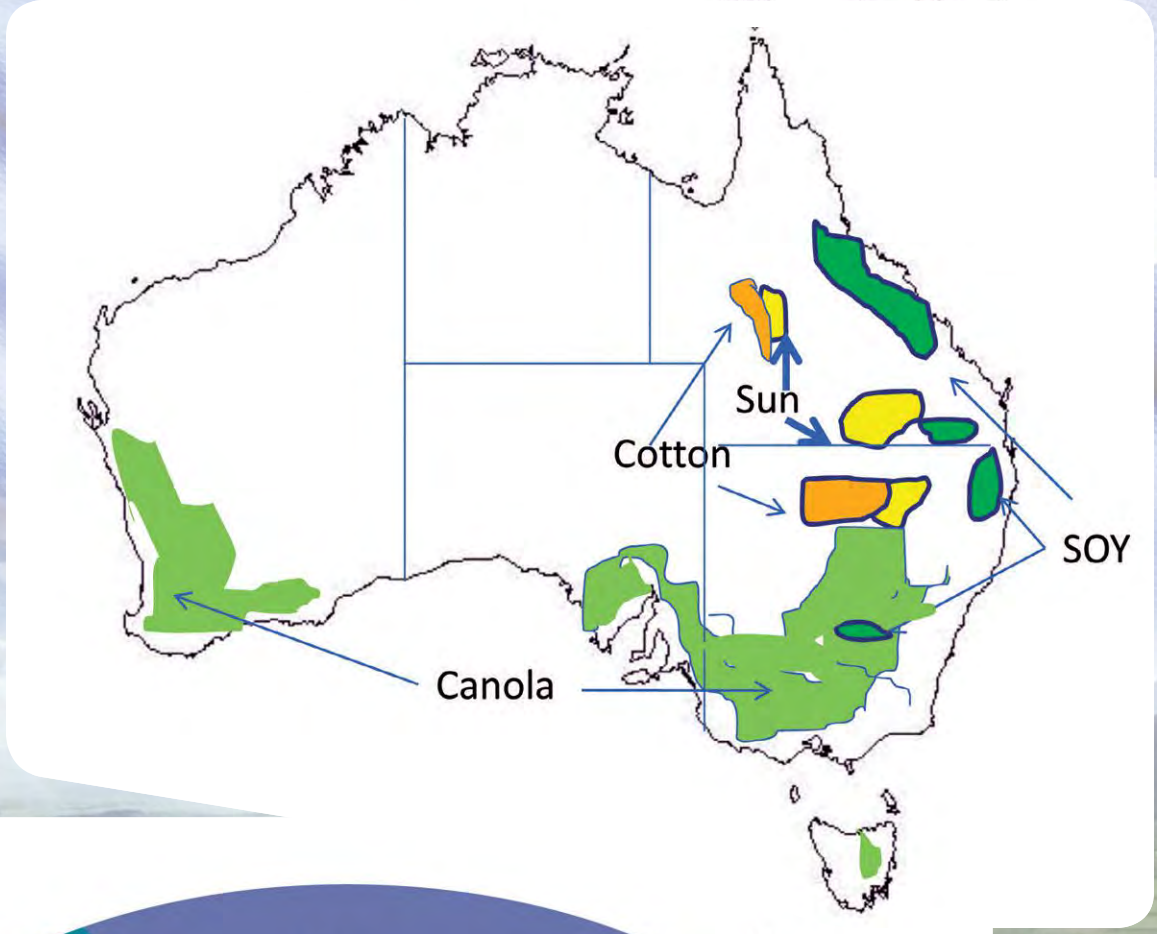

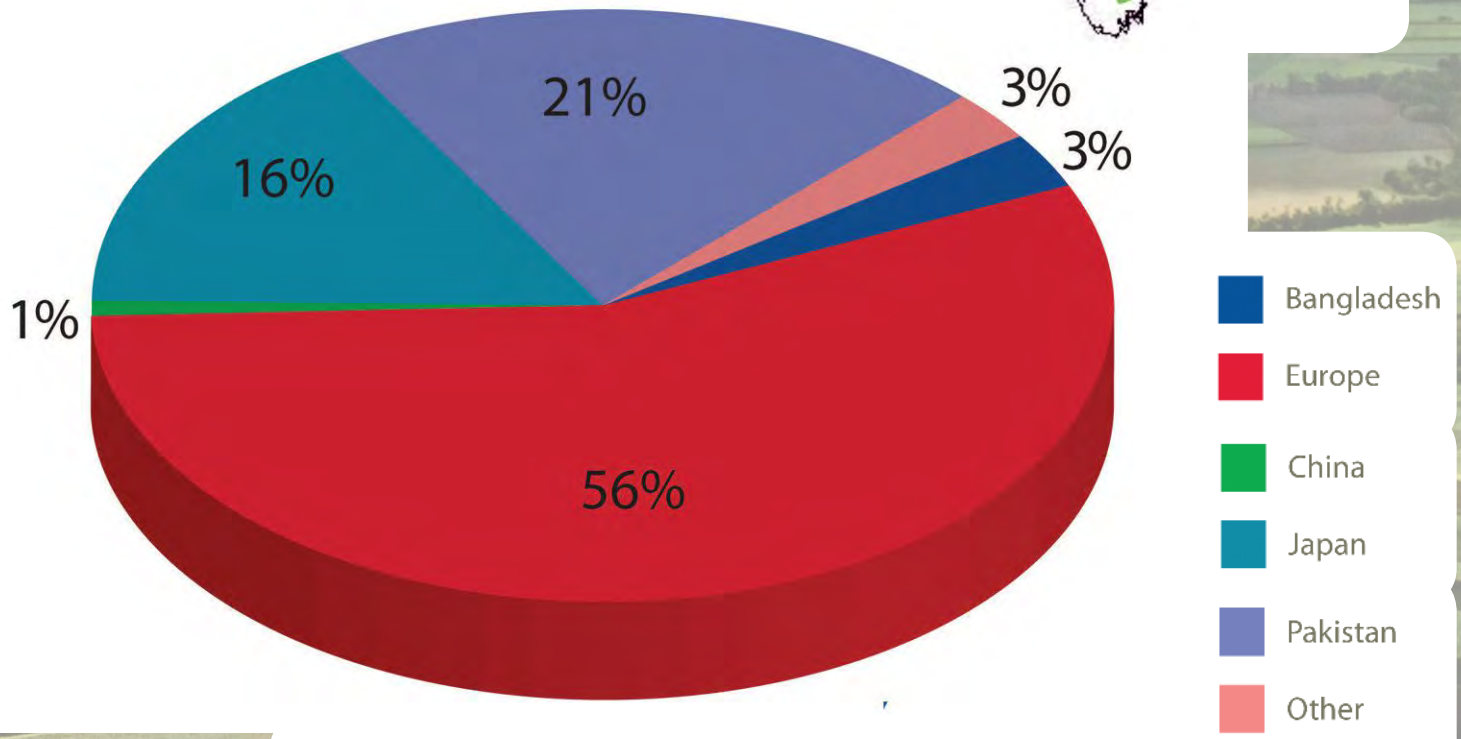

FIG. 1. *At top, Australian oilseed-growing regions.*

FIG. 2. *At bottom, Australian canola exports (five-year average (2006/07–2010/11).*

production. The primary markets for Australian cottonseed have been China and Japan.

Biotechnology gives additional choices

The most significant agricultural development in recent years has been the introduction and adoption of biotechnology. While *Bt* cotton (i.e., containing insect-fighting genes of *Bacillus thuringiensis*) has been in production for a number of years and constitutes over 90% of all production in Australia, the 2011/12 season represents only the fourth year of commercial cultivation of Roundup Ready® canola (canola that is genetically engineered to resist the herbicide Roundup Ready®). With a year-one contribution of only 1% of the national crop, penetration of Roundup Ready canola has grown to about 10% as growers realize the benefits of the technology as an additional weed management option.

The Australian oilseed industry has established a "market choice" philosophy with respect to the Roundup Ready trait, ensuring that end users can exercise their market choice as to whether seed, oil, or meal comes from nongenetically modified (GM) crops or not. The establishment of a market choice position and resultant non-GM segregation in the canola supply chain have paved the way for the future introduction of other GM crops.

A bright and growing future

On the basis of an already vibrant and growing oilseed industry, the recent introduction of canola containing high quantities of oleic acid (to serve the growing demand for more healthful frying oils by the fast-food industry), combined with the launch of canola-quality *Brassica juncea* varieties suited for drier inland environments, provides additional growth opportunities for both volume and value. Australia may be a relatively small player in the oilseed production stakes, but it certainly punches above its weight in terms of innovation, value, creation, and export marketing—all of which augur well for a profitable and sustainable industry. ■

Australia at a glance

Basic Statistics

Area: 7,692,024 km^2
World's sixth-largest country in land area
Capital: Canberra
Major cities: Sydney, Melbourne, Brisbane, Adelaide, Perth
Population: 22.7 million (2011)
Urban population: 88% of total population
Population growth: 1.4% per annum (March 2010 to March 2011)
Gross domestic product (GDP): US$1,507 billion
GDP per capita (PPP): US$66,984
GDP real growth: 1.8% per annum (2010–2011)
Total exports: US$318 billion (2011 forecast, International Monetary Fund)
Export commodities: iron ore and concentrates, coal, gold, crude petroleum, natural gas
Currency: dollar (A$)
Exchange rate: A$0.95 = US$1.00

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Dates to Remember

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Hotel Reservation Closes: March 29, 2012

Register now at AnnualMeeting.aocs.org/Registration.

Fats and oils processing "DOWN UNDER"

Integration is the name of the game when it comes to vegetable oil processing in Australia. From a market environment where crushers, refiners, and producers were distinct sectors a decade ago, today's market is moving toward a fully integrated processing model.

Nick Goddard
Nick Goddard is executive director of the Australian Oilseeds Federation. He can be contacted at nick_goddard@australianoilseeds.com.

As executive director of the Australian Oilseeds Federation, I believe that the industry needed to undertake some significant restructuring to remain competitive against both imported refined products and exported finished goods. As a result, the industry is transforming from an environment where a margarine or oil producer would buy refined oil from a refinery in which the crude input was sourced from a crusher, to fully integrated plants in which seeds come in the front door, and cooking oils, margarines, and shortenings go out the back door.

Ten years ago the industry was facing significant competitive pressure from overseas refinery operations that could, at times, deliver imported refined oil to an end user in Australia cheaper than a local supplier could. At that time, much of the oil was from seed that was crushed in one plant, trucked to a refinery, and then transported to a packing plant before finally being delivered to an end user. Those gross inefficiencies in the supply chain had to be eliminated if the Australian industry were to remain viable. Fortunately, industry foresaw the issues on the horizon, and during the last decade, significant investment was made by a number of operators to produce more efficient and fully integrated plants.

Today, two plants are fully integrated, with another one under construction (Fig. 1). Of seed grown in Australia, these three plants together will provide about two-thirds of the oil-crushing and -refining capacity via an integrated model. The savings from this approach are multidimensional. Not only are there freight savings, which can be significant in a country the size of Australia, but there are also working capital savings, as less inventory needs to be stored; energy savings, as oils do not have to be heated and cooled between steps; and better use of by-products, which can be incorporated into the meal.

As a relatively small producer on a global scale, we need to maximize efficiency throughout the value chain by minimizing waste and duplication. That is how we will remain a cost-efficient and competitive player on the world stage. ■

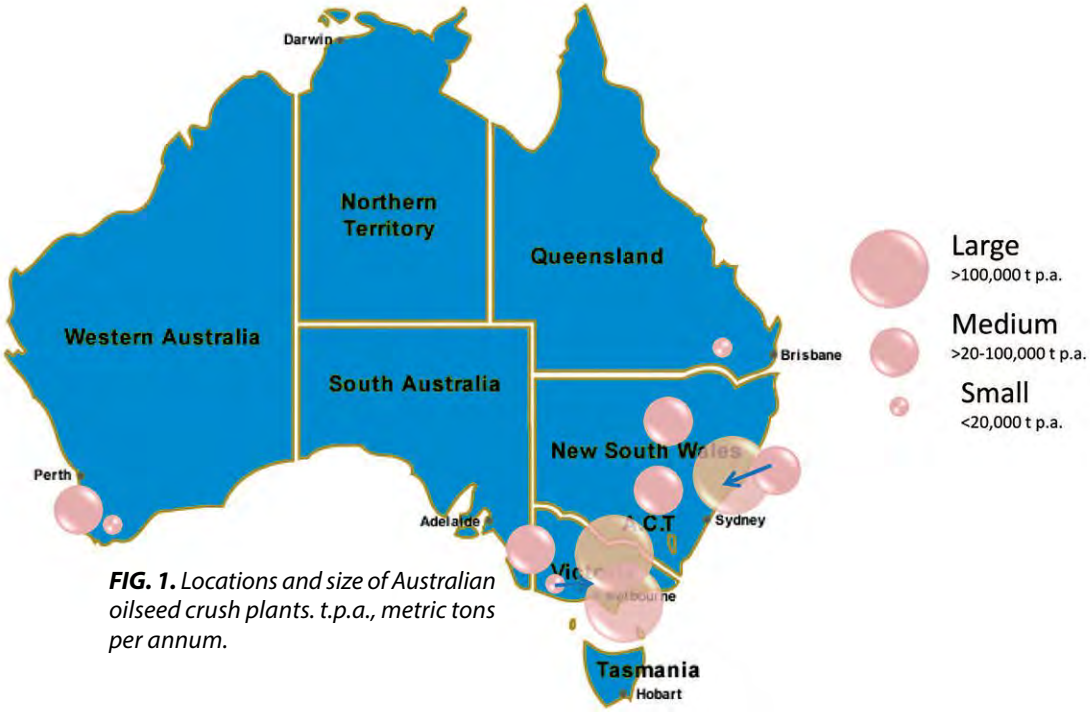


FIG. 1. *Locations and size of Australian oilseed crush plants. t.p.a., metric tons per annum.*

One-two punch R&D

Australia tends to "punch above its weight" on the global stage when it comes to research and development (R&D) in fats and oils. Nowhere was this more evident than at the Australasian Section of the AOCS Biennial Conference held in November 2011.

Nick Goddard and Matt Miller

Nick Goddard is executive director of the Australian Oilseeds Federation. He can be contacted at nick_goddard@australianoilseeds.com. Matt Miller is a research scientist at the New Zealand Institute for Plant & Food Research and secretary of the AOCS Australasian Section. He can be contacted at matt.miller@plantandfood.co.nz.

The week-long event, conducted in both Melbourne and Adelaide, included a two-day short course on the production of margarine, dairy blends, and spreads. It also featured an intensive two-day workshop on lipid oxidation and antioxidants and a symposium that focused on the new olive oil standard. These satellite events all preceded the two- day scientific conference, Fats and Oils—Industry, Innovation and Health, at which the best and brightest oil chemists, nutritionists, and other scientists presented their latest research.

Fats vs. carbohydrates

The conference had a strong emphasis on nutrition, highlighting the many health benefits of fats and oils. In contrast to an environment where fat is still demonized and ill-informed blanket dietary advice to eat less fat is still propagated, one paper presented by one of Australia's leading nutritionists highlighted the risks of replacing fats with carbohydrates (an inevitable consequence of a low-fat diet). In his study, Bill Shrapnel, a consultant for Shrapnel Nutrition Consulting Pty. Ltd. of Beecroft, New South Wales, Australia, demonstrated that in combination, the effective exchanges of carbohydrate for polyunsaturated fat, long-chain omega-3 fats, monounsaturated fat, and protein would be expected to increase coronary disease risk via several mechanisms

CONTINUED ON NEXT PAGE

as total carbohydrate intakes increased. He suggested this implies that there may be a progressive increase in coronary risk as carbohydrate intakes increase across the Acceptable Macronutrient Distribution Range (AMDR). He also suggested that there may be a case for lowering the upper and lower boundaries of the AMDR for carbohydrate intake and increasing and the upper and lower boundaries of the AMDR for fat as a strategy for chronic disease prevention.

Plant-based omega-3 fatty acids

With canola being the primary oilseed grown in Australia, there was significant interest in research developments aimed at producing canola-based sources of long-chain omega-3 fatty acids. Australia's Commonwealth Science and Industrial Research Organization (CSIRO) is researching this concept through its Food Futures National Research Flagship in conjunction with the CSIRO Plant Industry Division. Surinder Singh, group leader of the oilseeds group in the Plant Industry Division at CSIRO, shared the latest data on the significant amounts of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) that have been achieved in genetically modified canola, and how such plant oils will be able to meet the growing demand for sustainable sources of omega-3 fatty acids. This work recently won the CSIRO Research Achievement Medal, which recognizes exceptional research of CSIRO scientists and teams.

Olive oil standard

The hot topic symposium on the new Australian olive oil standard was a highlight of the meeting. Paul Miller, president of the Australian Olive Association, gave a compelling address on why the standard was needed. He explained that, owing to the increase in price and demand for high-quality olive oils, there is a growing propensity to label products falsely or misleadingly as being olive oil of high standards. Leandro Ravetti, a senior horticulturist and olive specialist from Modern Olives (Lara, Victoria, Australia), demonstrated the development of two new methods in which measurements of pyropheophytins and diacylglycerols may indicate that low-temperature deodorization has taken place. These analytical methods also show excellent correlation with the organoleptic assessment currently used to determine the aging/degradation of extra virgin olive oils. Rodney Mailer, who recently retired from his job as a research fellow at Australian Oils Research in Wagga Wagga, New South Wales, Australia, shared case studies of adulteration that had occurred in Australia and overseas, further highlighting the need for the new standard.

Developing industry leaders

A focus of the Australasian section of AOCS is to help develop future researchers and industry leaders. To this end, a number of student prizes were awarded at the conclusion of the Conference. Will Bignal from CSIRO/University of Tasmania won the Bryce Bell Student Prize for oral communication for his work on boosting the content of EPA and DHA in lamb toward becoming a significant dietary source. The judges were impressed with Bignal's work in supplementing sheep with omega-3 fatty acids, which combined traditional selective breeding techniques with genetic markers and lipid analysis. The Rod Mailer Student Poster Prize was awarded to Kim Jye Lee Chang from the CSIRO/University of Tasmania for his work on screening a large collection of novel heterotrophic protists (thraustochytrids) for the production of biodiesel and long-chain omega-3 oils. Finally, the Shimadzu Encouragement Award was won by Ramez Alhazzaa from CSIRO/University of Tasmania for his work on omega-3 fatty acid production in the Australian fish species barramundi, *Lates calcarifer*. ■

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

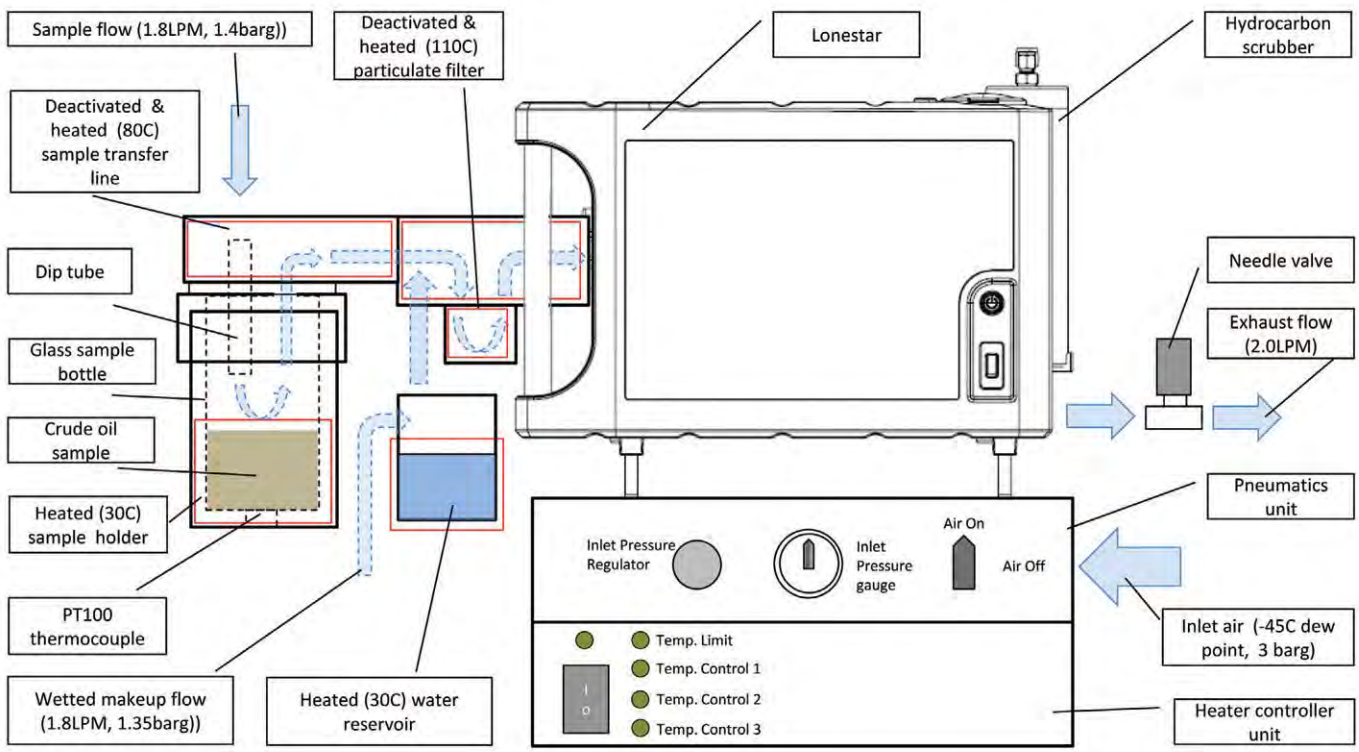


FIG. 1. *Edible oil analysis instrumental schematic. Abbreviations: LPM, liters per minute; barg, bar gauge; Mpa, megapascals. (Comment: Clean air flowing through the headspace at 2.3 LPM.)*

Field asymmetric ion mobility spectrometry (FAIMS): Quick screening detection and quantification of volatile organic compounds

FAIMS portable instrumentation brings the "lab to the plant floo " providing a highly sensitive and selective approach to analyzing chemicals of interest right at the point of need.

Russell Parris and Steve Freshman

Field asymmetric ion mobility spectrometry (FAIMS), also known as differential mobility spectrometry (DMS), is a gas detection technology that separates and identifies chemical ions based on their mobility under a varying electric field at atmospheric pressure. Samples in the vapor phase are introduced via a carrier gas to the ionization region, where the components are ionized via a charge transfer process or by direct ionization, depending on the ionization source used. It is important to note that both positive and negative ions are formed. The ion cloud enters an electrode channel, where an RF (radio frequency) waveform is applied to create a varying electric field under which the ions follow different trajectories dependent on the ions' intrinsic mobility parameters. A DC voltage (compensation voltage) is swept across the electrode channel shifting the trajectories so different ions reach the detector, which simultaneously detects both positive and negative ions. The number of ions detected is proportional to the concentration of the chemical in the sample.

CONTINUED ON PAGE 16

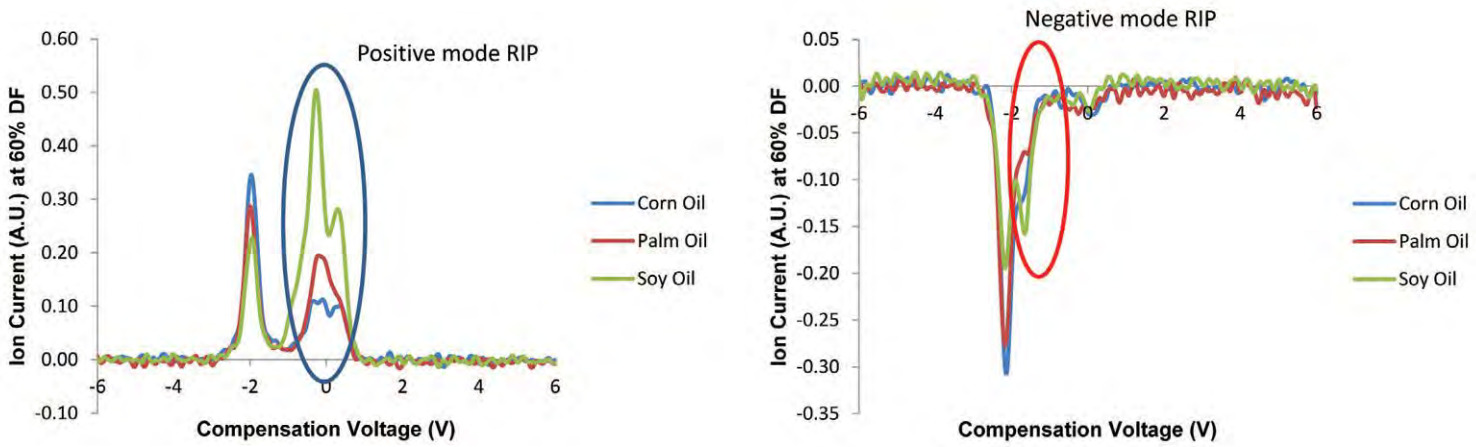


FIG. 2. *Field asymmetric ion mobility spectrometry (FAIMS) positive and negative mode compensation voltage plots of various vegetable oils illustrating the ability to rapidly differentiate edible oils. Abbreviations: RIP, reactive ion current; A.U., arbitrary unit; DF, dispersion field.*

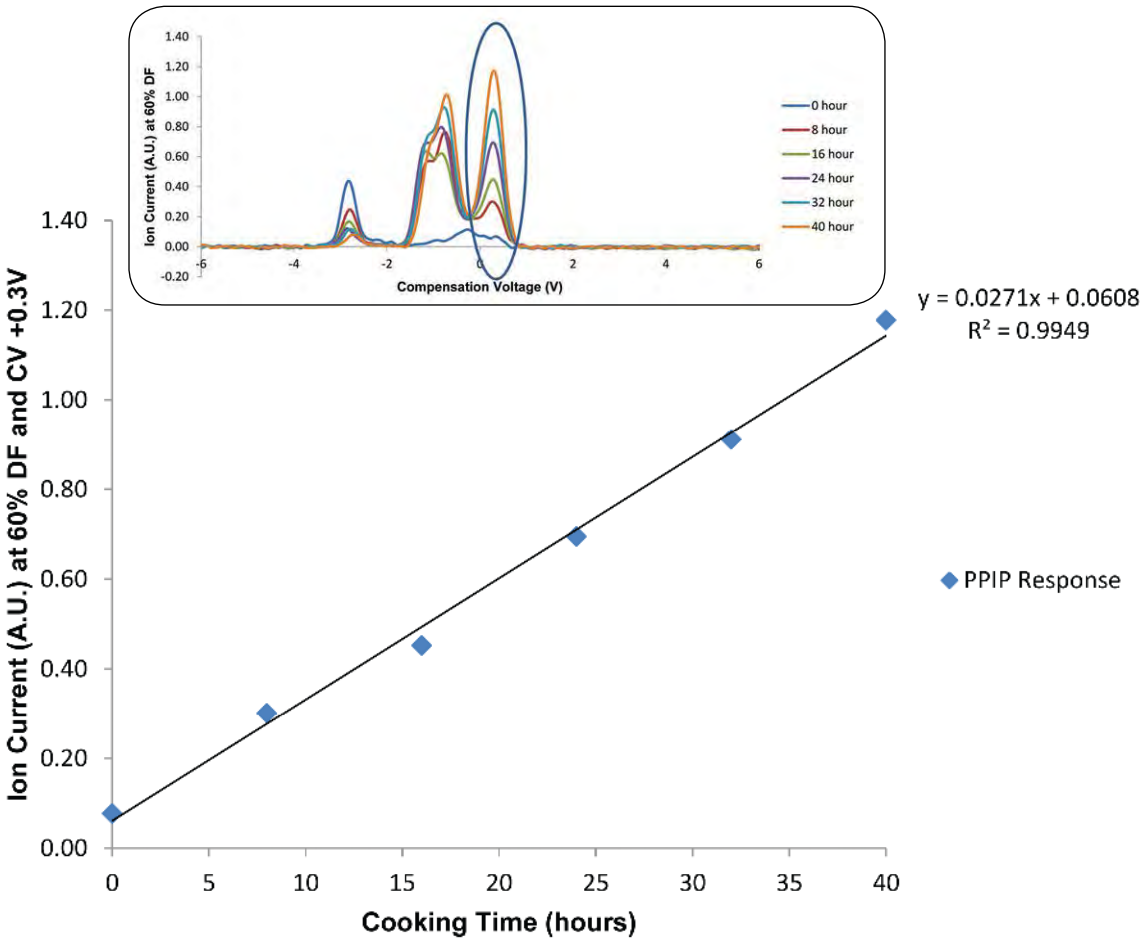


FIG. 3. *Calibration of cooking oil time derived from the FAIMS response (insert), enabling the user to accurately determine the aging of the oil during its useful lifetime. PPIP: positive product ion peak; CV, compensation voltage. For other abbreviations, see Fig. 2.*

Portable Rapid Detection

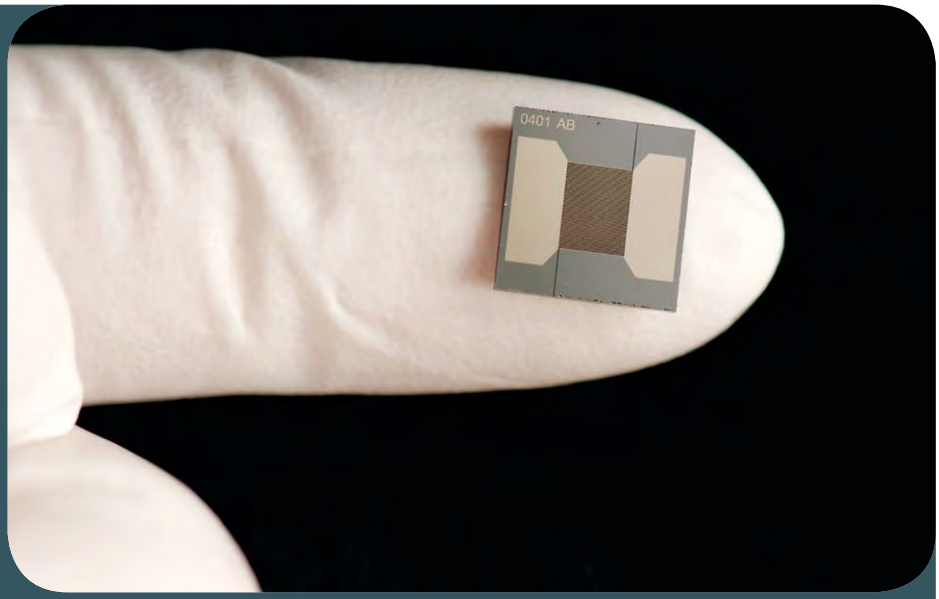
Using its proprietary FAIMS-based platform, Owlstone Inc. (Cambridge, UK) has created a portable rapid detection instrument, Lonestar, that can rapidly identify and quantify chemicals of interest at ppm/ppb levels.

The heart of its detection technology is a one centimeter square-sized silicon chip (3 millimeters in thickness) spectrometer.

Ions with the correct differential mobility pass through the device and hit the detector electrode. The ion current is an indicator of concentration.

Working with solid, liquid, and gaseous samples, nontechnical operators are able to use the instrument right at the point of need within a plant. The operator presents a small sample to the instrument and simply pushes a button to start the analysis. The concentration levels for the chemicals of interest within the specific matrix are reported based on the preprogramming of the instrument.

Within the edible oils industry, rapid, at-line screening applications of this instrument include the monitoring of raw material contaminants, flavor thresholds, preservative levels, fatty acid methyl esters, and residues from cleaning-in-place, to name just a few. ■



This dime-size silicon chip is a complete chemical detection system with the ability to rapidly monitor a broad range of chemicals at very low quantities with high confidence.

A detailed FAIMS overview is available at portal.sliderocket.com/AEFAV/100818-Lonestar-Tutorial. (Lonestar is a FAIMS portable sensor manufactured by Owlstone.)

FAIMS produces a unique, data-rich, two-dimensional fingerprint of the chemicals present within a sample matrix of interest. Chemicals are identified by their respective peak locations within the chemical fingerprint, and their concentrations are determined by the peak heights. FAIMS analyses of solid and liquid matrices are accomplished by analyzing the headspace created above the samples. Gas mixtures can also be analyzed. A static or dynamic technique can be employed depending on what needs to be determined. To solve the detection problem and provide a finished solution, the application must undergo a method development process. The target analyte response is identified in the sample matrix and then the instrument is calibrated for this response.

A video demonstration showing a FAIMS-based instrument in action is available at www.youtube.com/watch?v=PmSYYAo3Ukg.

FAIMS rapid detection can be used within the edible oils industry for such applications as at-line screening of raw material contaminants, flavor thresholds, preservative levels, and the age of oils.

Figure 1 (on page 14) is a schematic of a typical instrumental setup that could be used for the determination of such things as *tert*-butylhydroquinone (TBHQ) concentration, oil cooking time, and the differentiation of various edible oils.

For the TBHQ detection application, a 20 mL oil sample is placed into a glass bottle within the sample holder and heated to 30°C. Equilibrium is reached in approximately 3–5 minutes, at which time the headspace is continually flushed with clean, dry air. A FAIMS dispersion field (DF) matrix is created over a range of electric fields characterizing the headspace response. A precalibrated instrument then gives the user a concentration measurement with predetermined alarm levels reflected in a red light/green light response.

Fig. 2 (on page 15) highlights the ability of the FAIMS platform to differentiate and screen for various edible oils. Both the positive and negative mode compensation voltage (CV) plots of various palm oils can be analyzed simultaneously to further enhance detection efforts.

As the cooking time increases, various volatile organic compounds emerge. A clear linear response curve (Fig. 3) enables the method developer to quantify the age of the oil used in a particular process.

CONTINUED ON PAGE 63

News & Noteworthy

Briefs

The European Food Safety Authority (EFSA) said in early November 2011 that it has established an online "applications helpdesk" to provide information and support for applicants, member states, stakeholders, and other interested parties. The new tool is available at efsa.europa.eu/en/applicationshelpdesk.htm.

■■■

UK scientists have developed a waterproof, irreversible, reusable, ultraviolet-activated, oxygen-sensitive, "smart" plastic film. The film has potential as a "consume by" indicator in the food packaging industry, the researchers say. The film contains nanoparticles consisting of a methylene blue dye coated onto TiO_2. The blue indicator is first bleached using ultraviolet light, converting the methylene blue to its colorless form. This form persists in the absence of oxygen, but is re-oxidized to blue in 2.5 days in air under ambient conditions within the film. The rate of recovery is linearly dependent on the ambient level of oxygen. The oxygen-sensitive recovery step was found to be moderately dependent on humidity at 21°C, but not significantly dependent on humidity at 5°C. The work is described in *Analyst* (doi: 10.1039/c1an15774d, 2011; see tinyurl.com/Smart-Plastic).

■■■

A US program to advance camelina production in eastern Washington state "failed to attract any takers," according to the *Spokesman-Review* newspaper in Spokane (see tinyurl.com/WashCamelina). The test program of the US Department of Agriculture would have paid farmers to grow the oilseed crop. "Some regional farmers showed interest but none signed on," said Rod Hamilton, the program chief at the Spokane office of the Washington Farm Service Agency. He said the program would have supported camelina crops on up to 11,000 acres [4,500 hectares], according to the report. ■

EC acts on dioxins in vegetable oils and defines "nanomaterial"

Dioxin contamination in crude vegetable oils is the focus of a draft regulation under consideration by the European Parliament.

The European Commission's (EC) Standing Committee on the Food Chain and Animal Health endorsed the measure on October 21, 2011. The European Parliament and Council will review it next before the EC can officially approve it. The regulation is expected to come into force in mid-2012, according to a report by the Environment News Service newswire (ENS; see tinyurl.com/ECDioxin).

The action comes after yet another dioxin scare in Europe in December 2010 and January 2011. At that time, meat and egg sales from roughly 4,700 farms across Germany were halted after animal feed was found to be contaminated with dioxins. The contamination of about 136,000 metric tons of poultry and swine feed was traced to fat containing industrial dioxins.

The term "dioxins" refers to a family of chemical contaminants formed during combustion or during some industrial processes such as the bleaching of paper pulp. The US Environmental Protection Agency characterizes dioxins as likely human carcinogens that may increase the risk of cancer at background levels of exposure.

The contamination occurred when a batch of fatty acids produced in a biodiesel facility and meant for industrial use was mixed with fat for the production of animal feed. German authorities found that another seven suspect batches of fatty acids from the same biodiesel company were delivered to the feed fat company, according to ENS.

The draft regulation approved in October 2011 includes four measures aimed at reducing the risk of dioxin contamination in the food chain.

■ Feed businesses that process crude vegetable oils or manufacture products derived from oils of vegetable origin or blending fats will have to be approved and registered in accordance with Regulation (EC) No 183/2005.

■ Fats intended for feed and food must be strictly segregated during production and transport from fats intended for industrial use in nonedible applications. Product

CONTINUED ON NEXT PAGE

labels must explicitly mention their intended use to help prevent items unfit for use in feed from entering the food chain.

■ Mandatory minimum testing for dioxins, depending on the risk inherent to the products, will be introduced. "The testing will focus on the risky products at the moment they enter the feed chain to facilitate the detection of noncompliant cases and the enforcement of feed law," ESN notes.

■ Laboratories performing dioxin analyses must report results exceeding the limits provided for in Directive 2002/32/EC not only to the feed business operator but also to the competent authority.

EC DEFINES "NANOMATERIALS"

Also in October 2011, the EC formally defined "nanomaterials" as materials "whose main constituents have a dimension of between 1 and 100 billionth of a meter."

An October 18, 2011, EC news release states that this definition considers only "the size of the constituent particles of a material, rather than hazard or risk." As such, it describes nanomaterials as "a natural, incidental, or manufactured material containing particles, in an unbound state or as an aggregate or as an agglomerate and where, for 50% or more of the particles in the number size distribution, one or more external dimensions is in the size range 1 nanometer–100 nanometers."

The definition was created with input from the Scientific Committee on Emerging and Newly Identified Health Risks and the Joint Research Centre (JRC). According to the written statement, the EC hopes that the definition clearly lays out "which materials need special treatment in specific legislation" and "brings coherence to the variety of definitions that are currently in use in different sectors." The commission will review the definition in 2014 "in the light of technical and scientific progress."

"I am happy to say that the EU is the first to come forward with a cross-cutting designation of nanomaterials to be used for all regulatory purposes," said European Environment Commissioner Janez Potočnik. "Industry needs a clear coherent regulatory framework in this important economic sector, and consumers deserve accurate information about these substances. It is an important step toward . . . addressing any possible risks for the environment and human health, while ensuring that this new technology can live up to its potential."

California drafts another "green chemistry" reg

The US state of California has taken another stab at drafting a "green chemistry" rule to regulate toxic ingredients in consumer products.

California's Department of Toxic Substances Control issued a first draft in November 2010 that was widely criticized by environmentalists as being too limited. On the other hand, the first draft was labeled as being "totally unacceptable to the business community" by Dawn Koepke of the Green Chemistry Alliance. The Alliance includes 150 business associations and large California consumer products makers, according to the *Sacramento Bee* newspaper (see tinyurl.com/CalGreenChem).

The idea of the regulation—which is mandated by a 2008 law—is to help consumers identify harmful chemicals in household products and encourage manufacturers to replace them with safer formulations. Among the changes in the new draft:

■ The list of chemicals covered by the regulation has increased from about 800 to around 3,000.

■ Products containing some particularly risky chemicals will be exempted if they contain less than 0.01%, not 0.1% as previously proposed.

■ The range of products initially affected by the regulation has been reduced. Only two to five types of products—not yet determined—will initially be affected.

The draft regulations are available online at dtsc.ca.gov/SCPRegulations.cfm. ■

Sustainability watch

Sustainability science is growing and here to stay

Sustainability science continues to be fast growing, with widespread international collaboration, broad disciplinary composition, and wide geographic distribution, according to research from Los Alamos National Laboratory (New Mexico, USA) and Indiana University (Bloomington, USA).

The findings, published in the *Proceedings of the National Academy of Sciences* as the "Evolution and structure of sustainability science," were assembled from a review of 20,000 academic papers written by 37,000 distinct authors representing 174 countries and over 2,200 cities. Authors of the paper, Los Alamos research scientist Luís M.A. Bettencourt and Jasleen Kaur, a Ph.D. student in Indiana University Bloomington's School of Informatics and Computing, also identified the most productive cities for sustainability publications and estimated the field's growth rate, with the number of distinct authors doubling every 8.3 years. The study covered research generated from 1974 through 2010.

By analyzing the temporal evolution (distinct authors), geographic distribution, the discipline's footprint within traditional scientific disciplines, the structure and evolution of sustainability science's collaboration network, and the content of the publications, the authors ascertained that the field "has indeed become cohesive over the last decade, sharing large-scale collaboration networks to which most authors now belong and producing a new conceptual and technical unification that spans the globe."

Whereas specialized fields such as the natural sciences have generally been concentrated in a few cities in developed nations, Bettencourt and Kaur found that sustainability science has a very different geographic footprint.

"The field is widely distributed internationally and has a strong presence not only in nations with traditional strength in science—the United States, Western Europe, and Japan—but also elsewhere," Kaur said. "It is also perhaps surprising that the world's leading city in terms of publications in the field is Washington, DC, USA, outpacing the productivity of Boston or the [San Francisco] Bay Area, which in other fields are several-fold greater than that of the US capital."

Countries producing sustainability publications of noteworthy magnitude were Australia, the Netherlands, the United Kingdom, Brazil, China, India, South Africa, Nigeria, Kenya, and Turkey. Productive cities included London, Stockholm, Wageningen (Netherlands), Seattle (Washington, USA), and Madison (Wisconsin, USA).

When they dissected the discipline's footprint with respect to other fields contributing to sustainability science, social sciences accounted for 34% of the output, followed by biology with 23.3% and engineering at 21.6%. Within each of those leading fields, the authors then identified leading subfields in each group: Environmental policy was 20.2% of the social science output; weed management was 16.8% of the biology total; soil science was 23.6% of the engineering total.

The authors also found that sustainability science had a strong presence in smaller universities and laboratories and that the field had received support from cities and nations that differed from locations more commonly recognized in terms of strength of scientific production.

"The presence of political and economic capitals, rather than traditionally more academic places, is a common trend throughout the world," the paper noted. Regional centers with high production included Nairobi, Cape Town, Beijing, Melbourne, and Tokyo.

"We believe that all of this evidence, when taken together, establishes the case for the existence of a young and fast-growing unified scientific practice of sustainability science," Kaur said. "And it bodes well for its future success at facing some of humanity's greatest scientific and societal changes." ■

2012

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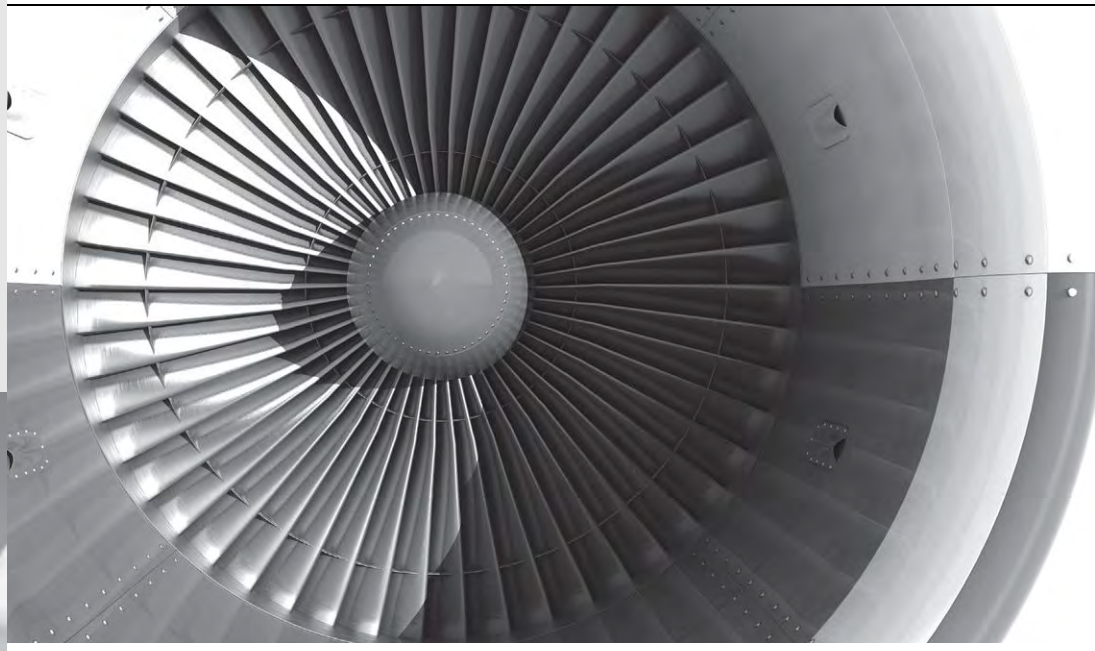
Biofuels News



Briefs

BP, the global oil and gasoline company headquartered in London, UK, announced in October its intention to become the world's leading supplier of biofuels. To this end, it will increase its already large land holdings in Brazil to grow sugarcane for the production of billions of gallons of ethanol. The financial website ThisIsMoney.co.uk reported that Phil New, BP's vice president of biofuels, said the company will accelerate plans by investing $500 million to $1 billion a year in the region.

■■■

On November 16, 2011, US President Barack Obama, the Environmental Protection Agency, and the Department of Transportation formally announced new fuel economy standards that will require model year 2017–2025 cars and light trucks to yield a combined fuel economy of 54.5 miles per gallon (as initially proposed in July 2011), or 4.3 liters per 100 kilometers. According to the government, these new Corporate Average Fuel Economy standards will help save as much as 2.2 million barrels of oil per day by 2025 and reduce greenhouse gas emissions by 6 billion metric tons.

■■■

Reuters news agency reported in November 2011 that a number of European biodiesel refiners are likely to cease production. There have already been closures in Germany and Spain. Demand for the fuel has been falling in Europe, and imports are providing stiff competition. Biodiesel output in Italy fell in 2011 by 32% in response to cheaper imports. To add to Europe's biodiesel woes, the harvest of rapeseed in the Europe Union (EU) in 2011 was expected to be "disappointing," leading to higher prices going forward for biodiesel manufactured in the EU. ■

RENEWABLE DIESEL

Biofuels in the air

The aviation industry continues to demonstrate its interest in incorporating biofuels into its future plans (see *inform 22*:497–499, 2011). Since the Paris Air Show, held in June 2011, additional companies have announced trials and test flights as well as limited commercial flights to evaluate the performance of biofuels under daily operating conditions (see Table 1 on page 22). The present article updates the 2011 *inform* article.

Beijing-based Air China flew its first test flight on October 28 using a commercial passenger plane powered with biofuel. The one-hour flight used 13.1 metric tons (MT) of biofuel blend (50% conventional jet fuel and 50% jatropha-based biofuel) in one of four engines of a Boeing 747-400 passenger plane; the other three engines were fueled with conventional jet fuel. The jatropha oil was produced and refined by PetroChina from plants grown on 80,000 hectares of low-quality farmland in southwest China's Sichuan and Yunnan provinces and was processed by Honeywell UOP. PetroChina plans to build a refinery by 2014 to produce 60,000 MT of biofuel annually. [Sources: tinyurl.com/China-biofuel; tinyurl.com/China-aviation]

Air France completed a flight on October 13 from Toulouse to Paris-Orly Field that achieved a fuel efficiency of 2.2 liters per passenger per 100 kilometers. CO_2 emissions were half those of a normal flight. Each engine of the Airbus A321 aircraft was powered by a 50% blend of biofuel, supplied by the Dutch aviation biofuels company SkyNRG (tinyurl.com/AirFrance-SkyNRG). Optimized air traffic management procedures, including a continuous descent approach, contributed to allowing the flight to claim CO_2 emissions of 54 grams per passenger per kilometer (g/passenger/km). According to the Air France-SkyNRG article, the best-performing airlines average over 100 g/passenger/km.

Two airlines—United Continental Holdings and Alaska/Horizon (parent group Alaska Air Group)—wound up competing to be the first US airline to fly a regularly scheduled flight or flights using biofuels. United came out the winner—by two days. Its one-off flight traveled from Bush Intercontinental Airport in Houston, Texas, to Chicago's O'Hare Airport on November 7. Fuel that was manufactured from algae by Solazyme, Inc. (South San Francisco, California) powered the Boeing 737-800 flight. United has announced its agreement with Solazyme to purchase 20 million gallons (76 million liters) of jet fuel a year, as early as 2014. This is equivalent to 0.6% of the airline's jet fuel

TABLE 1. Commercial airlines flying biofueled flights: Part II[a]

Airline	Plane(s)	First flight	Company name(s) of fuel source	Fuel feedstock (ratio biofuel to jetfuel)	Route	Distance (km)
Iberia Lineas Aereas de Espana SA	Airbus 320	October 3	Repsol YPF; UOP/Honeywell	Camelina (25:75)	Madrid to Barcelona	500
Aeromexico[b]	Boeing 737	October 4	UOP/Honeywell	Jatropha (25:75)	Mexico City to San José, Costa Rica	1,900
Air France	Airbus A321	October 13	SkyNRG	Used cooking oil (50:50)	Toulouse to Paris	680
Air China	Boeing 747-400	October 28	PetroChina; UOP/Honeywell	Jatropha (50:50), in 1 of 4 engines	N/A[c]	N/A
United Airlines	Boeing 737-800	November 7	Solazyme; UOP/Honeywell	Algae (40:60)	Houston to Chicago	1,490
Alaska Airlines[b], Horizon Air[b]	Boeing 737; Bombardier Q400	November 9–20	SkyNRG; Dynamic Fuels	Used cooking oil (20:80)	Seattle to Washington DC; Seattle to Portland	3,700 230

[a]For Part I, see *inform 22*:498 (2011).
[b]These airlines conducted a series of regularly scheduled commercial flights. Other airlines in this table have not yet announced regularly scheduled flights.
[c]N/A, not available.

consumption, according to Jimmy Samartzis, United's managing director of global environment affairs and sustainability (tinyurl.com/United-biofuel). The price of the fuel was not disclosed.

On November 9, Alaska Airlines and its sister carrier Horizon Airlines initiated regularly scheduled flights powered by biofuels. Alaska Airlines flew one one-way flight a day for 11 days from Seattle-Tacoma International Airport (SeaTac; Washington, USA) to Ronald Reagan Washington National Airport in Washington, DC. Horizon Airlines flew three one-way flights a day for a total of 64 flights from SeaTac to Portland, Oregon. Alaska Airlines reported paying $476,000 for the 28,000 gallons of biofuel to power these flights, or $17 per gallon ($4.49 per liter). Conventional jet fuel currently costs a little over $3 per gallon.

In a company statement, Alaska Air Group estimated that the 20% biofuel blend used for these 75 flights reduced greenhouse gas emissions by about 10%, or 134 metric tons, the equivalent of taking 26 cars off the road for a year (tinyurl.com/Alaska-Horizon).

Biofuels on the seas

The US Navy is investing more than $500 million in the biofuel industry to further its goal of reducing its dependence on petroleum-based fuels for its fleet by 50% over the next decade. (More than 50% of the Navy's fuel goes to maritime use.)

To this end, the US Navy sent its decommissioned destroyer Paul H. Foster on a cruise between San Diego, California, and Port Hueneme (near Los Angeles) on November 16–17, 2011. The 185-mile (300-kilometer) trip was powered by a 50:50 blend of petroleum (F-76) and a hydro-processed algal oil produced by Solazyme, Inc. (South San Francisco, California). Data on ship performance were collected during the cruise and compared with baseline data collected while the ship made the same trip earlier from Port Hueneme to San Diego on petroleum.

For the algal oil trial, the Paul H. Foster had been fueled so that 100% of the ship's propulsion power and 50% of its service power came from the algal oil/F-76 fuel blend. No changes had to be made to the infrastructure of the ship or the fueling pier for the test.

As reported by *Marine Log*, a business-to-business marine magazine, Mike Wolfe, the underway project officer, who is stationed with the Naval Surface Warfare Center Port Hueneme Division, said, "The fuel burned just like the traditional fuel we get from the Navy and have been burning for years. We could not tell the difference."

The Navy has already tested algae-based fuel in smaller vessels, such as in yard patrol craft at the US Naval Academy and in river-going boats.

Neste Oil (Espoo, Finland), the Port of Rotterdam, and the Rotterdam Climate Initiative announced that they would start trials of Neste's NExBTL renewable diesel, fueled at a 100% level, in a Port Authority patrol boat. The trial, whose start date was not specified in the original announcement, was planned to last a total of 1,000 hours. Exhaust emissions and engine performance were to be monitored, and operators would have the opportunity to gain experience with this new fuel. Neste's NExBTL can be produced from a wide range of vegetable oil and waste-based raw materials, such as waste animal food from food manufacturing.

ALGAE

Pahang Biodiesel building algae farm

Algaetech International Sdn. Bhd. is providing the technology for the construction of a microalgae farm on 2,000 hectares owned by Pahang Biodiesel Corp. Sdn. Bhd. in the southern part of Pahang State in central Malaysia. Work is to start in the first quarter of 2012. Production in the Malaysian Integrated Algae Valley will reach full scale within three years.

About 1,400 hectares of the site will be devoted to hundreds of open-air freshwater ponds, with the remainder of the land used for research, education, maintenance, and infrastructure.

According to Syed Isa Syed Alwi, chief executive officer of Algaetech International, which is headquartered in Kuala Lumpur, Malaysia, once the farm is fully operational it may be able to produce 500,000 metric tons (MT) of dry biomass annually. For an oil yield of 30%, this would be equivalent to 150,000 MT of biofuel. Algaetech has identified several microalgae species native to that part of Malaysia that can yield about 30% oil, and one strain that can yield as high as 60% oil.

In the early stages of algal growth, the organisms will be grown in a closed system to develop an inoculum, which will then be used to start growth in semi-open (i.e., covered greenhouses) or open systems.

The algae will be fed with CO_2 produced by several nearby industrial facilities. Organics-rich wastewater from 11 palm oil mills within a distance of about 50 kilometers will be piped to the site for its fertilizer value, diluted somewhat, and used as makeup water for the ponds.

According to the company, this farm will be the world's largest commercial project producing microalgae for biofuel. The ultimate cost for the facility is estimated as $383 million, according to *The New York Times* (tinyurl.com/Malay-algae).

Algaetech International was the winner of the 2011 Frost & Sullivan Asia Pacific Green Excellence Award for Service Innovation in Algae Technology (tinyurl.com/Algaetech-Frost).

ETHANOL

Risks/benefits for energy grasses

Researchers have identified so-called energy grasses such as switchgrass and Miscanthus as viable sources of cellulose for conversion into ethanol. Even as studies are proceeding to develop this energy source, other studies are looking at the effects of these grasses on the environments in which they would be grown. Evan H. DeLucia and coworkers (*Frontiers in Ecology and the Environment*: doi:10.1890/110003) used the DAYCENT [Daily Century] model to simulate fluxes of carbon and nitrogen among the atmosphere, vegetation, and soil (see tinyurl.com/DAYCENT). They calculated that if perennial cellulosic feedstocks were planted on cropland that is currently used to grow corn for ethanol production in the United States, more ethanol (+82%) and grain for food (+4%) could be produced. At the same time, nitrogen leaching would be reduced 15–22%, and greenhouse gas (GHG) emissions would drop 29–473%.

Thus, according to the DAYCENT model, switching to a low-input perennial crop for biofuel production would allow the corn-producing areas of the United States to move from becoming a net source to a net sink for GHG emissions.

Besides lessening GHG emissions, these grasses can cool the surface of the planet, in two ways. First, they reflect light and heat back into space—and because they grow year 'round, they reflect more heat and light than crops that are harvested.

Second, they draw water up from the soil, and because energy grasses have longer roots than corn and because they are perennials, they release more water to the atmosphere through evapotranspiration than corn does.

That is, energy crops remove more water from the soil than corn. Furthermore, as calculated from a mechanistic multilayer

canopy-root-soil model by Phong Le, Praveen Kumar, and Darren Drewry (*Proceedings of the National Academy of Sciences USA 108*:15085–15090, 2011), this effect is exacerbated by higher temperatures.

Le *et al.* concluded, "When climate change with projected increases in air temperature and reduced summer rainfall are also considered, there is a net increase in evapotranspiration for all crops, leading to significant reduction in soil-moisture storage and specific surface runoff." Thus, a warming climate potentially can alter the water cycle in areas of intensive conversion from growing corn to growing energy grasses.

JATROPHA

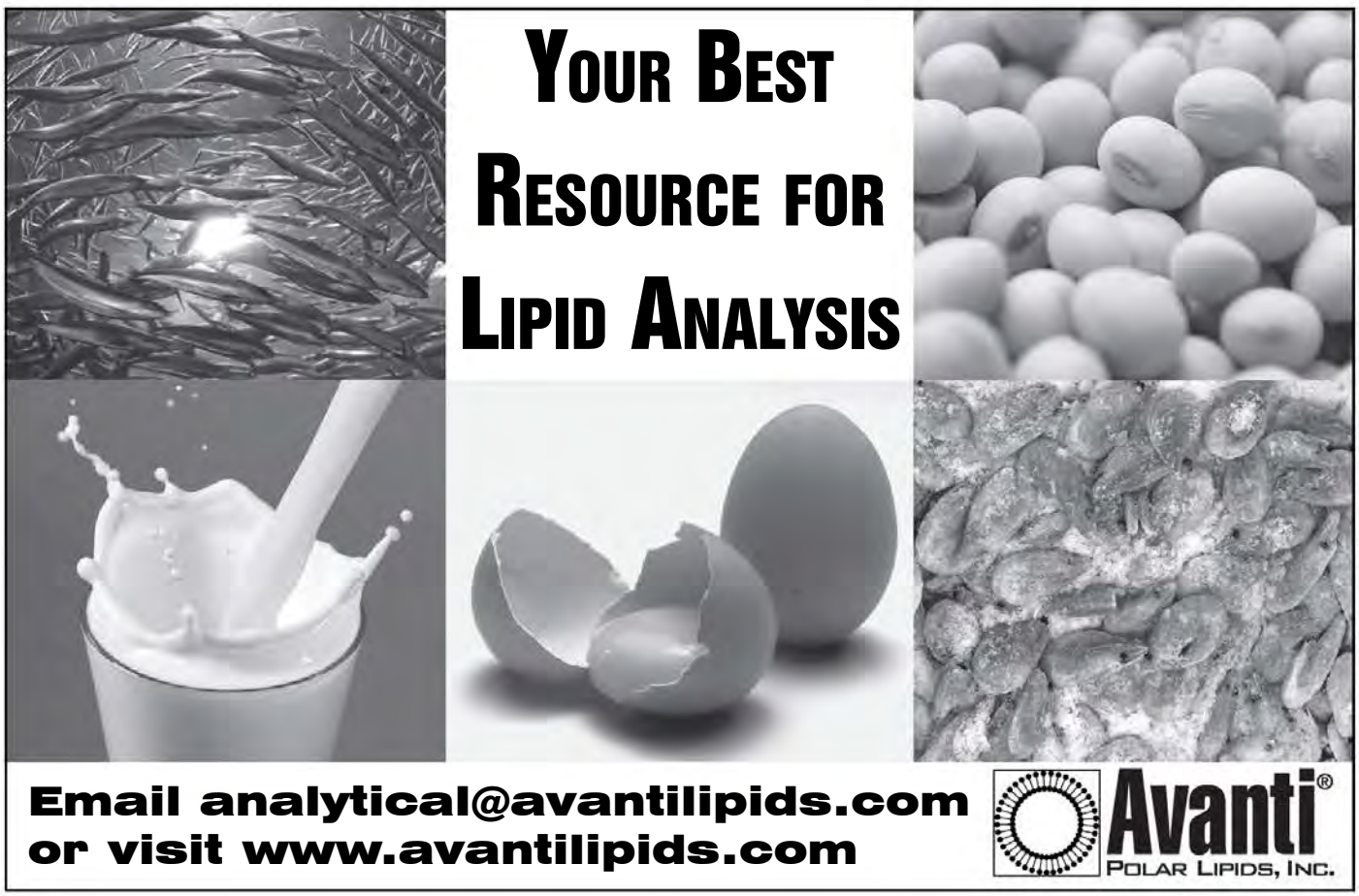
Mission NewEnergy and jatropha

Australia's Mission NewEnergy, a vertically integrated company growing jatropha and marketing oil from the seeds of the plant, was granted International Sustainability and Carbon Certification for its jatropha contracting model in the fourth quarter of 2011. This recognition certifies that the entire supply chain including indirect land use materially reduces green house gas emissions according to European Union-Renewable Energy Directive parameters.

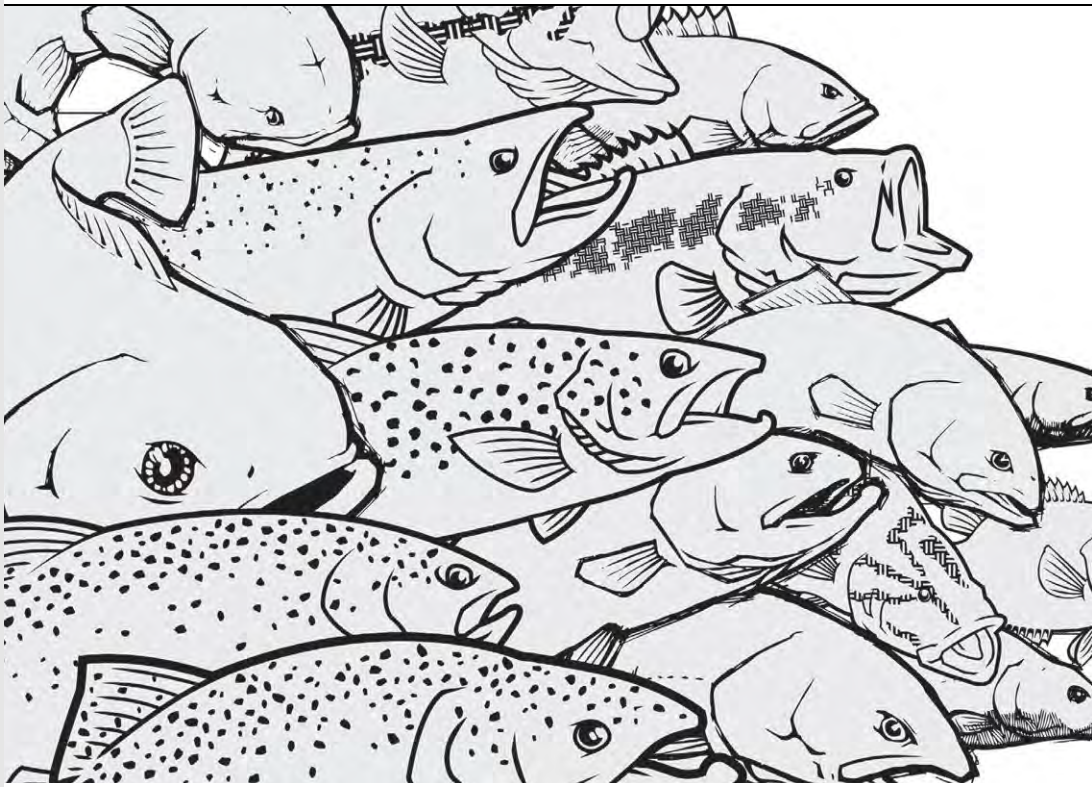
BioFuels Journal (tinyurl.com/BiofuelsJ-Mission) quoted Mission NewEnergy's Chief Executive Officer Nathan Mahalingam as saying, "The European biodiesel market represents a multi-billion dollar opportunity, and we are honored to be the first commercial scale provider of jatropha to receive this important endorsement." [Source: tinyurl.com/jatropha-sustainability]

The company's contract farming policy has provided some of India's poorest farmers a means to acquire education, exercise entrepreneurship, and experience upward mobility. For example, at the start of the fourth quarter, Mission Energy had materially completed its 2011 jatropha tree-planting efforts, adding 40,264 new acres (16,294 hectares) and 14,331 new jatropha contract farmers. The company now has a total of 234,587 acres (94,934 hectares) under contract representing a total of over 164 million trees.

Mission expects to receive 115 barrels of jatropha oil over the lifespan of each acre. This planting season, the company has planted high-yielding jatropha varieties from third parties, including JOil (Singapore) and Quinvita Ltd., based in the United Kingdom. These varieties are expected to increase yield and reduce the maturation cycle. ■



Health & Nutrition News



Benefits vs. risks of fish consumption

The benefits of fish consumption outweigh the risks, according to a joint expert consultation released in October 2011 by two United Nations agencies.

Environmental groups, including the Mercury Policy Project (MPP), an advocacy group based in Montpelier, Vermont, USA, disputed that analysis.

"Surprisingly, this expert group failed to address exposure concerns about fish with higher [methyl]mercury levels, which have led to consumption advisories in the United States and around the world," said Michael Bender, director of the MPP, in a statement.

The report resulted from work requested by the Codex Alimentarius Commission and was conducted by the Food and Agriculture Organization (FAO) and the World Health Organization (WHO) of the United Nations. The expert consultation found that the consumption of fish—especially fatty, cold-water fish—lowers the risk of mortality from coronary heart disease (CHD) among the general adult population. Further, the report notes an absence of probable or convincing evidence of CHD risk linked to methylmercury consumption, and says that potential cancer risks associated with dioxins are well below established CHD benefits from eating fish.

"When considering benefits of long-chain omega-3 polyunsaturated fatty acids (PUFA) vs. risks of methylmercury among women of childbearing age, maternal fish consumption lowers the risk of suboptimal neurodevelopment in their offspring compared to women not eating fish in most circumstances evaluated," the report suggests.

The report also discusses the intake of dioxin-like polychlorinated biphenyl (DLC) intake from fish and other dietary sources. It finds that neurodevelopmental risk is negligible at levels of maternal DLC intake that do not exceed the provisional tolerable monthly intake (PTMI) of 70 picograms/kilogram of bodyweight/month established by JECFA (the Joint FAO/WHO Expert Committee on Food Additives). Neurodevelopmental risk may no longer be negligible at levels of maternal DLC intake from fish and other dietary sources that exceed the PTMI.

The report also found that among infants, young children, and adolescents, "the available data are currently insufficient to derive a quantitative framework of health

Briefs

ASAGA (Asociación Argentina de Grasas y Aceites; Buenos Aires, Argentina) recently conducted a survey of seven internationally prominent researchers on the subject of fats and nutrition. The participants included Roger Clemens (University of Southern California), J. Edward Hunter (Xavier University in Cincinnati), Martijn B. Katan (VU University Amsterdam), William Lands (retired), Marcelo Tavella (University of La Plata), Ricardo Uauy (University of Chile), and Alfonso Valenzuela (University of Chile). The expert panel generally agreed on the need to avoid industrial *trans* fats and to decrease total and saturated fat consumption by replacing saturated fat with mono- and polyunsaturated fats. Further, they agreed on the beneficial effect of long-chain omega-3 fatty acids from marine sources and that the metabolic conversion rate in humans of α-linolenic acid to eicosapentaenoic and docosahexaenoic fatty acids is low. They did not agree on the effect of the omega-6/omega-3 ratio or whether *trans* fatty acids in dairy fat increase the risk of heart disease. The complete article in ASAGA's *A&G* magazine is available online in PDF format in Spanish (tinyurl.com/ASAGASpanish) and English (tinyurl.com/ASAGAEnglish).

■■■

Long-term aerobic exercise plus omega-3 supplementation have a synergistic effect in attenuating inflammation and augmenting bone mineral density in postmenopausal osteoporosis, according to a randomized, repeated-measures study led by Bakhtyar Tartibian of Urmia University in Iran. The study appeared in *Nutrition and Metabolism* (*8*:71–83, 2011; see http://tinyurl.com/Aerobicn-3).

■■■

Using mass spectrometry, Carol Robinson and colleagues at Oxford University in the United Kingdom, in collaboration with Daniela Stock at the Victor Chang Cardiac Research Institute in Australia, determined for the first time how the protein ATP synthase interacts with the fatty acids that form the membrane around cells. The work appeared in *Science* (doi:10.1126/science.1210148, 2011). ■

risks and benefits of eating fish. However, healthy dietary patterns that include fish and are established early in life influence dietary habits and health during adult life."

To minimize risks, the report recommended steps that governments should take to "better assess and manage the risks and benefits of fish consumption and more effectively educate and communicate with their populations." The FAO/WHO report is available online at http://tinyurl.com/FAOWHOfish (pdf).

Fighting fat with fat

The fat we typically think of as body fat is known as white fat. But another type—known as brown fat—does more than just store fat. It actually burns fat.

Researchers once thought that brown fat disappeared after infancy, but recent advances in imaging technology led to its rediscovery in adult humans. Because brown fat is so full of blood vessels and mitochondria—which is why it is brown—it is effective at converting kilocalories into energy, a process that malfunctions in obesity.

In a study published in *Cell Metabolism* (*14*:478–490, 2011, see http://tinyurl.com/Orexin), researchers at Sanford-Burnham Medical Research Institute (Orlando, Florida, USA) discovered that orexin, a hormone produced in the brain, activates calorie-burning brown fat in mice. Orexin deficiency is associated with obesity, suggesting that orexin supplementation could provide a new therapeutic approach for the treatment of obesity and other metabolic disorders. Whereas most current weight loss drugs aim to reduce a person's appetite, an orexin-based therapy would represent a new class of fat-fighting drugs—a class that focuses on peripheral fat-burning tissue rather than the brain's appetite control center.

"Our study provides a possible reason why some people are overweight or obese despite the fact that they don't overeat—they might lack the orexin necessary to activate brown fat and increase energy expenditure," explains Devanjan Sikder, senior author of the study and assistant professor in Sanford-Burnham's Diabetes and Obesity Research Center.

Sikder's team, which included postdoctoral researchers Dyan Sellayah and Preeti Bharaj, looked at mice genetically engineered to lack orexin. These mice weighed more than their normal counterparts did, but they actually ate less, suggesting that overconsumption was not the cause of their obesity. Rather, the orexin-deficient mice lacked diet-induced thermogenesis (heat production); in other words, when fed a high-fat diet, the mice failed to dissipate the extra calories as heat the way that normal mice (and people) do. Instead, they stored that energy as fat.

This finding prompted the team to look at the animals' brown fat—a source of thermogenesis. What they found is that brown fat in mice lacking orexin did not develop properly at the embryonic stage. This shortage had lasting effects on energy expenditure and weight, even in adulthood.

Taking the opposite approach, the researchers then gave the defective mice more orexin. With the hormone present, brown fat developed properly before birth and continued to be active into adulthood. What is more, adding orexin to stem cells in a laboratory dish caused them to differentiate into brown fat cells, creating more of this fat-burning engine.

"Without orexin, mice are permanently programmed to be obese. With it, brown fat is activated and they burn more calories," said Sikder. "We are now taking the next steps in determining how orexin—or a chemical that has the same effect—might be used in humans to therapeutically prevent or treat obesity."

Very-long-chain fatty acids and cancer

A new method developed by researchers at Princeton University (New Jersey, USA) may shed light on the difference between fatty acid metabolism in cancer cells and in healthy cells. And an understanding of those differences may lead to new treatments.

How the tightly regulated pathways used by cells to synthesize and break down a multitude of fatty acids work together—and how cancer genes change their regulation—remain enduring questions in cancer research. A further challenge arises because fatty acids containing more than 24 carbon atoms are rare and difficult to analyze.

Scientists led by Joshua D. Rabinowitz fed cells ^{13}C-labeled glucose and glutamine and then used mass spectrometry to see where the labeled carbon ended up in the cells' fatty acid chains. They first cultured mouse kidney cells with the labeled molecules. Next, they extracted the cells' fatty acids and analyzed them by liquid chromatography-mass spectrometry.

According to a report in *Chemical and Engineering News* (see http://tinyurl.com/CENLongFat), "the scientists could detect 45 different fatty acids with between 14 and 36 carbons per chain, and at concentrations as low as 5 ng/mL."

They found that fatty acids with the same length often had different ^{13}C labeling patterns. "Based on these patterns and knowledge of metabolic pathways, [the] team could figure out which fatty acids were made from scratch, which had been elongated in the cell, and which had been absorbed from the surrounding environment."

Then came the issue of how proliferating tumor cells ramp up their fatty acid production. To answer that question, the researchers studied mouse kidney cells expressing the gene *ras*, which promotes cancer cell growth. "The researchers found that these cells had more long-chain fatty acids than did those without the gene, and that the cells produced this abundance by elongating fatty acids that they had absorbed from their surroundings."

The study appeared in *Analytical Chemistry* (doi: 10.1021/ac202220b, 2011; see http://tinyurl.com/LongFat).

Does aging change DHA homeostasis?

Higher intake of fish and omega-3 fatty acids present in fish is associated with reduced risk for age-related cognitive decline (ARCD), based on epidemiological studies.

"Normally, docosahexaenoic acid (DHA) in plasma is positively associated with DHA intake," writes a research team led by Christian-Alexandre Castellano of the Université de Sherbrooke in Québec, Canada. "However, despite being associated with lower fish and DHA intake, unexpectedly, ARCD is not consistently associated with lower plasma DHA.

"Furthermore, DHA is often slightly but significantly higher in plasma and erythrocytes in the elderly without ARCD, compared to young adults. Higher plasma DHA in the elderly may be a sign that their fish or DHA intake is higher, but we show here that various aspects of DHA homeostasis also change with age," they continue.

The researchers' supplementation and tracer studies show that DHA metabolism is different in healthy elderly compared to

healthy young adults. "Apolipoprotein E4 increases the risk of ARCD, possibly in part because it changes DHA homeostasis," they write. "Therefore, independent of differences in fish intake, changing DHA homeostasis may contribute to making the elderly more susceptible to cognitive decline despite them having similar or sometimes higher plasma DHA than in younger adults."

The study appeared in *Oléagineux, Corps Gras, Lipides* (*18*:175–180, 2011; see http://tinyurl.com/77rxrfd).

Efficacy of vitamin D2 vs. D3

A review and meta-analysis led by Goran Bjelakovic of the University of Niš in Serbia compared the efficacy of vitamin D2 vs. D3 in terms of reduction in the risk of mortality.

He and his team analyzed 50 randomized controlled trials (RCT) involving a total of 94,000 participants that used some form of vitamin D and reported mortality rates as either primary or secondary outcomes. Thirty-two of the studies used vitamin D3 (74,000 subjects) and 12 of them used vitamin D2 (18,000 subjects). The scientists found a significant decrease in the relative risk of all-cause mortality (6%) when supplementing with vitamin D3, as opposed to a 2% relative risk increase when supplementing with vitamin D2.

This paper, which was published in July 2011 (*Cochrane Database of Systematic Reviews*: doi:10.1002/14651858.CD007470.pub2; see http://tinyurl.com/D2versusD3), slipped by us at the time. That is, until Harvey Murff of Vanderbilt University reviewed the study in late 2011 in the *Annals of Internal Medicine* (155:JC5–04, 2011).

"To my knowledge, these papers are the first to paint such a clear picture [of] the efficacy [comparisons] between D3 and D2," noted John Cannell, executive director of The Vitamin D Council, in a statement. "While there may be explanations for D3's superiority other than improved efficacy, for the time being, these papers send doctors a message: use D3, not D2."

Nuts to metabolic syndrome

For the first time, scientists report a link between eating nuts and higher levels of serotonin in the bodies of patients with metabolic syndrome (MetS), who are at high risk for heart disease. (Serotonin helps transmit nerve signals and decreases feelings of hunger, makes people feel happier, and improves heart health.) In work reported in the *Journal of Proteome Research* (doi:10.1021/pr200514h, 2011), it took only one ounce [28 grams] of mixed nuts (raw unpeeled walnuts, almonds, and hazelnuts) a day to produce the positive effects.

Cristina Andrés-Lacueva and colleagues from the Biomarkers & NutriMetabolomics Research Group at the University of Barcelona, in collaboration with the Human Nutrition Unit of the Rovira i Virgili University in Tarragona, Spain, explain that the worldwide rise in obesity brings with it a rise in the number of patients with MetS.

Dietary changes, however, may help patients shed the excess weight and become healthier. Among the changes: the regular consumption of nuts—which contain a number of healthful nutrients such as unsaturated fatty acids and polyphenols. To check the biochemical effects of nut consumption, the researchers put 22 MetS patients on a nut-enriched diet for 12 weeks and compared them to another group of 20 patients who were told to avoid nuts. The scientists analyzed the broad spectrum of compounds excreted in the patients' urine and found evidence of several healthful changes. One surprise was evidence that nut consumption had boosted patients' levels of metabolites of serotonin in their urine. The researchers point out that the study provides the first evidence in humans of the beneficial effects of nut consumption in reducing levels of substances associated with inflammation and other cardiovascular risk factors in the body of patients with MetS. ■

Biotechnology News

Briefs

The European Food Safety Authority (EFSA) published a scientific opinion at the end of October 2011 on the 2009 Post-Market Environmental Monitoring (PMEM) report for the cultivation of the genetically modified maize (corn) MON810, which is produced by Monsanto. The assessment, issued by EFSA's Panel on Genetically Modified Organisms (GMO Panel) concluded that (i) cultivation of MON810 for the 2009 growing season had no adverse effects on human and animal health or the environment. Furthermore, (ii) the outcomes of the PMEM report corroborated findings of the previous EFSA risk assessment of MON810 for 2009. However, the GMO Panel said there were a number of shortcomings in the methodology used for monitoring and surveillance, and it made recommendations to improve future data collection and reporting.

■■■

Dean Riechers, associate professor of weed physiology at the University of Illinois at Urbana-Champaign (USA), and co-workers have suggested that farmers may want to tank-mix auxinic herbicides (e.g., 2,4-D) with glyphosate (Roundup™) as a short-term option for broad-spectrum, postemergence weed control. Since the 1950s, 29 auxin-resistant weed species have been discovered worldwide, and 21 glyphosate-resistant weed species have been discovered since 1996, when Roundup Ready soybeans were commercialized. Two of the most problematic weeds in US fields of Roundup Ready soybean and cotton—common waterhemp and Palmer amaranth—have not yet developed a resistance to auxin. Riechers said, "If we don't find completely novel and new herbicides, our best bet is to mix glyphosate and another herbicide with relatively minor resistance problems. Auxin resistance is not considered a huge problem in the United States, particularly in corn, soybean and cotton." ■

Fate of *Bt* protein during the agricultural cycle

When genetically modified (GM) *Bt* corn is cultivated, *Bt* protein enters the soil via root exudates, decomposition of harvest residues, and pollen deposits. If *Bt* corn is then used as cattle feed, *Bt* protein could also enter the soil through liquid manure spread on the fields.

Helga Gruber, a Ph.D. student at the Bavarian State Research Centre for Agriculture and the University of Technology in Munich (TUM), and her co-workers recently reported results on the accumulation of *Bt* protein from MON810 corn in soils on which corn had been grown for eight and nine years in succession. As a control, the non-GM parent variety was also grown on the trial fields.

Plants were harvested in the autumn, soil samples were collected, residues were turned under, and soils samples were taken again in the spring before the new crop was sown. Protein was extracted and the *Bt* protein was analyzed by an ELISA (enzyme-linked immunosorbent assay) method. In a statement (http://tinyurl.com/Bt-MON810AgCycle) , Gruber said, "Our results show that *Bt* protein that enters the soil through harvest residues breaks down quickly. We did not find any accumulation of the protein on the long-term trial fields. In the spring before the next crop of maize was sown, we were no longer able to detect any *Bt* protein on any of the plots."

In another experiment Patrick Gürtler, of TUM, investigated the potential effects of feeding dairy cows with *Bt* corn over a period of 25 months. Eighteen cows were fed GM corn, and another group of 18 cows were fed non-GM corn. Gürtler reported, "The use of *Bt* maize had no impact on feeding behavior, milk yield or animal health, or on the performance and metabolic parameters."

In conjunction with the study of effects of *Bt* corn on cows, samples of blood, feces, urine and milk were collected and examined for GM DNA (specifically Cry1Ab DNA) as well as *Bt* protein. No elements of Cry1Ab DNA or *Bt* protein were found in either blood or urine. In feces, no Cry1Ab DNA was detected, but *Bt* protein was found. In milk neither *Bt* protein nor GM DNA was detected. Summarizing, Gürtler said, "We were unable to detect any transfer of these *Bt*

maize [corn] components from the animal feed to the milk".

Since it is theoretically possible that *Bt* protein and Cry1Ab DNA could enter the soil through the process of spreading liquid manure from the barns onto the fields, the researchers investigated whether *Bt* protein did in fact enter the soil via slurry. During the long-term feeding study with MON810 *Bt* maize, liquid manure from the cows fed on *Bt* maize and from the control group was collected at different times, stored in tanks and spread on grassland and trial corn fields at predefined times that are usual in farming practice. The feed, the liquid manure from the cows, the soil of the fertilized plots and the plants were then analyzed for both Cry1Ab DNA and for *Bt* protein.

Gruber and her team were not able to detect any Cry1Ab DNA in the slurry, but did find very small amounts of the protein, which were attributed to incompletely digested *Bt* plant remains. Nor was the *Bt* protein in the slurry completely broken down during storage.

Once the liquid manure had been spread on the fields, *Bt* protein could no longer be detected in the soil because the slurry was quickly broken down in the biologically active soil. Furthermore, no *Bt* protein was detected in the harvest (either cut grass and corn of the non-GM parent variety) taken from the fields where the slurry had been spread.

Honey and GM pollen

The European Union (EU) Court of Justice, the highest court in the bloc, ruled in late September that honey containing traces of pollen from genetically modified (GM) plants must receive prior authorization before it can be sold as food in the EU. According to FoodNavigator.com, European imports of honey from countries such as Argentina, where GM crops are widely grown, will likely be adversely affected. European food manufacturers may have to start testing honey for GM pollen traces as well as upgrade their labeling practices. The issue originally came up in 2005, when German beekeepers in Bavaria identified traces of pollen from Monsanto's insect-resistant MON 810 corn that was grown near their hives in a research project.

Although pollen in honey does not constitute a genetically modified organism (GMO), according to the Court of Justice ruling, because it has lost its ability to reproduce, it is an ingredient "produced from GMOs." It is immaterial whether the pollen was added to the honey intentionally or adventitiously.

Court challenge to growing GE crops on FWS refuges

The US public interest group Public Employees for Environmental Responsibility (www.peer.org) filed suit on November 2 in US District Court for the District of Columbia, in collaboration with the Center for Food Safety (CFS), against the US Fish & Wildlife Service (FWS), charging that the FWS entered into cooperative farming agreements and approved planting of genetically engineered (GE) crops in eight Midwestern states (Illinois, Iowa, Indiana, Michigan, Minnesota, Missouri, Ohio, and Wisconsin) without the environmental review required by the National Environmental Policy Act and in violation of the National Wildlife Refuge System Administration Act. This is the fourth lawsuit filed by PEER and CFS challenging FWS permitting GE crops on wildlife refuges.

FWS has allowed farming on refuge lands for many years. PEER and CFS contend that such farming interferes with protection of wildlife, native grasses, and biodiversity. In recent years a number of farmers planting on the refuges have used GE crops with FWS knowledge, claiming GE seeds are the only ones they can obtain. PEER claims that these seeds have largely been developed to resist Monsanto's Roundup herbicide.

In a statement, CFS staff attorney Paige Tomaselli said, "National Wildlife Refuges are sanctuaries for migratory birds, native grasses and endangered species. Allowing . . . GE crops degrades these vital ecosystems and is antithetical to the basic purpose of our refuge system."

Corn rootworms developing resistance to *Bt* toxin?

In early September 2011 the *St. Louis Post-Dispatch* (Missouri, USA) newspaper reported that Monsanto Co.'s biotech corn that is supposed to repel western corn rootworm—a major crop pest and yield-reducer—is showing signs that it no longer repels the pests it is engineered to kill. The evidence that *Bt* corn hybrids expressing the Cry3Bb1 protein were losing efficacy was first identified at Iowa State University (Ames, USA) by Aaron Gassmann and coworkers in 2009 [*PLoS One* 6(7):e22629, 2011; doi: 10.1371/journal.pone.0022629]. The authors suggested that insufficient planting of refuges and non-recessive inheritance of resistance may have contributed to resistance. They also proposed that improvements in resistance management and a more integrated approach to the use of *Bt* crops may be necessary.

Another report appeared in the August 26, 2011, issue of the University of Illinois Urbana-Champaign (UIUC) Extension's Pest Management and Crop Development Bulletin (http://tinyurl.com/UIUCpest-manage) of severe corn rootworm damage in two northwestern Illinois counties in *Bt* hybrids that express the Cry3Bb1 protein. Corn in the damaged fields has been in continuous production for many years, and the producers have relied on *Bt* hybrids that express the Cry3Bb1 protein as their primary protection against western corn rootworm injury. Michael Gray, an agricultural entomologist with UIUC who wrote the Bulletin report, recommended the following alternatives for planting in 2012 for farmers unsatisfied with root protection by their *Bt* hybrid:

- Rotation to soybeans or another nonhost crop
- A corn rootworm soil insecticide at planting
- A *Bt* hybrid expressing a different corn rootworm Cry protein than one that may have performed poorly in your fields in 2011

■ A pyramided *Bt* hybrid that expresses multiple Cry proteins targeted against corn rootworms

According to Bloomberg.com on September 2 (http://tinyurl.com/Bloomberg-corn), Gray was contacted by more farmers whose *Bt* corn had succumbed to corn rootworms.

Monsanto's response, according to the *Post-Dispatch*, was that the problem did not amount to "resistance." Instead, Monsanto told the paper that the problem was confined to as little as 10,000 acres (4,000 hectares).

A news report released on September 22 by the UIUC College of Agricultural, Consumer, and Environmental Sciences pointed out that confirmation of resistance would require collection of adult insects from affected fields and subsequent detailed laboratory investigations.

European study says GM corn safe for butterflies

Mechthild Schuppener of RWTH Aachen University (Germany) has carried out a three-year research study on the sensitivity of butterfly caterpillars to pollen from *Bt* corn. In the laboratory, she conducted a feeding study to identify their sensitivity, and in the field she looked at how much corn pollen lands on the butterflies' preferred food plants.

Both of the butterfly species studied—the small tortoiseshell (*Aglais urticae*) and the peacock (*Inachis io*)—develop caterpillars during the time that corn is pollinating. Both also feed on only one type of plant, the stinging nettle, which is common in the agricultural environment of her study.

The corn cultivar, MON89034 × MON88017, contained three *Bt* proteins, two of which are effective against the European corn borer, a moth.

In the laboratory, Schuppener and her colleagues applied different concentrations of pollen suspensions to pieces of stinging nettle and then presented them to the caterpillars. The researchers recorded feeding activity, weight gain, time to pupate, and mortality rate. In the field, they looked at how far corn pollen spreads by setting up pollen traps and stinging nettle plants at various distances from the edge of the corn field.

In the laboratory the scientists found sensitivity to the *Bt* corn pollen at levels of 200–300 pollen grains per square centimeter (cm^2). At those levels, the caterpillars ate less. At 1,000 pollen grains/cm^2, there clearly was mortality compared with control animals fed pollen from conventional corn.

In the field, Schuppener and her coworkers found that pollen quantities fell rapidly with increasing distance from the corn field. Immediately next to the edge of the field, rates of 150 pollen grains/cm^2 were counted in pollen traps; counts on stinging nettle leaves in the same vicinity were only 30 pollen grains/cm^2. Only rarely could a nettle leaf be found with up to 200 pollen grains/cm^2. The difference in numbers of pollen grains per square centimeter in traps vs. nettle leaves was attributed to the sticky surfaces of the pollen traps. Nettle leaves are not sticky, so pollen can roll off, be blown off by wind, or washed off by rain.

The researchers also found that a high proportion of the caterpillars develop before or after the corn-flowering period, and only some are present during the corn-flowering period itself. And not all of these will develop in the immediate vicinity of the corn fields.

Schuppener and her coworkers concluded that the risk to the butterflies from the type of *Bt* corn they studied is negligible.

Center for Food Safety petitions for GE labeling

The Center for Food Safety (CFS), a Washington, DC (USA)-based advocacy group, filed a petition on October 4 asking the US Food and Drug Administration (FDA) to require that any food products containing genetically engineered ingredients be labeled as such. The CFS prepared the legal action on behalf of the *Just Label It* campaign (www.justlabelit.org). The latter is a coalition of almost 400 health, consumer, environmental, and farming organizations, as well as food companies. Many of the members are involved in organic food production, marketing, and consumption.

The FDA will have 180 days to respond and, according to the *St. Louis Post-Dispatch* newspaper, will have to open up a comment period.

Just Label It contends the FDA has rejected labeling of GE foods since 1992. By contrast, labeling is required in the European Union, Australia, New Zealand, Japan, Korea, Brazil, and China.

In a statement released by *Just Label It*, Gary Hirshberg, chief executive officer of Stonyfield Farm, a member of the coalition, was quoted as saying, "Without labeling of GE foods, we cannot make informed choices about the foods we eat and we all should have this choice while the debate continues." ■

Surfactants, Detergents & Personal Care News

Forget cold-water washing—get rid of the clothes dryer

The major consumer-products companies continue to push consumers to reduce their carbon footprints by machine-washing clothes in cold water. But is the effort wasted?

A study conducted by US environmental and energy research firm Cadmus Group of Watertown, Massachusetts, suggests that energy savings realized through cold-water washing pale in comparison to cutting the time clothes spend in the dryer.

During the study, Cadmus engineers tracked the energy consumption of 115 household laundry systems in southern California and the San Francisco Bay Area. The team deployed energy monitoring devices to collect data at each site, measuring volumetric flow through the hot water hose serving the clothes washer, the temperature of the hot water entering the clothes washer, and the electricity consumed by the washer and electric dryer.

The collected data unearthed findings that can help inform manufacturers as they seek ways to fine tune new "smart" washers and dryers, according to David Korn, a principal at Cadmus Group and co-author of the study.

"Contrary to conventional wisdom, the energy use of the washer is not an issue. Hot water used in washing clothes is moderately important, but we found that households only use hot water about 13% of the time," Korn said. "The majority of the energy consumed and potential savings arise in reduced operation of the clothes dryer—not the washer."

As a result, washing machines should be set at a high rate during the spin cycle to remove as much moisture as possible from the clothes. This reduces the amount of time the clothes must spend in the more energy-intensive dryer.

Front-loading, or horizontal axis tumbling, washers have become increasingly popular among environmentally conscious consumers because they use less water than top-loading or vertical axis washers. But front loaders often shake and create noise in the spin cycle, causing consumers to set them at a slower spin speed to avoid the commotion.

Briefs

An article in *Cosmetics & Toiletries* magazine examines the rheological properties of almond, safflower, and palm oils used in cosmetic emulsions with phosphate-based surfactants. "Properties of Vegetal Oil-based Creams in Skin Care" by Kedar Kumtheka and Jayashree Nagarkar of the Institute of Chemical Technology at the University of Mumbai in India is available at cosmeticsandtoiletries.com.

■■■

Solazyme, Inc. (South San Francisco, California, USA; see http://tinyurl.com/SolUni) has extended its development agreement with consumer products giant Unilever by two years. The two began their collaboration in 2009, using Solazyme's technology to produce specialty oils for some of Unilever's personal care, soap, and nutritional products.

■■■

Solvay's Rhodia division is building a specialty surfactants and polymers plant at its Zhenjiang, China, site. "After acquiring Feixiang Chemicals in 2010, the Asia/Pacific business represents one-third of [Rhodia's] Novecare sales," Chen Pu, Novecare's vice president and general manager, Asia/Pacific, told *Chemical Week* magazine.

■■■

Scientists from the University of California Davis (USA) have incorporated 2-anthraquinone carboxylic acid (2-AQC), which bonds strongly to the cellulose in cotton, into cotton fabrics. Under exposure to light, 2-AQC produces reactive oxygen species that provide self-cleaning functionality. This mechanism is unlike compounds currently used to produce self-cleaning fabrics that stick to the fabric surface and are easily washed off. The study appeared in the *Journal of Materials Chemistry* (doi: 10.1039/c1jm12805a; see tinyurl.com/JMCselfcleaning).

■■■

Rivertop Renewables (Missoula, Montana, USA) has received a $1.5 million bridge-round investment from Cultivian Ventures, a venture fund focused on the food and agricultural sectors. The company's first product—glucarate-based detergent builders—was the subject of a recent *inform* article (see *22*:550–552, 584, 2011). ■

This leaves the clothes wetter than if the spin speed were high and negates much of the energy benefit of using a more efficient appliance, Korn said.

"These findings can serve as a bridge to help manufacturers better understand changes needed to make smart grid washers and dryers more effective," Korn said. "I hope they will also help the industry understand that consumers need to be educated about how to use the spin cycle." ("Smart grid" refers to the use of digital technology to improve the electricity supply chain as well as use of electricity within a dwelling.)

The report, "Do the Savings Come Out in the Wash? A Large Scale Study of In-Situ Residential Laundry Systems," can be downloaded in PDF format at tinyurl.com/CadmusReport.

Antibacterial soaps and antibiotic resistance

A new study "reaffirms that the use of antibacterial wash products in the home environment does not contribute to antibiotic or antibacterial resistance," according to a news release from the American Cleaning Institute (ACI), a trade association based in Washington, DC, USA.

The study, which appeared in the *International Journal of Microbiology Research* (3:90–96, 2011), compared the use of over-the-counter antibacterial liquid hand and body cleansers and antibacterial bar soaps—containing the germ-killing ingredients triclosan and triclocarban—against the use of nonantibacterial cleansers.

The study was led by Eugene Cole of the Brigham Young University Department of Health Science in Provo, Utah, USA. The research was supported by the ACI and the Personal Care Products Council, a trade association with headquarters in Washington, DC, USA.

From a pool of more than 450 individuals, 210 study participants were randomly selected, 70 for each of three groups: (i) those that frequently used liquid bath or shower products containing triclosan; (ii) those that frequently used bar soaps containing triclocarban; and (iii) those that did not use any antibacterial wash products and thus served as the control group.

A standard method for swabbing both forearms of all participants was used to collect samples of *Staphylococcus* bacteria, which were then tested against several different types of antibiotics that are commonly used to treat staph infections.

The experimental results showed that there was no increase in the antibiotic resistance of the staph strains isolated from either group that had been using antibacterial wash products, when compared to those isolates obtained from the control group. And those bacteria also showed no increased resistance to triclosan or triclocarban.

"There was no statistically significant difference in antibiotic resistance of *Staphylococcus* isolates obtained from the skin of regular antibacterial wash product users in comparison with nonantibacterial product users," said Cole. "There was also a definitive lack of antibiotic and antibacterial cross resistance among those bacteria."

Taiwan cited for dumping brightening agents

The US Department of Commerce set preliminary antidumping duties on imports into the United States of certain stilbenic optical brightening agents after the agency found Taiwanese producers were dumping brightening agents on the US market.

Commerce set a preliminary duty of 12.03% on Taiwanese imports. If the agency confirms its preliminary assessment and the US International Trade Commission agrees in April that imports hurt the domestic industry, Commerce will issue a final antidumping duty order. Taiwan's exports of brightening agents to the US totaled $18.9 million in 2010, according to focustaiwan.tw.

REACH review begins

It is 2012, which means that the European Commission (EC) is reviewing its controversial REACH regulation. The regulation went into effect in 2006 and requires chemical manufacturers to substantiate that their products are safe for consumers. The purpose of the regulation (Registration, Evaluation, Authorisation and Restriction of Chemicals) was to review the roughly 100,000 chemical compounds that are currently on the market and screen them for potential threats to human health or the environment.

A senior European Union (EU) official dealing with REACH told EurActiv.com (see tinyurl.com/EurActiv-Review) that the review would be "fairly limited in scope," adding (on condition of anonymity) that "a full-blown revision could open up 'a can of worms.'"

The EC will pay "special attention to the costs and administrative burden and other impacts on innovation," the EurActiv report notes. It will also examine the registration requirements for lower-tonnage substances.

The review will include (see tinyurl.com/ECReachReview for a complete list):

- An examination of the contribution of the regulation to the development, commercialization, and uptake of products of emerging technologies.
- An appraisal of the scope of REACH and other relevant EU legislation to assess overlaps.
- A review of the European Chemicals Agency, which coordinates and implements the REACH process.

Measuring viscosity in real time

A team at the University of Sheffield (South Yorkshire, UK) has developed a device that can measure the viscosity of liquids under different conditions in real time during production processes.

The research, published in *Measurement Science and Technology* (doi:10.1088/0957-0233/22/12/125402; see tinyurl.com/rheology), describes a noninvasive sensor system that feeds information back through an electronic device that calculates a range of likely behaviors.

Julia Rees of Sheffield's Department of Applied Mathematics said in a written statement: "We can produce equations to measure a liquid's total viscosity, but the rheology of most liquids is very complicated. Instead, we look at properties in a liquid that we can measure easily, and then apply maths to calculate the viscosity. The sensor device we have developed will be able to make these calculations for companies using a straightforward testing process."

Companies developing new products will be able to incorporate the device into their development process, suggests a news release from the university. Further, the device can be made to any scale and can even be etched onto a microchip, with channels about the width of a human hair.

Rees and her team have developed a laboratory prototype of the system and are currently working to refine the technology and develop a design prototype.

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People News/ Inside AOCS

Rajan Skhariya (right) receiving Micro, Small & Medium Enterprise award from Veerbhadra Singh, the minister of Medium, Small and Micro Enterprises of India, on behalf of Mecpro Heavy Engineering.

Mecpro receives awards

An award for Micro, Small & Medium Enterprises was presented in September 2011 by the Government of India to Mecpro Heavy Engineering Ltd. of New Delhi, India, for efforts in research and development. AOCS member and company Managing Director **Rajan Skhariya** received the award from Veerbhadra Singh, minister of Micro, Small and Medium Enterprises, who presented it on behalf of the Indian President Pratihba Devi Singh Ji Patil.

The company was also recognized in November with a national award, instituted by the Engineering Export Promotion Council (EEPC). The award was presented by Commerce & Industrial Minister Anand Sharma.

Mecpro supplies turnkey plants and machinery as well as technology to the edible oil industry. It has completed more than 150 projects in both India and abroad in the past 25 years.

UC Davis recognizes Dan Flynn

AOCS member **Dan Flynn**, executive director of the University of California at Davis (USA) Olive Center, was honored with one of 10 Awards of Distinction on October 14, 2011, by the College of Agricultural and Environmental Sciences. The awards recognize contributions to and achievements of staff, alumni, and friends of the university's founding college that enhance research, education, and outreach.

Flynn

Flynn was particularly recognized for his work leading to the establishment in 2008 of the Olive Center and his guidance of it during its growth and development into an internationally known program for olive research education. At present, he oversees strategy, industry networking, revenue generation, the UC-Davis olive oil program, and public education programs.

Eskin becomes editor of *Lipid Technology*

Eskin

Recently, **Michael Eskin** was selected as co-editor of the journal *Lipid Technology*. He will also continue in his duties as professor and associate head in the Faculty of Human Ecology, University of Manitoba, Winnipeg, Canada. Eskin is a Fellow of AOCS and received the Timothy Mounts Award from AOCS in 2007 for his work on canola oil. He has also served as an associate editor for the *Journal of the American Oil Chemists' Society* as well as as a member of the Editorial Advisory Board of *inform*. He is the author or co-editor of 10 books, the most recent being *Functional Foods and Cardiovascular Disease*, to be released by Taylor & Francis in March 2012.

NBB presents research award

Burton

The National Biodiesel Board (NBB; Jefferson City, Missouri, USA) presented its 2011 "Biodiesel Researcher of the Year" award to **Rachel Burton**, founder of Piedmont Biofuels (Pittsboro, North Carolina, USA). The presentation was made at the Biodiesel Technical Workshop, sponsored by the NBB, the US National Renewable Energy Research Laboratory (Golden, Colorado), and the US Department of Agriculture from November 1–3 in Kansas City, Missouri.

The award is focused on the technical advancement of biodiesel and has often gone to scientists at federal laboratories or universities. Burton's research in enzymatic catalysis may give the biodiesel industry a large variety of new feedstocks that have not previously been exploited for fuel production.

Burton has been involved with manufacturing biodiesel since 2002. She has led

Piedmont in fuel quality and analytics and guided Piedmont into its BQ9000 quality accreditation.

Piedmont Biofuels is a community-scale biodiesel producer, manufacturing fuel from locally collected cooking oil. It designs and builds small-scale biodiesel plants, and it performs research on methods of improving the production process and enhancing sustainability.

Anachem Award to Cody

The Association of Analytical Chemistry presented its Anachem Award to **Robert (Chip) Cody**, product manager of JEOL USA Mass Spectrometry in October at the annual meeting of the Federation of Analytical Chemical and Spectroscopy Societies in Las Vegas, Nevada, USA. The award recognized his contributions to the development of organic mass spectrometry. He was honored during a special session by five speakers who presented on mass spectrometry topics relevant to his work.

Cody

In February 2008, Cody authored an article in *inform* (*19*:78–80) on open-air mass spectrometry, showing how a Direct Analysis in Real Time (DART) ion source could be used to take the sample out of the mass spectrometer.

Clapper recognized

The Biotechnology Division of AACC International (American Association of Cereal Chemists) presented **Gina Clapper**, technical specialist with AOCS, with its Bruce Wasserman Young Investigators Award for her technical expertise in standardization of detection methods for biotechnology traits in grains.

Clapper

In her position with AOCS, Clapper coordinates international method development and harmonization and serves as a liaison with industry in the AOCS Laboratory Proficiency Program that tests for oil, oilseeds, and edible fats. She manages AOCS' program for Certified Reference Materials and administers US interests in ISO/TC 34/SC 16.

The AOCS Asian Section Leadership Team and some section members took a break from sessions at the 7th International Society for Biocatalysis and Agricultural Biotechnology Annual Meeting in October 2011 in Kyoto, Japan. Pictured are (left to right): Koretaro Takahashi, Hokkaido University, Hakodate, Japan; Yu-Ting Chen, National Chung Hsing University, Taichung, Taiwan; Kazuo Miyashita, Hokkaido University; Teruyoshi Yanagita, Saga University, Japan; Jei-Fu Shaw, Academia Sinica, Taipei, Taiwan; Ching T. Hou, National Center for Agricultural Utilization Research, US Department of Agriculture, Peoria, Illinois, USA; Yung-Sheng Huang, Asia University, Taichung, Taiwan; Suk Hoo Yoon, Korea Food Research Institute, Seoul, Korea; Lekh R. Juneija, Taiyokagaku Co., Tokyo, Japan; Yuji Shimada, Okamura Seiyu Co., Osaka, Japan; David Hildebrand, University of Kentucky, Lexington, Kentucky, USA; and Randall Weselake, University of Alberta, Edmonton, Canada. Weselake (current vice chairman) and Hildebrand (past chairman) are members of the AOCS Biotechnology Division. Huang is the current chairperson of the AOCS Asian Section, Miyashita is vice chairperson, Yoon is secretary, and Hou is an advisor to the section.

Biodiesel organizations announce new officers

European Biodiesel Board (EBB). During its General Assembly held November 17, 2011, EBB members elected their new governing board. Stefan Schreiber (Cargill, Germany) is the new president, replacing Bernard Nicol (Diester, France). The EBB board is now composed of the president, vice presidents Bernard Nicol and Douglas Ward (Argent, UK), and executive members Lefteris Antonakopoulos, G. Berloni, J. Cuesta, Detlef Evers, Michael Fiedler, Ilmari Lastikka, Roderic Miralles, Claus Sauter, and honorary founding member Claudio Rocchietta.

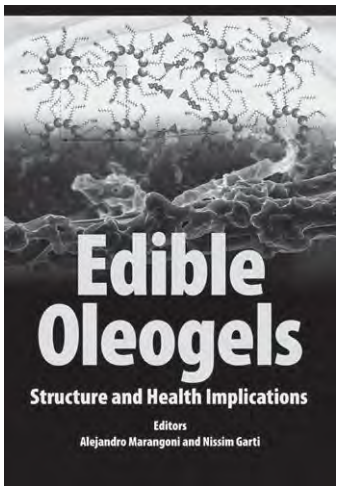
National Biodiesel Board (NBB). Members of the US NBB (Jefferson City, Missouri, USA) elected seven returning governing board members and one new member to serve on the leadership committee on November 17, 2011. Gary Haer (Renewable Energy Group; Ames, Iowa) is chairman, Ed Ulch (Iowa Soybean Board; Solon, Iowa) is vice chair, Ron Marr (Minnesota Soybean Processors; Brewster, Minnesota) is secretary, and Jim Conway (Griffin Industries; Cold Spring, Kentucky) is treasurer. Besides the four officers, the governing board has four additional members: Ed Hegland (Minnesota Soybean Research and Promotion Council; Appleton, Minnesota); Kris Kappenman (Archer Daniels Midland, Decatur, Illinois), Bob Metz, (South Dakota Soybean Research & Promotion Council, West Browns Valley, South Dakota) and Robert Stobaugh (Arkansas Soybean Promotion Board; Atkins, Arkansas). ■

Book Review

Edible Oleogels: Structure and Health Implications
A.G. Marangoni and N. Garti (eds.),
AOCS Press, 2011, 341 pages
ISBN 978-0-9830791-1-8, $125 (members)
or $149 (nonmembers)

Dominique Guillaume

As a result of consumer pressure, *trans* fats have become, for good reasons, public health enemy No. 1 in the food industry. Their negative impact on human health is, indeed, such that *trans* fats are considered an extremely unhealthful component of one's diet. However, their replacement is not an easy task. Therefore, a book explaining how *trans* fats can be eliminated and replaced by safer surrogates in processed food is extremely welcome.



In *Edible Oleogels: Structure and Health Implications*, several strategies are explored in great detail. The difficulties faced in finding new compounds presenting satisfactory characteristics to replace *trans* fats are explained. For example, the various properties of β-sitosterol + γ-oryzanol tubule-, ricinelaidic acid- or hydroxystearic acid-, or rice bran wax-based oleogels are exhaustively described.

The book is divided into 14 chapters; half of them are co-authored by A.G. Marangoni. This might be a bit unfortunate, since it could lead one to believe that the book presents, more or less, the perspective of just one person. Chapters rarely exceed 20 pages, and never 30 pages, and references are presented at the end of each chapter. Reading is therefore quite pleasant and straightforward. Nevertheless, the book is presented at a very high scientific level. Except for the first chapter, where the primary objective is to introduce the book, to provide some basic definitions, and to present a general overview of the problem, readers are expected to have a good basic knowledge of oleogels or be ready to do what is necessary to acquire this information.

Indeed, the results are frequently supported by large numbers of tables, graphs, charts, schemes, photos, and mathematical equations. Unfortunately, some of these illustrations are too small, so that it can be very difficult to read them. Consequently, their usefulness is limited.

Also, and as often is the case for multi-author books, chapter presentation is somewhat disparate. Some chapters resemble scientific papers and present a "materials and methods" section as in publications. Nevertheless, this can provide an advantage for researchers looking for more than general information, those working in that particular field, or those eager to perform experiments. It could be assumed, however, that these researchers are likely to have access to regular publications.

Another setback is that introductions often repetitively present the same arguments. Therefore, this book might be best used by readers with specific questions, who should identify their particular chapter(s) of interest. They will then, for sure, find comprehensive answers.

Only the last chapter of the book deals with the health aspect of oleogel ingestion. This chapter is welcome but can be considered as too limited, since the book title mentions "structure and health implications."

In summary, this book should be particularly attractive to graduate students and researchers in the field of lipid and food science. They will certainly find detailed explanations and full bibliographic information for their questions in these chapters.

Dominique Guillaume is a professor of medicinal chemistry at the University of Reims-Champagne in Ardenne, France, and has 15 years of research expertise in the field of edible oil research. She can be reached at dominique.guillaume@univ-reims.fr.

The AOCS member magazine, *inform*, is looking for book reviewers. We provide a general review guideline, you have three to four months to prepare the review, and—best of all—the book remains in your library. Interested? Please email William Artz, the book review editor, at wartz@illinois.edu and indicate your subject areas of interest. You do not need to be a member to participate.

Extracts & Distillates

An estimate of the global reduction in mortality rates through doubling vitamin D levels

Grant, W.B., *Eur. J. Clin. Nutr. 65*:1016–1026, 2011.

The reduction in mortality rates for six geopolitical regions of the world was estimated under the assumption that serum 25-hydroxyvitamin D [25(OH)D] levels increase from 54 to 110 nmol/L. The study is based on interpretation of the journal literature relating to the effects of solar ultraviolet-B (UVB) and vitamin D in reducing the risk of disease and estimates of the serum 25(OH)D level–disease risk relations for cancer, cardiovascular disease (CVD), and respiratory infections. The vitamin D-sensitive diseases that account for more than half of global mortality rates are CVD, cancer, respiratory infections, respiratory diseases, tuberculosis, and diabetes mellitus. Additional vitamin D-sensitive diseases and conditions that account for 2 to 3% of global mortality rates are Alzheimer's disease, falls, meningitis, Parkinson's disease, maternal sepsis, maternal hypertension (pre-eclampsia), and multiple sclerosis. Increasing serum 25(OH)D levels from 54 to 110 nmol/L would reduce the vitamin D-sensitive disease mortality rate by an estimated 20%. The reduction in all-cause mortality rates range from 7.6% for African females to 17.3% for European females. Reductions for males average 0.6% lower than for females. The estimated increase in life expectancy is two years for all six regions. Increasing serum 25(OH)D levels is the most cost-effective way to reduce global mortality rates, as the cost of vitamin D is very low and there are few adverse effects from oral intake and/or frequent moderate UVB irradiance with sufficient body surface area exposed.

Purified phenolics from hydrothermal treatments of biomass: ability to protect sunflower bulk oil and model food emulsions from oxidation

Conde, E., *et al., J. Agric. Food Chem 59*:9158–9165, 2011.

The phenolic fractions released during hydrothermal treatment of selected feedstocks (corncobs, eucalypt wood chips, almond shells, chestnut burrs, and white grape pomace) were selectively recovered by extraction with ethyl acetate and washed with ethanol/water solutions. The crude extracts were purified by a relatively simple adsorption technique using a commercial polymeric, nonionic resin. Utilization of 96% ethanol as eluting agent resulted in 47.0–72.6% phenolic desorption, yielding refined products containing 49–60% w/w phenolics (corresponding to 30–58% enrichment with respect to the crude extracts). The refined extracts produced from grape pomace and from chestnut burrs were suitable for protecting bulk oil and oil-in-water and water-in-oil emulsions. A synergistic action with bovine serum albumin in the emulsions was observed.

Screening of the entire USDA castor germplasm collection for oil content and fatty acid composition for optimum biodiesel production

Wang, M.L., *et al., J. Agric. Food Chem. 59*:9250–9256, 2011.

Castor has tremendous potential as a feedstock for biodiesel production. The oil content and fatty acid composition in castor seed are important factors determining the price for production and affecting the key fuel properties of biodiesel. There are 1,033 available castor accessions collected or donated from 48 countries worldwide in the USDA germplasm collection. The entire castor collection was screened for oil content and fatty acid composition by nuclear magnetic resonance (NMR) and gas chromatography (GC), respectively. Castor seeds on the average contain 48.2% oil with significant variability ranging from 37.2 to 60.6%. Methyl esters were prepared from castor seed by alkaline transmethylation. GC analysis of methyl esters confirmed that castor oil was composed primarily of eight fatty acids: 1.48% palmitic (C16:0), 1.58% stearic (C18:0), 4.41% oleic (C18:1), 6.42% linoleic (C18:2), 0.68% linolenic (C18:3), 0.45% gadoleic (C20:1), 84.51% ricinoleic (C18:1-1OH), and 0.47% dihydroxystearic (C18:0-2OH) acids. Significant variability in fatty acid composition was detected among castor accessions. Ricinoleic acid was positively correlated with dihydroxystearic acid (DHSA) but highly negatively correlated with the five other fatty acids except linolenic acid. The results for oil content and fatty acid composition obtained from this study will be useful for end users to explore castor germplasm for biodiesel production.

Characteristics of papaya seed oils obtained by extrusion-expelling processes

Lee, W., *et al., J. Sci. Food Agric. 91*:2348–2354, 2011.

About 300 g kg^{-1} of the weight of papaya fruits appears as waste materials during processing, including a considerable amount of papaya seeds. To make a more efficient use of papaya, it is worth investigating the utilization of the seeds. The aim of this study was to comprehensively assess the lipid characteristics of papaya seed oil obtained by expelling processes. Papaya seed oil was found to have several unique characteristics, including its high oleic content, the relative ratio of saturated/monounsaturated/polyunsaturated fatty acids of 29:68:3, the polyunsaturated fatty acids merely accounting for 3.34%, and its triacylglycerol composition being very similar to that of olive oil. Also, this oil was rich in chemopreventive benzyl isothiocyanate, the level ranging from 4.0 to 23.3 g kg^{-1} dependent on the various processing methods for the pretreatment of papaya seeds. On the basis of our results, papaya seed oil can be considered as a high-oleic oil with a chemoprotective effect and may be viewed as a healthy alternative in the functional food industry.

Long-term conjugated linoleic acid supplementation in humans—effects on body composition and safety

Jutzeler van Wijlen, R.P., *Eur. J. Lipid Sci. Technol. 113*:1077–1094, 2011.

In our contemporary adipogenic environment even modest improvements in body fat mass could be of relevance. In the last years animal and human studies have investigated the potential benefit of conjugated linoleic acid (CLA) on body composition. However, inconclusive results are often derived from short-term studies. Long-term intervention trials with supplemental CLA on body composition have not been reviewed exclusively up to now. Therefore, the objective of this study was to review the evidence of prolonged CLA supplementation as well as its influence on body composition in humans and

CONTINUED ON NEXT PAGE

to summarize results from safety assessments of CLA intake. A literature search was performed to find intervention trials with CLA supplementation and its effects on body composition as well as on insulin sensitivity. Only prolonged (≥12 wk) studies on body composition were included. The investigated studies indicate a modest reduction and/or prevention of regain of body fat in overweight/obese subjects. Results on the influence of CLA on insulin sensitivity are inconsistent, with newer data rather adding to the safety of CLA. Impaired insulin sensitivity by CLA remains a safety concern, yet is seemingly restricted to diabetic subjects and single-isomer application. A meta-analysis of extended studies only is warranted to quantitatively evaluate the effects of CLA on body composition. Future research may elucidate if CLA should be considered as a marginal missing, semi-essential nutrient in our present diet.

Refining of rice bran oil by neutralization with calcium hydroxide

De, B.K., and J.D. Patel, *Eur. J. Lipid Sci. Technol. 113*:1161–1167, 2011.

The applicability of calcium hydroxide (lime) in the neutralization of rice bran oil (RBO) was investigated. Crude RBO samples of three different free fatty acids (FFA) (3.5–8.4 wt%) were degummed, dewaxed, bleached, and neutralized with lime and deodorized. The oils obtained thus were characterized by determining the color, peroxide value (PV), content of unsaponifiable matter (UM), and FFA. Conventionally practiced caustic soda neutralization (at 80–90°C) of FFA has in the present investigation been replaced by a high-temperature (150–210°C) low-pressure (2–4 mm Hg) reaction with lime. It was observed that neutralization with $Ca(OH)_2$ at high temperature (210°C) and under low pressure (2–4 mm Hg pressure) may substantially reduce the FFA content (0.8 wt%, after 2 h). The deodorized oil was found to be of acceptable color, PV, and content of UM and FFA. Neutralization of oil was also carried out by using $NaHCO_3$ and Na_2CO_3, nonconventional alkalies for neutralization, and the results were compared with NaOH and $Ca(OH)_2$. Overall recovery of oil in $Ca(OH)_2$ refining process (88.5 ± 0.6 wt%, for Sample 1 containing 8.4 wt% FFA) was found to be more than other competitive processes studied.

AOCS Journals

Journal of the American Oil Chemists' Society (December)

- Quality assessment of heated cooking oil, Agab, using a simple newly-developed spectrophotometric method, Hamed, S.F., G.A. abo El-Wafa, A. El-Ghorab, and T. Shibamoto
- Phase behavior of palm oil in blends with palm-based diacylglycerol, Saberi, A.H., T. Chin-Ping, and L. Oi-Ming
- Rapid assessment of frying performance using small size samples of oils/fats, Aladedunye, F.A., and R. Przybylski
- Cold-pressed pumpkin seed oil antioxidant activity as determined by a DC polarographic assay based on hydrogen peroxide scavenge, Gorjanović, S.Ž., B.B. Rabrenović, M.M. Novaković, E.B. Dimić, Z.N. Basić, *et al.*
- Oxidative stability of polyunsaturated edible oils mixed with microcrystalline cellulose, Saga, L.C., E.-O. Rukke, K.H. Liland, B. Kirkhus, B. Egelandsdal, *et al.*
- Rapid method for the determination of moisture content in biodiesel using FTIR spectroscopy, Mirghani, M.E.S., N.A. Kabbashi, M.Z. Alam, I.Y. Qudsieh, and M.F.R. Alkatib
- Geographical classification of Turkish virgin olive oils from the Aegean region for two harvest years based on their fatty acid profiles, Dıraman, H., H. Saygı, and Y. Hışıl
- Optimization of enzymatic synthesis of cetyl 2-ethylhexanoate by Novozym® 435, Chen, H.C., C.-H. Kuo, H.H. Chen, Y.-C. Liu, and C.J. Shieh
- Interesterification of lard and soybean oil blends catalyzed by immobilized lipase in a continuous packed bed reactor, da Silva, R.C., F.A.S.D.M. Soares, T.G. Fernandes, A.L.D. Castells, K.C.G. da Silva, *et al.*
- Non-traditional oils as newer feedstock for rhamnolipids production by *Pseudomonas aeruginosa* (ATCC 10145), Pratap, A., S. Wadekar, S. Kale, A. Lali, and D.N. Bhowmick
- Valorization of beef tallow by lipase-catalyzed interesterification with high oleic sunflower oil, Segura, N., R.C. da Silva, F.A.S.D.M. Soares, L.A. Gioielli, and I. Jachmanián
- Effect of *Origanum vulgare* L. essential oil on growth and lipid profile of *Yarrowia lipolytica* cultivated on glycerol-based media, Chatzifragkou, A., I. Petrou, C. Gardeli, M. Komaitis, and S. Papanikolaou
- Biochemistry of citric acid production from rapeseed oil by *Yarrowia lipolytica* yeast, Kamzolova, S.V., J.N. Lunina, and I.G. Morgunov
- Fuel properties of biodiesel/ultra-low sulfur diesel (ULSD) blends, Dunn, R.O.
- Synthesis and characterization of ricinoleamide-based polyurethane, Kashif, M., E. Sharmin, F. Zafar, and S. Ahmad
- Effect of varietal differences on composition and thermal characteristics of avocado oil, Yanty, N.A.M., J.M.N. Marikkar, and K. Long
- Decolorization of rice bran oil using modified kaolin, Worasith, N., B.A. Goodman, N. Jeyashoke, and P. Thiravetyan
- Enzymatic extraction of wheat germ oil, Xie, M., N.T. Dunford, and C. Goad
- Physical properties of nutritive shortenings produced from regioselective hardening of soybean oil with Pt containing zeolite, Philippaerts, A., A. Breesch, G. De Cremer, P. Kayaert, J. Hofkens, *et al.*
- Insight into β-carotene thermal degradation in oils with multiresponse modeling, Achir, N., C. Pénicaud, S. Avallone, and Philippe Bohuon

Lipids (December)

- Uneven distribution of ceramides, sphingomyelins and glycerophospholipids between heads and tails of rat

spermatozoa, Oresti, G.M., J. M. Luquez, N.E. Furland, and M.I. Aveldaño

- Fish oil supplementation during late pregnancy does not influence plasma lipids or lipoprotein levels in young adult offspring, Rytter, D., E.B. Schmidt, B.H. Bech, J.H. Christensen, T.B. Henriksen, *et al*.
- Supplementation of DHA-rich microalgal oil or fish oil during the suckling period in mildly n-3 fatty acid-deficient rat pups, Kimura, F., S. Ito, Y. Endo, N. Doisaki, T. Koriyama, *et al*.
- LC-PUFA biosynthesis in rainbow trout is substrate limited: use of the whole body fatty acid balance method and different 18:3n-3/18:2n-6 ratios, Thanuthong, T., D.S. Francis, S.P.S.D. Senadheera, P.L. Jones, and G.M. Turchini
- Bacterial predators possess unique membrane lipid structures, Müller, F.D., S. Beck, E. Strauch, and M.W. Linscheid
- Synthesis of phosphatidylcholine through phosphatidylethanolamine *N*-methylation in tissues of the mussel *Mytilus galloprovincialis*, Athamena, A., S. Trajkovic-Bodennec, G. Brichon, G. Zwingelstein, and J. Bodennec
- Fatty acids of *Chthonomonas calidirosea*, of a novel class Chthonomonadetes from a recently described phylum Armatimonadetes, Vyssotski, M., K.C.-Y. Lee, K. Lagutin, J. Ryan, X.C. Morgan, *et al*.
- Lipoprint adequately estimates LDL size distribution, but not absolute size, versus polyacrylamide gradient gel electrophoresis, Varady, K.A., and B. Lamarche
- Electrospray ionization tandem mass spectrometry of sodiated adducts of cholesteryl esters, Bowden, J.A., F. Shao, C.J. Albert, J.W. Lally, R.J. Brown, *et al*.
- A novel approach for determination of free fatty acids in vegetable oils by a flow injection system with manual injection, Ayyildiz, H.F., H. Kara, and S.T.H. Sherazi

Short path evaporation for the production of premium quality oils

Skaliotis, L., *Lipid Technol. 23*:204–206, 2011.

The Centritherm® RM Series evaporator (CTRM) has been designed specifically for short path (molecular distillation) applications in the oils and fats industry. It can be used for a range of applications such as pesticide removal from citrus oils to omega-3 production from fish oils. The following article describes the CTRM, its benefits and applications in more detail.

Antioxidant properties of chlorogenic acid and its alkyl esters in stripped corn oil in combination with phospholipids and/or water

Laguerre, M., *et al.*, *J. Agric. Food Chem. 59*:10361–10366, 2011.

In bulk oil, it is generally thought that hydrophilic antioxidants are more active than lipophilic antioxidants. To test this hypothesis, the antioxidant activity of phenolics with increasing hydrophobicity was evaluated in stripped corn oil using both conjugated diene and hexanal measurements. Chlorogenic acid and its butyl, dodecyl, and hexadecyl esters were used as model phenolic antioxidants with various hydrophobicities. Results showed that hydrophobicity did not correlate well with antioxidant capacity. The combination of chlorogenic acid derivatives with dioleoylphosphatidylcholine (DOPC) and/or water was also studied to determine if the physical structure in the oil affected antioxidant activity. DOPC alone made hexadecyl chlorogenate a less effective antioxidant, but it did not change the antioxidant capacity of chlorogenic acid. In contrast, the combination of DOPC and water (~400 ppm) renders chlorogenic acid a less active antioxidant, whereas it does not change the activity of hexadecyl chlorogenate. These results show, in bulk oil, that intrinsic parameters such as the hydrophobicity of lipophilized phenolics do not exert a strong influence on antioxidant capacity, but they can be highly influential if potentialized by extrinsic factors such as physical structures in the oil.

Improved solvent extraction procedure and high-performance liquid chromatography–evaporative light-scattering detector method for analysis of polar lipids from dairy materials

Le, T.T., *et al.*, *J. Agric. Food Chem. 59*:10407–10413, 2011.

A normal-phase high-performance liquid chromatography–evaporative light-scattering detector method employing dichloromethane, methanol, and acetic acid/triethylamine buffer as the mobile phase was developed for analysis of polar lipids (PLs). This method was applicable for analysis of PL from both dairy materials and soy lecithin. All of the PL of interest, such as glycolipids, phospholipids, and sphingomyelin, were well separated with a total run time of 22.5 min and without necessitating the removal of neutral lipids beforehand. Peak retention times were stable, and the method was reproducible. In this study, a modified method of using solvents for extraction of PL from dairy matrices was also investigated. The modified method offered higher extraction efficiency, consumed less time, and in some cases saved solvent use.

Using high-intensity ultrasound as a tool to change the functional properties of interesterified soybean oil

Ye, Y., *et al.*, *J. Agric. Food Chem. 59*:10712–10722, 2011.

High-intensity ultrasound (HIU) was used to change the crystallization behavior, generate small crystals, and improve the texture of a low–saturated-fat shortening (interesterified soybean oil). Samples were crystallized at different temperatures (26, 28, 30, and 32°C) without and with the application of HIU. Different acoustic power levels (110, 72, 61, 54, and 44 W) were used. Results show that higher acoustic powers had a greater effect on crystal size reduction, induced crystallization, and generated harder, more elastic, and viscous materials. These effects were more significant when HIU was applied in the presence of crystals and when the sample was crystallized at 32°C. ■

Patents

Published Patents

Bio-based adhesive material for roof shingles

Wen, B., and J.P. Zhang, United Environment and Energy LLC, US7951417, May 31, 2011

An adhesive product and method of making the product replaces asphalt in the manufacture of roofing shingles. The method comprises steps of forming a mixture of oil comprising fatty acids and a powdered catalyst operable to catalyze the polymerization of the oil; maintaining the oil to powdered catalyst weight ratio in the mixture between 1 to 0.01 and 1 to 4.9; heating the mixture to a reaction temperature greater than 100°C; maintaining the reaction temperature for at least five minutes; and injecting air into the mixture while maintaining the reaction temperature. In making a roofing shingle, the method includes additional steps of: applying the heated mixture to a fiberglass mat sheet from an upstream roll to form a tacky coated strip; and, adding a layer of granules to the tacky coated strip. The adhesive material of this method comprises polymerized oil and the powdered catalyst.

Extraction and winterization of lipids from oilseed and microbial sources

Dueppen, D.G., *et al.*, Martek Biosciences Corp., US8012354, September 6, 2011

A process for purifying a lipid composition having predominantly neutral lipid components having at least one long-chain polyunsaturated fatty acid is disclosed. The process employs contacting the lipid composition with a polar solvent such as acetone; the solvent is selected such that contaminants are less soluble in the solvent than is the long-chain polyunsaturated fatty acid. The process is typically conducted at cooler temperatures including about 0°C. The long-chain polyunsaturated fatty acids can include arachidonic acid, docosapentaenoic acid, eicosapentaenoic acid, and/or docosahexaenoic acid. The process of the present invention effectively winterizes lipid compositions, thereby reducing the tendency of such compositions to become hazy.

Production of degummed fatty acid alkyl esters using both lipase and phospholipase in a reaction mixture

Holm, H.C., *et al.*, Novozymes AS, US8012724, September 6, 2011

The present invention relates to a method for producing fatty acid alkyl esters such as fatty acid methyl esters (FAME) and fatty acid ethyl esters with a low level of impurities such as phospholipids. Two process steps are combined into one process step and the process is therefore cheaper. The method includes mixing water, alcohol, triglyceride, and/or free fatty acids, a lipolytic enzyme, and a phospholipase. Subsequently the aqueous phase, which contains glycerine, residual enzyme, and most of the hydrolyzed phospholipids, is separated from the nonaqueous phase, whereby the content of phospholipids in the nonaqueous phase is reduced.

Process for preparing 1,3-propanediol

Husen, D.L., *et al.*, Shell Oil Co., US8013192, September 6, 2011

The invention provides a process for preparing 1,3-alkanediols, such as 1,3-propanediol (PDO), from 3-hydroxyaldehydes, such as 3-hydroxypropanal. The process comprises providing a mixture of 3-hydroxyaldehydes in an organic solvent; extracting into an aqueous liquid a major portion of the 3-hydroxyaldehydes to provide an aqueous phase comprising 3-hydroxyaldehydes in greater concentration than the concentration of 3-hydroxyaldehydes in the 3-hydroxyaldehyde mixture, and an organic phase; separating the aqueous phase from the organic phase; contacting the aqueous phase with hydrogen in the presence of a hydrogenation catalyst to provide a hydrogenation product mixture comprising 1,3-alkanediols and water; separating water from the 1,3-alkanediols using a multi-effect evaporation scheme; recycling water containing about 50 wt% or less PDO based on the total amount of PDO and water to the extraction stage; and recovering 1,3-alkanediols.

Rapid development of heat resistance in chocolate and chocolate-like confectionery products

Simbürger, S., Kraft Foods R&D Inc., US8017163, September 13, 2011

The invention relates to a process for manufacturing heat-resistant chocolate or chocolate-like confectionery products. Chocolate mass or chocolate-like confectionery mass which has been mixed with a water-in-oil emulsion, or chocolate mass or chocolate-like confectionery mass having an increased water content is molded and then subjected to a microwave treatment prior to, during, and/or after cooling. The heat resistance is developed essentially instantaneously, and the obtained product can be subjected to temperatures of up to about 40 or even 50°C without losing its form. The invention also relates to the products obtainable by that process.

Liquid developer and image forming device

Akioka, K., Seiko Epson Corp., US8021815, September 20, 2011

A liquid developer includes a toner particle mainly composed of a resin material, and a nonvolatile insulating liquid; the resin material includes an ethylene copolymer, and the insulating liquid includes a fatty acid triglyceride.

Self-contained biofuel production and water processing apparatus

Schuh, A.J., and P.A. Schuh, US8017366, September 13, 2011

A system for making biofuels comprising methane, ethanol, and biodiesel comprises a tank with a sealable lid. An algae mass, water, and either a yeast or bacterial culture are added to the tank. Under high temperature conditions, acid (CO_2-containing) methane is produced and stored in a container. Under lower temperature conditions, ethanol and CO_2 are produced. Heated or cooled water passed through a water jacket that surrounds the tank maintains the proper temperature within the tank. The CO_2 is stored in a second container. The acid methane and the CO_2 are optionally passed through a scrubber. Scrubbed methane is suitable for use as a fuel and drives a generator

that supplies power to various parts of the system. Carbon credits will be available for CO_2 that is trapped in the scrubber. A still separates ethanol and water for later use. Biodiesel can also be made in the apparatus by first making ethanol, then employing a transesterification process.

Liquid personal cleansing composition

Shiloach, A., *et al.*, Conopco, Inc., US8017566, September 13, 2011

A mild, substantially isotropic skin cleansing solution was found to be able to suspend insoluble components and provide copious amounts of lather. The cleanser is formulated with synthetic anionic surfactants and a specific ratio of carboxylic acid(s) to hydrophobically modified cross-linked acrylate copolymer(s). The carboxylic acid and acrylate polymer combination was found to provide a synergistic effect on zero shear viscosity at 25°C in a specific pH and copolymer/acid concentration ratio range.

Thermal treatment of triglycerides

Yao, J., *et al.*, ConocoPhillips Co., US8017819, September 13, 2011

A triglyceride or a triglyceride/hydrocarbon combination can be heated to produce thermally treated feeds. The thermally treated feeds can then be contacted with a hydrotreating catalyst in a reaction zone.

Cosmetic gel product on the basis of oils and gelling agents

Mateu, J., *et al.*, Coty B.V., US8021674, September 20, 2011

The invention refers to a new cosmetic gel product that contains oils or fats and suitable gel-forming polymers and that has improved characteristics as regards stability and structure. The product of the invention comprises 5–85% by weight of a fat phase forming agent selected from among oils, hydrogenated hydrocarbons, alkenes, monoesters, diesters, triesters, and mixtures thereof; 0.1–15% by weight of a further gelling agent selected from among 12-hydroxy stearic acid, polyethylene whose molecular weight is between 400 and 2500 Daltons, glyceryl behenate and mixtures thereof; 0.5–5% by weight of a surface-active agent; and other auxiliary substances, carrier substances, active substances, and mixtures thereof; all percentages being relative to the weight of the gel product. The product is wax free and free of fatty-absorbing substances, and has a water content up to 60% with no sweating or bleeding.

Very long chain polyunsaturated fatty acids, methods of production, and uses

Anderson, R.E., *et al.*, Board of Regents of the University of Oklahoma, US8021874, September 20, 2011

The present invention relates to processes for production of very long chain polyunsaturated fatty acids (VLC-PUFA). The present invention also relates to compositions (e.g., nutritional supplements and food products) containing such VLC-PUFA. Methods for biosynthesis and production of VLC-PUFA are provided, particularly C_{28}–C_{38} PUFA (also referred to herein as supraenes or supraenoics) by the expression, in a production host cell, of the full or partial sequence(s) of Elovl4 DNA/mRNA nucleic acids or ELOVL4 protein sequences encoded thereby, from any species (prokaryotic or eukaryotic). Elongation of C_{18}–C_{26} saturated fatty acids and PUFA is a preferred route to provide a dietary supplement, a food product, a pharmaceutical formulation, a humanized animal milk, an infant formula, a cosmetic item, and a biodiesel fuel, for example. A pharmaceutical formulation can include, but is not limited to: a drug for treatment of neurodegenerative disease, a retinal disorder, age-related maculopathy, a fertility disorder (particularly regarding sperm or testes), or a skin disorder.

Hydrogenation catalyst with improved textural properties

Velasquez, J., *et al.*, Intevep SA, US8022008, September 20, 2011

A method is provided for making a catalyst support and includes the steps of providing an aqueous suspension of refractory inorganic oxide and refractory inorganic carbide; forming the suspension into droplets; exposing the droplets to a gelling agent whereby the droplets are at least partially solidified so as to provide substantially sphere-shaped portions of refractory inorganic oxide and refractory inorganic carbide; and drying and calcining the sphere-shaped portions so as to provide substantially spherical particles of catalyst support containing refractory inorganic oxide and refractory inorganic carbide. Catalytically active metal phases and hydrogenation processes using the catalyst are also described.

Composition comprising a lipase and a bleach catalyst

Souter, P.F.., *et al.*, Procter & Gamble Co., US8022027, September 20, 2011

The present invention relates to a composition comprising: (i) a lipase; and (ii) a bleach catalyst that is capable of accepting an oxygen atom from a peroxyacid and transferring the oxygen atom to an oxidizable substrate.

Rubber composition for studless tire and studless tire

Hattori, T., and R. Kojima, Sumitomo Rubber Industries, Ltd., US8022121, September 20, 2011

The present invention provides a rubber composition for a studless tire and a high-performance studless tire produced therefrom which achieve good braking force and handling stability on ice and snow. The rubber composition for a studless tire includes: a rubber component; a zinc salt of a C_4–C_{12} aliphatic carboxylic acid, or a C_4–C_{12} aliphatic carboxylic acid and zinc oxide; and an oil or a plasticizer. The rubber component contains 40% by mass or more of butadiene rubber per 100% by mass of the rubber component.

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@adm.com.

2012–2013 Governing Board candidates

Ballots for the election of the American Oil Chemists' Society Governing Board members were sent to eligible members by mail or email in December. Completed ballots must be received (either electronically or via mail) at AOCS Headquarters (P.O. Box 17190, Urbana, IL 61803-7190 USA) by February 15, 2012. The new officers will be installed during the 103rd AOCS Annual Meeting & Expo in Long Beach, California, USA, on Monday, April 30, 2012.

President Candidate

Deland J. Myers (joined AOCS in 1990): Professor and Director, School of Food Systems, Great Plains Institute of Food Safety, North Dakota State University 2007–present.

Education: B.S., 1978, Biology, University of Missouri-Kansas City; M.S., 1981, Food Technology, Iowa State University; 1984, Ph.D., Food Technology, Iowa State University.

Previous Employment: Product Development Scientist, Pillsbury Co., 1984–1987; Senior Product Development Scientist, Pillsbury Co., 1984–1989; Assistant Professor of Food Science, Iowa State University, 1989–1995; Associate Professor of Food Science, Iowa State University, 1995–2003; Professor of Food Science, Iowa State University, 2003–2007.

AOCS Activities: Vice President, AOCS Governing Board, 2011–present; secretary, AOCS Foundation Board of Directors, 2009–present; chairperson, Education & Meetings Steering Committee, 2005–2011; chairperson, Program Committee, 2002–2004; chairperson, 94th AOCS Annual Meeting & Expo, Kansas City, Missouri, 2003; member, Annual Meeting Action Committee, 2000–2004; technical program chairperson, 90th Annual Meeting & Expo, Orlando, Florida, 1999; representative, Leadership Canvassing Committee, 1998–1999; associate editor, *inform*, 1998–2000; chairperson, Protein and Co-Products Division, 1998–2000; vice chairperson, Protein and Co-Products Division, May 1996–1998; member, Education and Conferences Administration Committee, 1996–1997; member, Membership Development Committee, 1994–1997; member-at-large representing academia, Protein and Co-Products Section, 1994–1995.

Other: Member, NCAA Academic Cabinet; invited speaker to the following conferences: Corn Derived Ethanol Conference, Peoria, Illinois, 1992; Corn Utilization Conference, St. Louis, Missouri, 1992; Corn Utilization Symposium, Seoul, South Korea, 1992; American Society of Agronomy Annual Meeting, Minneapolis, Minnesota, 1992; AOCS World Conference & Exhibition on Oilseed Technology & Utilization, Budapest, Hungary, 1992; American Seed Trade Association (ASTA) Soybean Seed Research Conference, Chicago, Illinois, 1994; US Department of Agriculture (USDA)-sponsored Food Marketing Workshop, Braşov, Romania, 1994; Soybean Utilization Conference, Washington, DC, 1994; USDA Food Marketing Workshop, Pardubice, Czech Republic, 1996; Eastern Region of the Forest Products Society, Winnipeg, Manitoba, Canada, 1999; World Soybean Conference, Chicago, Illinois, 1999; World Soybean Research Conference VII, Foz de Iguaçu, Brazil, 2004; The Industrial Utilization of Soy Protein and Soybean Industrial Uses Conference, Rio de Janeiro, Brazil, 2006. Proposal reviewer for USDA Small Business Innovation Research, USDA National Research Initiative Competitive Research Program, United Soybean Board, *Journal of Agriculture and Food Chemistry*, *Journal of the American Oil Chemists' Society*, *Journal of Industrial Crops and Products*, *Cereal Chemistry*, and *Journal of Food Chemistry*; member, Institute of Food Technologists and American Association of Cereal Chemists.

Research Interests: Functionality and utilization of cereal and legume proteins in food, industrial nonfood, and feed applications; product development, food safety, strategic planning of organizations.

Vice President Candidate

Timothy G. Kemper (joined AOCS in 1988): Global Technology Director, Solvent Extraction, Desmet Ballestra Group.

Education: M.B.A., 2001, Indiana Wesleyan University; B.S., 1986, Mechanical Engineering, University of Cincinnati.

Previous Employment: President and CEO, Desmet Ballestra North America, 1999–2011; Director of Engineering, The French Oil Mill Machinery Co., 1993–1999; product manager, solvent extraction, The French Oil Mill Machinery Co., 1988–1992; project engineer, The French Oil Mill Machinery Co., 1986–1987; engineering co-op, The French Oil Mill Machinery Co., 1982–1985.

AOCS Activities: Treasurer, AOCS Governing Board, 2008–present; member, CEO Search Committee, 2011; member, CEO Contract Committee, 2011; member, Audit Committee, 2008–present; member-at-large, AOCS Governing Board, 2006–2007; second vice chairperson, Technical Steering Committee (TSC), 2007; second vice chairperson, Financial Steering Committee (FSC), 2006–2007; AOCS Annual Meeting & Expo exhibitor, 1988–present; member, Processing Division, 1994–present; member, Processing Division Board, 1996–2002; session chairperson, AOCS Annual Meeting & Expo, 1996, 1998, 2000; presenter, AOCS Annual Meeting & Expo and short courses, 1988–2010; winner, Outstanding Paper Presentation, 1994, 2000; presenter, World Conference and Exhibition on Oilseed and Vegetable Oil Utilization, Istanbul, Turkey, 2002; presenter, SODEOPEC, Fort Lauderdale, Florida, 2005; presenter, Latin American Section of AOCS (LA-AOCS) Short Course, Rosario, Argentina, 2005; presenter, AOCS Biodiesel Short Course, Vienna, Austria, 2007; presenter, Biodiesel Conference, Munich, Germany, 2009.

Other: Member, Vistage CEO Organization, 2005–present; registered professional engineer, Ohio, 1993–present; inventor on seven United States patents; presenter, Texas A&M Short Courses, 1987–present; presenter, IOMSA annual meetings, 2000, 2003, 2004, 2006, 2009, 2011; author, Oil Extraction chapter, *Bailey's Industrial Oil & Fat Products*, Sixth Edition, 2005.

Research Interests: New technologies to advance current best practice in oilseed preparation, oilseed solvent extraction, and oils refining.

Candidate Statement:

Dear fellow members of AOCS,

It is a great privilege for me to be nominated for the position of vice president of AOCS by my peers who have had such an influential role in making AOCS the impressive global society that it is today. I would appreciate your voting me into this office, and look forward to the opportunity to help lead AOCS into the future.

I have been an AOCS member since 1988 and an active volunteer along the way. I have thoroughly enjoyed the 24 Annual Meetings and many global conferences I have attended. As a believer in life-long education, I believe AOCS is a tremendous forum for learning and information exchange to increase the value of its members. I also have thoroughly enjoyed the opportunity AOCS has given me to meet great people from across the globe.

My volunteer efforts led me to the AOCS Governing Board in 2006 as a member-at-large, and then treasurer for the past five years. This experience has widened my perspective of AOCS and made me realize that the Society serves a very diverse technology base spanning from oilseeds to cleaning products, as well as a very diverse set of people representing industry, academia, and government from many cultures. Our strength is in this diversity, yet it brings challenges in terms of meeting everyone's needs. As treasurer, I am very pleased to say that our financial viability has gone from dismal in my early days on the Governing Board to very sound today. However, just as in any institution, you can never rest. We must constantly be on the watch for new ways to bring value to our members and increase the revenue of the Society to ensure its relevance for future generations.

As vice president, I plan to work closely with Deland Myers, the incoming president of the Society, to best prepare me for the next role of president of the Society. The Governing Board and AOCS staff have made great progress in developing a strong strategic direction. As vice president and then president of the Society, I will not change course and move along a new path of my personal liking. My role is to help ensure that we execute the strategic plan already in place, and keep looking ahead to tune the strategic plan to best position us for the future.

There are some important strategic initiatives underway. As in any institution, it all starts with strong governance and leadership. Accordingly, we are reshaping the Governing Board to make it much more participative and strategic-minded. This is being accomplished through working board groups focused on continually improving our strategic plan to meet member needs, improving our Society governance, improving our financial viability, and improving our relations with constituent groups.

Our strategic direction has us focused on customers. Our customers are both our members and those nonmembers who find value in our Society.

Our strategic direction also has us focused on our three core deliverables; first, fast access to relevant, high-quality information; second, facilitated networking opportunities with others with similar interests; and third, globally recognized technical services.

Shifting our trade journals from internally published to Springer was a great example of a key strategic initiative. Today, we have far more paper submissions, we are more selective in those papers we publish, our number of published papers is increasing, and our impact factors have improved. At the same time, this latest, pertinent technical information is now readily available not only in print but also electronically via consortia agreements with institutions around the world and via the Internet to everyone's desk. Our continually improving website now has the AOCS Lipid Library articles, books, chapters of books, conference presentations, and the like available from your desk. These are just a couple examples of how we are improving fast access to relevant, high-quality information.

Our Annual Meeting and global conferences are well attended and provide irreplaceable face-to-face networking opportunities. However, we recognize that today we live in a fast-paced world where the morning newspaper is old news because you read it on your smart phone last night. We must adapt and offer real-time networking opportunities. This has been recognized, and over the next few years we will roll out the Global Information Portal to allow our customers to network in real time. We recognize the need to remain relevant and to provide high value to our customers.

Millions of tons of goods are traded and shipped around the world every day. Trade is not possible without two parties agreeing to the basis of that trade. AOCS serves the valuable role of having globally recognized standards of quality measurement (methods) that are used to facilitate trade. AOCS also helps ensure that the labs that measure quality can be certified to help ensure consistent and fair measurement practices. Our technical services are of increasing value and ever-broadening reach. Today, global organizations look to AOCS to be the unbiased organization to act as referee in ensuring fair practice and good science. We are seeing more and more opportunity in this area and will do what we can to grow our capability and broaden our reach to better serve these global customers.

When benchmarking against other societies, AOCS is on the leading edge. We are nimble and responsive to customer needs and forward thinking. As your vice president, I would work closely with my fellow board members and the talented AOCS staff to continue this great progress. It would be a true honor for me to serve.

Secretary Candidate

Neil R. Widlak (joined AOCS in 1977): Director, Product Services and Development, ADM Cocoa, Milwaukee, Wisconsin, March 2009–present.

Education: B.S., 1975, Food Science, University of Illinois, Champaign-Urbana, Illinois; M.S., 1980, Food Science, University of Illinois, Champaign-Urbana, Illinois; M.B.A., 1985, Lake Forest Graduate School of Management, Lake Forest, Illinois.

Previous Employment: Director, Strategic Technology Development, Archer Daniels Midland Co., Decatur, Illinois, 1995–March 2009; manager, Chemistry and Applications, Intermountain Canola, Pennsauken, New Jersey, 1992–1995; manager, research and development, Lou Ana Foods, Opelousas, Louisiana, 1989–1992; section manager, Kraft Foods, Glenview, Illinois, 1976–1989; refinery supervisor, Best Foods, Chicago, Illinois, 1975–1976.

AOCS Activities: Member-at-Large, AOCS Governing Board, 2008–present; second vice chairperson, Membership Steering Committee, 2009–present; chairperson, Edible Applications and Technology Division, 1996–2001; member-at-large, Edible Applications and Technology Division, 2001–present; member-at-large, Industrial Oil Products Division, 2000–2002; member-at-large, AOCS Governing Board, 1984–1985; chairperson and member-at-large, North Central

Section, 1980–1989; technical chairperson, AOCS Annual Meeting & Expo, 1988; member, Education and Meetings Steering Committee (EMSC), 1987–1990; co-author/instructor, short courses on Refining of Fats and Oils (North and Latin America), Physical Properties of Fats and Oils, Applications of Fats and Oils in Baking; session chairperson, Symposia on Fat Crystallization, 1997–present; chairperson, Conference on Physical Properties of Fats, Oils, and Emulsifiers, 1997 and 2000; chairperson, Award of Merit Canvassing Committee, 1999–2004.

Member-at-Large Candidates

Richard H. Barton (joined AOCS in 1995): Owner and President, N. Hunt Moore and Associates, Inc., Collierville, Tennessee, 2001–present; co-owner, NFI Iowa LLC, Osage, Iowa, 2007–present.

Education: B.Sc. and M.Sc., Agricultural Engineering, 1975–1980, Texas A&M University, College Station, Texas. Honors include Tau Beta Pi (Engineering) and Alpha Epsilon (Agricultural Engineering).

Previous Employment: Primary Engineer, N. Hunt Moore and Associates, Inc., Memphis, Tennessee, 1994–2001; plant superintendent, Central Soya Co., Inc., Indianapolis, Indiana, 1991–1994; senior process engineer, Central Soya Co., Inc., Fort Wayne, Indiana, 1988–1991; corporate project manager, Ag Processing, Inc., 1986–1988; project manager, assistant plant manager, plant engineer, Bunge Co., 1981–1986; research engineer, University of Kentucky, Lexington, Kentucky, 1981.

AOCS Activities: Governing Board Member-at-Large, 2009–2011; member, Publications Steering Committee, 2010–2011; member, Finance Steering Committee, 2011–present; member, Nominations and Leadership Canvassing Committee, 2000–2004; immediate past chairperson, AOCS Processing Division, 2002–2004; chairperson, AOCS Processing Division, 2001–2002; organizer, Processing Facility Manager Summits, 2003, 2004; secretary/treasurer, AOCS Processing Division, 2000–2001; division representative, Education and Conferences Administration Committee, 2000–2003; section representative, Sections Committee, 2000–2002; president, AOCS Mid-South Section, 2000–2002; vice president, AOCS Mid-South Section, 1999–2000.

Other: Chairperson, National Fire & Protection Association Committee 36, Standard for Solvent Extraction Plants; presenter, Food Protein Research & Development Center, Texas A&M University; licensed professional engineer in Tennessee and Texas; chairperson, Tri-State Oil Mill Superintendents Assoc. (assisted in merger with International Oil Mill Superintendents Assoc.) 1992–1994.

Research Interests: Energy optimization within oilseed processing; PSM facilitation; novel applications for preparation systems; multiseed extruder-press plants; novel extraction methods for non-HAP solvents; high bio-available organic ingredients; biomass-to-energy systems.

Masaki Tsumadori (joined AOCS in 1993): Research Fellow, Global R&D, Kao Corp., Wakayama-shi, Japan, March 2008–present.

Education: B.S., 1975, and M.S., 1977, Polymer Chemistry from Nagoya Institute of Technology, Nagoya-shi, Aichi-ken, Japan.

Previous Employment: Vice President, Global R&D, Fabric and Home Care, Kao Corp., 2002–2008; director of fabric care

products especially such as laundry detergents, fabric softeners, and bleaches, Kao Corp., 1997–2002; manager of laundry detergents/hard surface cleaners, Kao Corporation, 1987–1997; team leader of fabric finishers, Kao Corp., 1982–1987; research chemist of laundry detergents/fabric finishers, Kao Corp., 1977–1982.

AOCS Activities: Member-at-Large, AOCS Governing Board, 2011–present; member, Executive Committee, World Conference on Fabric and Home Care (Singapore 2012 Conference), 2011–present; member, Executive Committee, 7th World Conference on Detergents (Montreux 2010 Conference), 2009–2011; member, Asian Section, 2010–present; member, Surfactants and Detergents Division, 1986–present; chairperson, presenter, speaker, and co-author, AOCS Annual Meeting & Expos; presenter, chairperson, and member of program committee, Montreux Conference, 1986–present.

Other: Member, Program Committee for CESIO 2011 (European Committee of Organic Surfactants and their Intermediates); member, Technical Committee, Japan Soap and Detergent Assoc.; member, International Committee, Japan Oil Chemists' Society; director, Japan Research Association for Textile End-Uses.

Research Interests: Development and application of green surfactants/chemicals/technologies and new feedstocks that are sustainable and don't compete with food.

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Proposed Changes To the AOCS Bylaws

ARTICLE VI
Governing Board

Section 2. Composition, Qualifications, Selection and Term. The Governing Board is composed of the President, Vice President, Secretary, Treasurer, Immediate Past President, and ~~four~~ six to eleven members-at-large elected by the membership. ~~Two~~ Members-at-large are elected on a staggered basis such that approximately half are elected each year from among the Society membership. Each member-at-large serves a term of two years, or until their successors are duly elected, qualified, and take office. A member-at-large may serve no more than two consecutive terms. ~~The following individuals are invited to attend and participate without vote in all meetings of the Society's Governing Board, other than those held in executive session: the chairpersons of the Education and Meetings Steering Committee, the Technical Steering Committee, and the Publication Steering Committee.~~ The Society's chief staff executive is invited to attend and participate without vote in all meetings of the Governing Board, including executive sessions except where relating to his or her personal interests.

Rationale: Having a range in number of members-at-large gives the Board flexibility to have an appropriate Board size without requiring a bylaw change each time. Text regarding Steering Committee Chairpersons is deleted to allow flexibility in the AOCS Board and Committee Structure.

ARTICLE IX
Committees
Section 1. ~~Standing~~ Committees of the Board.
~~Section 2. Other Committees~~ Section 1. Committees of the Board
~~(d)~~ (b) Other Committees of the Board. The Governing Board, by resolution adopted by a majority of the Board members in office, may designate one or more committees, each of which will consist of two or more Board members and having a majority of Board members, which to the extent provided in the resolution will have and exercise the authority of the Governing Board in managing the Society; but designating such committees and delegating authority to them does not operate to relieve the Governing Board or any individual Board member of any responsibility imposed by law.

~~Section 1. Standing Committees.~~ Section 2. Other Committees
~~(b)~~ (a)Steering Committees. The Governing Board may designate one or more committees composed of Society members to provide for the direction and coordination of related activities within the Society. ~~There are five permanent Steering Committees: Membership Services, Financial, Education and Meetings, Technical, and Publication.~~

~~(1) Chair. The Secretary is chair of the Membership Services Steering Committee. The Treasurer is vice chair of the Financial Steering Committee. The Governing Board appoints the chairs of the other steering committees. Upon the recommendation of the Executive Committee, the Governing Board appoints the second vice chairs of all steering committees from among the Governing Board's members-at-large. The President may appoint the first vice chair of all steering committees in consultation with the steering committee's chair.~~

~~(2) Term. The chairs of the Education and Meetings, the Technical, and the Financial Steering Committees may serve no more than two consecutive three-year terms, which terms must be staggered so that no full terms expire in the same year. The chair of the Publication Steering Committee may serve no more than two consecutive full five-year terms.~~

~~(3) Meetings. All steering committees meet at least annually at a time and place determined by each committee's chair. The Financial Steering Committee will meet at least twice annually at a time and place determined by the committee chair. A special meeting of a steering committee may be called by its chair, the chief staff executive, or any two committee members. All steering committee actions must be in writing and reported to the Governing Board.~~

Rationale:

- Article IX, Section 1 is renamed Committees of the Board to more clearly represent the Board's involvement in the activities of these types of committees. Article IX, Section 2(d), Other Committees of the Board is also moved to Article IX, Section 1(b) in the bylaws to more clearly represent the Board's involvement.

- Article IX, Section 1(b) Steering Committees has been moved to Article IX, Section 2(a) Other Committees for clarity in the AOCS Committee Structure. The text defining the five permanent Steering Committees is deleted to allow flexibility in the AOCS Committee Structure and because this level of detail is not required by law to be in the bylaws.

SD&PC NEWS (CONTINUED FROM PAGE 33)

Specialty actives and the personal care market

There is big money in the specialty actives market: nearly $240 million in US sales in 2010 and just under $240 million in Europe during the same time period. That's according to Kline & Co., a market research firm based in Parsippany, New Jersey, USA.

"Specialty actives" is defined by Kline as active ingredients used in personal care products to deliver specific functionality, such as botanical ingredients used to delay or lessen the effects of aging.

"In the natural products arena, the presence of plant-based ingredients in the formulation used to be enough to encourage personal care consumers to purchase the products," comments Anna Ibbotson, an industry manager in Kline's Chemicals & Materials unit. "However, consumer awareness concerning product activity has increased, and the product's function and efficacy are regarded [as being] at least as important as the active ingredient source."

Continued demand for "natural" products will sustain growth in the botanicals segment, Kline says, which currently is the largest specialty actives category with a 38% market share. The fastest-growing category involves products produced through biotechnology.

For more information about the report, see klinegroup.com/reports/y571f.asp. ■

To social network or not to social network: That is the question

Catherine Watkins

Admit it. One item has been on your to-do list forever. It is probably on your list of New Year's resolutions: "Figure out if I should use online social networking sites."

The answer, in three words: Yes, you should.

We don't expect you to take our word for it, so if you aren't already networking online, read on for the whys and wherefores. To be clear, this article deals with the benefits of social networking (SN) in terms of job function. Countless books, articles, and workshops cover the benefits of SN for marketing goods and services; consult them for more information about that aspect of online promotion.

"The fact that business people are using social networking tools to link to people when previously swapping business cards fulfilled the same function I believe proves that there has been an adoption of social media for business use," writes Elizabeth Harrin, director of The Otobos Group (www.otobosgroup.com), a business writing and project management consultancy based in London. It is simple: You have to carve out your online SN presence or risk being labeled as a Luddite (a person who hates or fears technology, named for the 19th-century British textile workers who fought industrialization).

Social media 101

For the uninitiated, social media can be overwhelming. And finding the time to research the many platforms can be daunting. Here, then, are descriptions of the most popular SN sites with some pertinent demographic information, courtesy of the Ignite Social Media 2011 Social Network Analysis (download the report at ignitesocialmedia.com).

LinkedIn. LinkedIn is a social media application that allows users to connect with colleagues, business prospects, or people within an industry. Think of LinkedIn as 21st-century business card trading, as Harrin suggests.

Founded in December 2002 and introduced in May 2003, the site reported more than 120 million registered users in more than 200 countries and territories as of August 2011. LinkedIn currently is available in English, French, German, Italian, Portuguese, Spanish, Romanian, Russian, and Turkish, according to Wikipedia. Media research firm Quantcast reports LinkedIn had 21.4 million monthly unique US visitors and 47.6 million globally in 2010.

If you choose only one SN platform to use, this should be the one.

Facebook. Facebook is the most popular SN site in the world, with more than 800 million active users worldwide as of October 1, 2011. The site allows registered members to create personal profiles and to share messages, photos, links, and videos.

Note that is possible to set up your account so friends and family see more personal posts and business associates see only those posts you identify as being appropriate for that audience. A how-to will appear in a future issue of *inform*.

Twitter. This microblogging service allows users to type in short updates of no more than 140 characters that can be read by other

users who "follow" their posts. An individual message or status update is known as a "tweet." The author of this article finds Twitter to be a superb source for industry news, because it is so easy to retrieve and review (there are no long-winded news releases, just 140 characters of news).

"It is incredibly easy," affirms John Coupland, a professor of food science and chair of the Ingredients as Materials Impact Group at The Pennsylvania State University in University Park (USA). Coupland is also the 2004 recipient of the AOCS Young Scientist Research Award.

"My own tweets provide a sort of simple running diary of thoughts, pictures, ideas, and things I have found interesting," he says. "I meet thought-provoking people and learn about their perspectives. It is particularly useful to get a wider set of perspectives on food and agriculture."

Coupland notes that Twitter allows him to share information that is relevant to his courses and promote programs in which he is involved. "Further, I am paid largely from tax revenue. Through my Twitter feed, I can try to educate the public about what I actually do for their money."

YouTube. Founded in 2005 by Chad Hurley, Steve Chen, and Jawed Karim, YouTube was acquired by Google in 2006 for $1.65 billion, according to *PC Magazine*. Most companies and educational institutions now have a presence on YouTube, which is the self-proclaimed "largest worldwide video-sharing community" on the Internet. The AOCS YouTube channel (www.youtube.com/user/AOCS1909) features videos by book authors and expo vendors as well as meeting presenters. How you use YouTube to market yourself is limited only by your imagination.

Case studies

Early adopter and AOCS member Terese O'Neill—a key account manager for Arla Food Ingredients North America, Inc. in Basking Ridge, New Jersey, USA—has used LinkedIn for the past several years.

"I simply had to sign up in order to keep up with colleagues who are 10 or 20 years younger than I am," she notes. She suggests that new users set goals for increasing their participation and start by joining smaller LinkedIn groups, such as university, workplace, upcoming meetings, or other such special interest groups.

Establishing a basic presence on the major networking sites is not difficult. "It is easy to cut and paste your résumé right into your LinkedIn profile," O'Neill says. "And subscribing to groups related to your work or research allows you to find out who the players are."

The LinkedIn Press Center provides a number of case studies at http://press.linkedin.com/success-stories. There, Hervé Bloch, a sales director in Paris, says he has reduced his workload by 30% by using LinkedIn for at least 30 minutes a day, "mainly to find qualified contacts, decision-makers, and potential customers." A Brazilian marketer uses the site to schedule meetings. Others use SN sites as well as software for project management, both internally and externally. (The *inform* Editorial Advisory Committee, for example, has a private LinkedIn group for discussion of potential magazine articles.)

Just do it!

If you have held off from registering for the major SN sites because you fear the time it will take, you are not alone. You can, however, manage the time you spend and still be effective as a social networker. For one thing, be sure to control the influx of information by adjusting your email notification settings for daily or weekly digests (or no email notifications at all).

Make SN a part of your daily or weekly work routine. Commit to a small—but regular—investment of time. For instance, you can search real-time Twitter feeds on pertinent subjects ("omega-3 fats," for example) in seconds as you have your morning coffee. Or take 10 minutes to scan RSS (Really Simple Syndication) feeds of a few categories of questions that interest you on LinkedIn. (Future *inform* articles will address each of the major SN sites individually in more detail.)

Our advice is simple: Stop procrastinating about social networking and just do it. A modest investment of time now will pay dividends in the future. We guarantee it.

*inform*ation

Connect to other fats and oils professionals by using the social networking sites offered by AOCS. Visit www.aocs.org/network to begin.

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

Lipid oxidation: taking a new look at an old problem

Kathy Heine

Just about every week another food makes headlines for being a source of natural antioxidants. The US Department of Agriculture's (USDA's) current list of super foods—foods whose total antioxidant capacity (TAC) value exceeds 100,000 micromoles Trolox equivalents per 100 grams of food—includes more than 100 foods, from ground cloves to cucumbers, yet years of intensive research on the antioxidants in these foods as well as those from other plant, animal, and microbial sources have uncovered few natural antioxidants that can be used commercially to stabilize fats in processed foods. Oxidative rancidity continues to limit the food industry's efforts to replace saturated fats and *trans* fats with more with more healthful unsaturated fats, while consumer preferences for natural ingredients restrict the use of effective synthetic antioxidants.

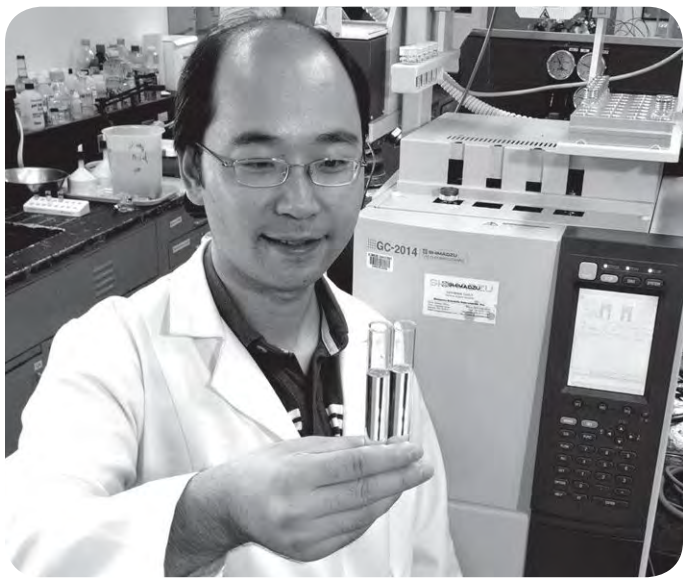
Bingcan Chen is taking a different approach. Instead of publishing yet another paper on the next promising natural antioxidant extract, he is, as a graduate student at the University of Massachusetts (Amherst, USA), trying to understand how the chemical and physical nature of edible oils impact rancidity. Such knowledge could lead to more efficient use of existing antioxidant ingredients as well as the development of new antioxidant technologies.

Although bulk oils have traditionally been viewed as homogeneous systems when considering lipid oxidation chemistry, refined oils actually contain surface-active lipids such as mono- and diacylglycerol, phospholipids, free fatty acids, and antioxidants. Recent evidence suggests that these surface-active lipids combine with trace amounts of water to form physical structures that serve as centers of lipid oxidation.

To understand how this occurs, Chen uses column chromatography to remove all of the minor components from bulk soybean oil. He then adds the surface-active compounds and water back to the oil and studies the nanostructures that form and the effect they have on oxidative stability. (See *inform 21*:577–578, 2010.)

This novel model for lipid oxidation has allowed Chen to produce the first detailed characterization of physical structures in food oil. In turn, that characterization helped Chen determine that phospholipids promote oxidation when they form physical structures but have no impact on oxidation when they are in their monomeric form. More recently, Chen's research shed light on how physical structures impact the activity of polar and nonpolar antioxidants. Such understanding could help the food industry to optimize the efficiency of available antioxidants by manipulating their concentration relative to other surface compounds.

The thought that his research may one day be used to solve problems in industry is very exciting for Chen, whose work distinguished him as one of nine AOCS students to receive a 2011 Honored Student Award at the 102nd AOCS Annual Meeting & Expo (AM&E) May 1–4 in Cincinnati, Ohio (USA), where he presented his paper on the "Role of reverse micelles on lipid oxidation: impact of phospholipids on antioxidant activity of α-tocopherol and Trolox in stripped soybean oil." In May 2011, he was awarded the 2010–2011 Thomas H. Smouse Memorial Fellowship, which encourages outstanding graduate students in areas of interest to AOCS; he will be formally recognized at this year's AM&E in Long Beach, California, USA.



Bingcan Chen uses column chromatography to remove all of the minor components from bulk soybean oil. He then adds the surface-active compounds and water back to the oil and studies the nanostructures that form and the effect they have on oxidative stability.

Science has played an integral role in the Chinese national's life since childhood. "Everything about it intrigued me—from what I could see under a microscope to the interconnection between every living thing and its environment," he says. He was initially attracted to food science, because "I like to eat delicious food myself." With an eye toward contributing to the food industry in his home country, Chen earned a B.S. degree in food science from Sichuan University of Science and Engineering (Sichuan, China) and an M.S. degree in pharmaceutical chemistry from Chongqing University (Chongqing, China). However, he was quickly recruited to be an assistant professor in College of Food Science at Southwest University in Chongqing, where he subsequently won a Chinese government grant for overseas research. Since 2007, Chen has worked as a visiting scholar and doctoral student in the laboratory of Eric Decker, professor and head of the Department of Food Science at the University of Massachusetts, where he is currently helping to bridge the gap between academia and industry.

Although Chen ultimately wants to pursue a career in research and teaching, he believes that it is important for a researcher to understand what is going on in industry. One of the ways to do that is through AOCS. Since joining the organization in 2007, Chen has been active in the Lipid Oxidation and Quality Division. As the division's student representative this year, he is helping the chair to plan activities and events and also to establish the student and poster awards. "Interacting with peers from industry is a great feedback mechanism that really enhances research," he says. "It has made the difference between just doing my own research in the lab and conducting research that is relevant in the real world." ■

Structured lipids in nutraceutical formulations

Garima Pande and Casimir C. Akoh

Recent advances in oil and food chemistry make it possible to modify the structure of natural lipids for specific food, medical, health, and nutritional applications. When incorporated into food products, such custom-made lipids promote better nutrient delivery and absorption. They reduce the risk of chronic diseases and can be used for therapeutic, pediatric, digestive, supplemental, and weight-management nutrition. Here, researchers from the Department of Food Science and Technology at the University of Georgia (Athens, USA) describe some of the products that have been developed so far.

How lipids are structured

Structured lipids (SL) are lipids (usually triacylglycerols, TAG, or glycerophospholipids, GPL) that have been structurally modified (either by incorporating new fatty acids [FA] or changing the position of existing FA) to yield novel products with desired physical, chemical, and nutritional properties. They are produced by either chemical or enzymatic interesterification. Lipases are used for enzymatic interesterification and are preferred over chemical interesterification because they are regio- and stereospecific and offer better control over the final product.

SL can be prepared as position-specific or -nonspecific depending on the method of synthesis. Position-specific SL usually contain long-chain essential FA at the *sn*-2 position and medium- or short-chain FA at *sn*-1,3 positions of the glycerol backbone. Enzymatically produced position-specific SL have desired nutritional qualities and functionalities and are sometimes referred to as nutraceuticals since they can play a role as a food or part of a food in the potential prevention and/or treatment of diseases. SL have been developed for nutritional and medical applications such as infant formulas, low-calorie fats, and enteral (oral tube) and parenteral (intravenous) nutrition. They are also used in food applications with specific functionalities such as plastic fats, shortenings, cocoa butter alternatives, salad oils, and coating lipids.

The role of FA chain length

Short-chain FA (SCFA). SCFA range from two to six carbons in length and are volatile. SCFA-containing TAG are neutral, chemically stable, and rapidly hydrolyzed by pancreatic and gastric lipases to glycerol and their respective FA. These are absorbed more rapidly by the stomach than other FA because of their shorter chain length, smaller molecular size, and higher solubility in water. SCFA have a lower heat of combustion than other FA, making them lower in calories and suitable for use in the synthesis of low-calorie SL.

Medium-chain FA (MCFA). MCFA are saturated FA having six to 12 carbon atoms. MCFA and medium-chain TAG (MCT) can pass directly into the portal vein and are readily oxidized in the liver to serve as a source of energy rather than being absorbed through the lymphatic system. They are consequently a source of additional and quick energy for patients recovering from surgery or illness and for athletes. MCFA also increase metabolic rates and may serve as weight-loss ingredients in foods. They are used for enteral and parenteral nutrition and for patients suffering from fat malabsorption, maldigestion, and metabolic disorders. In infant formula, they enhance fat digestion and absorption.

Long-chain FA (LCFA). LCFA include both saturated and unsaturated FA having more than 12 carbon atoms. Myristic (14:0) and palmitic (16:0) acids are considered hypercholesterolemic, whereas stearic acid (18:0) is considered neutral. Oleic acid (18:1n-9) is a nonessential monounsaturated FA that helps lower total and low-density lipoprotein cholesterol. Linoleic (18:2n-6) and linolenic acids (18:3n-3) are known as essential fatty acids (EFA), as they are not synthesized by mammals and must be obtained from the diet. Linolenic acid is the parent n-3 FA, which is converted to eicosapentaenoic acid (EPA, 20:5n-3) and docosahexaenoic acid (DHA, 22:6n-3). EPA and DHA have anticarcinogenic, antiatherosclerotic, antithrombotic, and anti-inflammatory properties. Unsaturated FA are better metabolized and used when present at the *sn*-2 position because of the slow hydrolysis and conservation of the FA present at the *sn*-2 position of TAG.

Metabolism of SL

The type of FA and its position on the glycerol backbone greatly influence the physical, functional, and nutritional behavior of dietary fats in food products. Figure 1 shows the metabolism of long-chain triacylglycerols (LCT), MCT, and SL.

Lipid hydrolysis starts in the upper intestinal tract where lingual lipase hydrolyzes TAG into monoacylglycerols (MAG), diacylglycerols (DAG), and free fatty acids (FFA). In the stomach, gastric lipase continues to hydrolyze SCFA and MCFA at *sn*-1,3 positions of the TAG to produce MAG, DAG, and FFA. Being more water soluble, SCFA and MCFA are transported via the portal vein to the liver where they undergo β-oxidation to yield acetyl-CoA end products. The hydrolyzed products are then transported to the small intestine where *sn*-1,3-specific pancreatic lipase acts. The hydrolyzed products (FFA and MAG) are absorbed through intestinal mucosa in the form of micelles. After absorption from the intestines, the FFA and 2-MAG are re-esterified to form chylomicrons and enter the lymphatic system where they reach the general circulation via the thoracic duct. Long-chain TAG (LCT) are absorbed slowly as partial acylglycerols in mixed micelles whereas MCT undergo near-complete hydrolysis and are transported via the portal vein to the liver where they undergo oxidation by a carnitine-independent pathway.

SL as nutraceuticals

Parenteral and enteral nutrition. People who are ill or under stress get more energy from lipids than carbohydrates. In this case, MCT are an excellent source of quick high energy, as they are highly mobile,

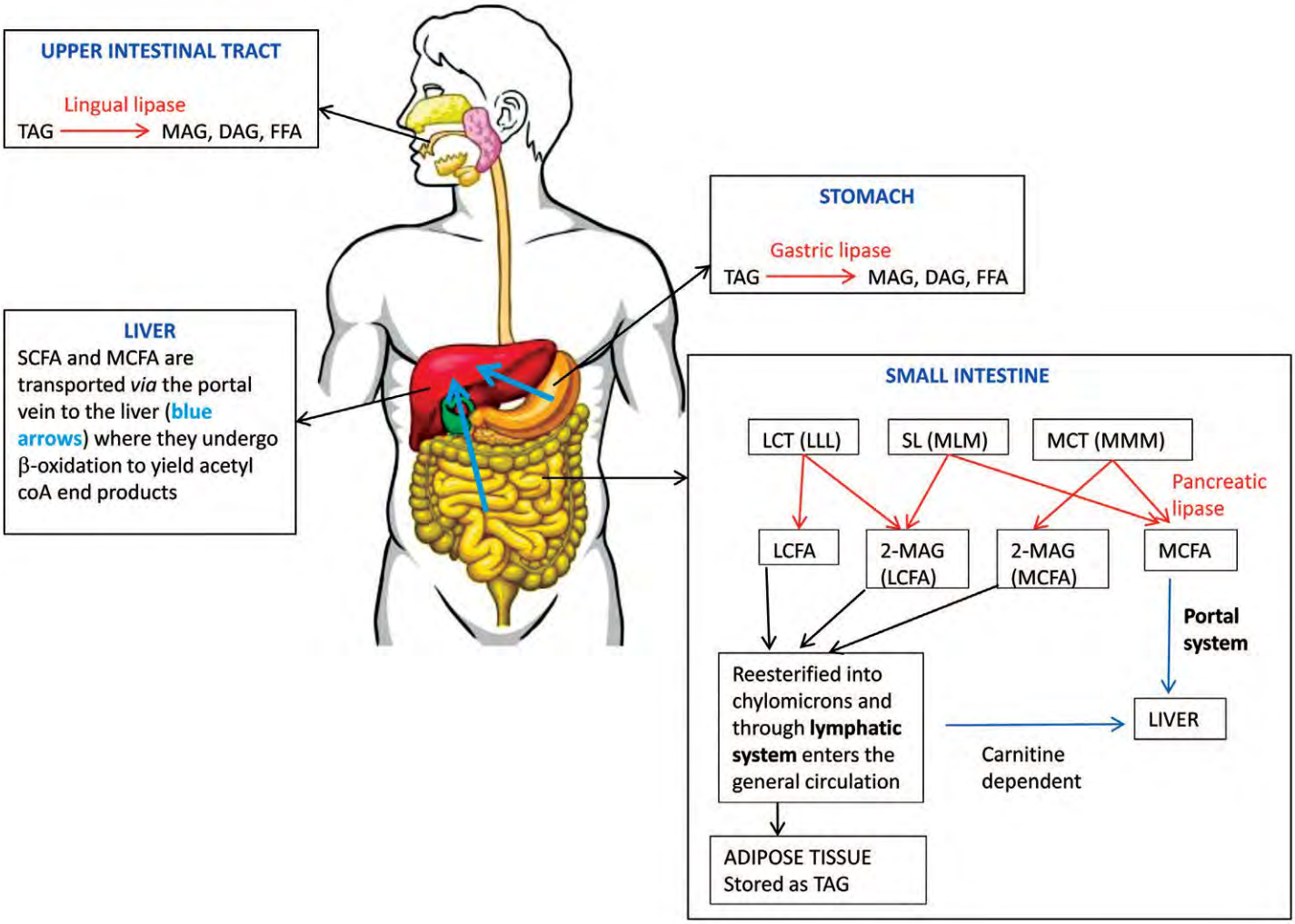


FIG. 1. *Metabolism of structured lipids (SL). Abbreviations: TAG, triacylglycerol; DAG,diacylglycerol; FFA,free fatty acid; SCFA, short-chain fatty acid; MCFA, medium-chain fatty acid; LCFA,long-chain fatty acid; 2-MAG, 2-monoacylglycerol; LCT, long-chain triacylglycerol containing long-chain fatty acids (LCFA) at* sn*-1,2,3 positions (LLL); SL, structured lipid containing LCFA at the* sn*-2 position and MCFA at the* sn*-1,3 positions (MLM); MCT, medium-chain triacylglycerol containing MCFA at* sn*-1,2,3 positions (MMM). Source: modified from Akoh and Kim, 2008; image from http://tinyurl.com/HumDigSystem.*

soluble, and easy to metabolize. MCT products in the form of enteral feeding formulas as well as oral supplements are used in the treatment and care of severely malnourished patients, infants, epileptic children, and patients with fat malabsorption disorders. They also provide rapid and easily digested energy to premature infants and surgery patients with higher caloric requirements. However, administering only MCT results in EFA deficiency.

SL containing SCFA, MCFA, and LCFA are an excellent source of nutrition and energy in intravenous- and enteral-fed patients. A randomized SL emulsion (MCT and LCT) improves hydrolysis and nitrogen balance. In an SL, it is beneficial for the LCFA to be at the *sn*-2 position owing to the low pancreatic lipase activity at the *sn*-2 position. LCFA are more readily absorbed in the form of 2-MAG. Captex® is produced by esterification of fractionated coconut or palm kernel oils (mainly caprylic and capric acids) and glycerol. It is manufactured by Abitec Corp. (Janesville, Wisconsin, USA) and used for clinical applications. Crucial® (Nestlé Nutrition, Florham Park, New Jersey, USA), which is a 50% fat source as MCT + marine oil and

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TABLE 1. Optimal levels of fatty acids for SL in clinical nutrition[a]

Fatty acids	Main sources	Optimum levels	Functions
n-3	Fish, algal, linseed, and chia seed oils, genetically modified soybean oil with increased stearidonic acid	2–5%	To enhance immune function, lower serum TAG, and reduce risk of cardiovascular diseases
n-6	Sunflower, corn, soybean and cottonseed oils	3–4%	To satisfy EFA requirement in the diet for optimum growth and development
n-9	Olive, high oleic soybean, high oleic sunflower, and peanut oils		For the balance of LCFA
SL containing SCFA and MCFA	Bovine milk (SCFA) Coconut, palm, and palm kernel oils (MCFA)	30-65%	For quick energy and rapid absorption, especially for immature neonates, hospitalized patients, and individuals with lipid malabsorption disorders

[a]SL, structured lipid; SCFA, short-chain fatty acid; MCFA, medium-chain fatty acid ; EFA, essential fatty acid; LCFA, long-chain fatty acid; TAG, triacylglycerol. Source: Modified from Akoh and Kim, 2008.

soybean oil (n-6/n-3, 1.5:1), is used for clinical nutrition. Vital AF 1.2 Cal® (Abbott Nutrition, Abbott Park, Illinois, USA) is a form of therapeutic elemental nutrition used for patients with inflammation and gastrointestinal disorders. It can be used for oral or tube feeding and as supplemental or sole-source nutrition. It contains a blend of SL (marine oil + MCT), MCT, canola oil, and soybean oil. Structolipid® (Fresenius Kabi, Bad Homburg, Germany) is an SL consisting of MCT and LCT. It provides energy and FA for critically ill patients who require intravenous nutrition. The sources, optimal levels, and functions of different fatty acids to be considered when synthesizing SL for clinical nutrition are presented in Table 1.

Infant formula. Breast milk is considered the best form of nutrition for infants. Fifty to sixty percent of the dietary energy in human milk comes to breast-fed infants as fat. Palmitic acid (20–30%) is the main FA present in human milk fat, of which more than 50% is located at the *sn*-2 position of the TAG. This is important owing to the increased absorption of palmitic acid in the 2-MAG form rather than in free acid form. Vegetable oils destined to be used for producing infant formula have long-chain unsaturated FA at the *sn*-2 positions and palmitic acid at *sn*-1,3 positions. After hydrolysis by pancreatic lipase, the palmitic acid that is released can form insoluble calcium soaps that result in loss of dietary calcium, hardening of stools, and constipation. SL containing palmitic acid at the *sn*-2 position are an excellent substrate for infant formula. Betapol® (Loders Croklaan, Chanhannon, Illinois, USA), produced by reacting tripalmitin with unsaturated FA using 1,3-specific lipase, was the first commercially available enzymatically synthesized SL for use in infant formula. Additionally, SL that benefit infant growth and development have been prepared with palmitic acid at the *sn*-2 position and DHA or arachidonic acid (20:4n-6) or γ-linolenic acid (18:3n-6) at the *sn*-1,3 positions. Vital Jr.® (Abbott Nutrition, Abbott Park, Illinois) is a pediatric product (ages 1–13 years) that contains a combination of SL (interesterified canola oil and MCT) and a physical blend of oils to provide 50% MCT. It is designed for children with malabsorption, maldigestion, and other gastrointestinal conditions. It can be used for oral or tube feeding and as supplemental or sole-source nutrition.

Obesity management. Pancreatic lipase has positional and chain-length specificity. Therefore, SCFA attached to the *sn*-3 position of TAG are likely to be completely hydrolyzed in the lumen of the stomach and small intestine. SCFA are useful ingredients in the synthesis of low-calorie SL such as Benefat® (Danisco A/S, Copenhagen, Denmark), which consists of 30–67 mol% SCFA and 33–70 mol% LCFA. MCFA are not readily re-esterified into TAG and are metabolized more rapidly than LCT. Ketogenesis and thermogenesis of MCT may be possible reasons for its very low tendency to deposit as depot fat. MCT also provide satiety. SL that contain MCFA at *sn*-1,3 positions and conjugated linoleic acid (CLA, 18:2) at the *sn*-2 position may also be useful in weight maintenance and obesity control, as CLA has hypolipidemic and hypoglycemic effects and also helps to decrease body fat content.

Disease management. SL containing n-3 polyunsaturated FA (PUFA), monounsaturated FA, and MCFA have been synthesized both chemically and enzymatically from fish oil, DHA single-cell oil (i.e., DHA extracted from the marine microalgae *Crypthecodinium*

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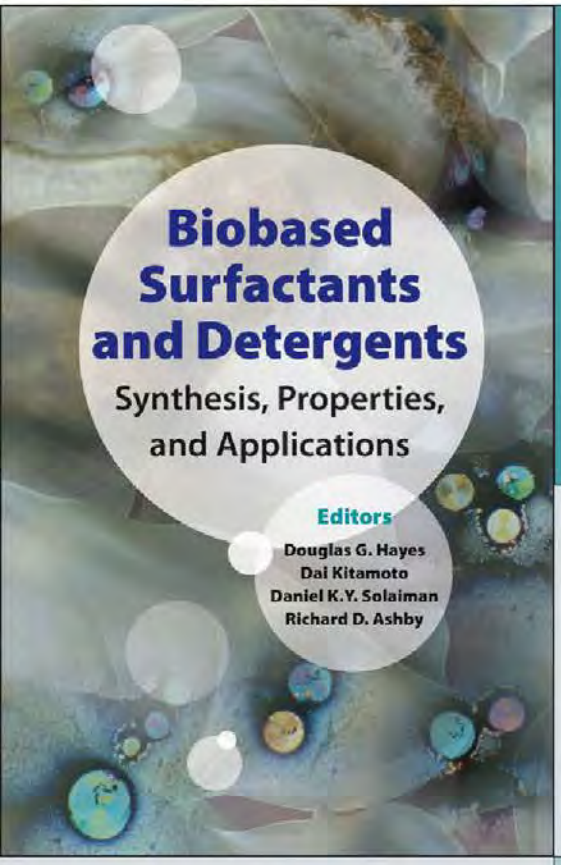

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Synthesis, Properties, and Applications

Douglas G. Hayes, Dai Kitamoto, Daniel K.Y. Solaiman, and Richard D. Ashby, Editors

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Today's petroleum prices and supply issues mean more interest in biobased surfactants and detergents, which can outperform synthetic, petroleum-derived, surfactants (biodegradability, biocompatibility, and measures of sustainability). Consumers want eco-friendly and biobased products, leading to increased use of biobased surfactants. This new, must-have book highlights the latest biobased surfactants being developed, the potential for the "sustainable" manufacturing of biobased surfactants via a biocatalytic route, and novel applications for biobased surfactants. Contents include how to reduce manufacturing and purification costs, impurities, and by-products.

CONTENTS

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AOCS Since 1909
Your Global Fats and Oils Connection

10 reasons to attend the 103rd AOCS Annual Meeting & Expo

Emily Wickstrom

More than 1,600 industry professionals representing 60 countries are expected to gather in Long Beach, California (USA) April 29–May 2, 2012, for the 103rd AOCS Annual Meeting & Expo. This premier global science and business forum on fats, oils, surfactants, lipids, and related materials has been reformulated for 2012, with several exciting additions (schedule on page 64). Here are 10 reasons to attend this can't-miss event.

1 Absorb the best educational program in the industry.

AOCS is known for its extensive program, which features more than 600 presentations covering 12 interest areas. Leading experts will present the latest information in their fields, which will include sessions on health and nutrition, biotechnology, lipid oxidation and quality, surfactants and detergents, and processing.

2 Network with colleagues.

Don't worry if you are new. Several activities are designed to help you break the ice. The speed-networking event for newcomers that was so successful last year will be back this year. Mixers in the Expo hall include the Opening Mixer on Sunday, the Expo Express Breakfast Monday morning, the Networking Break Tuesday afternoon, and a Networking Reception on both Monday and Tuesday evenings. Students won't want to miss the Student Business Luncheon and Mentoring Program on Wednesday.

3 Enjoy a superior Expo.

The AOCS Annual Meeting Expo showcases more than 80 companies from across the globe, highlighting the industry's most prestigious corporate, government, and academic institutions as well as the most current products and services. Don't have time to attend sessions? A special expo-only pass for just $60 will allow you to network with industry professionals.

4 Attend a short course.

Attend a short course. Short courses that delve into hot topics affecting the fats, oils, and related materials industries are offered prior to the AOCS Annual Meeting & Expo. All short course registrants are also invited to attend the 103rd AOCS Annual Meeting & Expo's Opening Mixer. This year's short course offerings include:

- Edible Oils Refining: From the Fundamentals to New Technologies
- Fats and Oils for Confectionary and Chocolates: Chemistry, Primary Sources, Crystallization, Alternatives, and Stability
- Future of Lipid Oxidation, Antioxidants, Nutrition, Genomics, and Metabolomic Aspects
- Olive Oil Chemistry and Sensory Relationships

5 Find people near you with similar interests.

Attending a program session or attending a Division or Section event is the best way to meet colleagues in your interest area or from your part of the world. The seven AOCS sections provide a local forum for fats and oils professionals, enhancing your networking opportunities within your region of the world. Twelve AOCS Divisions covering various interest areas allow professionals the opportunity to collaborate with like-minded professionals. Division and Section events take place throughout the week at the Annual Meeting, and anyone is welcome to attend.

6 Discuss what's hot.

The Forum on Emerging Technologies is another exciting addition that will benefit all attendees. On Monday morning, five informative sessions will go beyond the science to address how the following critical issues impact the business of fats and oils:

- Analytical Horizons—What's ahead, what's important, what's needed
- Communication and Computer Technology in the Workplace
- Functional Lipids
- Moving Sustainable Technologies from Niche to Marketplace
- Renewable Oils for Biobased Products

7 Enjoy the AOCS Symposia — for free!

A free symposium is offered to all registrants prior to the AOCS Annual Meeting & Expo. "Tocotrienols: Vitamin E Beyond Tocopherols," organized by American River Nutrition, Inc. and AOCS, will take place on Sunday. Another offering, "Teaching Lipids—Physics and Engineering," will be held during the AOCS Professional Educators' Common Interest Group meeting on Monday morning.

8 Put a co-worker on the Executive Fast Track.

New at the 103rd AOCS Annual Meeting & Expo is the Executive Fast Track, a one-and-half-day package geared toward business executives who want to experience a conveniently streamlined annual meeting. The program is designed for industry professionals who may not be scientists but who have careers that are impacted by the research being done in fats, oils, oleochemicals, surfactants, and related materials.

9 Join your colleagues at the all-new AOCS Annual Business Meeting.

This year's keynote address at the AOCS Annual Business Meeting will be given by Jackie Freiberg, recognized as one of the "Top 30 Best Minds on Leadership" by Leadership Excellence magazine. The society's 103rd annual business meeting will now be accompanied by a luncheon on Monday afternoon, immediately following The Forum on Emerging Technologies. Attend to hear a great keynote and witness the passing of the gavel as the new AOCS president is inducted.

10 To experience Southern California.

There is something for everyone in Long Beach, which combines the excitement of a big city with the allure of a beach town. Popular Long Beach attractions include the Queen Mary ocean liner, Aquarium of the Pacific, gondola rides, and whale-watching tours. The top amusement parks in southern California are also just a short drive away, including Disneyland, Universal Studios, and Sea World. AOCS will offer two tours during the annual meeting: a tour of Long Beach landmarks and a historical Hollywood Beverly Hills tour.

Emily Wickstrom is a marketing and public relations specialist at AOCS. She can be reached at emilyw@aocs.org.

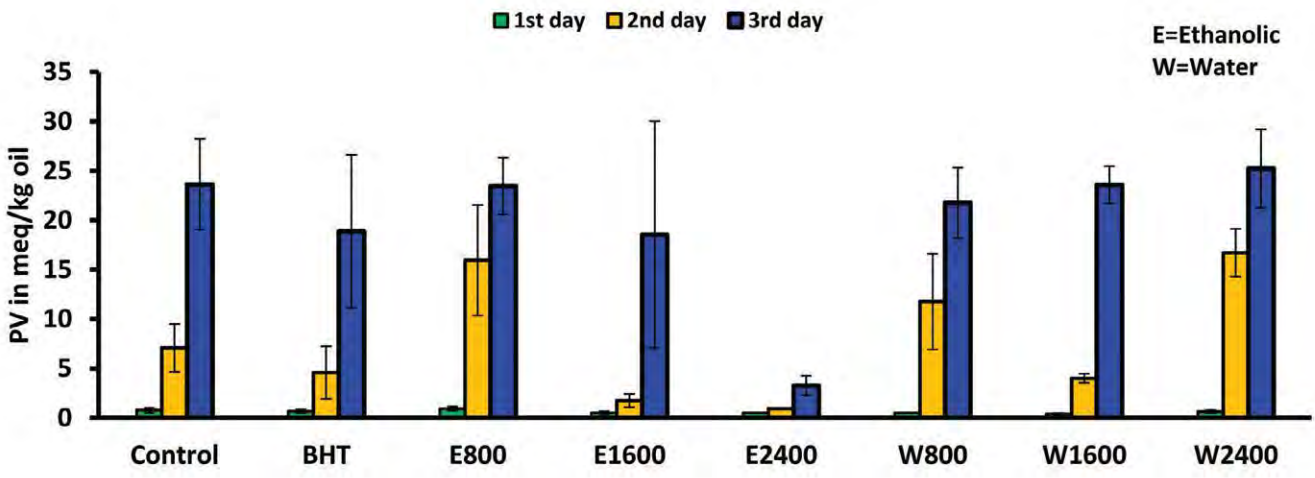


FIG. 1. *The effe t of diffe ent concentrations (0.8, 1.6, and 2.4 g/kg) of ethanolic (E) and water (W) extracts of potato peels on the oxidative stability [expressed as peroxide value in milliequivalents/kg oil) of fish/ apeseed oil (1:1)] stored at 55°C. The fatty acid composition of the oil used was as follows: unsaturated fatty acids: 16:1, 4.1%; 18:1, 36.6%; 18:2, 10.2%; 18:3, 4.5%; 18:4, 1.1%; 20:1, 6.5%; 20:5, 4.7%; 22:1, 3.12%; 22:5, 0.62%; 22:6, 6.2%; saturated fatty acids (total): 10.8%. BHT, butylated hydroxytoluene.*

Potato peel extracts: a potential antioxidant for omega-3-enriched products

Sabeena Farvin Koduvayur Habeebullah, Nina Skall Nielsen, and Charlotte Jacobsen

The potato (*Solanum tuberosum*) is one of the most commonly consumed vegetables in the world. World potato production was 325.30 million metric tons in 2007, with China producing the most, followed by India. In looking ahead, one can see that the global consumption of potatoes as food is shifting from fresh potatoes to value-added French fries, chips, and puree. During the processing of such foods, potatoes are usually peeled by steam, abrasive, or lye. Abrasion peeling is typically applied in chips production, whereas steam peeling is used to make frozen and dehydrated potato products. The losses from peeling range from 12% to 15% and create a major disposal problem. Hence, transforming this by-product from a waste product into a value-added product is of considerable interest to the potato industry.

The long-chain (LC) highly unsaturated omega-3 fatty acids eicosapentaenoic acid (EPA; 20:5n-3) and docosahexaenoic acid (DHA; 22:6n-3) are vital for a wide range of biological functions that directly affect human health, growth, and well-being. They have also been implicated in the prevention of numerous disorders such as cardiovascular disease, cancer, diabetes, and mental illness. Since the human body cannot synthesize EPA and DHA at sufficient levels, these lipids must be provided through the diet. Traditionally, this was ensured through the consumption of seafood. However, our diets have changed over the decades, and most Western diets are now seriously deficient in LC omega-3 polyunsaturated fatty acids.

One way to increase intake is to replace some of the land-based fats in various foods with fish oils. Great efforts have been made to incorporate marine oils into various food products, but these enrichments have proven to be problematic owing to the possible introduction of oxidative instability and resulting potential for off-flavor formation. Adding synthetic antioxidants, such as butylated hydroxyanisole (BHA), butylated hydroxytoluene (BHT), and tertiary butyl hydroquinone (TBHQ), can control lipid oxidation in foods. However, the use of such synthetic antioxidants is under strict regulation because of the potential for associated health risks and toxicity. Consequently, the importance of replacing synthetic antioxidants with natural ingredients has increased greatly.

An antioxidant with "appeal"

Potato peels are a rich source of fiber and phenolic compounds. Although the antioxidant properties of potato peel extracts in muscle foods and soybean oil have been reported, their use as an antioxidant in highly unsaturated fish oil and fish oil-enriched products has not yet been explored.

Recently, we evaluated potato peel extracts as antioxidants in several different omega-3-rich food models. Phenolic-rich aqueous and ethanolic extracts of two Danish varieties of potato (Sava and Bintje) were tested for their antioxidant activity in *in vitro* assays (i.e., radical-scavenging activity, reducing power, Fe^{2+} chelating activity, and ability to prevent lipid oxidation in a liposome model system), in bulk fish/rapeseed oil (1:1), in oil-in-water (O/W) emulsions (5% fish oil in water), and in minced mackerel muscle. We found that peels of the Sava potato had a higher total phenolic content than those of the Bintje variety, and that ethanolic extracts had a higher total phenolic content than the water extracts. Ethanolic extracts, which contained ferulic, caffeic, and salicylic acids, showed high radical-scavenging and reducing power and prevented lipid oxidation in the liposomal model system, whereas water extracts showed higher Fe^{2+} chelating activity.

Sava performed better than Bintje in all assays, so it was selected for further evaluation (at concentrations of 0.8, 1.6, and 2.4 g/kg) in bulk fish-rapeseed oil and in O/W emulsions. In bulk fish-rapeseed oil, oxidation was induced by heating at 55°C, whereas in emulsions oxidation was induced by addition of iron. Both in bulk fish oil (Fig. 1) and in O/W emulsions (Fig. 2), the 2.4 g/kg ethanolic extracts showed best protection against oxidation at the end of the storage period. At this concentration the ethanolic extract was more effective than the synthetic antioxidant BHT. Water extracts did not show any preventive effects against lipid oxidation in bulk oil, and they even seemed to promote oxidation in emulsions, particularly when added in higher concentrations. The same higher antioxidative effect of ethanolic extracts was also confirmed in minced mackerel. Taken together, these results indicate that ethanolic extracts from potato peels are very effective in preventing lipid oxidation in highly unsaturated n-3 fatty acids irrespective of whether oxidation is induced by heat, iron, or the presence of hemoglobin/myoglobin (in minced mackerel). Thus, these ethanolic extracts could potentially be used as replacements for synthetic antioxidants in omega-3-enriched products. Further studies should be conducted to characterize the compounds present in the extract and to investigate whether they have any positive or negative health effects.

Sabeena Farvin Koduvayur Habeebullah is a postdoctoral researcher in the Division of Industrial Food Research, National Food Institute (DTU-Food), Technical University of Denmark, Lyngby. She can be contacted at safa@food.dtu.dk. Nina Skall Nielsen and Charlotte Jacobsen are both senior research scientists in DTU-Food, Technical University of Denmark.

information

Sabeena Farvin Koduvayur Habeebullah, Nina Skall Nielsen, Charlotte Jacobsen. Antioxidant Activity of Potato Peel Extracts in a Fish-Rapeseed Oil Mixture and in Oil-in-Water Emulsions. *Journal of the American Oil Chemists' Society 87*: 1319-1332 (2010).

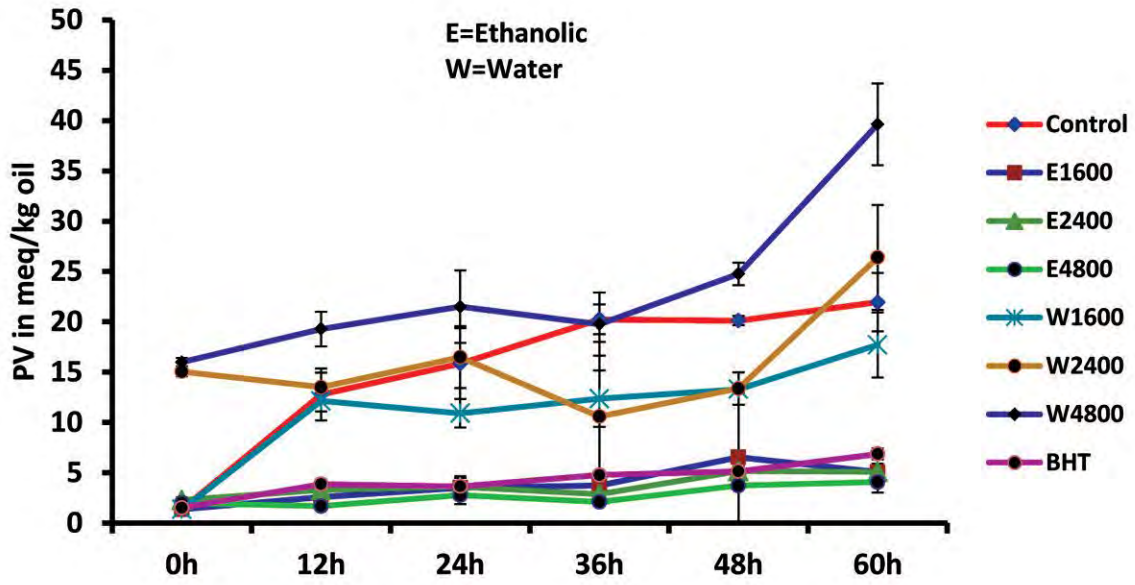


FIG. 2. *The effe t of diffe ent concentrations (1.6, 2.4, and 4.8 g/kg) of ethanolic (E) and water (W) extracts of potato peels on the oxidative stability of 5% oil-in-water emulsions where oxidation is induced by iron. PV, peroxide value.*

AOCS member bringing clean water to developing nations

Did you know that the water in your toilet is cleaner than the water nearly a billion people have to drink? Or that about 2.5 billion people do not have access to a toilet? Or that women the world over spend 200 million hours each day collecting water? (That effort is equivalent to constructing twenty-nine 100-story skyscrapers, according to www.water.org.) Lack of access to clean water exacts a considerable toll: More than two million people—mainly children—die every year because of unsafe drinking water.

Long-time Surfactants and Detergents Division and AOCS member David Sabatini has taken these realities to heart and then some. Sabatini is the David Ross Boyd Professor in Civil Engineering and Environmental Science and Sun Oil Company Endowed Chair at the University of Oklahoma in Norman (OU; USA). He is also a founding director of the Water Technologies for Emerging Regions (WaTER) Center at OU.

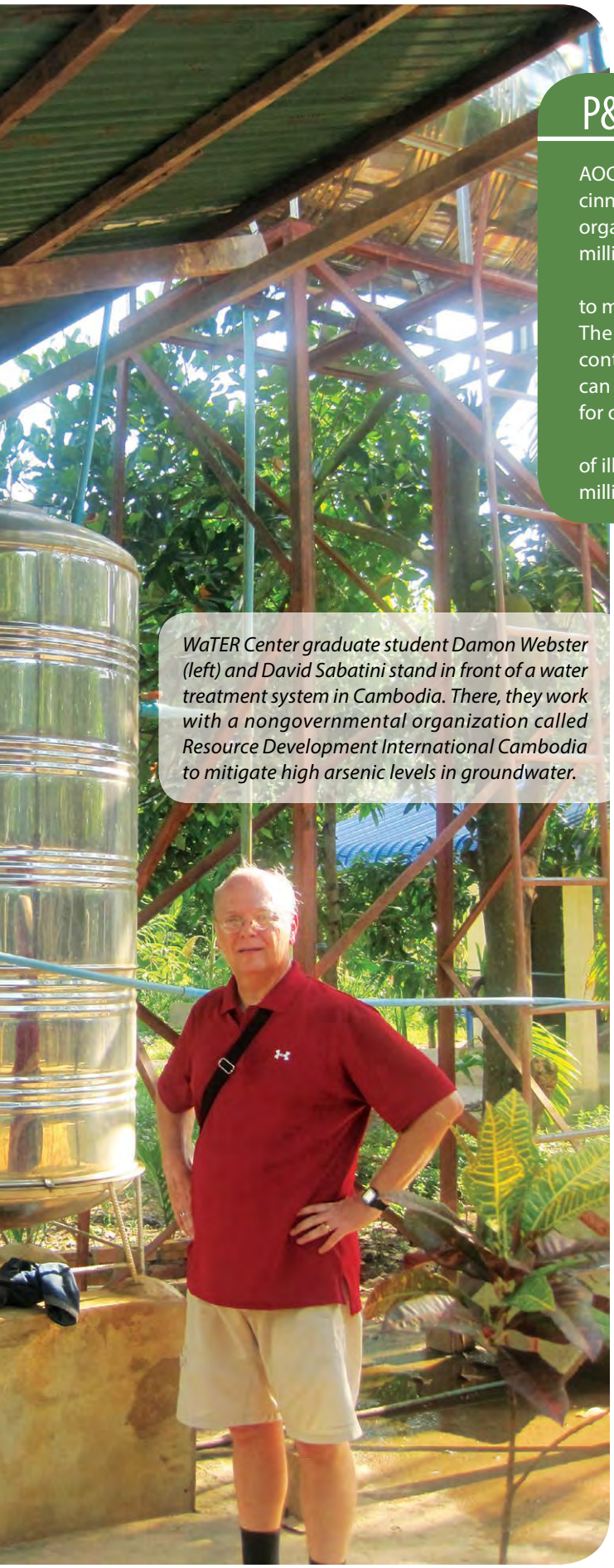
"I began my career examining how contaminants migrate through the environment and dealing with their remediation, which is how I got into the surfactants field," Sabatini says. "It also meant that I traveled around the world, including travel for the cooperative graduate program the OU Institute for Applied Surfactant Research (IASR) runs in Thailand." Sabatini is associate director of the IASR.

This travel allowed Sabatini to experience the plight of the "bottom billion" of Earth's human population of 6.75 billion, who live on less than $1 per day. He began to realize, he says, "the more basic challenges they face, such as mortality rates that are 10 times those in the developed world. In fact, their mortality rates—if you think about it—are what ours were 100 years ago. We have simply had the good fortune to advance."

In 2006, Sabatini co-founded the multidisciplinary WaTER Center (http://water.ou.edu) with environmental engineer Keith A. Strevett and hydrologist Randall L. Kolar. In addition to Sabatini, the Center currently has four co-directors (Yang Hong, Robert C. Knox, Kolar, and Robert W. Nairn) and a core leadership group of five others. Additional expertise represented by the team includes groundwater hydrology, treatment ecosystems, water resource/climate change, civil engineering, anthropology, geography, education, business, and public health.

The wide range of expertise reflects the multifaceted benefits and challenges posed by developing water technology for emerging regions.

"Access to safe water, better sanitation, food, and health care can lead to longer lifetimes, more education, and a move up the development spectrum—all of which can lead to an increase in hope, peace, and stability," Sabatini notes.



WaTER Center graduate student Damon Webster (left) and David Sabatini stand in front of a water treatment system in Cambodia. There, they work with a nongovernmental organization called Resource Development International Cambodia to mitigate high arsenic levels in groundwater.

P&G provides clean drinking water

AOCS Silver Level Corporate Member The Procter & Gamble Co. (P&G; Cincinnati, Ohio, USA) is working with a number of international humanitarian organizations and the Clinton Global Initiative to provide more than 300 million liters of clean drinking water to victims of drought in East Africa.

The collaboration will provide 31 million PUR™ packets made by P&G to more than two million persons without access to clean drinking water. The packets use a powder technology developed by P&G that removes contaminants from water while killing viruses and bacteria. Each packet can purify 10 liters of contaminated water, creating enough clean water for one family for a day.

"This commitment is estimated to prevent more than 10 million days of illness in the region and represents a total investment of more than $3 million," the company said in a statement.

An engineer by training, he found that technology alone is not the answer. Local residents have to be involved in the process and contribute to the effort, even if only minimally, in order for changes to be sustained. The use of indigenous materials, including waste materials that can be treated and processed, can provide economically viable solutions while promoting local entrepreneurs and businesses. Also critical is an understanding of the cultural attitudes toward water and sanitation that impact people's choices and behavior, he says.

As an example, WaTER Center staff have been involved in southern Cambodia, where groundwater in some areas is contaminated with arsenic at levels as high as 3,000 parts per billion (ppb). Arsenic also occurs naturally in Oklahoma; the city of Norman abandoned half of its wells, because they are no longer in compliance with the new US Environmental Protection Agency standard of 10 ppb for arsenic.

In the United States, arsenic remediation generally is accomplished using proprietary iron-based materials that are expensive for use in the United States and thus out of reach for use in Cambodia. Instead, the WaTER Center team is developing a water treatment technology using iron oxide that will mimic the properties of the proprietary material. In 2011, Sabatini and several OU graduate students conducted the first field test of the material in Cambodia, with promising results. In the next year or two, they hope to do a pilot study comparing the Center system to the proprietary material.

WaTER Center teams are also working in a number of other countries, including Bolivia, Pakistan, and Ethiopia, following a similar strategy. The problem in Ethiopia is an excess of fluoride. One solution—using charred cattle bones from local slaughterhouses—is effective at removing fluoride but might not be acceptable to all cultures and religions, so other simple materials are being developed.

"I once thought that I perhaps should have been a medical doctor so I could help those people in the 'bottom billion,'" Sabatini says. "Since founding the WaTER Center, though, medical doctors have commented on our work. They point out that whereas doctors only treat people once they are sick, we keep people from getting sick. And, further, because we bring safe water, our help continues long after we return home."

Those interested in enabling the work of the OU WaTER Center through a charitable donation should contact OU Development Director Jill Hughes at jillq@ou.edu. ■

FAIMS (CONTINUED FROM PAGE 16)

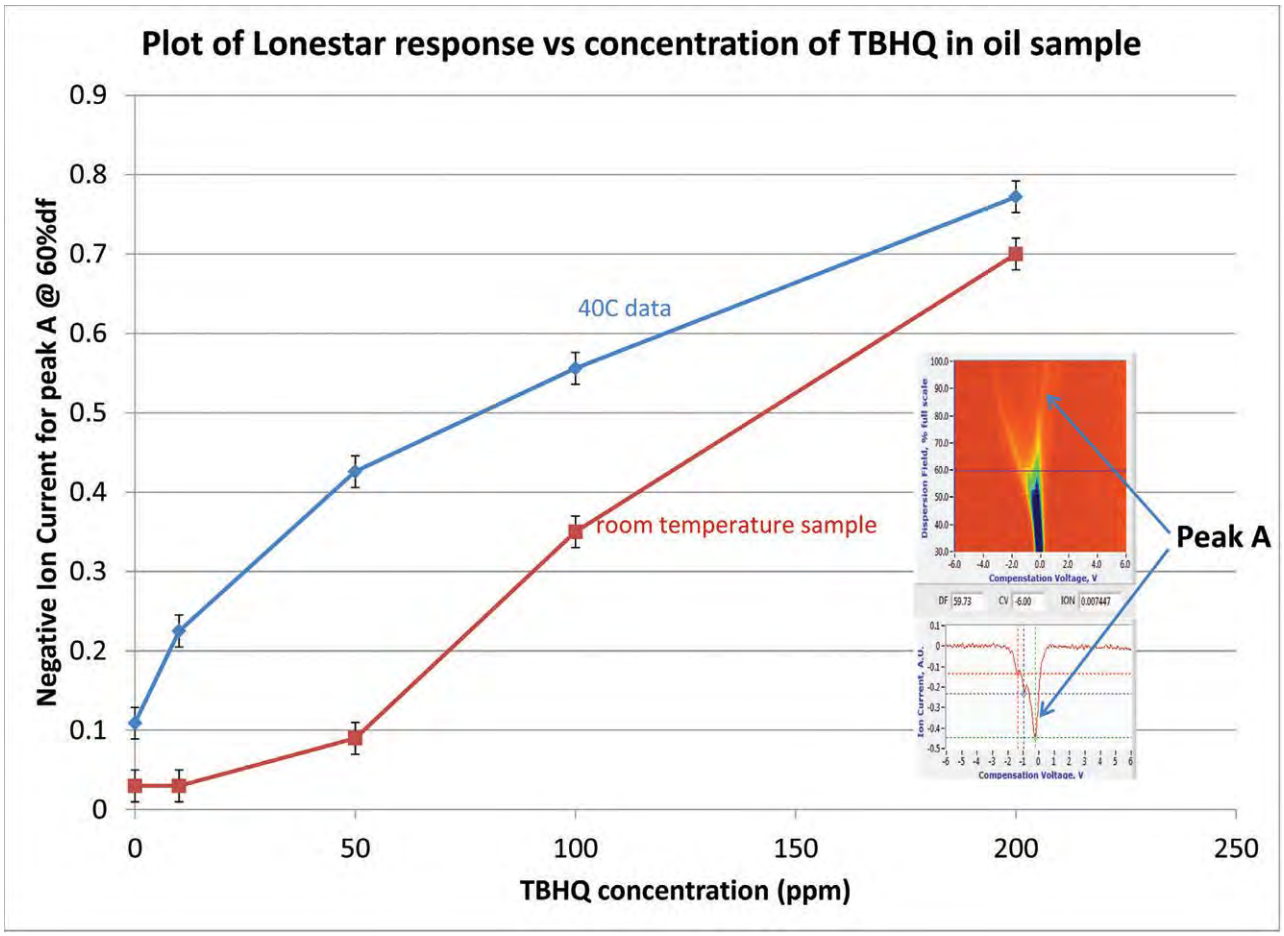


FIG. 4. *Characterization of TBHQ (*tert*-butyl hydroxyquinone) in oil at different concentration levels and different sample holder temperature regimes. Abbreviation: df, dispersion field.*

Based on the requirements and specifications of a particular application, additional parameters such as the temperature of the sample matrix can be optimized before conducting the analysis to achieve the desired result. The impact of temperature on sensitivity is illustrated in Fig. 4.

In this comparative analysis, the incubation temperature of TBHQ oil samples was changed. Increasing the incubation temperature of the TBHQ samples from ambient to 40°C lowered the sensitivity of the FAIMS spectrometer from 50 ppm to 10 ppm. By using this 40°C method, it is now possible to build a detection algorithm for TBHQ from 10 ppm to 200 ppm with 10% precision and accuracy. Once the algorithm is created, the TBHQ concentration of outgoing products can be reported in real time. (Note: A video demonstration showing a FAIMS-based instrument in action is available at www.youtube.com/watch?v=PmSYYAo3Ukg.)

Parris

Freshman

Russell Parris graduated from the University of Manchester with a Ph.D. in analytical chemistry. He worked within the UK Ministry of Defence before moving to Owlstone Inc. (Cambridge, UK), where he now leads the chemistry group in developing and supporting new and existing FAIMS applications. He can be reached at russell.parris@owlstone.co.uk. Steve Freshman holds an M.B.A degree in marketing. He is responsible for FAIMS partnering efforts globally at Owlstone. He can be reached at steve.freshman@owlstoneinc.com.

STRUCTURED LIPIDS (CONTINUED FROM PAGE 52)

cohnii, as marketed by DSM's Nutritional Lipids division, Columbia, Maryland, USA , borage oil, and MCT. These SL are an excellent source of EFA and have exhibited several health-promoting functions *in vivo*. These include tumor inhibition, cholesterol reduction, and improved immunity. Compared to a physical mixture of MCT and LCT, SL are absorbed and deliver EFA more easily. They are readily available as energy, reduce muscle catabolism, and improve nitrogen balance.

Physical mixtures of MCT/LCT do not improve the absorption of LCT as each of the individual TAG maintain their original absorption rate. Neobee® (Stepan Co., Northfield, Illinois), an SL consisting of MCT and LCFA, is used in nutritional or medical beverages and in snack bars. In randomized TAG, the LCFA at the primary positions have a slower rate of hydrolysis whereas SL with LCFA at the *sn*-2 position and MCFA at the primary positions are rapidly hydrolyzed and absorbed. SL containing PUFA and MCFA can be used in various food applications and as diet supplements for better delivery of health benefits.

Other uses. Designer glycerophospholipid (GPL) containing PUFA can be produced using phospholipases. GPL have important biological functions and health benefits, such as maintaining cell membrane integrity, and are currently used in several food products as emulsifiers and stabilizers. Incorporating different FA will result in a wide range of functional and biological properties. Similarly, designer partial acylglycerols, commonly known as MAG and diacylglycerols, can be produced containing essential PUFA. These SL can be used in various food products as functional ingredients. They will provide novel health benefits along with their native emulsification properties.

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List of abbreviations used

CLA, conjugated linoleic acid; **DAG**, diacylglycerol; **DHA**, docosahexaenoic acid; **EFA**, essential fatty acid; **EPA**, eicosapentaenoic acid; **FA**, fatty acid; **FFA**, free fatty acid; **GPL**, glycerophospholipid; **LCFA**, long-chain fatty acid; **LCT**, long-chain triacylglycerol; **MAG**, monoacylglycerol; **MCFA**, medium-chain fatty acid; **MCT**, medium-chain triacylglycerol; **MUFA**, monounsaturated fatty acid; **PUFA**, polyunsaturated fatty acid; **SCFA**, short-chain fatty acid; **SL**, structured lipid; **TAG**, triacylglycerol.

New and improved AOCS Annual Meeting and Expo schedule for 2012 (see article on page 56)

Sunday, April 29	Monday, April 30	Tuesday, May 1	Wednesday, May 2
	7:30–9:00 am Expo Express Breakfast 7:00–8:55 am Committee Meetings	7:00–7:55 am • Committee Meetings	7:00–7:55 am • Committee Meetings
9:00–11:45 am Division Leadership Meetings	9:00–11:45 am THE FORUM on Emerging Technologies	7:55–11:00 am Division Programming	7:55am–12:00 pm Division Programming
		11:00 am–12:15 pm Award Lectures and Recognition	
	12:00–1:55 pm Business Meeting/Luncheon with Keynote Address	12:30–1:55 pm Committee Meetings and Division/Section Luncheons	12:00–1:55 pm Committee Meetings and Division/Section Luncheons
1:00–5:00 pm Division and Committee Meetings	1:55–5:00 pm Division Programming	1:55–3:20 pm Division Programming	1:55–5:00 pm Division Programming
		3:20–4:00 pm • Beverage Break in Expo Hall	
		4:00–6:00 pm Division Programming	
5:30–7:00 pm • Opening Mixer	5:00–6:30 • Expo Networking Reception 5:30–6:30 • Poster Session—Authors Present	6:00–7:30 • Expo Networking Reception 6:30–7:30 • Poster Session—Authors Present	
	6:30–9:30 • Division Receptions/Dinners	7:30–9:30 • Division Dinners	

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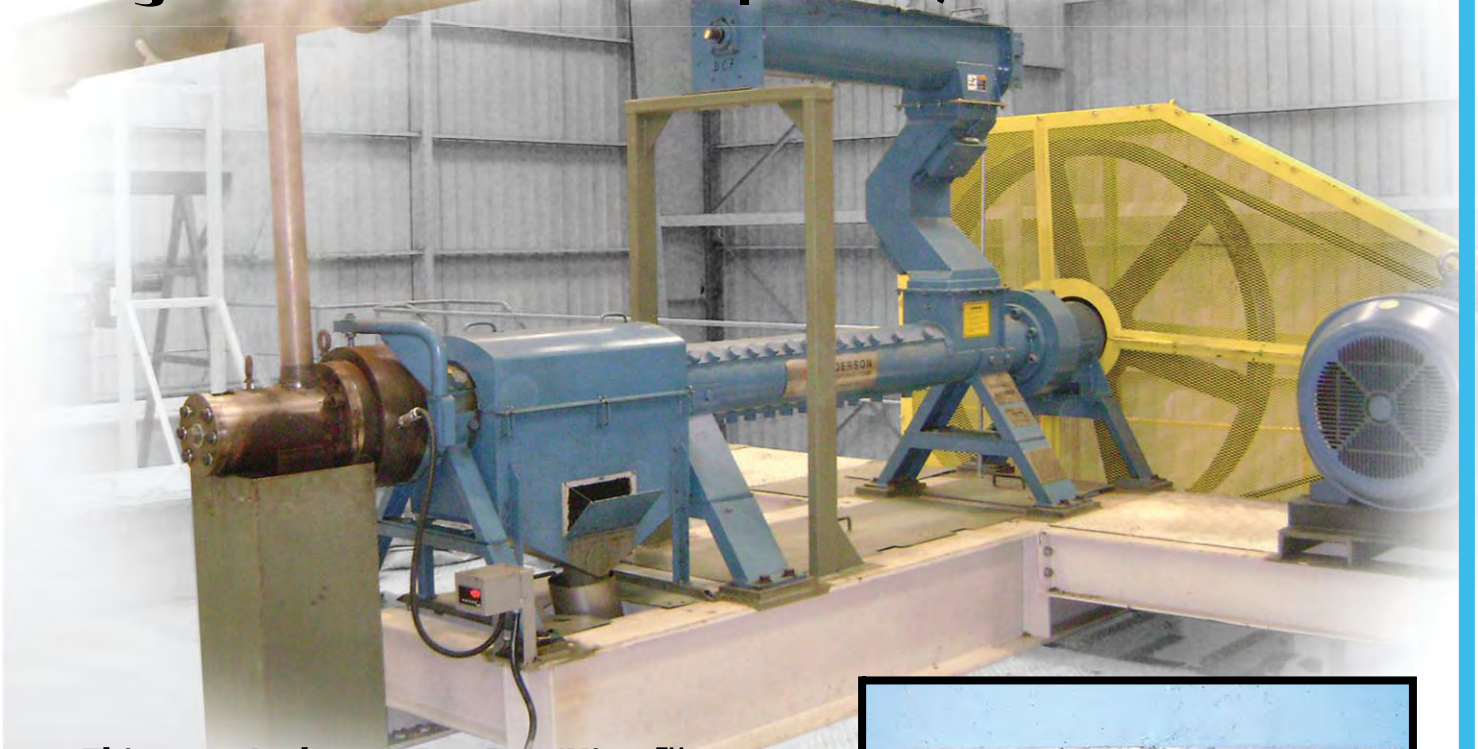

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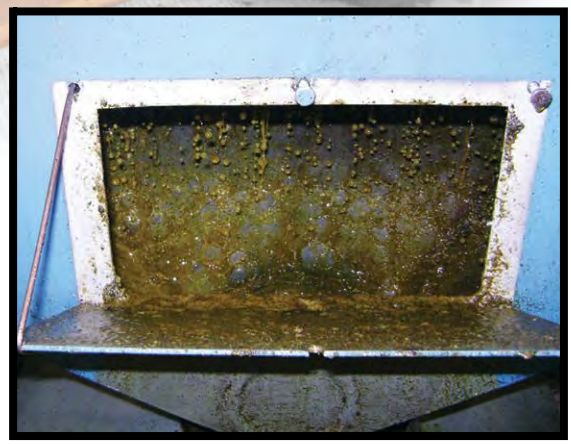

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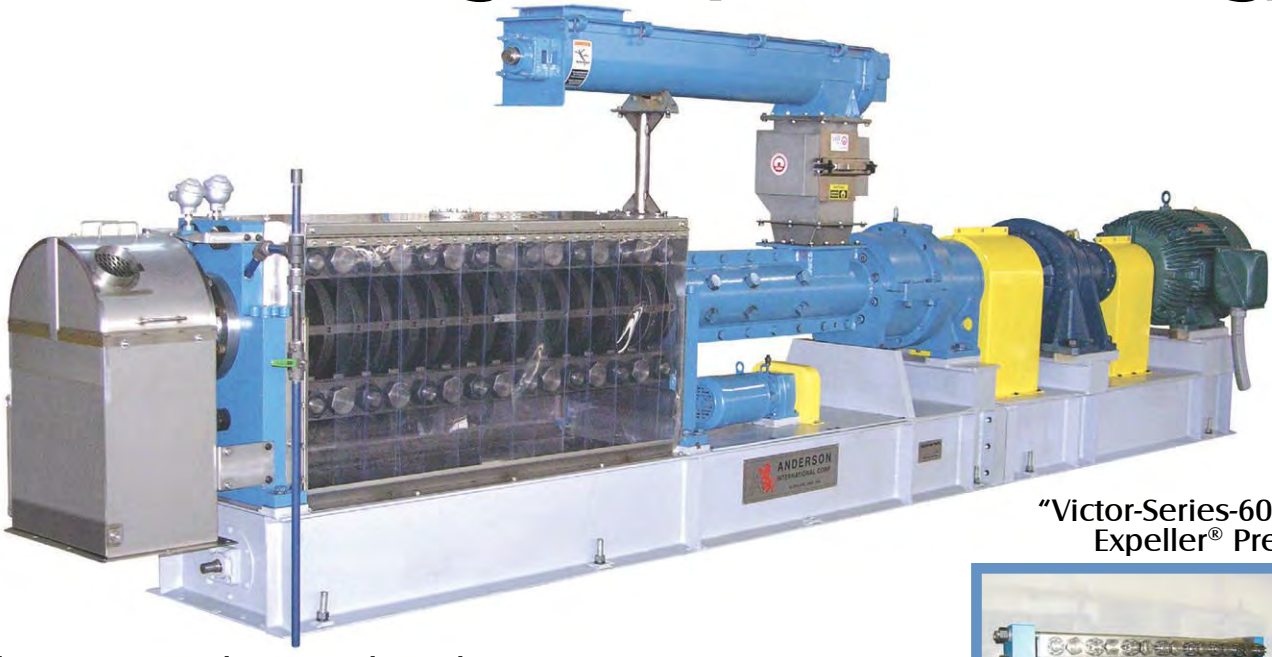

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