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

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Inside AOCS

Patrick Donnelly named CEO of AOCS

The search is over: Patrick Donnelly is the new chief executive officer of AOCS, effective January 30, 2012.

"I am both honored and excited to be part of such an accomplished and storied organization," Donnelly said. "I am grateful for this wonderful opportunity to work closely with a talented team of professionals and build on AOCS' remarkable success."

Donnelly

Donnelly brings to his new position over 20 years of senior-level experience in leading private and nonprofit organizations and initiatives. Most recently, he was a senior policy advisor and practice group chair at Crowell & Moring LLP, an international law firm with headquarters in Washington, DC, USA. Notably, Donnelly was the first nonattorney in the firm's 32-year history to be named chair of a practice group. As leader of the public policy practice, he provided strategic business, regulatory, and policy counsel to a roster of top-tier clients.

Prior to joining Crowell & Moring, Donnelly was executive vice president and chief operating officer of CropLife America, a Washington, DC-based trade association that represents US agrochemical manufacturers. In addition, he has served as global leader of government and public affairs for Dow AgroSciences, LLC, and as director of federal government relations for Ciba and Novartis.

Donnelly holds M.S. and Ph.D. degrees in reproductive physiology from West Virginia University. "Science has always been my passion," he said, noting the strong connection to science and science-based organizations evident throughout his career.

"I look forward to working to enhance the profile, global reach, and value of AOCS to our members and constituents, while ensuring that we continue to be the premier scientific authority in the field of oil chemistry," added Donnelly.

Members of the Executive Search Committee included AOCS past presidents Ian Purtle (chairperson), Keith Grime, and Mark Matlock; AOCS Treasurer Tim Kemper; and AOCS Vice President Deland Myers.

"AOCS is fortunate to have found in Patrick Donnelly an excellent successor to Jean Wills Hinton," said AOCS President Erich Dumelin.

"His in-depth experience in international organizations and cultures, along with an extensive knowledge of communication and organization management, will be instrumental in the expansion of our global network."

Wills Hinton, who joined AOCS in 1988 and served as head of the organization for 10 years, stepped down in January 2012 to pursue other goals. ■

Index to advertisers

*Corporate member of AOCS who supports the Society through corporate membership dues.

Fun fact

What AOCS member's name was mentioned in the answer on the *Final Jeopardy!* segment of the *Jeopardy!* television show on Jan. 11, 2012?

Answer: Keith Downey. The answer on the *Final Jeopardy!* segment was: "Keith Downey developed rapeseed into this cooking product now a huge cash crop for farmers in Saskatchewan."

The correct question was: "What is canola?"

Calendar

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

February

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

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

February 26–March 2, 2012. ApoE, Alzheimer's and Lipoprotein Biology, Keystone Resort, Keystone, Colorado, USA. Information: 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: ift.org/innovation.

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

March

March 1–3, 2012. Commodity Classic, Nashville, Tennessee, USA. Information: commodityclassic.com.

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

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

March 11–13, 2012. National Institute of Oilseed Products Annual Convention, Palm Springs, California, USA. Information: niop.org.

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

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

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

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: 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: abiosus.org/kit-workshop-2012.html.

March 25–26, 2012. Global Castorworld 2012, Jaipur, India. Information: jatropha-biodiesel.org.

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

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

March 28–30, 2012. Southeast European Conference & Exhibition "SAVE the Planet," Sofia, Bulgaria. Information: eco.viaexpo.com/en/exhibition.

April

April 1–3, 2012. 80th Oil Mill Operators Short Course, Wichita, Kansas, USA. Information: Rich Clough, phone: +1 979-862-2262; fax:

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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; 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; 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; aocs.org/meetings.

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

+1 979-845-2744; email: rclough@tamu.edu; foodprotein.tamu.edu.

April 3-4, 2012. Advanced Biofuels Leadership Conference, Washington, DC, USA. Information: tinyurl.com/BiofuelsLeadership.

April 10–12, 2012. Critical Commodities Conference 2012, New Orleans, Louisiana, USA. Information: CriticalCommoditiesConference.com.

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

April 16–17, 2012. Global Moringa Meet 2012, Jaipur, India. Information: tinyurl.com/Moringa2012.

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

April 21–25, 2012. American Society for Biochemistry and Molecular Biology Annual Meeting, San Diego, California, USA. Information: 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: bitlifesciences.com/wcbe2012.

April 26–28, 2012. INAPALM 2012, Pekanbaru, Riau, Sumatra, Indonesia. Information: inapalm-exhibition.com.

April 28–30, 2012. 13th International Exhibition on Surfactant and Detergent, Shanghai Everbright Convention and Exhibition Center, China. Information: email: yihanexpo@vip.sina.com; iesdexpo.com.

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; annualmeeting.aocs.org.

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; stle.org.

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

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14th Latin American Congress on FATS AND OILS

The 14th Latin American Congress was held in Cartagena, one of Colombia's leading ports and an important center of manufacturing and commerce. The Expo included more than 50 exhibits on crushing technologies, oils processing, analytical instrumentation, processing aids, and more.

Héctor Carlos Autino and Eduardo Dubinsky

Eduardo Dubinsky is an international technical consultant on fats and oils for food applications. His company, Eduardo Dubinsky & Assoc., is located in Buenos Aires, Argentina. He may be contacted at edubinsky@dubyasoc.com.ar. Héctor Carlos Autino is a corporate industrial manager at Bunge Argentina SA and a former president of the AOCS Latin American section (2009–2010).

Surrounded on three sides by the blue waters of the Caribbean, the lovely colonial city of Cartagena, Colombia, was a spectacular venue for the 14th Latin American Congress on Fats and Oils. More than 500 registrants and lecturers from more than 30 countries gathered at the UNESCO-designated World Heritage site during October 17–21, 2011, to consider almost all aspects of fats, oils, and related products. [UNESCO is the United Nations Educational, Scientific and Cultural Organization.]

Special sessions featured presentations from international lecturers on biodiesel, health and nutrition, soaps and detergents, crushing, chemical and physical refining, quality, oleochemistry, olive oil, food technology innovation, specialty oils, sustainability, confectionery fats, and enzyme utilization. Meanwhile, the Expo included more than 50 exhibits on crushing technologies, oils processing, analytical instrumentation, processing aids, and just about any other need attendees might have. The result was a resources space for the Iberoamerican market that was truly second to none.

Short courses held prior to the conference were well attended and covered basic concepts on edible oils processing and refining, such as fats modifications; new technologies for change; soap, detergents, oleochemistry, and personal care products; and the structure and functionality of confectionery fats.

The conference, which was supported by AOCS, ASAGA (Argentine Society of Fats and Oils), CORCHIGA (Chilean Corporation of Oils and Fats), Fedepalma (National Federation of Oil Palm Growers of Colombia), and SBOG (Brazilian Society of Oils and Fats), began with a plenary session in which Latin American Section President Roberto Berbesi welcomed the audience with the warm hospitality that is typical of the Colombian people. After his welcome speech, AOCS President Erich Dumelin addressed the audience and gave Fedepalma President James Meza a gift for his active collaboration in organizing the Congress. After that, James Fry from LMC International in the UK gave a very interesting lecture on markets (see page 72), and Juan Carlos Espinosa from Fedepalma Colombia gave an inspiring lecture on sustainability.

The congress closed with an excellent, original, and emotive lecture on personal innovation that reflected on the equilibrium between personal life and work.

During the congress, several well-known experts attended a special discussion on enzymatic degumming of oil. The results of this forum appear on page 75 of this issue of *inform* and will be published in Spanish in the March issue of ASAGA's *A&G Magazine*. Also, at the Latin American Section Meeting it was confirmed that Chile will be the location of the 15th Latin American Congress in 2013. ■

Latin America's role in the production and consumption of VEGETABLE OILS

This article draws on a presentation at the AOCS conference in Cartagena, Colombia in October 2011. It highlights Latin America's role in vegetable oil production and consumption. We examine the region's contribution to oil-in-seed output (the oil content of its oilseed production, including oil palm), to vegetable oil output, and to vegetable oil demand worldwide.

James Fry and Claire Fitton

James Fry is chairman of LMC International, Oxford, UK. He can be reached at Jfry@Lmc.co.uk. Claire Fitton is a research economist at LMC International, Oxford, UK. She can be reached at Cfitton@Lmc.co.uk.

Latin America produces 20% of total world output of oil-in-seeds, measuring the oil content where seeds are grown, not where they are crushed.

Table 1 compares the production of oil-in-seed and vegetable oil by region. This analysis includes the main vegetable oils: palm, palm kernel, coconut, soybean, rapeseed, sunflower, and cottonseed oils. The volumes are all calculated in two ways: on an oil-in-seed basis and in terms of actual vegetable oil output.

Much of Latin America's soybean production is crushed overseas. Table 1 reveals that the region's share of world oil output was only 13.5% in 2010, which contrasts with its share of 20.9% of global oil-in-seed production in the same year. The table also describes the evolution since 2000 of the physical volumes in each region, together with Latin America's share of the world total.

The lower half of this table measures actual oil production from domestic crushing facilities. It does not correspond to the oil derived from the seed grown in each country since a sizeable percentage of Latin America's output of oilseeds is exported without being crushed and also because roughly 10% of world oilseed production is consumed directly (e.g., soybeans for tofu) or is used for planting.

Table 2 depicts average annual regional growth in oil-in-seed output between 2000 and 2010, alongside growth in food demand for oils in the same regions. The oil content of Latin American output has increased at over 6% per annum since 2000, but Southeast Asia has grown even faster, thanks to the surge in oil palm areas.

Excluding all consideration of biofuel demand and examining only food oil consumption reveals that global vegetable oil demand continued to rise even during the recession. With respect to food demand growth since 2000, Asia has led the way, and growth in Latin America has occurred

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The 14th Latin American Congress was held in Cartagena, one of Colombia's leading ports and an important center of manufacturing and commerce.

TAbLE 1. Regional output of oil-in-seed and vegetable oil, 2000–2011[a] (million metric tons)

	2000	2002	2004	2006	2008	2010
World output of oil	79.3	84.8	94.7	111.3	121.0	132.5
Latin America	*11.3*	*12.4*	*14.5*	*16.0*	*18.2*	*17.9*
Southeast Asia	*23.9*	*27.5*	*32.4*	*38.9*	*44.2*	*49.4*
Other Asia	*15.7*	*16.8*	*19.1*	*22.6*	*22.8*	*25.9*
Latin America share, %	*14.2*	*14.6*	*15.3*	*14.4*	*15.1*	*13.5*
World output of oil-in-seeds	89.5	93.5	102.9	121.7	127.1	145.8
Latin America	*15.5*	*18.2*	*21.2*	*23.4*	*27.3*	*30.4*
Latin America share, %	*17.3*	*19.5*	*20.6*	*19.2*	*21.4*	*20.9*

[a]Sources: US Department of Agriculture and LMC International, Oxford, UK. Note: World output of oil-in-seed exceeds world output of oils because a significant tonnage of oilseeds is not crushed for oil but is used directly or as planting seeds.

TAbLE 2. Average regional growth in oil-in-seed output and average oils in food demand per annum, 2000–2011[a]

	Oil-in-seed output	Food demand for oils
World	4.6%	3.7%
North America	*2.2%*	*0.6%*
Africa & Others	*2.4%*	*3.8%*
Other Asia	*2.5%*	*5.4%*
Europe	*3.5%*	*2.1%*
Latin America	*6.1%*	*1.8%*
Southeast Asia	*7.1%*	*4.8%*

[a]Sources: USDA and LMC International, Oxford, UK. Note: Food demand for oils grew more slowly than oil-in-seed output because of the rapid growth in nonfood demand, notably for biofuels.

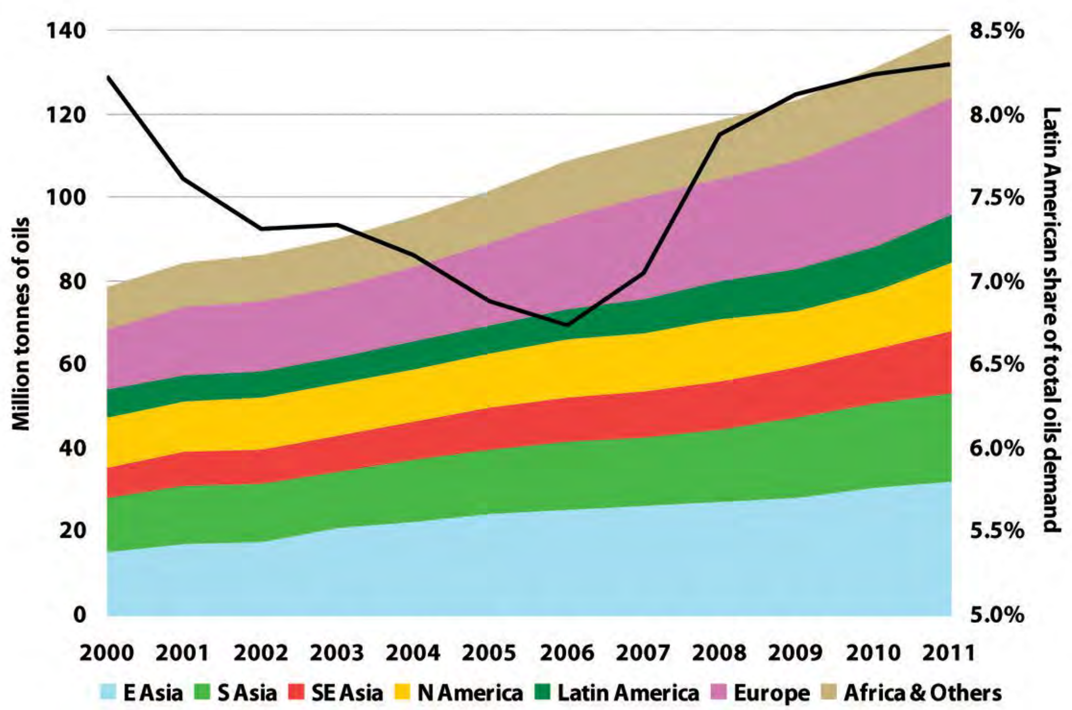

FIG. 1. *Vegetable oil demand by region. Million tonnes = million metric tons.*

at only half the worldwide average pace in the same period.

Figure 1 demonstrates that rapid growth in Latin America's biodiesel demand in the past five years has lifted the region's share of world oil consumption back above 8%, after falling below 7% in 2006.

We conclude that Latin America plays a very valuable role in supplying oilseeds for other countries to crush.

- Whereas the region's share of world oil-inseed production is close to 20%, its share of world production of vegetable oils is in the region of 14%.
- In other words, the equivalent of 6% of world vegetable oil output or over 40% of total Latin American oil production (i.e., 6% as a share of 14%) is exported from Latin America as seeds.
- Latin American oil-in-seed production has averaged over 6% compound anual growth since 2000, which has been surpassed only by Southeast Asia's growth. The Latin American figure compares with a global growth rate of 4.5%.

The picture on the demand side of the market differs considerably.

- Latin America's share of world oil consumption in 2011 is little changed from the region's 2000 level of over 8%.
- Latin America's share dropped below 7% in the mid-2000s, but the surge in local biodiesel production reversed the downward trend in Latin America's global share.
- Focusing on food demand for oils, we discover that Latin America has lagged well behind many other regions in its growth rate since 2000.
- Average Latin American growth in food demand for oils was less than 2% per annum, which was only half the growth recorded in food demand worldwide. ■

Eight industry experts answer questions about enzymatic DEGUMMING

Owing to increased interest in enzymatic degumming in Argentina and Brazil, the Argentine Association of Fats and Oils (Asociación Argentina de Grasas y Aceites, or ASAGA) recently asked its members to submit questions on this topic for consideration by a panel of industry experts during the 14th Latin American Congress on Fats and Oils, held in October 2011 in Cartagena, Colombia. The panel was chaired by **Jim Willits**, chairman of AOCS' Processing Division, and moderated by **Flavio Galhardo**, manager of business technology at Bunge Ltd. (White Plains, New York, USA.).The eight panelists included **David Cowan**, from Novozymes; **Otis Curtis**, from DSM; **Fernando Cadore**, from Verenium Corp.; **Ken Carlson**, from Danisco; **León Pablo Espinoza**, from Desmet Ballestra; **Frederico Vianna**, from Alfa Laval; and **Chris Dayton**, from Bunge Global, Innovation. The following responses were recorded by **Héctor Autino** and **Eduardo Dubinsky** of ASAGA.

What are the economic benefits of using enzymes in oil degumming? How are they generated, measured, and validated on a plant scale? Is physical refining necessary to capture the most value?

Dayton: Economic benefits are generated by reducing neutral oil losses and adding value to the coproducts (increasing the value by concentrating the tocopherols and producing a technical-grade concentrated fatty acid). Enzymatic treatment of the phospholipids yields recoverable diacylglycerols (DAG) and fatty acids and reduces the resultant heavy phase consisting of water and gums. That is, the amount and viscosity of the gums are reduced dramatically owing to their transformation into water-soluble compounds with few emulsification properties. In acid-degumming and/or caustic-refining processes, the whole phospholipid molecule is removed via emulsification. In the enzymatic process, only the lysophospholipids and/or phospho compounds are lost. Also, the amount of energy and chemicals used is reduced.

The benefits of enzymatic processing may be validated by measuring: (i) the incoming oil volume and its phospholipid, DAG, and free fatty acid (FFA) composition; (ii) the DAG and FFA content of the outgoing oil; (iii) the neutral oil content of the generated heavy phase; and (iv) recovered tocopherols and fatty acids in the distillate following physical refining.

Enzymatically degummed oil should be physically refined to maximize the yield benefit. However, in a stand-alone extraction plant that exports its production, degumming using a phospholipase C (PLC) enzyme will allow you to meet all specifications while increasing the oil yield.

Willits and Espinosa: Economic benefits include less neutral oil loss, less wastewater contamination, and lower maintenance as a result of free-flowing gums. The only sure way to measure these is through physical inventory changes in and out of the plant. For degumming alone, physical refining does not make a difference. For a complete refining operation, enzymatic degumming followed by physical refining is most cost effective.

Carlson: The benefits are primarily yield gain and reduction of residual phosphorus (when this is desired, as in total degumming). We prefer to measure the gain by comparing the output of wet gums from the centrifuge over a specific time period. Obviously, the feedstock and processing parameters must be the same (except for temperature and addition of

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enzyme/caustic). In this case, the reduction in gums for enzymatic degumming can be directly translated to increased oil output. As for measuring residual phosphorus (especially in total degumming), we recommend inductively coupled plasma (ICP).

Cadore: The economic benefits include reduction in the overall volume of gums and consequent reduction in losses of neutral oil trapped in the gums. Also, gums from an enzymatic process (using either phospholipase C [PLC] or phospholipase A [PLA] as a processing aid) have less acetone-soluble content, that is, less fat. This means that the overall mass of gums and the percentage of oil present in the gums are reduced. When PLC is used as a degumming aid, yield is increased by conversion of phospholipids into DAG and phosphorus removal is enhanced. The best way to measure benefits at plant scale is to compare the amount of gums created during conventional water degumming with the amount of gums created with an enzymatic process. The reduction in total gums generated should correlate with an increase in levels on storage tanks and also the reduction in total fat in the meal.

Final conclusions on yield gain should be drawn only after weeks or months of operation, since process variations are always experienced whether using enzymatic or conventional degumming. The use of analytical methods can give a very good indication of the benefits, but the efficiency of an enzymatic reaction is better validated by measuring the products for each type of enzyme used. Therefore, analytical methods serve well as a tool for process improvement and monitoring than as a yield measurement tool. In plants using PLC, DAG creation can be determined by using high-performance liquid chromatography, but plant managers should be aware that DAG creation is an indication of reaction efficiency. It does not necessarily mean that the benefits are being captured during the subsequent separation process.

Note that centrifuge adjustments are necessary to separate gums resulting from an enzymatic process, since they have slightly different physical properties (denser, less viscous) from those obtained with water degumming. The reduction of fat retained in the gums can also be taken into account when using analytical processes, and methods based on acetone solubility demonstrate the efficiency of the separation and enzyme reaction. The use of ICP to measure total phosphorus can also indicate the efficiency of reaction, especially in processes using acid pretreatment.

For integrated soybean processing plants, removal of phosphorus (P)with enzymatic processes and recovery of FFA by physical means is the most economical in terms of operational costs. Enzymatic degumming can be used alone or in combination with physical refining. With degumming processes preceded by acid treatment, very low P levels can be achieved, the resulting oil may be physically refined into edible oil or biodiesel, and overall losses are reduced compared to alternative methods. Plant managers should be aware that although enzymatic degumming followed by physical refining offers the lowest operational cost, it requires more upfront investment than conventional water degumming followed by chemical refining.

Vianna: For crude oil, DAG content may be increased by using PLC. For crude oil with lecithin production, using PLA may reduce losses. Enzymatic degumming can reduce the use of acid and caustic chemicals, the saponification of neutral oil, and effluent amounts while increasing yields and producing greater quantities of added-value products (e.g., tocopherols and FFA). Benefits are generated through fewer losses during separation. Because the enzyme reacts with phospholipids, it does not damage the neutral oil. Such benefits can be measured by mass balance using mass flow meters.

Physical refining enhances this benefit by recovering components such as tocopherol and FFA. While enzymatic degumming takes care of one oil impurity (phosphorus), physical refining takes care of the second impurity, FFA, in a more environmentally friendly way.

Curtis: Oil processors will never be fully aware of all the benefits of enzymatic degumming if they do not measure the right performance parameters of their current process. You need to assess input costs (e.g., oil from the extraction, energy, acid, and caustic) and output value of material produced (e.g., separated gums, meal cake, degummed oil, FFA, soapstock, etc.). The No. 1 driver for enzyme degumming is economics. When a process is properly monitored, we have heard reports of as much as about 1% oil yield improvement and even more when combinations of enzymes are used. But there are other potential economic, safety, and sustainability benefits such as reduced use of chemicals, safer work environment, and reduced generation of lower-value co-products. All these benefits can be realized whether you are physically refining or simply producing and enzymatically degumming oil.

Which are the most important process variables that impact an enzyme's performance, and what contaminants may reduce its activity? Can enzymes be applied to both crude and crude degummed oils?

Dayton: It is important to dry the crude oil from the extraction process before enzymatic processing. Otherwise, moisture will hydrate the hydratable phospholipids – primarily phosphatidylcholine (PC) and phosphatidylinositol (PI), causing them to foul the heat exchanger when the oil is cooled down to a temperature that is optimal for enzymatic activity. High-shear mixing using an IKA® Dispax mixer with 100–200 horsepower produces the emulsion needed for the enzymatic process to be successful (US patent 7,713,727). Other variables include controlled citric acid addition for dissociation of metals from phosphatidic acid (PA), phosphatidylethanolamine (PE), and PI; controlled base addition for optimal pH of the enzyme's activity and selectivity; addition of acid after the enzymatic reaction (to reduce pH prior to heating and separating, which prevents fouling from calcium and magnesium citrate; US patent 7,713,727); and addition of silica and clay for zero phosphorus, calcium, magnesium, and iron after silica treatment for physical refining.

No contaminants that will reduce enzymatic degumming activity are known to be present in the oil. A combination of PLC and PLA may be applied to both crude and degummed oil (US patent applications US 2008/0182322 and US 2008/094847). If single enzymes are used, PLC will not work on degummed oil due to the prior removal of PC and PE.

Willits and Espinosa: The most important variables are quality of the water (soft water), strict control of pH, temperature, and quality of the mixer. Contaminants in the oil, such as citric acid and iron, reduce the enzyme's activity.

Enzyme degumming works for both crude and crude degummed oils. PLC is more effective on crude, and PLA is more effective on crude degummed due to the amount of non-hydratables present. Instrumentation and automation quality is also key.

Carlson: We have not experienced anything that negatively affects the enzyme. The critical issues are that the feed oil should be dry and cooled to the right temperature (55–60°C). In extraction plants with integrated degumming, the crude oil is not normally vacuum dried or cooled, as it goes directly to degumming. This is acceptable, as the oil can be hydrated (or acid-conditioned) at, say, 80°C, and any gums already precipitated in feed oil will come out in separation. However, if a wet oil is cooled, there is a risk that the precipitated gums will clog the cooler. Also, the enzyme will not work with already hydrated (precipitated) gums, which reduce yield gain.

Cowan: Water quality is important to achieve best performance. Chlorine content should be maintained as low as possible. pH control and the right temperature are also decisive when increasing performance.

Cadore: Each enzyme has an optimal pH and temperature range. Also, because enzymes are water soluble, there usually is an optimal concentration for each type of enzyme to ensure the most efficient reaction; this information should be supplied by the enzyme companies. These parameters must be achieved and, most importantly, stably maintained during operation. For instance, residual moisture from crude oil extraction can affect enzyme activity, particularly when there are wide variations.

The presence of metals (Ca, Mg, and Fe) in the hydration water and the pH of the water also require attention. In a process where we are trying to remove metals from the oil, the water used should be as free of metals as possible, and the pH of the water should be within the operating range indicated by the enzyme company.

Enzymes can be used for crude and for degummed oil. Phospholipases may be selective to certain types of phospholipids; therefore, it is important to know what phospholipids are present in the oil and select the appropriate type of enzyme for each application. Purifine® PLC is indicated for use in crude oils with high levels of phosphorus, since it reacts with two types of phospholipids that are only found in crude oil (PC and PE). In this case, enzymatic degumming can be used to minimize degumming losses and reduce the phosphorus content of crude oil to the standard of the trade (commonly 200 ppm for soy oil). PLA enzymes may react with all types of phospholipids, but they generate FFA as a product. Therefore, PLA may be better suited for removing P from oils that have been previously degummed with water.

Usually, in processes where enzymatic degumming is implemented, we can easily get to a lower phosphorus level compared to other degumming alternatives.

Vianna: Important process variables include oil moisture, oil quality, water quality, and process control and stability. Enzymes can be used for both crude and degummed oil.

Curtis: Fortunately, enzymes have a range of conditions where you get good performance. So you have some flexibility to optimize both the enzyme and your processing. This year, DSM launched Gumzyme®, a specific subclass of phospholipase (PLA2) that operates at higher temperatures and more nearly neutral pH. It also has an affinity for the less hydratable phospholipid species such as PA and PE. This gives you options, in addition to other enzymes in the market, when designing your total process. An enzyme for degumming is designed to help hydrate phospholipid species and improve their subsequent removal in the heavy phase. Therefore, you can use this process for any oil where you have phospholipids, including crude and crude degummed oils.

What storage conditions affect enzyme activity? What is the enzyme shelf life expected to be? Can enzyme activity be directly measured?

Willits and Espinosa: Temperature and light affect shelf life. With proper conditions, enzymes can be stored for several months from the time of manufacture. You have to follow the storage conditions suggested by the enzyme supplier. In some cases the temperature has to be below 10°C. These conditions are also important during transportation. You can measure the enzyme activity directly. It is possible to do this at the plant level.

Carlson: The activity of our enzyme, LysoMax® Oil, is measured by activity on a standard phospholipid (sourced from Sigma). A copy of the protocol for conducting the enzyme activity measurement is available on request. Customers can easily implement this assay in their labs.

Cowan: A good temperature for enzyme storage is 10°C. Transfer conditions must also be controlled to ensure enzyme quality. Enzyme activity can be controlled, but that is not critical if the proper storage conditions have been maintained correctly.

Cadore: Each manufacturer develops studies/experiments to determine the optimal storage conditions producing the longest shelf life for each of their products. As with any other biological product, enzymes degrade with time, especially if the recommended storage conditions are not observed. These storage conditions usually involve certain temperature ranges and avoiding exposure to direct light. Each manufacturer formulates its enzyme products to provide a specific activity and guarantees that the enzyme will remain above a minimum level of activity if storage conditions are met. Enzyme companies develop activity assays that are specific for each enzyme product, but they usually require lab apparatus, reagents, and analytical equipment not commonly found in plant labs, making it difficult to accurately measure activity onsite.

Vianna: Enzymes should be stored according to manufacturer's specifications. They normally need a cold room around 15–20°C.

Curtis: Generally, cooler temperatures will extend enzyme storage life. We recommend storage at 4–8°C for a one-year shelf life. However, we also know that enzymes can be shipped at ambient temperatures without loss of activity; so they don't need to be treated like an ice cream cone in the middle of summer. The important thing is to talk to your enzyme supplier for guidance. If you have expiring product in inventory, your supplier can usually test the activity. Alternatively, they can provide you with the analytical procedure to do it yourself or pursue third-party testing. This same approach would allow you to test incoming products at your discretion.

Are there any problems inherent to enzyme degumming, such as tank bottoms? What other problems can be expected? How can these problems be solved?

Dayton: The calcium, magnesium, and iron citrates that form when the dissociated metals react with the citric acid present in the oil are an inherent problem. These salts will precipitate out of solution and foul any economizers, heat exchangers, and the centrifuge in as little as one day. US patent 7,713,727 describes the process for eliminating these salts.

Willits and Espinosa: There are no significant unexpected problems associated with enzymatic degumming. If the process is well controlled, with good automation and the right size of mixer and reactor, you should not expect new problems with this technology.

Carlson: Our only comment is that, when using our enzyme, there is no more sedimentation in degummed oil than in normal water or total degumming.

Cadore: When comparing two identical degumming processes, one assisted by enzymes and the other not, the enzymatic process usually will provide oil with a lower total phosphorus level. Since there is a standard in the industry for trading degummed soy oil at 200 ppm P, plant managers may opt to adjust the centrifuges to allow for P to go into the oil phase up to the 200 ppm threshold. However, since the greatest portion of the P remaining in the oil phase is reacted P, this P has the tendency to precipitate really fast. This creates deposits on the bottom of storage tanks. So, when using a degumming process, plant managers should try to set up centrifuges to remove all reacted P, even if this means producing degummed oil with total P levels around 100 ppm.

When using PLA in crude oil, plant managers should be aware that the product of the PLA enzyme reaction is FFA. If one plant processes crude oil for export, there is a risk that this oil will easily exceed the maximum allowable threshold for degummed oil of 1% FFA. If a plant processes crude oil into edible oil/biodiesel and the removal of the FFA is done by physical means, the column must be designed to operate with the appropriate amount of FFA present in the oil coming into the column. These are not really problems, but characteristics of the enzyme, and the correct enzyme should be selected for each application.

Some enzymes function at low pH values, and often the pH is not corrected after the retention tank. Thus, oil with a very low pH goes into the heat exchanger and subsequently into the centrifuge for phase separation. The widely known problem of precipitation of calcium and magnesium salts of as a consequence of low pH can be easily overcame just by increasing the pH to near-neutral. This technique also makes the gums more fluid and consequently allows for a cleaner separation. Although sometimes this problem can be correlated with the use of enzymes, this is not a consequence of the enzyme reaction but simply of the pH of the process.

Vianna: If the separation step is not carried out properly, the reacted gums will precipitate in the tank. Also, if the moisture of the oil is not controlled properly, the heat exchangers may clog.

Curtis: We are not aware of any unanticipated problems with enzymatic degumming based on our experience with processors. If there are gums in your oil, you will have them falling to the bottom of tanks. So, the best solution is to optimize the process to ensure effective gum removal, but this is true for all processing.

Are there any health and safety issues in dealing with enzymes during processing? Are there any concerns on the safety of the processed oil?

Willits and Espinosa: No issues, no enzyme in oil, and the enzyme doesn't have activity in the by-products.

Carlson: When working with enzymes, you should always prevent skin contact by wearing gloves. Prevention of aerosol formation in the factory also is important. There are no health implications from the enzyme in the refined oil, because no enzyme is left in the oil. The enzyme will follow the gum, which, when added to the meal, is inactivated when the meal is heated above 100°C. Also, any minute amounts of enzyme left in oil will be denatured and removed in downstream processing.

Cowan: No issues are identified in relation to health. Customers should apply the right procedures to eliminate the enzymes before centrifugal separation. Enzymes are not toxic.

Cadore: Enzyme manufacturers issue Material Safety Data Sheets (MSDS), and plant operators should be aware of how to handle the product. Enzymes must go through rigorous processes to be certified for use in each country or region where they are sold. Enzymes are water soluble, and no traces of enzyme are found in the final oil product. Additionally, both oil and meal containing enzyme residues are submitted to high temperatures during processing that denature the enzyme. Any enzyme residues present in the meal will be broken down to their constituent amino acids with no effect on feed safety.

Curtis: As with any compound in the workplace, information about handling and safety precautions should be found on the MSDS. Generally, enzymes do not pose a contact hazard to humans or equipment. Some enzymes are powders that, when airborne, can cause sensitization by inhalation.

Can the reacted gums be used for anything else, other than sending them to the meal? Can lecithin be produced when using enzymes for degumming?

Dayton: Currently, no commercial lecithin products are produced from enzymatic degumming owing to the destruction of the emulsification properties of the treated phospholipids and the presence of unwanted salts that would need to be removed in the case of PLA degumming. Several companies produce enzymatically treated egg lecithins for mayonnaise and heat-resistant lecithin, but not from the enzymatic degumming process.

PCT/US2009/000032 Generation of Triacylglycerols is a method of generating triacylglycerols from gums that are recovered from an oil-refining process. More particularly, this invention relates to an enzymatic process for the treatment of various phospholipids and lecithins (known collectively as "gums") from vegetable oils to produce, or "generate," triacylglycerols (triglycerides or oils).

Willits and Espinosa: There are no commercial alternatives to meal application as of today. You cannot produce lecithin using enzymes.

Carlson: Potential markets for lyso gums are under investigation.

Cowan: Lyso gums can be used for other purposes. Oil from lyso gums can be recovered using a specific enzymatic process.

Cadore: Phospholipase enzymes by definition destroy phospholipids, which then become different molecules that no longer have the same emulsifying properties, which is what phospholipids are commonly sold for. As of now, plants using enzymes as processing aids during degumming/refining steps are incorporating the gums in the meal with the advantage of having a reduced total amount of gums to dilute the protein content of the meal.

Vianna: The reacted gums can theoretically be used, but there is no commercial use yet developed. It is possible to produce lecithin and still use enzymatic degumming by using PLA enzymes.

Curtis: Generally, the product known as lecithin would be changed if you were doing enzymatic modification of the phospholipids. However, since the enzymatic modification of egg yolk phospholipids improves their emulsification properties, it would be worth looking at the functional properties of enzymatically modified phospholipids from vegetable oil production. ■

Novel foods legislation (see tinyurl.com/NovelFoods) has passed the second reading in the European Parliament, RSSL reports. "The new legislation, which amends Regulation (EC) No 1331/2008 and repeals many other laws, sets new standards for the definition of novel foods and gathers together legislation concerning a wide range of novel foods, including genetically modified or cloned sources of food and foods from nanotechnology or foods in contact with packaging components derived from nanotechnology." The legislation also presents a broad outline of testing required before a product is deemed suitable to be sold in the European Union.

■ ■ ■

The US Food and Drug Administration (FDA) has formed a Food Safety Preventive Controls Alliance to help the food industry comply with preventive control requirements under the FDA Food Safety Modernization Act. FDA is acting in cooperation with the Illinois Institute of Technology's Institute for Food Safety and Health (IIT IFSH) to develop training courses and materials on preventing contamination in both human and animal food during production. For more information, visit tinyurl.com/FDAAlliance.

■ ■ ■

Bunge North America, the North American operating arm of Bunge Ltd. (White Plains, New York, USA), announced in December 2011 that it has created a joint venture company with Twin Rivers Technologies–Entreprises de Transformation de Graines Oléagineuses du Québec Inc. (TRT), a subsidiary of Felda Global Ventures Holdings Sdn. Bhd. of Malaysia. The joint venture, Bunge ETGO LP, will combine the commercial activities related to the crushing and refining operations of Bunge's Hamilton, Ontario, plant and TRT-ETGO's plant located in Bécancour, Québec.

In other company news, Bunge India Private Ltd., a wholly owned subsidiary of Bunge Ltd., and Amrit Banaspati Co. Ltd. also announced in December 2011 that Bunge India has entered into definitive agreements with Amrit Banaspati and Amrit Corp. Ltd. to acquire the edible oils and fats business of Amrit Banaspati.

CONTINUED ON PAGE 83

News & Noteworthy

The following excerpt from "World Aquaculture 2010," a report by the Food and Agriculture Organization of the United Nations, is reprinted with permission. The full report is available in PDF format at tinyurl.com/FAOAquaculture. The references cited are available on page 111 of the 120-page report.)

Fishmeal and fish oil: trends in use and prices

Fishmeal and fish oil are preferred components in the feed of many land-farm animals, including swine, poultry, and dairy cattle. In 2002, aquaculture used 45% of the total global annual fishmeal production, and by 2006, its share increased to 57%. This growth was the result of a reduction in the share of fishmeal used for land-farm animals, rather than an increase in the pelagic [living in the open sea] fish catch that is used for fishmeal. In particular, poultry's share registered a sharp decline from 22% to 14% over the four-year period. In the case of fish oil, aquaculture's share was about 87% of the total global annual production in 2006, with the remaining 13% used for a variety of purposes, including direct human consumption and land-farm animal feed. It has been estimated that, by 2012, 60% of world fishmeal production and 88% of world fish oil production will be used by aquaculture (Huntington and Hasan, 2009).

Global production of fishmeal and fish oil has stabilized at 6–7 million metric tons (MMT) and 1 MMT, respectively, resulting in increased competition for a limited supply of resource between the expanding aquaculture and livestock sectors (FAO, 2006a). It has been argued that the growing demand for fishmeal and fish oil will continue to drive the price upward and that the price could reach a level where the use of fishmeal and fish oil may no longer be financially viable. The European Feed Manufacturers Federation has accordingly suggested that the fish feed industry reduce the inclusion of fishmeal and fish oil by 5–10% per year between 2007 and 2010 in order to support a sustainable aquaculture development (Váradi *et al.*, 2011).

CONTINUED ON NEXT PAGE

Analyzing the trends in prices of fishmeal and fish oil and their alternative ingredients, soymeal and rapeseed oil, respectively, over the past decade, including the last couple of years that saw significant increases in global food prices, Jackson (2010) points out that despite the fact that fishmeal and fish oil production is not increasing, their prices are remaining stable against alternative ingredients.

Moreover, for the last few years, the amount of fishmeal and fish oil has remained static, while output from aquaculture has continued to increase. He therefore stresses that the higher prices of fishmeal and fish oil alone are not limiting the growth of aquaculture, rather that the higher prices of all feed ingredients could have an impact on the pace of aquaculture growth.

The continuing concerns about the use of fish as feed and the rising prices of fishmeal and fish oil have led to considerable investments in research to find alternative sources of affordable and high-quality plant- and animal-based feed ingredients. Fishmeal could be replaced by vegetable protein concentrates, including genetically modified-derived feed materials such as soybean or rapeseed meal.

However, such replacement results in increased costs in the form of enzymes to remove antinutritional factors and amino acids to improve the nutritional profile. The replacement of fish oil appears to be a challenge because of the difficulty in finding alternative sources of omega-3 fatty acids.

Among the ongoing research activities, Researching Alternatives to Fish Oils in Aquaculture, coordinated by the University of Stirling, the United Kingdom, and Perspectives of Plant Protein Use in Aquaculture, coordinated by the Institut National de la Recherche Agronomique, France, focus on targeted reduction of dependence on fishmeal and fish oil.

As an example, salmon's current inclusion of fishmeal of between 35 and 47% is expected to be reduced to 12–16% (Rana, Siriwardena, and Hasan, 2009). Moreover, as a positive impact of research, the FCR [feed conversion ratios] of salmons and trouts are about 1.3 and are likely to remain at this level over the next few years, while FCR of other fish and crustaceans are expected to be reduced over the next 10 years. Among others, FCR for selected species are: carp, 1.8–1.6; catfish, 1.5–1.3; milkfish, 2.0–1.6; and shrimp, 1.6–1.4 (Tacon, Hasan, and Metian, forthcoming).

Nonetheless, further research in aquaculture nutrition will continue to find better substitutes that could partially replace and supplement fishmeal and fish oil. In doing so, consideration should be given to environmental factors and consumers' perceptions with regard to risks and benefits of substitutes.

The use of trash/low-value fish in aquaculture is another important issue that is being considered by policymakers. It is estimated that some 5–6 MMT of trash/low-value fish are used as direct feed in aquaculture worldwide (Tacon, Hasan and Subasinghe, 2006), particularly for marine carnivorous fish species (in China, Indonesia, Thailand, and Viet Nam); marine crustaceans (lobsters and crabs); and certain freshwater fish species (Hasan and Halwart, 2009). Based on production estimates of commodities in 2004 that rely on trash fish/low-value fish as the main feed source, one estimate (De Silva and Turchini, 2009) placed the Asian use of trash fish as fish feed at between 2.465 and 3.882 MMT per year. Moreover, it has been estimated that by 2013 aquaculture in Viet Nam and China may require about 1 MMT and 4 MMT of trash/low-value fish, respectively (Hasan *et al.*, 2007). Hence, the demand for trash/low-value fish is likely to continue unless viable alternatives become available. There are, however, growing concerns that the continued use of trash/low-value fish may result in adverse environmental effects and biosecurity risks. In addition, there are mounting claims that the so-called trash fish could be used as human food, an issue that has been addressed in a recent study (Hasan and Halwart, 2009). The industry urgently needs to reduce its dependence on trash/low-value fish through the development of suitable dry pellet feeds and must convince farmers of the benefits of using such feeds (De Silva and Hasan, 2007). ■

Sustainability watch

TheAtlantic.com recently interviewed sustainability communications strategist Andrea Learned. She advised companies to explain the connections between their actions and environmental issues more effectively. Telling stories about small initiatives in terms of big-picture issues makes them more compelling, Learned said. "Thinking big about the connections of cultural trends, consumer behavior research, and other things that don't seem to relate at all can give meaning and help build momentum for even the smallest individual sustainable-business steps," she noted. The interview is available at tinyurl.com/AtlanticSustainability.

■■■

A recent study by researchers at the University of California, Chico, found that sustainability efforts are increasing among large US companies. Researchers looked at online sustainability promotion among the financial, information technology, health care, energy, utilities, telecommunications, and manufacturing industries and found that companies are increasing their sustainability efforts and promoting these efforts on their websites. From 2008 to 2011, of the companies reviewed by Nathan Heinze and Timothy Heinze, those that advertised energy-saving efforts on their websites increased from less than 50% to 66%. The utility industry was the most active in sustainability efforts, with more than 80% featuring programs in energy, waste reduction, and climate-change prevention. The financial industry had the lowest percentage of such programs, with 48% addressing sustainability efforts. The study appeared in the *International Journal of Global Environmental Issues* (*11*:157–169, 2011).

■■■

The United Nations (UN) completed what it says is the first-ever assessment of the state of the planet's land resources and warns that 25% is "highly degraded." The trend must be reversed, the UN Food and Agriculture Organization (FAO) said, in order to feed the world's increasing population.

The FAO estimated that farmers will have to produce 70% more food by 2050 to meet the needs of the world's probable population of 9 billion. To meet the world's future food needs, a "sustainable intensification" of agricultural productivity on existing farmland will be necessary, the agency said in "State of the World's Land and Water Resources for Food and Agriculture" (see tinyurl.com/FAOLand-Water).

Whereas 25% of the world's land is now "highly degraded," another 8% is moderately degraded, a further 36% is stable or slightly degraded, and 10% was rated as "improving," the report said. ■

Briefs (continued from p. 81)

■■■

US biotech firm Verdezyne (Carlsbad, California) told xconomy.com it is now operating a pilot plant that can make adipic acid from genetically engineered yeast and raw material from palm oil and other renewable sources at an estimated cost savings of 30–35%. The company is producing "multiple kilogram" batches of adipic acid in production runs that take roughly 100 hours, according to Verdezyne Chief Executive Officer E. William Radany.

The company claimed its biobased adipic acid is identical to the petroleum-based polymer and can be used to manufacture nylon for clothing, carpets, and other textiles, "as well as polyurethane resins and engineered plastics." Verdezyne estimates that the global market for adipic acid is more than $6 billion a year (see tinyurl.com/Verdezyne). ■

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Briefs

The US-based company, POET, best known for producing ethanol from corn for use in transportation fuel, estimated that it would produce enough corn oil as a by-product of its ethanol production for the manufacture of 12 million gallons (45 million liters) of biodiesel per year by the end of 2011. The company, based in Sioux Falls, South Dakota, USA, has been selling Voilà™ corn oil into biodiesel and feed markets since January 2011. POET Biorefining, in Hudson, South Dakota, was the first plant to come online. The technology was installed at five more plants in 2011, and more of POET's ethanol plants will be fitted to capture corn oil in 2012.

■ ■ ■

An announcement was made in Durban, South Africa, that the Carbon War Room, an independent nonprofit organization dedicated to aiding entrepreneurs in finding solutions to climate change, has joined with the scientific publisher Elsevier to introduce RenewableJetFuels.org. The aim of the website is to accelerate the use of sustainable biofuel in aviation by making it clear which companies have viable technologies and the way these technologies can be applied. On the date the site was launched, the top five renewable jet fuel supply chain companies were Lanzatech (headquartered in Auckland, New Zealand), SG Biofuels (San Diego, California, USA), AltAir Fuels (Seattle, Washington, USA), Solazyme (South San Francisco, California), and Sapphire Energy (San Diego, California).

■ ■ ■

The Algal Biomass Organization has hired the Washington, DC, USA, office of the global law firm K&L Gates LLP to lobby the federal government on its behalf. The firm will provide education to policy makers about the potential for biofuels made from algae and the role algae can play in US energy production, national security, and economic development. ■

Biofuels News

BIOFUELS

US Navy continues to develop its plans for biofuels

Maritime testing. Finishing its 2011 tests of alternative fuels, the US Navy operated a landing craft air cushion (LCAC) amphibious transport vehicle in the Gulf of Mexico near Panama City, Florida, in December 2011 (tinyurl.com/LCACbiofuelTest).

"The craft was operated . . . using two different fuel configurations," said Naval Sea Systems Command's Navy Fuels Engineering Manager Richard Leung on the US Navy website (navy.mil/search/display.asp?story_id=64290). "After draining the [usual] diesel, LCAC 91 received approximately 5,000 gallons of 50:50 algal blend." Engine torque, acceleration rates, craft speed, fuel flow rates, propeller pitch, compressor discharge pressure, and inlet and exhaust gas temperatures were monitored as the craft was underway.

Following the tests, Scott Feenstra, mission director for the LCAC test, also was quoted on the website as saying, "LCAC 91 performed without issue. The operators were able to use high power; and reported that the crafted handled beautifully and without problems."

Additionally the tests marked the fastest speed—50 knots (93 km/hr)—achieved to date by a US Navy surface craft using alternative fuel blends. The previous record was 44.5 knots by a riverine command boat in October 2010. The record so far for naval tests of biofuels in the air is Mach 1.7 (2,100 km/hr).

2012 testing. The Navy plans to use a biofuel blend to power aircraft and most vessels participating in a maritime exercise that is scheduled to be carried out near Hawaii in the third quarter of 2012 (http://www.defense.gov/news/newsarticle.aspx?id=66359)

Neste Oil opens plant, announces new project

Porvoo, Finland-based Neste Oil celebrated the grand opening of its renewable diesel refinery in the Port of Rotterdam, the Netherlands, on December 19, 2011. The start-up of the facility took place in September 2011. The refinery produces the company's NExBTL renewable diesel. The installation was finished on schedule and on budget (tinyurl.com/Neste-Rotterdam).

The plant has an annual production capacity of 800,000 metric tons (1 billion liters) of renewable diesel. The annual volume produced in Rotterdam will be enough for more than a half million cars to run on pure NExBTL. Neste calculates that the emission benefits of the refinery's output will be equivalent to removing more than 250,000 cars from the roads, reducing greenhouse gases by over 1.5 million metric tons annually.

Feedstocks for the Rotterdam refinery can include virtually any vegetable oil or waste fat, including crude palm oil, waste animal fat, stearin, palm fatty acid distillate, rapeseed oil, and soybean oil. The company also anticipates processing algae oil once it becomes economically viable.

Neste Oil plans to build a pilot plant in Porvoo to produce waste-based microbial oil, according to the company announcement on December 15, 2011. The plant will be used to develop microbial oil production processes and test various raw materials for producing microbial oil, such as straw and other agricultural residues as well as industrial waste and residues, for conversion into NExBTL. The facility is scheduled for completion in the second half of 2012. The company has already successfully produced NExBTL renewable diesel from microbial oil at laboratory scale. In a company statement (tinyurl.com/NesteMicrobialOil), Neste Oil's Petri Lehmus, vice president for research and technology, said, "Commercial production of microbial oil is likely to be possible by 2015 at the earliest."

The company applied for patents covering its microbial oil technology in the third quarter of 2010. The technology uses fungi to break down waste and residues into sugars, which are then used in the next step, the production of NExBTL diesel. Since fungi do not require sunlight to grow, they can be produced almost anywhere, including in bioreactors such as those used by brewers and biotechnology companies.

New program to boost camelina production

The Risk Management Agency of the US Department of Agriculture (USDA) announced on November 30, 2011, a new pilot program of insurance for camelina growers. The program was made available to farmers in 41 counties in the state of Montana and 11 counties in North Dakota. The closing data for application to the program for the 2012 crop year was February 1, 2012.

Only spring-planted camelina grown under contract with a processor was eligible for coverage against damage from adverse weather, fire, wildlife, earthquake, volcanic eruption, and insect and plant disease. The insurance will not provide compensation for any losses attributable to insufficient or improper application of pest or disease control measures. Coverage levels offered ranged from the catastrophic level to 65%.

Montana Senator Jon Tester inserted camelina insurance into the most recent farm bill. He said, "There's got to be a safety net. You don't go into new crops unless you're independently wealthy or you have a safety net."

Both Sustainable Oils (Bozeman, Montana, USA) and Great Plains Oil & Exploration–The Camelina Co. (Cincinnati, Ohio, USA) offered contracts to Montana and North Dakota farmers to grow camelina in 2012.

The USDA also offered a program in August 2011 to encourage camelina planting in the state of Washington, but there were no takers (*inform* 22:560, 2011). The failure of that program was attributed to the short time available for the signup, federal budget constraints, and farmer unwillingness to commit to a new crop if it should happen to fail or produce insufficient revenue.

Camelina oil is being developed as a feedstock for the production of aviation fuel.

Ethanol tax credit ends

The volumetric ethanol excise tax credit (VEETC), also known as the ethanol blenders' tax credit, ended in the United States on December 31, 2011. In addition, the offsetting tariff on imported ethanol expired.

According to the US Renewable Fuels Association (RFA), "The domestic ethanol industry has evolved, policy has progressed, and the market has changed, making now the right time for the incentive to expire. Ethanol producers never intended for the tax incentive to be permanent."

Furthermore, the RFA said, "Like all incentives, it was put in place to help build an industry, and when successful, it should sunset."

US RFS2 for 2012 finalized

The US Environmental Protection Agency (EPA) announced on December 27, 2011, the final version of the 2012 percentage standards for four fuel categories that are part of the agency's Renewable Fuel Standard program (RFS2).

The Energy Independence and Security Act of 2007 established the RFS2 program and the annual renewable fuel volume targets. These targets are scheduled to increase steadily to an overall level of 36 billion gallons (136 billion liters) in 2022. To achieve these volumes, the EPA calculates a percentage-based standard for the following year. Based on the standard, each refiner and importer determines the minimum volume of renewable fuel that it must ensure is used in its transportation fuel.

The final 2012 overall volumes and standards are:

- Biomass-based diesel: 1.0 billion gallons, 0.91%
- Advanced biofuels: 2.0 billion gallons; 1.21%
- Cellulosic biofuels: 8.65 million gallons, 0.006%
- Total renewable fuels: 15.2 billion gallons, 9.23%

For further information, see tinyurl.com/RFS2Final2012.

Algal biomass standards

The US Department of Energy's Idaho National Laboratory (INL) announced the funding of a new research agreement with OriginOil, Inc. (Los Angeles, California) in December 2011. The goal of the collaboration will be to establish industry standards for algal biomass, a critical step toward making algal biofuels a competitive alternative to petroleum.

Under the terms of the agreement, OriginOil will provide INL with its single-step extraction technology and contribute its knowledge of how to stimulate oil production and pre-treat for consistent extraction of the algae and its co-products. INL will contribute scientific and engineering expertise and its large-process demonstration facility, which has advanced biofuels processing capabilities and equipment. A primary effort will be to integrate algae with terrestrial biomass sources to achieve large-scale biofuels production.

Argentine biodiesel production increasing

According to Santiago & Sinclair, LLC, a US-based regional consultancy that develops renewable energy projects in Latin America, Argentina was on track to surpass Brazil and France by the end of 2011 to become the third-largest biodiesel producer in the world. In 2007, Argentina was in eighth place. For comparison, Brazil rose from sixth to fourth place in the same interval.

The Argentine Biofuels Chamber (Cámara Argentina de Biocombustibles; CARBIO) announced on December 28 that Argentine biodiesel exports rose more than 58% to $1.9 billion in 2011 compared with 2010. In volume terms, biodiesel exports from Argentina increased 128.5% to 1.6 million metric tons (MMT).

CARBIO indicated that Argentina would produce a total of 2.4 MMT in 2011. All regular diesel sold in Argentina must contain 7% biodiesel, and industry leaders are advocating this level should be raised to 10%.

Enzyme marketed for biodiesel production

Verenium Corp. (San Diego, California, USA) announced December 7, 2011, that it is now targeting its Purifine® phospholipase C enzyme product for use in pretreatment of oil for biodiesel production. By removing phospholipid impurities, the product improves crude oil degumming as compared with water degumming or other degumming enzyme alternatives. According to James Levine, president and chief executive officer of Verenium, "Purifine PLC can be applied to replace chemical or crude refining, making for a much 'greener' process."

Purifine PLC has been in the market since 2008 for processing of edible oils. ■

Cancer patients undergoing chemotherapy may want to stay away from fish or fish oil capsules, a Dutch team of researchers suggests. Led by Emile Voest of the University Medical Centre Utrecht, the team investigated resistance to the platinum-based chemotherapeutic agent cisplatin (*Cancer Cell 20*:370–383, 2011). The researchers found that platinum-based drugs induced endogenous mesenchymal stem cells (MSC) to secrete two types of fatty acids that protected tumor cells.

According to Voest, the platinum-induced polyunsaturated fatty acids 12-oxo-5,8,10-heptadecatrienoic acid and hexadeca-4,7,10,13-tetraenoic acid (16:4n-3) exhibit some structural similarity to the polyunsaturated fatty acids found in two fish oil-based products the team analyzed. “We currently recommend that these products should not be used whilst people are undergoing chemotherapy,” he writes. The Global Organization for EPA and DHA Omega-3s points out that three publications in 2011 alone have shown that long-chain omega-3 fatty acids can increase chemotherapy efficacy.

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A study in mice examined the effects of eating small amounts of fish oil on fat accumulation in the mouse liver after the animals had consumed a high-cholesterol diet for eight weeks. The mice were fed purified experimental diets with an added fat portion. One diet provided 2% of energy from safflower oil and 18% from fish oil; the other diet provided 5% energy from fish oil and 15% from safflower oil. These diets were given with or without cholesterol (added at 2% by weight), making a total of four different experimental diets.

Triglyceride and total cholesterol contents of the livers were significantly lower in groups that were fed diets predominantly containing fish oil and cholesterol, compared to those that were fed safflower oil and cholesterol. The results suggest that low-dose fi h oil-containing diets improve lipid metabolism by modifying the expression of lipid metabolism-related genes in the liver and increasing fecal cholesterol excretion. The study appeared in the *Journal of Agriculture and Food Chemistry* (doi:10.1021/jf203761t, 2011; see tinyurl.com/LiverLipid). ■

Health & Nutrition News

Is oxidative stress less harmful than suspected?

Researchers have long suspected that many disease states—and even the aging process itself—are at least partially caused or are accelerated by oxidative stress.

“However, up to now, nobody was able to directly observe oxidative changes in a living organism and certainly not how they are connected with disease processes,” said Associate Professor Tobias Dick of DKFZ, the German Cancer Research Center in Heidelberg. “There were only fairly unspecific or indirect methods of detecting which oxidative processes are really taking place in an organism.”

That changed when Dick and a team at DKFZ were able to observe oxidative changes in a living animal in real time. Together with Aurelio Teleman (also of DKFZ), they introduced genes for biosensors into the genetic material of fruit flies. These biosensors are specific for various oxidants and indicate the oxidative status of each cell by emitting a light signal—in real time, in the whole organism, and across the entire life span.

The investigators had already discovered that oxidants are produced at differing levels in different tissue types in fly larvae. Thus, blood cells produce considerably more oxidants in their mitochondria than, for example, intestinal or muscle cells. In addition, the larvae’s behavior is reflected in the production of oxidants in individual tissues. The researchers also were able to distinguish whether the larvae were eating or moving by the oxidative status of the fat tissue.

The assumption that the aging process is associated with a general increase in oxidants throughout the body was not confirmed by the observations made by the investigators across the entire life span of the adult animals. They were surprised to discover that almost the only age-dependent increase in oxidants was found in the fly’s intestine. Moreover, when comparing flies with different life spans, they found that the accumulation of oxidants in intestinal tissue accelerated with a longer life span. The group thus found no evidence supporting the frequently voiced assumption that an organism’s life span is limited by the production of harmful oxidants.

To test the idea that antioxidants can protect against oxidative stress and, thus, are health-promoting, Dick and colleagues fed their flies with the antioxidant N-acetyl cysteine (NAC). Interestingly, no evidence of a decrease in oxidants was found in the NAC-fed flies. On the contrary, the researchers were surprised to find that NAC prompted the mitochondria of various tissues to increase oxidant production significantly.

"Many things we observed in the flies with the help of the biosensors came as a surprise to us. It seems that many findings obtained in isolated cells cannot simply be transferred to the situation in a living organism," said Dick, summarizing the team's findings.

"The example of NAC also shows that we are currently not able to predictably influence oxidative processes in a living organism by pharmacology," he adds. "Of course, we cannot simply transfer these findings from fly to man. Our next goal is to use the biosensors to observe oxidative processes in mammals, especially in inflammatory reactions and in the development of tumors."

The study appeared in *Cell Metabolism* (doi:10.1016/j.cmet.2011.10.010, 2011).

Norway raises concern over oxidation in n-3 products

In November 2011, the Norwegian Scientific Committee for Food Safety (VKM) found via a qualitative assessment that oxidation in omega-3 products could cause health problems.

VKM noted that " . . . animal studies with whole oxidized vegetable oils indicate that high doses can affect health negatively, but the data were not sufficient for risk assessment. Based on the very limited information available, VKM concludes that there is some concern related to regular consumption of oxidized marine oils."

Harry Rice, vice president of regulatory and scientific affairs for the Global Organization for EPA and DHA Omega-3s (Salt Lake City, Utah, USA), told Nutraingredients.com that the opinion was based on a "curious, actually troubling" lack of scientific data.

"The concern stems from a small number of animal studies demonstrating a 'potential' negative health effect from large doses of highly oxidized vegetable oils," Rice was quoted as saying.

"While VKM's report notes a lack of published scientific studies on the effects of oxidation products on human health, research currently under review for publication demonstrates no link between the consumption of 8 g of rancid fish oil—equivalent to 1.6 g of omega-3—per day for seven weeks and adverse health effects."

Rice also noted that in 2010, the European Food Safety Authority found that there was a lack of scientific literature demonstrating any adverse links between the consumption of oxidized fish oil and negative health outcomes.

The VKM report may be found at tinyurl.com/VKMReport.

Lipid blocks influenza

A lipid found in the fluid lining the lungs inhibits influenza infections in both cell cultures and mouse models, according to researchers at National Jewish Health hospital in Denver, Colorado, USA. These findings, combined with previous studies demonstrating effectiveness against respiratory syncytial virus, suggest that the compound, known as POPG (palmitoyl-oleoyl-phosphatidylglycerol), may have broad antiviral activity.

"Supplemental POPG could be an important, inexpensive, and novel approach for the prevention and treatment of influenza and other respiratory virus infections," said Dennis Voelker, professor of medicine and senior author of the report, published in the *American Journal of Respiratory Cell and Molecular Biology* (doi:10.1165/rcmb.2011-0194OC, 2011).

Influenza infects millions of persons across the globe, killing 500,000 each year, according to Voelker. Vaccines are highly effective, he adds, but must be reformulated each year to counter new viral strains. Two classes of drug are currently available to treat established influenza infections, although widespread resistance has developed against one class and is developing against the other.

Several proteins that inhibit viral activity have been identified in the fluid lining the lungs. Until recently, however, the antiviral role of POPG has been unknown. Previous research by Voelker, Mari Numata, and their colleagues demonstrated that POPG reduces inflammation in the lung and prevents infection by respiratory syncytial virus.

In the most recent study, the researchers looked at the ability of POPG to inhibit infection by two strains of influenza, H1N1-PR8 and H3N2. They found that POPG suppressed inflammatory responses, viral propagation, and cell death normally associated with influenza infection.

In mice, POPG also suppressed viral infection and replication and markedly reduced the inflammatory response to the virus. There were no observable deleterious effects of POPG in animal behavior or histopathology.

"Lipids such as POPG offer potential advantages over antiviral proteins because they are less likely to elicit unwanted immune responses, are more chemically stable, and are less expensive to manufacture than proteins," said Numata, an instructor at National Jewish Health, and lead author on both the RSV and influenza papers. "Because POPG is effective against at least two different viruses, it also seems likely that a single mutation, which can make influenza vaccines and current drugs ineffective, is unlikely to have the same effect on POPG's action."

The researchers showed that POPG works by binding strongly to viral particles, which prevents attachment and infection of cells. This means that POPG works best if given before an infection occurs.

It has potential, however, to work after an infection has begun by inhibiting spread of the virus to uninfected cells. The success of POPG treatment after a viral infection has been established depends on keeping the lipid levels high for an extended period. At present, it is difficult to maintain high levels of POPG in mice because of their rapid metabolism and rapid respiratory rate.

"We believe POPG may prove effective both before and after an infection has occurred," said Voelker. "Our initial results suggest that it may be possible to maintain therapeutic levels in the body with a reasonable dosing scheme, and we are investigating that now." ■

Briefs

The US Department of Agriculture (USDA) announced on December 16, 2011, that it had deregulated the biotech trait, MON 87705, in Monsanto's Vistive® Gold soybeans. Soybeans having this trait produce oil having 60% less saturated fat and significantly increased levels of monounsaturated fat. These changes result in improved oil stability compared with conventional soybean oil. Deregulation of MON 87705 allows for field testing and seed production to take place within the United States. The trait has also been approved for use in Canada. Further information regarding the deregulation is available at aphis.usda.gov/biotechnology/news.shtml.

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A recent report from New Zealand found that 80% of over 500 consumers surveyed believe that the current requirement to label genetically modified (GM) foods should be retained. Under the present law, food products retailed in the country that have more than 1% GM content must be labeled clearly as GM foods. The survey occurred during discussions of the proposed Trans Pacific Partnership Agreement, under which the US government has said GM labeling is a trade barrier. The New Zealand Food and Grocery Council pointed out that there is no need for GM labeling as the volume of these products on sale is very low.

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On November 28, 2011, the Conseil d'Etat, France's highest administrative court, ended a moratorium on genetically modified (GM) corn in the country, allowing the possibility of planting such crops. The next day, the French ministries of ecology and agriculture announced their continued opposition to cultivation of GM crops on French soil, specifically Monsanto's MON 810, along with efforts to impose a new ban that will have the same eff ct. The government intends to impose a ban by April, in time for the new planting season. ■

Biotechnology News

Drought tolerance

MON 87460. In late December, the US Department of Agriculture (USDA) deregulated Monsanto's genetically engineered drought-resistant corn, thus clearing the variety for sale. Environmental and risk assessments, public comments, and research data from Monsanto were reviewed before approval was granted for the variety, known as MON 87460.

Germany-based BASF collaborated with Monsanto in developing this drought-tolerant trait.

In a company statement, Hobart Beeghly, US product management lead for Monsanto, said, "This spring [2012], farmers in the western Great Plains will have an opportunity to see how the system performs on their farm[s] through on-farm trials." Data from these trials will help guide the company's commercial decisions.

Reuters news agency reported that in Monsanto's 2009 petition for approval of MON 87460, the company said that suboptimal moisture is responsible for 40% of crop losses in North America (tinyurl.com/Reuters-CropLoss).

Response to MON 87460. The day after the USDA announced approval of unlimited planting of MON 87460, the public interest group Union of Concerned Scientists (UCS) expressed reservations about the variety (tinyurl.com/UCS-CornDrought). The UCS pointed out that both Monsanto and USDA admit the crop will fare only somewhat better than current conventional varieties under conditions of low and moderate drought. Furthermore, the UCS says that there are several types of new drought-tolerant corn, developed through conventional breeding, in the United States and abroad, that are likely to do as well as or better than Monsanto's corn.

Doug Gurian-Sherman, senior scientist for the UCS's Food & Environment Program, said, "The biotechnology industry has been working on drought-tolerant and water-saving crops for more than a decade, and the results so far, while useful, are underwhelming compared to conventional techniques like breeding."

Gene search. Monsanto and BASF are not the only companies seeking the Holy Grail of drought tolerance for crops. DuPont and Rosetta Green Ltd. (Rehovot, Israel) announced in December 2011 that they had entered into a strategic research agreement to identify drought tolerance genes in both corn and soybeans (tinyurl.com/DuPont-Rosetta). Rosetta Green develops improved plant traits for the agriculture and biofuel industries using microRNAs (i.e., small RNA molecules).

DuPont, through its Pioneer Hi-Bred business, will test candidate genes in target crops. Pioneer will have an exclusive commercial license for genes identified through this collaboration.

Another approach. Researchers at the University of California, Riverside (UC-Riverside; USA) announced another approach to developing drought-tolerant crops. Sean Cutler, an associate professor of plant cell biology at UC-Riverside, and colleagues have been working to identify the responses a plant makes in responding to drought stress (Mosquna, A., *et al., Proc. Natl. Acad. Sci. 108*:11518–11523, 2011).

They have found that when plants encounter drought, they naturally produce abscisic acid, a stress hormone that helps them cope with drought conditions. The hormone turns on receptors in the plants, resulting in a suite of beneficial changes that help the plants survive. Examples of these changes reported in 2009 include guard cells on leaves closing to reduce water loss and cessation of plant growth to reduce water consumption (Park, S.Y., *et al., Science 324*:1068–1071, 2009).

Using *Arabidopsis*, a model plant widely used in plant biology studies, Cutler's research team has now succeeded in enhancing plant response pathways by modifying the abscisic acid receptors so that they can be "turned on" at will and stay on. According to Cutler, each stress hormone receptor is equipped with a "lid" that operates like a gate. For the receptor to be in the on state, the lid must be closed. Using receptor genes engineered in the laboratory, the group created and tested over 740 variants of the stress hormone receptor, hunting for variants that caused the lid to be closed for longer periods of time.

In a report from UC-Riverside, Cutler said, "We found many of these mutations. But each one on its own gave us only partly what we were looking for. But when we carefully stacked the right ones together, we got the desired effect: The receptor locked in its on state, which in turn was able to activate the stress response pathways in plants."

EU Ombudsman criticizes EFSA over "revolving door"

The European Food Safety Authority (EFSA) has been charged with failing to address a conflict of interest that arose in 2008. At the time, Suzy Renckens, a Belgian national, left her position as head of EFSA's Genetically Modified [GM] Organisms Unit and moved two months later to the Swiss biotechnology company Syngenta as head of Biotech Regulatory Affairs for Europe, Africa, and the Middle East. In that position, she lobbied former EFSA colleagues in support of GM crops.

The original complaint against EFSA was filed in 2010 with the European Ombudsman by Testbiotech, a German nongovernmental organization that lobbies against GM crops. In a news release at the time, Testbiotech representative Christoph Then said, "It is unacceptable that EFSA failed to act to prevent conflicts of interest in the case of Ms. Renckens' move to Syngenta, considering the agency's powers over food safety decisions in Europe. As the two-year period within which officials need permission has still not passed, EFSA should immediately impose a ban on Ms. Renckens lobbying to influence EFSA."

EFSA's response was that Renckens, as head of unit, had not been a decision-maker with respect to EFSA's provision of scientific advice, and therefore there was no conflict of interest.

On December 7, 2011, the European Ombudsman, P. Nikiforos Diamandouros, called on EFSA to strengthen its rules and procedures to avoid potential conflicts of interest in "revolving door" cases. He said that EFSA had not carried out as thorough an assessment of the alleged potential conflict of interest as it should have. The text of the ombudsman's recommendation is available at tinyurl.com/Ombudsman-recommendation.

EFSA acknowledged receipt of the ombudsman recommendations on December 14. It said that its procedures have been strengthened since this incident, and it is committed to providing records of any thorough assessment should a similar case arise in the future. For example, EFSA staff are required to advise the Authority on future employment for a two-year period following their departure. EFSA's full response to the ombudsman is available at tinyurl.com/EFSA-response.

More on corn rootworm and Bt toxin

Further information is appearing on damage by corn rootworms to corn plants genetically engineered by Monsanto Corp. to contain *Bacillus thuringiensis* (*Bt*) toxin (see *inform* 23:30, 2011). According to a US Environmental Protection Agency report posted November 30, 2011 (available as EPA-HQ-OPP-2011-0922-0003.pdf), insect damage has also been documented in Minnesota since 2009 and in Nebraska since 2008. As in the reports out of Illinois and Iowa, damage was found in fields planted continually with *Bt* corn hybrids expressing the Cry3Bb1 protein. Rootworm damage in *Bt* corn is also suspected in Colorado, South Dakota, and western Wisconsin.

An Associated Press report dated December 28, 2011, quoted University of Minnesota entomologist Kenneth Ostlie as saying that the severity of rootworm damage to *Bt* fields in Minnesota seemingly has eased since 2009 (tinyurl.com/AP-CornRootWorm). On the other hand, reports of damage have become more widespread. Ostlie pointed out that rootworm damage is not always readily apparent. In the absence of strong winds, wet soil, or both, plants with root damage can remain upright. The damage in Minnesota in 2009 became apparent only when wind storms knocked down corn plants.

Planting of transgenics increasing in Brazil

The market research firm Celeres (Uberlandia, Minas Gerais, Brazil) predicted that the area sown with transgenic varieties in the 2011/12 crop year will be 20.9% higher than in the 2010/11 crop year. Transgenic soybeans, corn, and cotton were forecast to total 31.8 million hectares for 2011/12. The comparable number for 2010/11 was 30.5 million hectares.

The area in Brazil planted with genetically modified soybeans is predicted to total 21.4 million hectares, an increase of 16.5% over the 2010/11 crop year. The Central-Western region of Brazil leads in the production of GM soybeans, at 42.7%. The area devoted to GM cotton will be 469,000 hectares for 2011/12, an increase of 32.2% over the previous harvest.

Celeres also forecast that the summer-plus-winter plantings of GM corn in Brazil for 2011/12 will increase 67.3% over 2010/11. Insect-resistant hybrids should occupy 4.9 million hectares, and 4.4 million hectares will be planted with varieties having combined gene technologies (i.e., stacked genes, or hybrids with resistance to insects and tolerance for herbicides. ■

Surfactants, Detergents & Personal Care News

Anglo-Dutch consumer products giant Unilever has acquired 82% of Concern Kalina, a leading Russian personal care company. The transaction, which was still pending regulatory approvals at press time, values the equity of the total business at 21.5 billion rubles ($674 million). Concern Kalina is based in Ekaterinburg and sells its products primarily in Russia, Ukraine, and Kazakhstan.

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Japan's Kao Corp. announced in late November 2011 that it planned to unify its beauty care management structures across its North American and European businesses as of January 2012. Prior to this, subsidiaries such as Kao Brands Co. (Cincinnati, Ohio, USA), hair care products leader producer KPSS (Kao Professional Salon Services; Darmstadt, Germany), manufacturer and retailer Molton Brown Ltd. (London, UK), and the manufacturers of the Sensei cosmetics brand, Kanebo Cosmetics Inc. (Tokyo, Japan), all operated as separate independent businesses in the North American and European markets.

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Chinese scientists are reporting the development of a new cotton fabric that cleans itself of stains and bacteria when exposed to sunlight. Their report appears in the journal *Applied Materials & Interfaces* (doi:10.1021/am201251d, 2011). Mingce Long and Deyong Wu of Shanghai Jiao Tong University describe a cotton fabric coated with nanoparticles made from a compound of titanium dioxide and nitrogen. They show that fabric coated with the material removes a methyl orange stain when exposed to sunlight. Further, dispersing nanoparticles composed of silver iodide with the N-TiO_2 film synergistically increases the photocatalytic discoloration process. The coating remains intact after washing and drying.

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Yale University scientists, a surfactant industry veteran, and Elm Street Ventures, an early-stage venture fund, have joined forces to form P2 Science in New Haven, Connecticut, USA. The company is using patent-pending technology from the Yale Center for Green Chemistry and Green Engineering to develop and manufacture a new class of high-performance surfactants, *C*-glycosides (CG). ■

Europe restricts phosphates

In December 2011, the European Parliament approved legislation to restrict the phosphate content of household cleaning products. The vote of 631–18 backed changes that had already been endorsed by European Union (EU) member states' representatives in November aimed at creating a common European phosphate standard, according to EurActiv.com, an online news site. National representatives still must formally approve the new legislation.

"By strictly limiting phosphorus in consumer laundry and dishwasher detergents, we have done the environment a good turn and consumers will be assured that these products will be more environmentally friendly," said UK Member of the European Parliament Bill Newton Dunn, the parliamentary leader on the legislation.

Although livestock waste is the main source of phosphorus in water supplies, farm fertilizers account for 16% and household detergents 10%, EurActiv noted.

If the legislation is formally approved, consumer laundry detergents will be restricted to no more than 0.5 grams of phosphorus per dose, beginning in June 2013. Automatic dishwasher detergents will be limited to a phosphate content of 0.3 grams per dose, as of January 2017. Although many companies offer alternative phosphate-free products, phosphates comprise up to half the weight of some detergents, EurActiv said.

"Many EU countries already limit the use of phosphates, but the EU measures will provide a common standard across the 27 countries, allowing simplified trade in soaps and detergents," the EurActiv report noted.

Also in Europe, the European Consumer Organisation and the European Environmental Bureau have published a joint position paper on the draft criteria for the EU ecolabel for laundry and dishwasher detergents for professional use, according to chemicalwatch.com.

The two groups were reported as saying in a statement that they "welcome improvements in the ecological criteria for laundry and dishwasher detergents" but emphasized that they "are not supporting broad exemptions from the list of banned hazardous substances and mixtures."

In the position paper, the groups recommend the exclusion of the presence of endocrine-disrupting substances and nanomaterials from Ecolabel products, as a precautionary measure, chemicalwatch.com said. The groups also reportedly suggest a reintroduction of the criterion requiring the anaerobic biodegradability of surfactants, as well as a ban on all phosphate compounds in both laundry and hand dishwashing detergents.

Novozymes studies washing temperatures

Consumers the world over continue to use washing temperatures that are higher than necessary.

That is according to a study commissioned by Novozymes and conducted by Efficience3, a market research firm based in Reims, France. The firm created an online questionnaire based on the results of two focus groups held in each of six countries, where wording of questions and answer options were tested. The online test itself took place in September 2011.

The online questionnaire reached 2,500 consumers across six markets (1,000 in the United States and 500 each in Germany, Japan, Spain, China, and Brazil). The confidence interval was 95%.

The study found that just 30% of consumers wash at 30°C/86°F or lower, despite the fact that most laundry can be done at low temperatures. The study also revealed great differences from country to country. In Brazil (64%), Japan (54%), and China (32%), the percentage of persons using only low-temperature washes is significantly higher than in the US (21%), Spain (19%), and Germany (10%).

"There's money to be saved by lowering the temperature, because a large part of total laundry costs is related to heating the water," said Cynthia Bryant, household care director at Novozymes. "By lowering the temperature from 60°C/140°F to 30°C/86°F, you save 60% of the energy cost."

According to the International Association for Soaps, Detergents and Maintenance Products, the average washing temperature in Europe has dropped only 2°C/3°F over the past three years, from 43°C/109°F to 41°C/106°F.

New cleaning system for hospitals

A new disinfection system developed by Canadian researchers may change how hospital rooms are cleaned as well as help fight bedbug outbreaks in hotels and apartments.

"This is the future, because many hospital deaths are preventable with better cleaning methods," said Dick Zoutman, who is a researcher at Queen's University in Kingston, Ontario. "It has been reported that more than 100,000 people in North America die every year due to hospital-acquired infections at a cost of $30 billion. That is 100,000 people every year who are dying from largely preventable infections."

Zoutman has also used the disinfection technology to kill bedbugs. A major US hotel chain has expressed interest in the technology because of its potential to save the company millions of dollars in lost revenue and infested furniture, he says.

Zoutman worked in collaboration with Michael Shannon of Medizone International at laboratories located in Innovation Park, Queen's University. Medizone, a research and development firm, is commercializing the technology, and the first deliveries are scheduled for the first quarter of 2012.

The new technology involves pumping a mixture of ozone and hydrogen peroxide gases into a room to completely sterilize everything, including floors, walls, drapes, mattresses, chairs, and other surfaces. Zoutman says the technology could also be used in food preparation areas and processing plants. Study results on the process appeared in the *American Journal of Infection Control* (39:873–879, 2011; see tinyurl.com/ZoutmanMedizone).

Washing machines a source of microplastic pollution?

Scientists are reporting that household washing machines seem to be a major source of so-called microplastic pollution—bits of polyester and acrylic smaller than the head of a pin—that have been detected on ocean shorelines worldwide.

Mark Browne and colleagues at Ireland's University College Dublin explain that the accumulation of microplastic debris in marine environments has raised health and safety concerns. The bits of plastic contain ingredients that are potentially harmful to animals and to persons who consume fish.

How big a problem is microplastic contamination? Where are these materials coming from? To answer those questions, Browne and his team looked for microplastic contamination along 18 coasts around the world.

They found more microplastic on shores in densely populated areas and identified an important source—wastewater from household washing machines. They point out that more than 1,900 fibers can be rinsed off a single garment during a wash cycle, and these fibers look just like the microplastic debris on shorelines. The problem, the researchers say, is likely to intensify in the future, and the report suggests solutions: "Designers of clothing and washing machines should consider the need to reduce the release of fibers into wastewater and research is needed to develop methods for removing microplastic from sewage."

The study appeared in *Environmental Science & Technology* (doi:10.1021/es201811s, 2011). It is also the subject of a podcast from the American Chemical Society, which is available at tinyurl.com/Microplastic. ■

In Memoriam

A.R. Baldwin dies at age 93

George Willhite

A. Richard (Dick) Baldwin, 52nd president of AOCS and a member for 67 years, died November 28, 2011, in the Fairview University Medical Center in Hibbing, Minnesota, USA.

It would be hard to overestimate the importance of his contributions to AOCS. He was a towering figure during the latter half of the 20th century as he spurred the society's international growth, expanded its publications program, and championed short course and other educational activities while serving on technical, finance, membership, and governance committees.

Baldwin volunteered for several committees soon after joining the organization in 1944, one year after he received his doctorate in chemistry from the University of Pittsburgh (Pennsylvania, USA).

He became editor of the *Journal of the American Oil Chemists' Society* (*JAOCS*) in 1949 at age 31. When he became president in 1963 he was the second-youngest person to hold that office. As the society's director of publications, Baldwin served on the Governing Board as a voting or nonvoting member for more than 25 years. During much of that time he also was a member of a five-person executive committee authorized to act for the Governing Board between formal board meetings. Thus, he played a key role in guiding AOCS growth during the 1970s and 1980s.

Retired AOCS Executive Vice-President Jim Lyon noted, "There have been lots of nice people in AOCS, some of them good leaders, but there was only one Dick Baldwin.

"He was powerful as a long-time member of the Governing Board and the executive committee. For many years the Governing Board met only twice a year and thus the executive committee was where a lot of decisions were made. Dick would come into a meeting with a proposal and have his facts marshaled. The board usually would follow his lead."

A contemporary, George Cavanagh, who served as AOCS president in 1969, remembers meeting Baldwin at a 1940 AOCS meeting and discussing a paper Baldwin gave on corn germ oil. "He was a stimulating person who always seemed to have a lot of enthusiasm," Cavanagh said. "He was sort of an idol of mine."

AOCS' 1982 president, Karl Zilch, described Baldwin as "a very important individual. He really pushed programs along so that things were getting done."

In 1951, Baldwin became the first non-German to receive the Normann Award from the Deutsche Gesellschaft für Fettwissenschaft (DGF) in recognition of his work to improve *JAOCS*. Baldwin became a charter member of the International Society for Fat Research (ISF) when that organization was founded in 1961 during an international fats and oils meeting in Germany.

AOCS publications

When Baldwin became *JAOCS* editor, he discovered publication of accepted research papers in the monthly journal was delayed many months by an arbitrary page limit. He quickly revoked that limit to speed distribution of the latest research to *JAOCS* readers.

In the 1960s, he recognized the increasing importance of lipid research to the world of fats and oils and urged AOCS to start a new journal, then served as founding editor for *Lipids* during 1966–1967, which was issued bimonthly before becoming a monthly journal in 1970.

The society's first monograph, *Tumor Lipids*, appeared in 1973 when Baldwin initiated a program that now numbers more than 200 books and electronic publications.

In January 1974 AOCS published a 220-page proceedings of the World Soy Protein Conference held November 11–14, 1973, in Munich, Germany. Baldwin had arranged for AOCS to publish the volume. Bringing it into print so quickly in an era before computer typesetting was considered astounding. Sales of the proceedings returned a financial surplus to AOCS.

Baldwin convinced the AOCS Governing Board that the society could bolster its standing and treasury by organizing international conferences on its own and then publishing the proceedings. He proved his point with the AOCS World Conference on Oilseed and Vegetable Oil Processing Technology held March 1–5, 1976, in Amsterdam (Netherlands). He recruited an AOCS colleague, Thomas H. Applewhite, to serve as general chairperson, and Baldwin was a key member of the organizing committee and edited the proceedings. The conference was a financial and scientific success. It was the first of a series of AOCS international meetings throughout the Western and Eastern hemispheres, fueling a growth of 2,000 members (to more than 5,000 members) during the next 20 years. The majority of that increase represented new non-North American members. Baldwin edited the proceedings of the early world conferences.

Baldwin prodded AOCS in other ways. When members specializing in oilseed protein were discussing at an annual meeting how to form a specialty section within AOCS in the 1980s, Baldwin challenged them to recruit new members by pledging to contribute $25 of his own personal funds to the group's treasury for each new member enrolled during the ensuing year. Protein and Co-Products became the first specialty section authorized by the Governing Board.

In a herculean effort, Baldwin compiled a cumulative 35-year index of *JAOCS* and its predecessor publications (the Chemists' Section of *The Cotton Oil Press*, *Journal of Oil and Fat Industries*, *Oil and Fat Industries,* and *Oil & Soap*). At the time, the task involved creating index cards for each topic, then collating them. The 79-page index was published in 1953. Computers are now used for literature searches, but at the time Baldwin's accomplishment was a major aid to fats and oils researchers.

AOCS awards and recognition

When AOCS created its Distinguished Service Award in 1981, it named the award for Baldwin as it presented the first award to him.

The A. Richard Baldwin Distinguished Service Award is for members who provide distinguished service to AOCS at positions of high responsibility over a period of years. The award has been presented about a dozen times in three decades.

Almost two decades previously, in 1963, he had received the Alton E. Bailey Award, which recognizes outstanding research and exceptional service in the field of lipids and associated products.

AOCS members bestowed honorary membership on Baldwin in 1984, which at the time had been granted to only 20 persons since the society's founding in 1909. AOCS later designated its honorary members as Distinguished Fellows, reserving honorary membership for nonmembers who provide outstanding service to AOCS.

Baldwin created an AOCS award in the 1950s. He told the Governing Board that an anonymous donor, hoping to improve the annual meetings, had provided funds for a gold-plated medal, to be known as the Bond Award (presented annually until 1977), to recognize the best paper at AOCS annual meetings in terms of both content and presentation. The donor, of course, was Baldwin. The first medal was presented in 1959.

Baldwin also had a role in the creation of The Soap and Detergent Association (SDA) Award for best scientific surfactant paper [now called the American Cleaning Institute Distinguished Paper Award]. The award came about as a result of conversations between Baldwin and the late Ted Brenner, SDA's chief staff officer, during the 1978 AOCS Annual Meeting in St. Louis, Missouri, USA. Those conversations also led to creation of an S&D news section in *JAOCS*, and thus eventually to creation of the current *Journal of Surfactants and Detergents*.

A mahogany forest in Honduras has been named for Baldwin. In 1997, The Pan-American School for Agriculture in Honduras said it was naming a new plantation of African mahogany trees "The Dick Baldwin Living Forest." The goal was to create a forest of more than 1 million trees within a decade. Baldwin was a member of the school advisory board and had been urging the school to adopt a forest program.

Biography

A.R. Baldwin was born February 20, 1918, in Palmyra, Michigan, where his father farmed. He attended John B. Stetson University in DeLand, Florida, where he received his bachelor's degree in 1940. During his undergraduate years, he played semi-pro baseball to help pay for his education.

After receiving a doctorate in chemistry from the University of Pittsburgh (Pennsylvania, USA) and a few post-doc positions, Baldwin joined Argo Corn Products where one of his main responsibilities was Argo's Mazola brand products. In 1954, Cargill hired him as its director of research. He subsequently became an assistant vice president, then vice president and executive director of research. He also served as secretary for Cargill's long-range development and research board. He led the organization and direction of the company's research and technical programs until he retired in 1983.

These included grain storage and processing; vegetable proteins; animal and poultry nutrition and production; vegetable oils and oil-modified resins; plant breeding hybridization of corn, sorghum, sunflower, barley, and wheat; and biochemical research on salt, molasses, and other commodity products. He traveled to most countries of the world on business. During those travels, he spread the word about AOCS to many individuals. Baldwin directed Cargill's development of products such as polyurethane varnish and high oil content (45%) sunflower seed.

Role in US sunflower industry

Baldwin's role in bringing high-oil sunflower to the United States was recounted in the November 2005 issue of *inform*. During a 1965 visit to a Soviet agronomy research facility in Krasnodar, he was shown a sunflowerseed variety under development with 45% oil content. The station's research director said he could not allow Baldwin to take any samples with him. But the research facility's young librarian-translator had tasted some of those seeds from a small bag the director had provided. When Baldwin and the translator left the director's office, she still held the bag. Baldwin asked if he could have the bag. She gave him the small bag which still contained a few seeds. He headed directly to Moscow and had those seeds sent back to the United States in a diplomatic pouch. Two years later Cargill was able to purchase several thousand pounds of the seed as the Soviets realized their secret was out. That purchase helped US geneticists improve US high-oil varieties by further selection and hybridization.

His many "recreational" pursuits included, at various times, woodworking, lapidary (including owning a retail lapidary shop in Minneapolis for about seven years), photography, the Hammond organ, and a construction company of which he was a co-owner and treasurer.

Baldwin grew up on a farm in Michigan and continued farming activity after joining Cargill. He owned a Minnesota Christmas tree farm on which he hand-planted approximately 20,000 tress.

He used postage stamps to send manuscripts and other correspondence to AOCS, asking that the canceled stamps be returned to him. He later would distribute those stamps to youngsters during his worldwide travels, hoping to spark an interest in philately and in the United States.

In 1978, Baldwin used his lapidary skills to make small replicas of traditional gavels for each past president attending the AOCS Annual Meeting. He continued to provide replica gavels to past presidents in following years.

Survivors include his wife, Eleanor, and three children, Eleanor Louise, Arthur Christian, and Richard Lawrence, and three grandchildren, Alexi Louise Baldwin, Nicole Larissa Baldwin, and Arthur (Andy) Baldwin.

The essence of the man

During the AOCS 2009 Centennial meeting in Orlando, Florida, Baldwin was present as AOCS' senior past president. He was asked to say a few words at the start of opening mixer. His enthusiastic remarks energized what had been a somewhat lethargic crowd.

Research scientists, when being recognized for their discoveries, often will note that what they did was made possible by earlier scientists—that they are standing on the shoulders of those who have gone before.

Everyone involved with AOCS today is standing on Dick Baldwin's shoulders.

George Willhite is a former managing editor of inform *magazine. He can be contacted at georgewillhite@aol.com.*

David Byong Sung Min

Min

David Min, winner of the 2007 AOCS Alton E. Bailey Award, died on November 20, 2011, in Seoul, Korea, while visiting family. He was 69 years old at the time of his death. His wife, Irene, survives him, as well their sons, Peter and Stephen, two grandsons, and several brothers and sisters.

Min received his B.S. from Seoul National University (Korea) in 1965, and his M.S. from the University of Minnesota (Minneapolis, USA) in 1969. He then moved to Rutgers University (New Brunswick, New Jersey, USA), where he completed his Ph.D. under the direction of Stephen S. Chang.

From 1973 to 1975 Min was senior scientist with the Quaker Oats Co. (Barrington, Illinois, USA). He joined CPC International (Murray Hill, New Jersey) in 1976 as principal scientist and manager, and then moved to the Department of Food Science and Technology at The Ohio State University (Columbus, USA) in 1979, where he worked until his retirement in 2011.

His association with AOCS was early, long, and fruitful. In 1972, Min was named an AOCS Honored Student, and in 1973, he received the AOCS Student Research Award from the Northeast Section. He assumed his first leadership role in AOCS in 1979 as treasurer for the Northeast Section, and over the years served variously on the Lipid Chemistry Award Committee, chaired short courses, and served on the Education, Analytical, and Publication Committees.

He organized symposia and chaired technical sessions at AOCS national meetings. He was associate editor for *inform* for five years and the *Journal of the American Oil Chemists' Society* (*JAOCS*) for 13 years. He also served on the editorial advisory board for *JAOCS.*

He was on the Governing Board, and was named an AOCS Fellow in 2001. Min received the Alton E. Bailey Award in recognition of his service to AOCS and for his pioneering research on flavor stability of oils.

Min's work on flavor in oils is internationally known. His identification of singlet oxygen oxidation of linolenic acid provided the foundation for the current understanding of reversion flavor formation in soybean oil and how to prevent it. This research translated into studies of singlet oxygen formation in meat and dairy products and its effect on flavor quality. The results from these studies resulted in an understanding of the mechanism of riboflavin degradation under light, which led to new processing and packaging methods to minimize the development of undesirable flavors in dairy products.

His research led to three US patents and two foreign patents and over 200 presentations and publications, including three AOCS Press books for which he served as co-editor: *Flavor Chemistry of Fats and Oils* (1985), *Flavor Chemistry of Lipid Foods* (1989), and *Lipid Oxidation Pathways, Vol. 2* (2010).

Steven Jon Brouwer

Brouwer

On November 27, 2011, Steven Jon Brouwer died in Grand Rapids, Michigan, USA, at the age of 53. He is survived by a brother and sister, aunts, nieces, and numerous cousins.

Brouwer was a senior research scientist with Amway Corp. (Ada, Michigan), where he was deeply involved with home care product development activities. He was awarded eight US patents and 11 foreign patents for his work with Amway, which he joined right after receiving his bachelor's degree in chemistry from Calvin College (Grand Rapids, Michigan) in 1980.

His work with Amway ranged from developing highly concentrated laundry powders to being in the forefront of the market shift to concentrated liquids. Brouwer helped create detergents that do not cake in the washer, water softeners made from simple sugars, and fabric softeners for use in the dryer.

Fellow AOCS member and Amway colleague Mike Wint said of Brouwer, "His dry humor and quick wit were much appreciated in a topic as dry as washing clothes." He added, "His ability to see connections between seemingly unrelated events was greatly welcome in our Home Care product development efforts."

Brouwer joined AOCS in 1983 and was a member of the Surfactants and Detergents Division. ■

Book Review

Omega-3 Oils: Applications in Functional Foods
E.M. Hernandez and M. Hosokawa (eds.),
AOCS Press, 2011,
305 pages, ISBN 978-1-893997-82-0, $138 (nonmember), $117 (member).

Laurence Eyres

Omega-3 Oils: Applications in Functional Foods covers a topical subject, both for the dietary supplement industry and the food industry. In fact, Frost & Sullivan, a market research firm based in San Antonio, Texas, USA, estimates that the omega-3 oil ingredient supply will reach $1.6 billion by 2014.

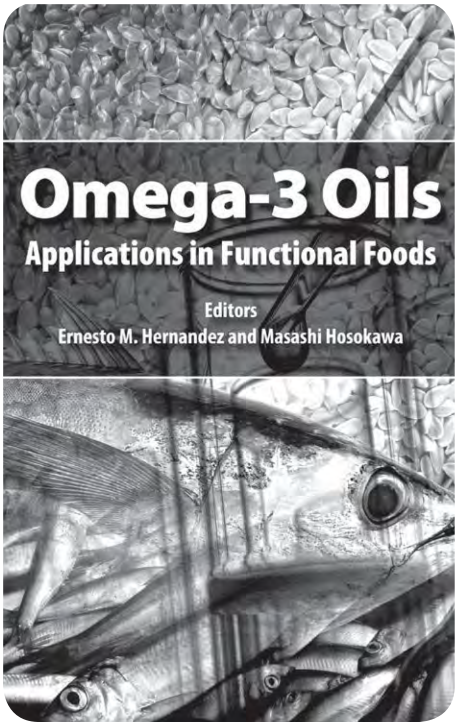
There have been many attempts to incorporate omega-3 oils into food products to take advantage of the favorable consumer attitude toward this important nutrient. There have also been many spectacular economic market failures, due either to poor consumer targeting or to technical difficulties with the product and its manufacturing. This new book has a slightly misleading title—"Applications"—since it provides extensive coverage of the science and the technology of omega-3 oils, rather than just formulation information regarding food matrices.

The 12 chapters cover three basic areas: structure and function, production and processing, and health effects. The editors have assembled an interesting and select group of international authors from the United States, Canada, and Japan. The amount of discussion relating to the science and benefits of omega-3 fatty acids in the body may be slightly disappointing to those only interested in the practical food technology application of omega-3 oils in functional foods; however, that does not detract from the overall value and utility of the book.

The chapter by Ernesto Hernandez is comprehensive and deals with formulations and product stability. The contents are useful and practical, especially to someone who has struggled with the flavor and stability of functional foods. Tomoko Okada and co-workers provide an interesting and relevant chapter on the synergistic, additive, and health effects of fish oils and bioactive compounds, which includes antioxidants, and their synergy with statins, which is of great medical importance.

A question of particular concern in the omega-3 business is the efficacy of the structural form of the lipid. There is still some debate as to the differences in unaltered triacylglycerols from processed fish oil, lipids structured by transesterification, ethyl esters, and, more recently, phospholipids. There is an entire chapter on the synthesis of structured lipids, now a key component of infant formulae. A competitive advantage has been attributed to krill oil because of its high content of phospholipids and the presence of the antioxidant astaxanthin. While some of these advantages are dealt with in the book, they remain largely unexplored and a discussion of the role of krill vs. other forms of omega-3 oils in dietary supplements (soft gels) is not provided.

The comprehensive chapter by Anthony Bimbo detailing the production of marine oils is technical, detailed, and informative, although a great deal of this information has been published in other texts and journals.



The chapters on the health effects of omega-3 oils read like reports of clinical trials in medical journals. They are a vital reference for companies wishing to have scientific backing for the use of omega-3 oils in their functional foods. The short, six-page chapter on the dietary role of phospholipid-containing omega-3s in obesity disorders of rats is, in my opinion, out of place in this book and should have been a paper in a refereed journal.

There is extensive coverage of flaxseed by an author from the Flax Council of Canada. This comprehensive chapter complements the AOCS book *Flaxseed in Human Nutrition*. The chapter does not dwell on the consumer confusion between the 18-carbon omega-3 and the longer chain-length fatty acids found in marine oils. There is no doubt α-linolenic acid has health benefits on its own merits, but it has been proven not to have any significant transformation to docosahexaenoic acid in the human body although there is some transformation to eicosapentaenoic acid. The biological mechanisms are dealt with well in this chapter, particularly the competition between omega-6 and omega-3 fatty acids, and the nutritional problems in consuming too much linoleic acid at the expense of omega-3 fatty acids has been emphasized.

Overall, this book is extremely readable, with only a few minor spelling mistakes. It will be extremely useful to a wide range of readers. It is well referenced and has a comprehensive index. The information contained in this book will enable scientists and practical technologists to make a detailed evaluation of whether the incorporation of omega-3 oils in functional foods has a proven benefit.

Laurence Eyres is a consultant to the food and dietary supplement industry in New Zealand. He has been involved in the science and commercial technology of oils and fats for over 35 years, is a member of AOCS, and is the chairman of the New Zealand Institute of Chemistry Oils and Fats Specialist Group. He may be contacted at eyresy@gmail.com.

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

Global phosphorus scarcity: identifying synergies for a sustainable future

Neset, T.S., and D. Cordell, *J. Sci. Food Agric.* 92:2–6, 2012.

Global food production is dependent on constant inputs of phosphorus. In the current system this phosphorus is not predominantly derived from organic recycled waste, but to a large degree from phosphate rock-based mineral fertilizers. However, phosphate rock is a finite resource that cannot be manufactured. Our dependency therefore needs to be addressed from a sustainability perspective in order to ensure global food supplies for a growing global population. The situation is made more urgent by predictions that, for example, the consumption of resource-intensive foods and the demand for biomass energy will increase. The scientific and societal debate has so far been focused on the exact timing of peak phosphorus and on when the total depletion of the global reserves will occur. Even though the timing of these events is important, all dimensions of phosphorus scarcity need to be addressed in a manner that acknowledges linkages to other sustainable development challenges and that takes into consideration the synergies between different sustainability measures. Many sustainable phosphorus measures have positive impacts on other challenges; for example, shifting global diets to more plant-based foods would not only reduce global phosphorus consumption but also reduce greenhouse gas emissions, reduce nitrogen fertilizer demand, and reduce water consumption.

Characterization of lipids and antioxidant capacity of novel nutraceutical egg products developed with omega-3-rich oils

Kassis, N.M., *et al.*, *J. Sci. Food Agric.* 92:66–73, 2012.

This study demonstrated an alternative approach to developing novel, nutraceutical egg products. Instead of dietary modification of

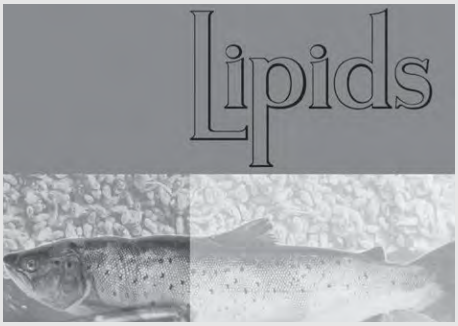
AOCS Journals

Journal of the American Oil Chemists' Society (January)

- An update on the use of co-products from the milling of rice in value-added food products, Shih, F.F.
- TMAH-catalyzed transesterification of EPA and DHA in encapsulated fish oil products, Tsai, C., C.-C. Liu, L.-B. Hung, and B.S. Pan
- Solid lipid nanoparticles: effect of carrier oil and emulsifier type on phase behavior and physical stability, Qian, C., E.A. Decker, H. Xiao, and D.J. McClements
- Technological factors affecting sterols in Australian olive oils, Guillaume, C., L. Ravetti, D.L. Ray, and J. Johnson
- Frying performance of canola oil triacylglycerides as affected by vegetable oils minor components, Aladedunye, F.A., and R. Przybylski
- Radical scavenging activity and performance of novel phenolic antioxidants in oils during storage and frying, Catel, Y., F. Aladedunye, and R. Przybylski
- TAG profiles of *Jatropha curcas* L. seed oil by easy ambient sonic-spray ionization mass spectrometry, Cardoso, K.C., M.J. Da Silva, R. Grimaldi, M. Stahl, R.C. Simas, *et al.*
- Influence of extraction processing on rheological properties of rapeseed oils, Liu, C., M. Yang, and F. Huang
- Application of a handheld portable mid-infrared sensor for monitoring oil oxidative stability, Allendorf, M., A. Subramanian, and L. Rodriguez-Saona
- Evaluation of *Rhizopus oryzae* lipase for the determination of regiodistribution in triacylglycerols with medium chain fatty acids, Pérignon, M., J. Lecomte, M. Pina, A. Renault, C. Simonneau-Deve, *et al.*
- Modulation of the selectivity of immobilized lipases by chemical and physical modifi ations: release of omega-3 fatty acids from fish oil, Fernández-Lorente, G., L. Betancor, A.V. Carrascosa, J.M. Palomo, and J.M. Guisan
- Optimization of lipase-catalyzed synthesis of cetyl octanoate in supercritical carbon dioxide, Kuo, C.-H., H.-Y. Ju, S.-W. Chu, J.-H. Chen, C.-M.J. Chang, *et al.*
- Utilization of agro-industrial residues for poly(3-hydroxyalkanoate) production by *Pseudomonas aeruginosa* 42A2 (NCIMB 40045): optimization of culture medium, Rodríguez-Carmona, E., J. Bastida, and A. Manresa
- Canopy fruit location can affect olive oil quality in 'Arbequina' hedgerow orchards, Gómez-del-Campo, M., and J.M. García
- Characterization of lipid components in two microalgae for biofuel application, Wang, G., and T. Wang
- Mixed alkyl esters from cottonseed oil: improved biodiesel properties and blends with diesel fuel, Joshi, H., B.R. Moser, and T. Walker
- Textural and physical properties of biorenewable "waxes" containing partial acylglycerides, Yao, L., and T. Wang
- Extraction and functional properties of non-zein proteins in corn germ from wet-milling, Hojilla-Evangelista, M.P.
- Neutral oil loss during alkali refining (Letter to the Editor), Dijkstra, A.J.
- Isolation of pure phospholipid fraction from egg yolk (Letter to the Editor), Gładkowski, W., A. Chojnacka, G. Kiełbowicz, T. Trziszka, and C. Wawrzeńczyk

Lipids (January)

- Role of a disordered steroid metabolome in the elucidation of sterol and steroid biosynthesis, Shackleton, C.H.L.
- Niemann-Pick C2 protein expression regulates lithogenic diet-induced gallstone formation and dietary cholesterol metabolism in mice, Balboa, E., G. Morales, P. Aylwin, G. Carrasco, L. Amigo, *et al.*
- Probucol suppresses enterocytic accumulation of amyloid-β induced by



saturated fat and cholesterol feeding, Pallebage-Gamarallage, M.M., S. Galloway, R. Takechi, S. Dhaliwal, and J.C. L. Mamo

- Serum 2-methoxyestradiol, an estrogen metabolite, is positively associated with serum HDL-C in a population-based sample, Masi, C.M., L.C. Hawkley, and J.T. Cacioppo
- High dose *trans*-10,*cis*-12 CLA increases lean body mass in hamsters, but elevates levels of plasma lipids and liver enzyme biomarkers, Liu, X., S.V. Joseph, A.P. Wakefield, H.M. Aukema, and P.J.H. Jones
- Dietary CLA combined with palm oil or ovine fat differentially influences fatty acid deposition in tissues of obese Zucker rats, Martins, S.V., P.A. Lopes, S.P. Alves, C.M. Alfaia, M.F. Castro, *et al.*
- Low levels of lipogenic enzymes in peritumoral adipose tissue of colorectal cancer patients, Notarnicola, M., A. Miccolis, V. Tutino, D. Lorusso, and M.G. Caruso
- Linolenate 9*R*-dioxygenase and allene oxide synthase activities of *Lasiodiplodia theobromae*, Jernerén, F., F. Eng, M. Hamberg, and E.H. Oliw
- Differences in lipid characteristics among populations: low-temperature adaptability of ayu, *Plecoglossus altivelis*, Xue, C., M. Okabe, and H. Saito
- Separation of lipid classes by HPLC on a cyanopropyl column, Olsson, P., J. Holmbäck, and B. Herslöf

Journal of Surfactants and Detergents (January)

- Environmental impact of ether carboxylic derivative surfactants, Jurado, E., M. Fernández-Serrano, M. Lechuga, and F. Ríos
- Correlation between enzyme activity and stability of a protease, an alpha-amylase and a lipase in a simplified liquid laundry detergent system, determined by differential scanning calorimetry, Lund, H., S.G. Kaasgaard, P. Skagerlind, L. Jorgensen, C.I. Jorgensen, *et al*.
- Solubilization of aromatic hydrocarbons in ethylene oxide-propylene oxide triblock micelles: location of solubilizate and its effect on micelle size from 2D NMR and scattering techniques, Parekh, P., K. Singh, D.G. Marangoni, V.K. Aswal, and P. Bahadur
- Aggregation and thermodynamic properties of some cationic gemini surfactants, Akbaş, H., A. Elemenli, and M. Boz
- Mixed micellization of sodium dodecylbenzene sulfonate with polyoxyethylene lauryl ether surfactants (POLE4 and POLE23) in *n*-butanol aqueous solution, Park, I.J., and B.H. Lee
- Aggregation, counter ion binding and adsorption behaviors of cetylpyridinium chloride in water/glycerol media at 25°C, Mukhim, T., and K. Ismail
- Interactions of polyacrylamide with cationic surfactants: thermodynamic and surface parameters, Niranjan, P.S., R. Shukla, and S.K. Upadhyay
- Degradation of two persistent surfactants by UV-enhanced ozonation, Tehrani-Bagha, A.R., H. Nikkar, F.M. Menger, and K. Holmberg
- Synthesis of quaternary ammonium salts with novel counterions, Jiang, Y., T. Geng, and Q. Li

- Synthesis and characterization of silicone-based surfactants as anti-foaming agents, Kekevi, B., H. Berber, and H. Yıldırım
- Synthesis and surface activities of novel monofluoroalkyl phosphate surfactants, Wang, Q., S. Zhang, B. Geng, L. Zhang, J. Zhao, *et al*.
- Synthesis of alkanolamide: a nonionic surfactant from the oil of *Gliricidia sepium*, Adewuyi, A., R.A. Oderinde, B.V.S.K. Rao, and R.B.N. Prasad
- Interaction between the surface properties of the textiles and the deposition of cationic softener, Agarwal, G., A. Perwuelz, L. Koehl, and K. S. Lee
- Surface-active properties and antimicrobial study of conventional cationic and synthesized symmetrical gemini surfactants, Kuperkar, K., J. Modi, and K. Patel
- Separation of monoester and diester in the esterification product of polyethylene glycol and acrylic acid by the Weibull method, Lei, J.-H., H. Li, A.-F. Zhang, X.-D. Du, and Q. Lu

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chicken feed, yolk substitution with ω-3 polyunsaturated fatty acids (PUFA) oils resulted in enhancement of ω-3 PUFA beyond levels possible to achieve by modifying chicken feed.

Near-infrared spectroscopic determination of degradation in vegetable oils used to fry various foods

Ng, C.L., R.L. Wehling, and S.L. Cuppett, *J. Agric. Food Chem. 59:*12286–12290, 2011.

Near-infrared (NIR) spectroscopic methods for measuring degradation products, including total polar materials (TPM) and free fatty acids (FFA), in soy-based frying oil used for frying various foods have been successfully developed. Calibration models were developed using forward stepwise multiple linear regression (FSMLR) and partial least-squares (PLS) regression techniques and then tested with an independent set of validation samples. The results show that the quality of oil used for frying different foods can be measured with a single model. First-derivative treatments improved results for TPM measurement. In addition, PLS models gave better prediction results than FSMLR models. For PLS models, the best correlations (r) between the NIR-predicted data and the chemical method data for TPM and FFA in oils were 0.995 and 0.981, respectively. For FSMLR models, the best r values for TPM and FFA in oils were 0.993 and 0.963, respectively.

Chemoenzymatic synthesis of phytosteryl ferulates and evaluation of their antioxidant activity

Tan, Z., and F. Shahidi, *J. Agric. Food Chem. 59*:12375–12383, 2011.

The feasibility of a two-step chemoenzymatic synthesis of phytosteryl ferulates was successfully established in this work. An intermediate vinyl ferulate was first chemically produced and subsequently esterified with phytosterols through alcoholysis with *Candida rugosa* as a catalyst. The structures of phytosteryl ferulates were confirmed by Fourier transform infrared (FTIR) and high-performance chromatography–mass spectrometry/mass spectrometry (HPLC-MS/MS) using atmospheric pressure chemical ionization (APCI) under both positive and negative ion modes. The antioxidant activity of phytosteryl ferulates was higher than that of the starting material and the intermediate in the assays employed. The results indicated that phytosteryl ferulates had a good potential to be used as food antioxidants and may also serve as cholesterol-lowering agents.

Squalene resources and uses point to the potential of biotechnology

Naziri, E., F. Mantzouridou, *et al., Lipid Technol. 23*:270–273, 2011.

Squalene uses extend from cosmetics to the medical and nutraceutical sectors. International concern for the protection of deep-sea sharks, the major source for this hydrocarbon so far, has engendered research interest in other directions (plant kingdom, microbes). Biotechnology offers an alternative approach with the potential of safety requirements and high yield. *Saccharomyces cerevisiae* appears to be a promising choice for food and nutraceutical applications.

Modifications of stearidonic acid soybean oil by enzymatic acidolysis for the production of human milk fat analogues

Teichert, S.A., and C.C. Akoh, *J. Agric. Food Chem. 59*:13300–13310, 2011.

Structured lipids (SL) from stearidonic acid (SDA) soybean oil pre-enriched with palmitic acid (PA) at the *sn*-2 position with Novozym 435 (NSL) or Lipozyme TL IM (LSL) from previous research were further enriched with γ-linolenic acid (GLA) or docosahexaenoic acid (DHA). Small-scale acidolysis reactions with Lipozyme TL IM were performed to determine the optimal reaction conditions as 1:1 substrate mole ratio of NSL or LSL to free DHA at 65°C for 24 h and a 1:0.5 substrate mole ratio of NSL or LSL to free GLA at 65°C for 12 h. Optimized SL products were scaled up in a 1 L stir-batch reactor, and the resulting SL of NSL:DHA (NDHA), LSL:DHA (LDHA), NSL:GLA (NGLA), and LSL:GLA (LGLA) were chemically and physically characterized. The SL contained >54% PA at the *sn*-2 position with GLA > 8% for the GLA SL and DHA > 10% for the DHA SL. The oxidative stabilities of the SL were increased by the addition of 200 ppm *tert*-butylhydroquinone, with NGLA being more stable due to higher tocopherol content than the other SL. The melting and crystallization profiles did not differ between the DHA SL or the GLA SL. The triacylglycerol (TAG) species were similar for the GLA SL but differed between the DHA SL, with tripalmitin being the major TAG species in all SL.

Lipid classification, structures and tools

Fahy, E., *et al., Biochim. Biophys. Acta 1811*:637–647, 2011.

The study of lipids has developed into a research field of increasing importance as their multiple biological roles in cell biology, physiology, and pathology are becoming better understood. The Lipid Metabolites and Pathways Strategy (LIPID MAPS) consortium is actively involved in an integrated approach for the detection, quantitation, and pathway reconstruction of lipids and related genes and proteins at a systems-biology level. A key component of this approach is a bioinformatics infrastructure involving a clearly defined classification of lipids, a state-of-the-art database system for molecular species, and experimental data and a suite of user-friendly tools to assist lipidomics researchers. Herein, we discuss a number of recent developments by the LIPID MAPS bioinformatics core in pursuit of these objectives.

High sensitivity quantitative lipidomics analysis of fatty acids in biological samples by gas chromatography–mass spectrometry

Quehenberger, O., A.M. Armando, and E.A. Dennis, *Biochim. Biophys. Acta 1811*:648–656, 2011.

Historically considered to be simple membrane components serving as structural elements and energy-storing entities, fatty acids are now increasingly recognized as potent signaling molecules involved in many metabolic processes. Quantitative determination of fatty acids and exploration of fatty acid profiles have become common place in lipid analysis. We present here a reliable and sensitive method for comprehensive analysis of free fatty acids and fatty acid composition of complex lipids in biological material. The separation and quantitation of fatty acids are achieved by capillary gas chromatography. The analytical method uses pentafluorobenzyl bromide derivatization and negative chemical ionization gas chromatography–mass spectrometry. The chromatographic procedure provides baseline separation between saturated and unsaturated fatty acids of different chain lengths as well as between most positional isomers. Fatty acids are extracted in the presence of isotope-labeled internal standards for high quantitation accuracy. Mass spectrometer conditions are optimized for broad detection capacity and sensitivity capable of measuring trace amounts of fatty acids in complex biological samples.

Informatics and computational strategies for the study of lipids

Orešič, M., *Biochim. Biophys. Acta 1811*:991–999, 2011.

The ability to translate vast amounts of information, as obtained from lipidomic analysis, into the knowledge and understanding of biological phenomena is an important challenge faced by the lipidomics community. While many of the informatics and computational tools from other domains such as bioinformatics and metabolomics are also applicable to lipidomics data processing and analysis, new solutions and strategies are needed for the studies of lipidomes at the systems level. This is due to enormous functional and structural diversity of lipids as well as because of their complex regulation at multiple spatial and temporal scales. To better understand the lipidomes at the physiological level, lipids need to be modeled not only at the level of biological pathways but also at the level of the biophysical systems they are part of, such as cellular membranes or lipoprotein particles. Herein the current state, recent advances, and new opportunities in the field of lipid bioinformatics are reviewed.

Plasma sphingomyelins are associated with cognitive progression in Alzheimer's disease

Mielke, M.M., *et al., J. Alzheimer's Dis. 27*:259–269, 2011.

Plasma sphingolipids have been shown to predict cognitive impairment and hippocampal volume loss, but there is little research in patients with Alzheimer's disease (AD). In this study we sought to determine whether plasma ceramides, dihydroceramides (DHCer), sphingomyelins (SM), or dihydrosphingomyelin (DHSM) levels and ratios of SM/ceramide or DHSM/DHCer were predictive of progression in AD. Probable AD patients ($n = 120$) were enrolled in the Alzheimer's Disease and Memory Disorders Center at Baylor College of Medicine. Plasma sphingolipids were assessed using electrospray ionization/mass spectroscopy/mass spectroscopy. Linear mixed effects models were used to examine the relation between baseline plasma sphingolipid levels and cross-sectional and longitudinal performance on the Mini-Mental State Exam (MMSE), Alzheimer's Disease Assessment Scale-Cognitive Subscale (ADAS-Cog), and Clinical Dementia Rating-Sum of Boxes (CDR-Sum). Participants were followed a mean of 4.2 visits and 2.3 years. There were no cross-sectional associations. In longitudinal analyses, high levels of DHCer and ceramide were associated with greater progression, but findings did not reach significance ($P > 0.05$). In contrast, higher plasma levels of SM, DHSM, SM/ceramide, and DHSM/DHCer ratios were associated with less progression on the MMSE and ADAS-Cog. The ratios were the strongest predictors of clinical progression. Compared to the lowest tertiles, the highest tertiles of DHSM/DHCer and SM/ceramide ratios declined 1.35 points ($P = 0.001$) and 1.19 ($P = 0.004$) points less per year on the MMSE and increased 3.18 ($P = 0.001$) and 2.42 ($P = 0.016$) points less per year on the ADAS-Cog. These results suggest that increased SM/ceramide and DHSM/DHCer ratios dose-dependently predict slower progression among AD patients and may be sensitive blood-based biomarkers for clinical progression.

High-throughput lipidomic analysis of fatty acid-derived eicosanoids and N-acylethanolamines

Dumlao, D.S., *et al., Biochim. Biophys. Acta 1811*:724–736, 2011.

Fatty acid-derived eicosanoids and N-acylethanolamines (NAE) are important bioactive lipid mediators involved in numerous biological processes including cell signaling and disease progression. To facilitate research on these lipid mediators, we have developed a targeted high-throughput mass spectrometric-based methodology to monitor and quantitate both eicosanoids and NAE, and can be analyzed separately or together in series [*sic*]. Each methodology utilizes scheduled multiple reaction monitoring (sMRM) pairs in conjunction with a 25 min reverse-phase high-performance liquid chromatographic separation. The eicosanoid methodology monitors 141 unique metabolites, and quantitative amounts can be determined for over 100 of these metabolites against standards. The analysis covers eicosanoids generated from cycloxygenase, lipoxygenase, cytochrome P450 enzymes, and those generated from nonenzymatic pathways. The NAE analysis monitors 36 metabolites, and quantitative amounts can be determined for 33 of these metabolites against standards. The NAE method contains metabolites derived from saturated fatty acids, unsaturated fatty acids, and eicosanoids. The lower limit of detection for eicosanoids ranges from 0.1 pg to 1 pg, while NAE ranges from 0.1 pg to 1000 pg. The rationale and design of the methodology is discussed.

Novel developments in omega-3 fatty acid-based strategies

Davidson, M.H., D. Kling, and K.C. Maki, *Curr. Opin. Lipidol. 22*:437–444, 2011.

Omega-3 polyunsaturated fatty acids (n-3 PUFA) have been attributed with several health benefits, including triglyceride lowering and cardiovascular disease risk reduction. This review focuses on new prescription omega-3 fatty acid products in development and recently published data regarding omega-3 fatty acid effects on arrhythmias, heart failure, and platelet inactivation. A free fatty acid form of n-3 PUFA was found to produce a fourfold higher area under the plasma n-3 PUFA curve than prescription omega-3-acid ethyl esters in patients on a low-fat diet. Eicosapentaenoic acid ethyl esters reduced triglyceride without significantly elevating low-density lipoprotein cholesterol in patients with severe hypertriglyceridemia and in those with mixed dyslipidemia. Recent investigations of n-3 PUFA effects on ventricular and atrial arrhythmias, including studies in patients with implanted defibrillators, failed to demonstrate a significant benefit. However, increased fatty fish or n-3 PUFA consumption was associated with a lower rate of hospitalization in heart failure patients. A further important finding was potentiation of the antiplatelet response when n-3 PUFA were added to aspirin + clopidogrel. Although n-3 PUFA therapy continues to show promise in the prevention and management of cardiovascular diseases, further research is necessary to more fully elucidate its role in specific disorders. ■

Patents

Published Patents

Two-component solvent-free polyurethane adhesives

Wu, Y., *et al.*, Microvast Inc.; Huzhou Ochem Chemical Co., Ltd., US8022164, September 20, 2011

A two-component solvent-free polyurethane laminating adhesive for flexible packaging, including a First Component and a Second Component, is provided. The First Component, which acts as a resin, includes a first vegetable oil-based Polyol A (20–40 wt%), a second vegetable oil-based Polyol B (0.5–5 wt%), and a Polyisocyanate C (60–74 wt%). The Second Component, which acts as a hardener, includes a first vegetable oil-based Polyol A (87–99 wt%) and a Polyol E (0.5–5 wt%). The first vegetable oil-based Polyol A is preferably a hydroxylated castor oil, and the second vegetable oil-based Polyol B is preferably hydroxylated linseed oil.

Compositions of phospholipid ether boronic acids and esters and methods for their synthesis and use

Pinchuk, A., *et al.*, Cellectar, Inc., US8022235, September 20, 2011

The present invention discloses boronic acids and esters of phospholipid ether analogs and methods for their synthesis and use. The boronic acids and esters of phospholipid ether analogs described herein can be used in treating cancer and in particular can be used in conjunction with radiation therapy, such as external beam radiation therapy and neutron capture therapy to specifically target and kill cancer cells.

System and process for production of fatty acids and wax alternatives from triglycerides

Hassan, A., *et al.*, H R D Corp., US8026380, September 27, 2011

A method of producing volatilized fatty acids by heating a feedstock comprising at least one fat or oil in a reactor under inert vacuum to volatilize fatty acids, and removing volatilized fatty acids from a bottoms residue comprising cross-linked oil. A system for producing a hydrogenated product including a reactor comprising an inlet for a stream comprising triglycerides, an outlet for volatilized fatty acids, and an outlet for a cross-linked product, heating apparatus, a vacuum pump capable of pulling a vacuum in the range of 1–50 kPa on the reactor, and a hydrogenation reactor, wherein an inlet of the hydrogenation reactor is fluidly connected to the outlet for cross-linked product.

Hydrodeoxygenation process

Abhari, R., and P. Havlik, Syntroleum Corp., US8026401, September 27, 2011

A process for producing a hydrocarbon from biomass. A feed stream having free fatty acids, fatty acid esters, or combinations thereof is provided. The feed stream is heated in the presence of a first catalyst to produce a partially hydrodeoxygenated stream. The partially hydrodeoxygenated stream is heated in the presence of a second catalyst to produce an effluent stream containing the hydrocarbon.

Fatty acid alkyl ester production from oleaginous seeds

Aiken, J.E., US8022236, September 20, 2011

A process is described for producing fatty acid alkyl esters for both diesel fuel and nonfuel uses. The feed material includes whole oleaginous seeds slurried in a liquid triglyceride oil containing at least 2 wt% free fatty acid, wherein oil from inside the seeds is first extracted with concurrent esterification of free fatty acids from all sources in an acidic environment. Following sufficient free fatty acid reaction, the intermediate product is subjected to base-catalyzed concurrent extraction and transesterification. Decanting of the by-product glycerin is followed by water washing. Subsequently, the fatty acid ester product is concurrently purified and fractionated into a biodiesel fuel stream and a nonfuel fraction, each of which undergoes post treatment as needed. The process is optionally integrated with glycerin purification and/or methanol recovery.

Cooking aid for improving the removal of extractives in pulp production, its production and use

Ravaska, M., Arizona Chemical B.V., US8025762, September 27, 2011

The present invention relates to a wood cooking aid that comprises a mixture of fatty acids and rosin acids and/or salts thereof in a ratio that is effective in removing the extractives in pulp production. The invention also relates to a method for preparing a wood cooking aid wherein fatty acids and rosin acids are provided in a mixture in a ratio that is effective in removing the extractives in pulp production. If desired, salts of said acids are prepared by reacting said fatty acid rosin acid mixture containing the desired fatty acid and rosin acid distribution with water and sodium hydroxide. The wood cooking aid of the invention is used in cooking of hardwood.

Film formation method and apparatus

Miyoshi, H., *et al.*, Tokyo Electron Ltd., US8029856, October 4, 2011

A film formation method is arranged to react carboxylic acid with an oxygen-containing metal compound to produce carboxylate salt gas of a metal of the metal compound. The method then supplies the carboxylate salt gas of the metal onto a substrate. The method applies energy to the substrate to decompose the carboxylate salt of the metal supplied onto the substrate, thereby forming a metal film.

Lipid acyltransferases

Soe, J.B., *et al.*, Danisco A/S, US8030044, October 4, 2011

The present invention relates to a method of producing a variant lipid acyltransferase enzyme by selecting a parent enzyme that is a lipid acyltransferase enzyme having the amino acid sequence motif GDSX;

modifying one or more amino acids to produce a variant lipid acyltransferase; testing the variant lipid acyltransferase for activity on a galactolipid substrate, a phospholipid substrate, and/or a triglyceride substrate; selecting a variant enzyme with an enhanced activity toward galactolipids compared with the parent enzyme; and/or preparing a quantity of the variant enzyme. In some embodiments, the variant lipid acyltransferase enzyme may include the amino acid sequence motif GDSX, wherein X is one or more of the following amino acid residues: L, A, V, I, F, Y, X, Q, T, N, M, or S, and wherein the variant enzyme has one or more amino acid modifications compared with a parent sequence.

Fatty acid blends and uses therefor

Knuth, M., *et al*., COH Inc., US8029579, October 4, 2011

Provided herein are blends oils or fatty acids comprising more than 50% medium-chain fatty acids, or the fatty acid alkyl esters thereof, and having low melting points. Such blends are useful as a fuel or as a starting material for the production of, for example, a biodiesel. Also provided genetically altered or modified plants, modified such that the amount of medium-chain fatty acids generated by the plant are increased. Further provided is a method of predicting the melting point of a blend of fatty acid methyl esters and the use of such a method for identifying blends suitable for use as, for example, a biodiesel.

Method for production of pearlescent composition comprising a fatty acid glycol ester mixture

Hosoya, S., *et al*., Kao Corp., US8030266, October 4, 2011

A method for producing a pearly luster composition containing pearly luster particles (A) containing a fatty acid glycol ester (a1) and a fatty acid glycol ester (a2) having a melting point higher than the melting point of the fatty acid glycol ester (a1), and a surfactant (B), wherein the method includes the steps of: (i) solubilizing the fatty acid glycol ester (a2) in the presence of the surfactant (B); (ii) mixing the solubilized solution obtained in step (i) with a molten fatty acid glycol ester (a1) to emulsify the mixture; and (iii) cooling the emulsified mixture obtained in step (ii), to precipitate the pearly luster particles (A); a pearly luster composition obtained by the method; and a shampoo containing the pearly luster composition. The pearly luster composition obtained by the present invention is suitably used for shampoos, conditioners, body shampoos, liquid detergents, and the like.

Biodiesel production method

Martin, A., *et al*., B&P Process Equipment and Systems, LLC, US8030505, October 4, 2011

A process for producing lower alkyl esters of higher fatty acids from an oil phase and lower alcohols, in a catalytic transesterification process in the presence of an alkaline catalyst. A reaction mixture is provided by mixing oil-phase fatty acids with a solution comprising methanol and an alkaline catalyst comprising sodium methylate. The transesterification reaction of the reaction mixture is accelerated by subjecting the reaction mixture to a temperature above the boiling point of methanol and pressurizing the reaction mixture sufficiently to prevent boil-off. A centrifugal separator separates glycerin phase from biodiesel phase of a resulting reaction product stream. The biodiesel phase is washed by countercurrent extraction.

Process for the production of biodiesel

Portilho, M. deF.., *et al*., Petroleo Brasileiro SA-Petrobras, US8034130, October 11, 2011

The present invention relates to production of biodiesel by means of protonated lamellar titanate catalysts in nanostructured form; said forms can comprise nanotubes, nanofibers, or nanosheets.

Polyunsaturated fatty acid-containing oil product and uses and production thereof

Abril, J.R., Martek Biosciences Corp., US8034391, October 11, 2011

The present invention includes a solid fat composition that includes an oil having saturated fat and a microbial oil having a long-chain polyunsaturated fatty acid (LC-PUFA) and an emulsifier. In particular, the solid fat composition can have high levels of LC-PUFA and low amounts of emulsifiers. In preferred embodiments, the polyunsaturated oil is an unwinterized microbial oil. The invention also relates to methods for making such compositions and food, nutritional, and pharmaceutical products comprising said compositions. The present invention also includes a microbial oil product prepared by extracting an oil-containing fraction comprising at least one LC-PUFA from a microbial biomass, and treating the fraction by a process of vacuum evaporation, wherein the oil product has not been subject to one or more of a solvent winterization step, a caustic refining process, a chill filtration process, or a bleaching process.

Oil-in-water type emulsion

Ichiyama, H., and H. Hidaka, Fuji Oil Co., Ltd., US8034392, October 11, 2011

The present invention provides an oil-in-water type emulsion for light-exposed food. The emulsion has photodegradation resistance, good taste, and is less prone to deterioration (such as off-taste and off-flavor) when exposed to irradiating light. The first embodiment is an oil-in-water emulsion for light-exposed food containing fat and nonfat milk solids, wherein the fat comprises at least 40% lauric acid plus palmitic acid, and the total amount of oleic acid, linoleic acid, and linolenic acid is not more than 50%, and the total amount of linoleic acid and linolenic acid is not more than 5%; and the ratio of milk fat/total fat is not more than 0.95. The second embodiment thereof is a nonfat milk solid-containing oil-in-water type emulsion for light-exposed food, which is the same as the emulsion of the first embodiment and the fat is non-milk fat having the above constituent fatty acid composition.

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.

Clicking on the down arrow next to "People" in the search box on the far right reveals a drop-down menu. There, you can also search for jobs, companies, answers, groups, and specific topics or key words in all of the foregoing plus your inbox and connections' updates.

FIG. 1. *Start by investigating the LinkedIn toolbar drop-down menus.*

Social networking 101: LinkedIn

Whether you are job hunting or simply want to establish or maintain credibility within your industry, academic, or government setting—building a presence on LinkedIn is a must.

Catherine Watkins

Welcome to Part 2 of our series on social networking (SN). We have convinced you—we hope!—that you need to spend just a bit of time each week building and maintaining your SN presence online. Now, we are going to walk you, step by step, through the process. This month we are featuring LinkedIn™. In following months, we will give you tips for using Facebook and Twitter.

Caveat: The major SN platforms periodically update their sites, so the taskbar we describe today as we go to press may not match what you will find online as you read this article. Chances are, however, that it will still be similar enough for this article to make sense.

Getting started

Step No. 1. Visit linkedin.com and register. There is an advantage to inputting both your personal and professional email addresses. As LinkedIn (LI) notes, "If someone sends an invitation to an email address you haven't listed [with LI], you could get an error message or accidentally create a second account when you try to accept." LI profiles do not list any email addresses; business is conducted between the site and your primary (presumably work) email address; connections do not ever "see" any of your email addresses, personal or otherwise.

As part of this first step, visit the LI Learning Center under More on the LI taskbar (see Fig. 1). There, you will find user guides tailored to your needs. For example, there are guides for job seekers, consultants, new users, and more. In addition, LI holds free weekly webinars for new users. See learn.linkedin.com/training for more information.

Step No. 2. Log in and examine the taskbar at the top of your screen. Spend a little time investigating the drop-down menus under each heading. Also, notice the navigational links at the very bottom of the page. This is where you will find a link to the Help Center. As much as we hope you will never need it, chances are you will have a question or two on occasion.

- **Home:** Your personal homepage holds news items and "people you may know" suggestions. It is also the place to write and post updates and view updates posted by your connections.
- **Profile:** Visit tinyurl.com/LIUpload for instructions about uploading your CV to LinkedIn. Consider your profile a work in progress; add a bit each week. Note the big yellow button on the right titled Improve Your Profile. Click on it to receive tips on creating a more compelling profile. For one thing, make it obvious what you have done in your career as well as what you *want* to do.

  Tip: When creating a profile, use keywords relevant to your industry in your headline (the line that appears just below your name on the profile page). Think of core words that you would associate with the individuals with whom you hope to network. For example: vegetable oil processing, food technology, NIR, biodiesel; the point is to be specific. More tips on profile building are available at learn.linkedin.com/profiles.
- **Contacts:** For information about how to import your email address books, see tinyurl.com/LIimportContacts. You can issue a batch invitation simply by choosing "Add Connections" under the Contacts tab or clicking the green Add Connections link at the far right of the taskbar.
- **Groups:** Joining targeted groups on LI can expand your reach and connections by allowing you to participate in discussions with industry and academic professionals around the world. Participation marks you as an expert in your field even as you build relationships with your contacts. It can also make you more visible to potential employers.

Find groups through the Group Directory (linkedin.com/groupsDirectory). Many have lively discussions of general interest to industry/academia/government. The GOED group, for example, recently had extensive discussions on the issue of virgin fish oil. (GOED stands for "Global Organization for EPA and DHA Omega-3" and is a trade group based in Salt Lake City, Utah, USA.) There are a number of active groups with discussions on oils- and fats-related topics. For example, a recent posting to the AOCS group (see tinyurl.com/AOCSLinkedIn) was from a member looking for help in reducing water content as a process by-product to less than 1%. Other discussions involve raw material sourcing issues.

The LI "Groups You May Like" feature will automatically recommend groups based on your profile information. For more tips about using groups, visit tinyurl.com/GroupsLI and linkedin.com/groups.

- **Jobs:** Remember that the more detail you add to your profile, the more likely your name will surface as employers data mine the listings for prospective employees. Also, be sure to give and get recommendations (available under the Profile tab.) LI reports that users with recommendations are three times as likely to get inquiries through LinkedIn searches as those without recommendations.

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- **Companies:** You can follow companies as well as groups. Simply search for those you wish to follow. After you click the Follow button on the upper right and the page refreshes to show you are now following the company, click on the downward arrow and choose Settings. This is where you can modify the frequency and types of communication you will receive about this particular business. For example, if you do not want to receive word when employees join, leave, or are promoted, then remove the check from that checkbox.
- **More:** We will only talk about two items on the drop-down menu under More: Answers and Learning Center. The latter holds many tools for learning how to use LI to best advantage. We suggest you start with the New User Guide at learn.linkedin.com/new-users.

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To recap: As of November 2011, LI had more than 135 million members in over 200 countries and territories. Take 15 minutes right now and make that 135 million plus one. You'll be glad you did.

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

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If you attend the 2012 AOCS Annual Meeting & Expo (AM&E), visit The Lab on the Expo floor. There, AOCS' resident social networking expert, Web Strategy Manager Amy Lopez, will personally answer your questions. If you will not be attending the AM&E or need immediate help, then email or call her at amylo@aocs.org or +1 217-693-4836.

Another good source of information on social networking (SN) best practices is YouTube.com. You can search for many quick and helpful videos on specific SN platforms and features.

Asian oleochemicals sector attractive for companies willing to invest in new technology, mergers, and acquisitions

Kongkrapan Intarajang

Companies that invest in new technologies or grow through mergers and acquisitions will emerge as winners in the buoyant Asian oleochemicals sector.

The oleochemicals industry in Asia should benefit from a global recovery that has broadened, in today's terms, to encompass more firms, countries, and components of aggregate demand.

Better labor market conditions in high-income countries and increasing domestic demand in developing countries bode well for a continued global recovery that has been going on for almost two years. Overall, global growth is projected to ease from 3.8% in 2010 to 3.2% in 2011, as lingering post-crisis difficulties in the United States and the European Union (EU) continue to pose downside risks, with ripple effects expected throughout 2012.

Developing economies, on the other hand, should expand by at least 6.3%, reflecting an end to bounce-back factors that served to boost growth in 2010 and the tightening of monetary and fiscal policies as capacity constraints increase.

Closer to home, the Association of Southeast Asian Nations (ASEAN) economic community is set to spur member countries' economic growth beyond 2015 as Southeast Asia is forecast to lead recovery. Domestic demand within East Asia and the Pacific is forecast to continue its domination in the Asia Pacific region until 2013. Intra-region trading, driven by strong internal demand in China and India, will further propel East Asian and Pacific growth rates, superseding the world average.

Market drivers

The oleochemicals industry is unique in that, despite the market volatility seen by most commodity-based business in the last decade, it has benefitted from an increasingly mature and growing market. New applications, innovation, and demand for sustainable solutions have taken center stage.

Fueled by a hike in demand from a growing consumer market and wider availability of raw materials such as palm oil, palm kernel oil, and coconut oil, the oleochemical industry in Southeast Asia—the world's leading oleochemicals manufacturing hub—is expected to enjoy strong growth into 2012.

Here, oleochemical production is mainly centered on the manufacture of fatty acids, fatty alcohols, methyl esters, and refined glycerin. These then go into end-use applications of surfactants, soaps and detergents, cosmetics, food emulsifiers, paints and inks, and lubricants.

Offering many advantages to oleochemical players—such as abundant raw material supply, lower manpower costs, and improving infrastructure— key market drivers for the industry at large include the following:

Rationalization and consolidation opportunities. Downstream integration by large plantation companies that aim to capture additional value from their control of the key vegetable oil resources took the lead in consolidation efforts in 2008 and 2009, seizing opportunities in Europe and North America. Reduced profitability, low interest rates, and capacity overhang worldwide provided room for acquisitions and consolidations in 2010. Industry players became more vertically integrated and better suited to leverage market drivers such as technological advancements and establishing market presence through consolidation. Improved earnings stability is now within reach.

Growing and maturing markets. Rising consumer demands for fabric, home, and personal care products in Asia and Latin America are major drivers supporting growth. Demand in Southeast Asia for derivatives is spurred by the detergents, personal care, industrial, food, and fuels markets. This is encouraged by population growth, expanding middle class, increased focus on sustainability, and the buildup of infrastructure, particularly in China and India. As China strives to be self-sufficient, India's oleochemicals demand will continue to increase at the compound annual growth rate of more than 7%. Oleochemical manufacturers will benefit from rising consumption as it fuels the development of pharmaceuticals and plastics.

Raw materials. Overall, 2010 saw a healthy oleochemical market performance, but feedstock volatility continues to pose a challenge. Nonetheless, Asian palm plantation companies are expected to do well, as they continue to vertically integrate their operations and invest more in downstream processing of their feedstocks. Burgeoning palm plantations in Malaysia and Indonesia give the ASEAN region a predominant supply position in the vegetable oil industry, leading the oleochemical industry's recovery momentum with Southeast Asia alone to produce about 3.5 million metric tons in 2010.

Green chemistry. Stimulated by increasing demand for green chemicals and uses in new applications such as biolubricants, green chemicals, bioplastics, and biopolymers, industry players have further invested to advance product offerings in the high-value derivatives segment. Consumer interest in renewable and sustainable products is a positive trend, with growing environmental push to provide products that are comparable with petrochemical-based solutions.

Just over two decades ago, Asia Pacific had no place on the oleochemical map. Almost 90% of the world's production of fatty acids and alcohols, and virtually 100% of all the other basic oleochemicals, were produced in developed countries such as the United States, Europe, and Japan. Today, the majority of global fatty acid expansion is centered in Asia while demand for fatty acids in the United States and Europe will be supplied via a combination of tallow- and palm-based material.

Market constraints

Production and overhead costs will be significantly affected in the next two to three years as raw material and energy prices may remain high, diluting the profits of market participants. With the rapid development of the chemical industry and the surge in the biodiesel industry, raw material prices have continued to be extremely volatile.

The production of chemicals from refining and distillation processes consume high amounts of energy, adding to overhead costs. Managing this in the larger business strategy remains key to profitability, as well as managing the entire carbon chain.

The region's oleochemicals market shows a trend toward polarization. Local players that lack investment or a partner to develop downstream products remain on the commodity side in oil production. But firms investing in advanced technology, equipment, and high-end production in Southeast Asia join forces with specialized partners to grow in presence and provide more solutions in areas such as anionic surfactants, personal care raw materials, food processing, and fatty acids.

Critical to long-term viability, oleochemical business strategies must be able to: (i) identify, create, and leverage growth segments; (ii) systematically improve production and distribution efficiencies; and (iii) emphasize product quality and consistently innovate to drive product improvement and development.

Given that there are a limited number of end-customers, developing the right economies of scale and growing to a right size will ensure sustained business, as even large-scale players are expected to witness a downward trend in revenues due to intense competition in the market. Forming strategic alliances that allow players to tap economies of scale and supplies of raw materials with plantation companies could prove to be a preferred route for the industry.

Key success factor

Many chemical companies are investing resources to further their participation in the "green" dialogue, as renewables and sustainability become more relevant to consumers. Product innovation in this space is anticipated as oleochemical players devise ways to enhance product performance of even existing solutions that remain largely untapped. One such example is methyl ester sulfonate, whose growth is propelled mainly by the surfactant market because of its higher biodegradability and environmentally friendly characteristics.

More stringent environmental regulations will most certainly affect the overall Southeast Asian chemical industry. Europe and China alike, both important markets for this industry, have taken measures to better control their exports of chemical substances. China's REACH regulation (where REACH means **R**egistration, **E**valuation, **A**uthorisation and Restriction of **Ch**emical substances), in force since October 2010, utilizes many of the measures of the EU's REACH and also incorporates unique provisions specific to the country.

While regulators seek to harmonize all these rapidly maturing regulations, they will invariably increase production costs and could delay the time-to-market.

Other regulatory moves, such as those outlined by the Roundtable on Sustainable Palm Oil, will also have an effect on a company's value chain as everyone rallies to participate in the global "green" agenda.

Emery Oleochemicals is experienced in providing materials for plastic additives and bio-lubricants. Now we are working to widen our portfolio in the home and personal wellness and surfactant segments through investments and joint ventures.

This article was reprinted with permission from ICIS, *the world's leading information provider for the global energy, chemicals, and fertilizer markets. For more information, visit icis.com. Kongkrapan Intarajang is chief executive officer and board member of Emery Oleochemicals Group, a producer of oleochemical basestocks for cosmetics, detergents, and other industries.*

Beefing up soybean oil

Could half an ounce of soybean oil a day keep the doctor away? It might, if it is the soybean oil Chelsey Castrodale worked with as a graduate student in the lab of Andrew Proctor, a professor in the Department of Food Science at the University of Arkansas (Fayetteville, USA).

Kathy Heine

Investigating the oxidative stability of CLA-rich soybean oil required Honored Student Chelsey Castrodale to become well-versed in the analytical techniques used to measure oil quality.

Researchers in Proctor's lab use ultraviolet light to convert the linoleic acid in soybean oil to conjugated linoleic acid (CLA)—a collection of different isomers of linoleic acid that are naturally produced by bacteria in the digestive systems of ruminants (see *inform* *20*:280-281, 2009). Medical and nutritional research has shown that these naturally derived isomers may have antioxidant properties, reduce body fat, and offer protection against atherosclerosis, diabetes, and inflammation.

Interestingly, photoisomerization with ultraviolet light results in soybean oil that is 20% CLA (see *inform 20*:280-281, 2009). Just half an ounce provides 3 grams of CLA that could easily be delivered via salad dressing or, since potato chips contain 39% oil, 1.5 ounces of potato chips. Such products would also offer the benefits of soybean oil.

It is an exciting idea, but some previous studies had shown that CLA isomers are less oxidatively stable than other dienoic fatty acids—something that could shorten their shelf life. Would that be the case with CLA-enriched soybean oil?

In fall 2010, Castrodale embarked on a master's thesis project to investigate the oxidative stability of CLA-rich soybean oil. A key objective was to determine if an iodine catalyst used during the photometric conversion had any effect on its oxidative stability. Doing so required her to become well-versed in analytical techniques used to measure oil quality including gas chromatography (GC), GC-mass spectrometry, and attenuated total reflectance-Fourier transform infrared—skills that will complement those she developed during her undergraduate honors thesis research project at the University of Arkansas in which she studied the processing and storage effects on the polyphenolic content and antioxidant capacity of conventional and sugar-free blueberry jams.

Castrodale ultimately learned that the iodine catalyst did have a slight negative effect on the oxidative stability of the oil. She presented her results in a poster entitled "Oxidative stability of conjugated linoleic acid-rich soy oil" during the 102nd AOCS Annual Meeting & Expo (AM&E) May 1–4, 2011, in Cincinnati, Ohio (USA).

Her work distinguished her as one of nine AOCS students to receive a 2011 Honored Student Award at the AM&E and earned her the Peter and Clare Kalustian Award that recognizes outstanding merit and performance by an AOCS Honored Student. Best of all, it helped her land a job with ADM-Cocoa. Beginning with blueberry jam and moving on to soybean oil, chocolate is the next big step on Castrodale's tasty career path.

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The Food Safety Modernization Act and its relevance to the oilseed industry

Bryan Yeh

On January 4, 2011, US President Barack Obama signed into law the Food Safety Modernization Act, known as FSMA. This act is a significant overhaul of the Federal Food, Drug, and Cosmetic Act that was enacted in 1938. Since that time, we have seen our population grow and become more diverse, we have a greater awareness of foodborne illness, we have a larger variety of foods, and we have increased the importation of food into the United States. The intent of this act is to improve food safety in the United States by focusing on four themes: (i) prevention; (ii) inspections, compliance, and response; (iii) import safety; and (iv) enhanced partnerships.

Motivation for the new law

Consumers in the United States spend over $1.1 trillion on food annually, making food a major economic driver. However, foodborne illness is a significant burden, resulting in 48 million people getting sick each year (one in six Americans). Of these, 128,000 are hospitalized and 3,000 die (Taylor, 2011); some face long-term consequences, such as arthritis or kidney failure. Individuals with reduced immune capacity, such as infants, children, pregnant women, the elderly, and those on chemotherapy, are especially vulnerable. All told, Belden and Orden (2011) estimated that over $150 billion is spent annually on food-related illnesses in the United States alone.

The United States imports 15% of its food. Some foods are imported in significantly higher proportions than others. For example, 20% of all vegetables, 50% of all fruit, and 80% of all seafood consumed in the United States are imported (Taylor, 2011). All of these foods have short shelf lives, which increases their risk of spoilage. The *E. coli* outbreak that occurred in Germany during the summer of 2011 as well as contamination issues involving food from China has increased awareness about the need to monitor the safety of imported foods.

At the same time, our food supply chain is more complex than ever before. As a greater variety of foods, including ethnic foods, processed and prepared foods, and new ingredients such as low-calorie sweeteners and flavors, are made available, the steady stream of new products entering the market needs to be addressed as part of an overall food safety initiative.

Prevention

The core focus of FSMA is preventing incidents as opposed to reacting to them. The act provides a legislative mandate for the Food and Drug Administration (FDA) to require comprehensive and prevention-based controls across the entire food chain. Food facilities are defined as locations that manufacture, process, pack, or store food and include food manufacturers, processors, and retailers such as grocery stores and restaurants. Specifically, the law requires that food facilities:

- Develop a written analysis of hazards that are "known or reasonably foreseeable" in their operations and implement the appropriate controls to prevent unintentional as well as intentional contamination. These potential hazards include biological and chemical hazards, foreign material, decomposition, natural toxins, pesticides, and unapproved additives.
- Identify and implement preventive controls to "significantly minimize or prevent" identified hazards. Within the law, preventive controls are defined as "risk-based, reasonably appropriate procedures, practices, and processes that a person knowledgeable about the safe manufacturing, processing, packing, or holding of food would employ."
- Monitor the effectiveness of the preventive controls to determine whether the desired outcome is achieved.
- Take appropriate corrective action to rectify failures if/when it is determined that preventive controls are not appropriate.
- Develop and implement a written food safety plan that documents and describes the procedures used to comply with FSMA. This plan will need to be readily available upon request by the FDA.
- Reanalyze the plan at least every three years or sooner if a change is made at the facility that could result in a "reasonable potential" for introduction of a new hazard, or if there is a significant increase in the risk of a previously identified hazard.

FSMA does provide for some exemptions to its requirements; however, these are restricted to farms generating less than $500,000

Relevance to the oilseed industry

Although the oilseed processing industry has enjoyed a good record with respect to food safety, there have been several incidents from analogous manufacturing from which we can learn.

1. In 2005, a large US ice cream retailer recalled ice cream that had raw cake batter included in the mix. The cake batter, which was not cooked, contained flour that was contaminated with salmonella.
2. Between 2008 and 2009, peanut butter, peanut paste, and peanut products containing salmonella were shipped from a plant in Georgia. This resulted in the largest food recall in the nation's history and the bankruptcy of a major peanut processor.

In response to a request for comments from the FDA, the National Oilseed Processors Association listed several process controls that eliminate or reduce to acceptable levels the potential hazards that are associated with oilseed products:

- Restricting access to critical plant areas.
- Keeping vegetable oil in a closed system, free of contamination.
- Using elevated temperatures during processing to reduce the number of microbial organisms that may be present.
- Putting in place pest control programs.
- Securing hazardous chemicals and lubricants.
- Using common carriers who employ procedures to ensure that prior loads are compatible with food/feed ingredient products being shipped.
- Inspecting rail and barge cargo compartments for prior cargo and cleanliness.
- Using railcar sealing best management practices for crude vegetable oil.
- Following truck cleaning requirements and requiring truck drivers to certify that no prohibited mammalian protein was present in prior loads.
- Training employees on product safety and operating parameters.
- Using FDA-recommended recall procedures and implementing event-reporting procedures.
- Maintaining records for processing, maintenance, and inbound and outbound product shipping to support one-step-forward, one-step-back tracing.
- Sampling, grading, and visually inspecting inbound oilseed shipments for contamination.
- Following supplier-certified safety/purity requirements for meal flowability additives.

Although oilseed processing facilities are considered as "food" plants and are therefore covered by FSMA, it is expected that oilseed plants will fall under the "non-high-risk" category owing to the limited risk of these products.

The implication is that some of the mandates that are triggered by the "high-risk" food threshold will probably not need to be addressed. Despite the "non-high-risk" status of the industry, FSMA's focus on prevention is appropriate for the industry. As many of the processors have already adapted preventive measures, we should expect that the oilseed industry will continue to set a good example for food safety in the future.

in annual income from food or to a "qualified end user" such as the food consumer

FSMA also has a section that addresses intentional adulteration. In addition to the requirement identified above, the law mandates that the FDA coordinate with the Departments of Homeland Security and Agriculture to promulgate regulations to protect against intentional adulteration. These regulations, which are still pending, will be applicable to "high-risk" products, specifically those with short shelf lives or susceptibility to intentional contamination at critical control points, as well as products that are in bulk or batch form prior to being packaged for the final consumer.

Inspection, compliance, and response

FSMA requires the FDA to use a risk-based approach toward setting inspection frequency. This will allow the FDA to be efficient and effective with its existing resources. Specifically:

- Domestic high-risk facilities shall be inspected once in a five-year period following the enactment of FSMA and not less than every three years thereafter.
- Domestic non-high-risk facilities shall be inspected once in the seven-year period following the enactment of FSMA and not less than every five years thereafter.
- Six hundred (600) foreign facilities shall be inspected in the one-year period following the enactment of FSMA; and in each of the five years following the initial one-year period, the FDA shall inspect not fewer than twice the number of foreign facilities inspected by the FDA in the previous year. In other words, the law requires the FDA to double its resources every year for the inspection of foreign facilities.

FSMA also increases the authority of the FDA with regard to food safety compliance and response. Specifically, FSMA authorizes the FDA:

- To issue mandatory recalls if there is a "reasonable" probability that an article of food (other than infant formula) is adulterated or misbranded and the use of or exposure to such article will cause serious adverse health consequences or death to humans or animals and if the responsible party declines to cease distribution and recall such article.
- To access all existing facility records relating to an article of food whose use, or exposure to, is likely to have a reasonable probability of causing serious health consequences or death to humans or animals. Access is limited to records having to do with the manufacture, processing, packing, distribution, receipt, holding, or importation of such article by the responsible party.
- To detain an article of food administratively when there is "reason to believe" that it is "adulterated or misbranded."

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New food regulations in India

In August 2011, India's comprehensive Food Safety and Standards Act (FSSA) came into effect. The new act, passed five years ago, replaced the previous patchwork of safety laws with one set of rules that apply to all food products and food handlers.

The new rules regulate the production of food from farm to fork and involve government testing of agricultural produce and imported food; the mandatory registration and licensing of all food operators and vendors, including street vendors; strict hygienic procedures for processing, storing, supplying, and purchasing food; monetary penalties for breaking the rules; and parameters for acceptable fat content in foods.

The FSSA has also established a single reference point for all matters relating to food safety and standards, by moving from multilevel, multidepartmental control to a single line of command. Now, one independent statutory authority—the Food Safety and Standards Authority of India based in Delhi—will set science-based standards for articles of food destined for human consumption and will regulate its manufacture, storage, distribution, sale, and importation.

The government has increased the number of state testing laboratories and appointed more food safety officers to police food quality and hygiene as opposed to just monitoring adulteration. Meanwhile, *The Times of India* reported on October 20, 2011 (tinyurl.com/IndiaFoodSafety), that according to a study by the Confederation of Indian Food Trade and Industry and the Federation of Indian Chambers of Commerce and Industry, about 30% of those engaged in the food industry were unaware of the FSSA. However, 75% of the respondents who knew about the act felt there was "a need for harmonization of food regulations in the country with internationally accepted standards."

Under FSMA, all domestic and foreign facilities that manufacture, process, pack, or store food are required to register with the FDA under the Bioterrorism Act of 2002. Similarly, FSMA authorizes the FDA to suspend the registration of a facility if it determines that food manufactured, processed, packed, received, or held at the facility has a "reasonable probability" of causing serious adverse health consequences or death to humans or animals. This action ultimately results in the shutting down of the facility if it is located in the United States. For foreign facilities, it will result in the food from that facility being refused entry into the United States.

Import safety

As discussed earlier, an increasing amount of food consumed in the United States is imported, much of which is in the "high-risk" category. FSMA provides significant enhancements in the FDA's ability to provide greater oversight of imported food. The practice of relying on port-of-entry inspection is being shifted toward having importers responsible for ensuring that their foreign suppliers have adequate preventive controls in place. The intent is to have the food supply from abroad be as safe as the domestic food supply. Some of the important mandates related to import safety are as follows:

- FSMA requires that importers verify that their suppliers use risk-based preventive controls that provide the same level of protection as US requirements.
- FSMA provides for the expedited review and importation of food offered for importation by importers who participate in a voluntary supplier importer program.
- FSMA grants the FDA the authority to require assurances of compliance for high-risk foods.
- The FDA can deny entry of food from facilities that deny FDA access for inspection.
- The FDA can rely on accredited third parties to certify that foreign food facilities meet US requirements. This step will facilitate the ability of importers to participate in the voluntary qualified importer program, as well as provide assurances for the safety of high-risk food.

Enhanced partnerships

To facilitate the requirements for import safety, the FDA has a mandate to work with foreign governments to build their food safety capacity. This will allow the FDA to rely more heavily on foreign government oversight and prevent problems before the products reach the United States. In addition, the FDA will establish offices in foreign countries to provide assistance on food safety measures for food exported to the United States.

Enhancing food safety will also require partnerships between different US agencies. Although the FDA has jurisdiction over approximately 80% of the food supply, the Department of Agriculture has jurisdiction over the other 20%, which includes meat and poultry. Furthermore, the Department of Homeland Security handles matters involving intentional adulteration of food. Hence, FSMA sets the expectation that the different agencies will work together with a common goal of improving the country's food safety.

When an adulteration event occurs, the cooperation of state and local agencies will be necessary. Performing surveillance, attribution, and analysis will also require the joint effort of laboratories throughout the country. The requirements for these partnerships are outlined in FSMA. [See tinyurl.com/FSMAtext.]

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*inform*ation

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Methods for differentiating recycled cooking oil needed in China

Qian Ye and Xiaofang Pei

Chinese consumers have been repeatedly impacted by food safety events over the past few years. Recently, recycled cooking oil has emerged as a food safety issue that challenges government authorities and consumers alike.

Recycled cooking oil, or "gutter oil," is refined from kitchen waste, gutters, drains, and animal fat, as well as oil that has been repeatedly used to fry foods. By using a series of simple processes that include collection, preliminary filtration and boiling, refining, and the removal of adulterants, illegal gutter oil can be cleaned up enough to meet the sanitation standards of cooking oil and sold to low-end restaurants and small canteens. As a result, low-income people are major consumers of recycled cooking oil.

Although contamination with pathogenic microorganisms is not likely to be a problem in such recycled cooking oil, significant levels of toxic substances that remain in the oil, such as aflatoxins, polycyclic aromatic hydrocarbons, and 4-hydroxy-*trans*-2-nonenal (HNE), among others, might be harmful and could even cause cancers. So, the reuse of the gutter oil has caused great concern.

Why does recycled cooking oil make it back to the table? Significant profits are the major reason. Since the price of edible oils surged three years ago, a processor can easily sell one short ton of recycled cooking oil at half the price of fresh oil at a huge profit. For example, waste cooking oil can be purchased for about 3,000 renminbi (RMB), or $470 per ton. After a preliminary extraction, including deodorization, dehydration, and decolorization, the raw oil can then be re-sold at a price of 5,000 RMB per ton, while the retail market price of the end product is about 8,000–10,000 RMB per ton. Such huge profits lure greedy people to take part in this illegal practice, making it difficult to manage and control. Inadequate inspection, difficulties in identifying recycled cooking oil, and consumer habits, such as over-ordering at restaurants to show respect to guests, might also contribute to this phenomenon.

The Chinese government is taking several steps to address these problems and eliminate recycled cooking oil from people's dining tables. It has launched a plan to cut off the source of the recycled cooking oil by uniformly collecting kitchen waste and gutter oil. Harsh punishments have been introduced in an effort to deter unscrupulous traders and manufacturers. Restaurants that are found to purchase and use the harmful oils will be immediately shut down and subjected to heavy fines in accordance with the Food Safety Law of China.

Eradicating the marketing and use of recycled cooking oil is not an easy task. There are too many small restaurants for the public health authority to oversee. Recycled cooking oil is also extremely challenging to identify, so the Chinese government has made national and global appeals to scientists to develop new analytical methods that

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More on China

Gutter oil is just one of many recent food scandals that have plagued China. In 2007, thousands of pets in the United States and Canada fell ill after eating pet food containing ingredients from China that had been illegally adulterated with melamine and cyanuric acid. A year later, 300,000 people in China became sick, and at least six babies died, after consuming milk powder—again, laced with melamine. Then, in April 2011, three children in China died and an additional 35 were hospitalized after drinking milk contaminated with nitrite.

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CALENDAR (CONTINUED FROM PAGE 69)

May 13–16, 2012. 10th International Symposium on Supercritical Fluids, San Francisco, California, USA. Information: issf2012.com.

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

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

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

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

May 25–26, 2012. Global JojobaWorld 2012, Jaipur, India. Information: tinyurl.com/Jojoba2012.

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: issfal.org/conferences/vancouver-2012.

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

May 30–31, 2012. Cosmetic Science: The Good, the Bad and the Beautiful, Trinity College, Dublin, Ireland. Information: scs.org.uk/symposium-2012.

June

June 4–5, 2012. 9th European Workshop on the Biotechnology of Microalgae, Nuthetal, Germany. Information: microalgal-biotechnology.com.

June 10–13, 2012. The 2nd International Conference on Algal Biomass, Biofuels and Bioproducts, San Diego, California, USA. Information: algalbbb.com.

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; singapore.aocs.org. ■

Home and personal care: resilient surfactants and emerging markets

Developed markets may be teetering on recession, but demand for surfactants remains steady. In fact, demand is downright buoyant in countries such as Brazil, Russia, India, China, and the rest of Southeast Asia.

Tom Branna

Things are getting ugly out there, again. In the first half of 2011, raw material costs surged, forcing household and personal product marketers to sharpen their pencils and recalculate just how much it will cost to produce all those detergents and shampoos. In the second quarter (Q2), Unilever raised its prices sharply to offset higher commodity costs. More recently, in August 2011, there were growing signs that the US economy might be sliding toward recession. That spooked markets and sent consumer confidence levels tumbling.

Of course, industry experts are quick to point out that most categories in the household and personal care space are recession resistant. "The surfactant component of the home and personal care industry has been relatively inelastic under varied economic conditions," observed Mark Miller, business director, home and personal care, BASF. "For instance, while certain segments suffered in 2008, this was not the case for surfactants."

Stewart Warburton, global marketing director, home and personal care, Rhodia Novecare, agreed. "The surfactant market has remained resilient throughout these difficult times," he explained. "Some consumers may have traded down to lower price point brands, while others may have started buying their cleansing products through different channels; they have not reduced their level of personal or household hygiene."

Detergent prices took a hit last year as consumers shopped for value brands

Still, it took several personal care categories years to reclaim 2008 levels. And when budgets get tight, shoppers opt for private-label products or third-tier brands that may contain fewer ingredients and more water. That trend led to a price war within the laundry detergent market.

"[It] has been a challenging year for surfactants as oleochemical feedstock rose to unprecedented highs during the first two quarters of the year," said Phil Matena, vice president, sales and business development, active chemicals, Americas, at Innospec. "Q3 has seen an encouraging decline in these feedstocks; however, softening of

CONTINUED ON NEXT PAGE

demand will slow the flow of higher-cost product through the supply chain."

According to Matena, customers are coming to Innospec requesting reformulation assistance to address the rise in raw material costs. Their goal: take cost out while maintaining performance. "We are seeing successes in these collaborations," he insisted.

Last year, AkzoNobel's surfactant business recorded good results with continuing strong performance in home and personal care markets joined by a powerful recovery in other applications in its portfolio, such as agrochemicals and mining. This year, growth has moderated, but demand remains good in most markets, with some softening in consumer markets.

"We have not seen a slowdown in surfactant sales. Summer months are generally strong with consumers doing more laundry and hotel and restaurant vacation travel," said Craig Lundell, team leader–supplier relations, Sea-Land Chemical Co. "There have been supply disruptions due to raw material shortages such as the force majeure on Akypo products. We have seen a flattening of sales, but we are still up over 2010. Consumers are looking to save money and so far the manufacturers have worked hard to keep their market shares."

Growth markets

Market leaders such as Procter & Gamble, Unilever, and L'Oréal are all focused on emerging markets these days, especially those in Latin America and Asia, and the vast number of consumers who are growing more eager for western-style personal cleansers and household cleaners.

Neil Burns, of Neil A. Burns LLC, Freehold, New Jersey, USA, noted that the entire emerging market category is a growing one for surfactants, especially the much-touted BRIC countries (Brazil, Russia, India, and China). In addition, Southeast Asian countries such as Malaysia, Indonesia, and the Philippines are expanding rapidly.

In these markets, consumer products such as detergents, shampoos, and dishwash are still increasing in consumer penetration (as increasing percentages of these populations use such products on a daily basis), said Burns. "For these reasons, we continue to see substantial investment in surfactant and oleochemical feedstock production in these countries."

Back in the United States, RITA Corp. is experiencing an upsurge in the number of smaller hair care marketing companies with ideas and concepts who are looking for a development partner to help them bring their products to market.

"We can not only help formulate these products, but we're also helping our customers through the rest of the testing and scaleup," explained Dan Beio, vice president for research and development for RITA. "We've become, in many instances, their outsourced research and development (R&D). There are many of these marketing groups out there, the hard part is finding and connecting with them. Once we've had that initial meeting and can show the value we add, it's a totally transparent relationship."

In fact, Beio maintains that the company's surfactant sales are as strong as ever. In particular, there's growing demand for Ritafactant blends that do not contain any sulfated surfactants. These patented blends of lactylates, glucosides, sarcosinates, and betaines are custom-formulated and designed to mimic the foam performance of the sulfated surfactants for flash and foam stability, explained Beio.

"Many customers are using them as their entire surfactant phase, limiting the number and types of ingredients they have to order," he said.

As a result, instead of sourcing, ordering, receiving, and running quality assurance checks on four or five surfactant ingredients, RITA can custom blend one ingredient, to save customers time and money.

Green, greener, greenest

Rhodia offers a broad range of products designed to meet the increasing sustainability needs of the home and personal care market, according to Warburton. Rhodia's R&D projects are focused on developing more sustainable processes and products without compromising on performance.

"In alignment with our sustainability strategy, we have recently developed 100% biobased nonionic surfactants for application in laundry and household products," he said. "Our R&D program also focuses on developing a broad range of formulations that are effective at reduced chemical loading."

Consumers in the personal care market still demand mild products that give good skin feel and copious lather, noted Art Pavlidis, business manager, Hamposyls and APIs, Chattem Chemicals."The Hamposyls deliver those properties and more. We have enjoyed good growth as a result of the need to provide mild, nontoxic, and readily biodegradable surfactants."

With more marketers seeking a more sustainable corporate profile, they're turning to their suppliers for solutions. Chattem Chemicals is focusing on applications where there is concern about the biodegradability of the raw materials. According to Pavlidis, Hamposyl surfactants are readily biodegradable so they are becoming attractive for those applications.

Another aspect of sustainability is concentration. According to Miller of BASF, an ongoing trend in the home, personal care, and I&I [industrial and institutional cleaning] markets is the growing demand for more concentrated solutions that help reduce environmental impacts while maintaining effectiveness.

"There is also a continued need and market for concentrated products that help reduce consumption as well as a continued drive for consumer convenience," he said. "BASF's newly formed home and personal care team will now have a broad product offering combined with research and development expertise that will allow us to initiate joint development projects with our customers to meet market demands."

With the rise in consumer awareness for safe and environmentally friendly formulations, the need for natural surfactants is growing, noted Ellen Delisle, technical sales manager, Bio-Botanica Inc., adding that surfactant companies are looking at ways to supply consumer demand with many of them expanding into Asia.

"We offer BioSaponins, the natural surface-active agent. It is a combination of four saponins: wild yam root, yucca root, sarsaparilla root, and quillaja root," she said. "Saponins are naturally occurring, high-molecular-weight glucosides. If you want to remove harmful chemicals from your personal care products, go the natural route."

All Emery Oleochemical products are made from natural oils and fats derived from renewable raw materials such as coconuts, oil palms, sunflower seeds, and tallow. The product line is said to have wide-ranging appeal, especially for those seeking to drive the sustainability and renewable agenda.

According to Kongkrapan Intarajang, group chief executive officer of Emery Oleochemicals, the company's strong foundation in oleo basics enables it to provide naturally based products that meet special customer specifications and requirements for items such as soap bars, fragrances, and cosmetics through its fatty acid and fatty alcohol range.

"Globally recognized names such as Edenor and Emery are brands much sought after for their natural, high quality, and good biodegradable properties," explained Intarajang. "In addition, our approach to innovation, which draws its strength from industry recognitions such as being remembered as developers of the highest grade (99.8%) of natural based glycerin at that time, is fundamental to our long-term success."

Stepan Co. entered into a joint developmental agreement with Elevance Renewable Sciences, Inc. to evaluate and commercialize novel surfactants, antimicrobials, and polyurethane polyols based on Elevance's specialty feedstocks, including 9-decenoic ester and C18 di-basic ester. They have a variety of applications for the consumer, institutional, industrial, and broader surfactant marketplace.

Both companies agree the move is an opportunity to provide an expanded product portfolio based on biorenewable feedstocks. Developing new biorenewable technologies with performance benefits is consistent with Stepan's customer's growth initiatives and their sustainability goals.

Sustainability plays a key role in product development at many other companies, including AkzoNobel.

"In the fabric and cleaning area, we see increased emphasis on not only environmentally friendly products but also products which are produced from sustainable resources as consumers worldwide become increasingly aware of their environmental footprint," explained Alfred Wong, global marketing and development manager, fabric and cleaning, AkzoNobel Surface Chemistry.

According to Burns, work is under way to add a so-called "third leg" to the surfactant supply chain. The existing two legs are petrochemical and oleochemical—but both legs have sustainability issues. A solution to these sustainability problems, he said, is in the form of new technology to enable the production of surfactant feedstocks from sources such as sugarcane, corn, lignocellulose, and beets.

These are being commercialized by relatively new companies such as Solazyme and Elevance, said Burns.

A quiet year for regulations

With so many suppliers taking the lead on issues such as sustainability, most agree that it has been a relatively quiet year for regulations. Burns noted that REACH [the European program of **R**egistration, **E**valuation, **A**uthorisation and Restriction of **Ch**emical substances] has had the biggest impact on surfactant producers in the recent past.

For example, AkzoNobel Surface Chemistry successfully submitted all 2010 REACH registrations, the first registration phase of the new European Union chemical legislation. A total of 51 dossiers were submitted to the European Chemicals Agency (ECHA) before the November 30, 2010, deadline.

"From our vantage point, REACH has had an impact on all companies that wish to do business with or in Europe," explained Andy Girdharry, global personal care. "This has required a vast amount of regulatory input to support existing products made today and creates a hurdle rate for new products—a minimum return required—when they are placed onto the market."

Wong pointed out that nonylphenol ethoxylates (NPE) are being phased out globally, especially in cleaning applications. In North America, the phaseout, which has already begun, is being coordinated with the US Environmental Protection Agency's Design for Environment (DfE) Safer Detergent Stewardship Initiative (SDSI) and would end the use of NPE in industrial laundry detergents by 2013 for liquids and 2014 for powders.

"The AkzoNobel Fabric and Cleaning team has designed Berol 609 to replace specific APEOs [alkylphenolethoxylates] in specific cleaning applications," he explained. "Berol 609 is a green surfactant that is DfE-registered and continues to gain traction in the marketplace."

The ban on phosphates in the United States will continue to drive new solutions for the automatic dishwash market, according to Miller, who pointed out that BASF's broad portfolio for home care and I&I includes special additives, such as rinse aid surfactants, complexing agents, and polymers that can be used as alternatives to phosphates in automatic dishwashing formulations, while maintaining high performance.

At the same time, BASF remains focused on methanesulfonic acid (MSA), which is phosphoric acid replacement in detergent formulations, because of the high solubility of its salts and relatively low corrosivity. MSA is easy to handle, nonoxidizing, readily biodegradable, and chloride free, according to Miller.

"The California solvent legislation will drive formulators to look for new solutions that reduce VOC [volatile organic compound] levels—this can include a shift toward surfactants," he told *HAPPI*. "At BASF, we offer naturally derived surfactants such as APG [alkyl polyglucoside], a mild, biodegradable surfactant that plays an important role in cosmetic and body care formulations."

Recent moves

While global economies ebb and flow and regulators debate new action, surfactant suppliers aren't standing still. In June 2011, Rhodia and SIBUR signed a letter of intent to create a joint venture in specialty surfactants. This strategic alliance is focused on creating a leader in the CIS [Commonwealth of Independent States] market where specialty surfactants are used particularly in home and personal care, as well as in the oil and gas industries, where the surfactants sector is growing more than 6% a year, according to Rhodia.

SIBUR, the leading petrochemical company in Russia, will contribute its raw materials, production, and logistics capabilities. The new 50:50 joint venture will be located in Russia at Dzerzhinsk, near SIBUR's petrochemicals operations, 400 km east of Moscow, and will begin operating in 2013.

"This strategic partnership is a key step in our development in the dynamic surfactants market in the CIS and Eastern Europe," commented Christophe Clemente, vice president–Europe, Rhodia Novecare.

"This alliance will reinforce our leading position worldwide in specialty surfactants and is fully aligned with our growth strategy. It demonstrates our commitment to become the preferred partner of our customers as they expand in fast-growing countries," added Emmanuel Butstraen, president, Rhodia Novecare.

Earlier in 2011, Rhodia acquired a guar-derivatives production unit in Zhangjiagang, China. It complements Rhodia's existing global guar-derivatives manufacturing footprint with production units located in the United States, France, and India. This acquisition enables Rhodia to meet the fast-growing demand for guar-based products in Asia, particularly in personal care.

And in 2010, Rhodia acquired Feixiang Chemicals. Feixiang, China's leading producer of amines and surfactants, strengthens Rhodia's leadership position in surfactants and enhances its footprint in the world's fastest-growing region. Feixiang will contribute its expertise in amine and cationic surfactants technologies and will extend Rhodia's portfolio in amphoteric and cationic surfactants for the home and personal care and industrial cleaning markets.

Lubrizol acquired the Performance Products Group from Nalco in January 2011, adding the market-leading brands Merquat and Sensomer CI-50 conditioning polymers to its existing cassia-derived conditioning polymers.

"Through this acquisition, Lubrizol has gained expertise in conditioning and delivery of actives to the hair and skin to complement our already market-leading position in rheology and appearance modification in surfactant cleansing systems," explained Timothy Roach, strategic marketing manager, cleansing applications, Lubrizol Advanced Materials.

RITA is always on the lookout for new partners and technologies, according to Beio, who noted that plant expansions were recently completed at its Mexican and Crystal Lake, Illiniois, USA, facilities.

"We have also partnered with new companies worldwide to take advantage of positions on raw feedstock ingredients," said Beio. "If we can't make it, we'll find someone who can and put the necessary pieces in place to ensure the quality and consistency our customers expect from RITA."

RITA also expanded its Ritafactant blends. These surfactant combinations with RITA's acyl lactylates are patented, giving the company the flexibility to custom blend for its customers, and design molecules that perform exactly as they would like.

Emery Oleochemicals recently formed joint ventures with ERCA Group (Europe) and AK Chemtech (Korea) to advance in the household and personal care sectors.

"In our drive to broaden our portfolio, customers can expect us to continue to maintain our focus on our core commodity chemical business, whilst leveraging our competitive advantage—in size, scale, global footprint, and technology—to move toward becoming a recognized specialty chemical player," explained Intarajang.

Innospec expands its reach

Innospec continues to expand its commercial presence in Asia, Latin America, and Europe to enhance its intimacy with regional and global customers. In January 2011, the company commissioned a new reactor at its site in North Carolina to stay ahead of the growing demand for Iselux, its new sulfate-free surfactant. Elsewhere, Innospec is actively pursuing acquisition opportunities to enhance its portfolio and global position in personal care, according to Matena.

During the past 18 months, the surfactants group of Stepan Co. made investments to diversify its product line and expand its franchise geographically. With its large, diverse, and growing consumer, agricultural, and oil field markets, Brazil provides a substantial growth market. Stepan has added neutralization capacity to its large sulfation unit in Vespasiano, Brazil, to better serve this large, growing market.

A key part of Stepan's strategy is to build its surfactant franchise in Asia. More than 18 months ago, Stepan acquired manufacturing assets of Peter Cremer's 100,000-ton-per-year methyl ester plant located in Singapore. It enables Stepan to provide global customers with methyl esters and value-added derivatives, a core building block of its specialty surfactant business. Production will begin in the second quarter 2012.

Stepan also increased ownership in its joint venture, Stepan Philippines Inc. (SPI). SPI operates a surfactant manufacturing plant producing laundry and cleaning products, fabric softeners, and functional surfactants for the Philippines and other Asian markets.

AkzoNobel has made two key acquisitions. To further strengthen its leadership position in specialty surfactants while enhancing its manufacturing footprint in Asia, the company acquired Boxing Oleochemicals, which is said to be the leading supplier of nitrile amines and derivatives in China and throughout Asia. Boxing's activities will be integrated into AkzoNobel's Surface Chemistry business. The deal was completed in January 2012.

In early 2011, AkzoNobel acquired from Integrated Botanical Technologies (IBT) its patented Zeta Fraction technology, which is transforming how plant-based chemistry is used. The process developed by IBT makes it possible to harvest and separate constituent parts of a living cell from any plant or marine source without any solvents.

But perhaps the biggest move to affect the industry was BASF's December 2010 acquisition of Cognis. According to Miller, the integration of Cognis is proceeding successfully and the BASF team is ready to provide solutions to the home and personal care market.

"The combined portfolio and collective expertise from BASF and Cognis enable us to supply the most comprehensive product portfolio, formulation concepts, new innovations, technical and research capabilities, and sustainable solutions," he said.

"Better understanding of consumer needs, and more opportunities for innovation will enhance our position in personal care ingredients and strengthen our leading position in value added products for home care."

Neil A. Burns LLC entered into a long-term agreement with Reed Business Information Ltd. of the United Kingdom to produce conferences and training courses relating to surfactants globally. The venture's first event was a surfactant conference in May 2011 in New York City. The ICIS Asian Surfactant Conference, held November 10-11, 2011, at the Intercontinental Hotel in Singapore, was the first conference as part of this formal agreement.

New launches

As companies expand their operations they are, of course, expanding their product lines, too. Stepan introduced Bio-Soft GSB-9, a nonionic blend for those looking at APE replacement or for those interested in a versatile nonionic surfactant for use in multiple hard-surface cleaning applications. Bio-Soft GSB-9 has a quick dissolution time and no gel phase when added to cold water (40°F, or 4.4°C).

For the personal care industry, AkzoNobel launched four rheology modifiers in 2011, which also act as foam boosters, under its new Structure Cel trade name. The new products, ethyl hydroxyethyl cellulose, methyl ethyl hydroxyethyl cellulose, and hydrophobically modified ethyl hydroxyethyl cellulose derivatives, are natural-based polymers with high surface activity, wide molecular weight range, and various degrees of ethoxylation, alkylation, and surface treatments, according to Girdharry.

Those properties contribute to enhanced foam characteristics for rinse-off applications such as shampoos, body washes, and facial cleansers," he explained. "In addition, they build viscosity, exhibit shear-thinning rheology, improve elasticity, contribute to formula stabilization, and provide salt tolerance—all attributes that are desirable for personal care applications, including shampoos, body washes, conditioners, and hair styling formulations."

In the home care sector, AkzoNobel's Wong pointed to several launches that address market needs and the growing emphasis on being both environmentally friendly and sustainable. For example, Alcoguard H 5240 is a more sustainable water-soluble polymer for detergents. It uses hybrid biopolymer technology that combines the benefits of both synthetic and natural polymer components to provide effective performance and an improved environmental profile. Most recently, Alcoguard H 5240 was granted DfE certification by the US Environmental Protection Agency.

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Singapore: *the* place to be in October 2012

Emily Wickstrom

During October 29–31, 2012, some of the best minds in the fabric and home care industry will gather at the Shangri-La Hotel in Singapore for Singapore 2012, AOCS' World Conference on Fabric and Home Care. This rare meeting of minds will continue the conversation that began at the 2010 Montreux World Conference, a premier industry event that is held every four years in Montreux, Switzerland. Will you be among them?

Sometimes called the "little red dot," for the way it appears on many world maps, Singapore is surprisingly big in the world economy. In 2011, the World Bank Ease of Doing Business Index ranked Singapore as the easiest place in the world to do business—ahead of both Hong Kong and New Zealand. Singapore also ranked third in the World Economic Forum's Global Competitiveness Report and was the third-fastest growing economy in the world in 2010. Its vibrant culture not only draws on its own rich and unique history but is also a showcase for innovation and design that spans the east-west divide.

As a destination, Singapore defies its geographical size. There are endless things to do and see, which allow visitors to customize their experience to their preferences. Whether you like art and culture, nature and adventure, or eating and shopping, you will find it in Singapore!

Need more convincing? Here are 10 things in Singapore that you do not want to miss.

1. Culture

Singapore is one of the most cosmopolitan places in the world, with a diverse blend of people and cultures. Almost all of the locals speak more than one language, with English, Chinese, Malay, and Tamil all considered to be official languages of the country. Singapore is known for its mixture of diversity as well as its cohesiveness, which is evident in the profusion of dining and entertainment options.

2. Cuisine

No matter what you are hungry for, you can satisfy your craving in Singapore, where food is taken very seriously. The country's diversity is reflected in its dining selections, highlighted by local cuisines of Chinese, Malay, Indian, and Peranakan. Must-try dishes include Hainanese chicken rice, nasi lemak, and ayam buah keluak.

3. Nightlife

Looking for some nighttime diversions? You can find that in Singapore as well. Local music acts take center stage nightly at venues like Timbre @ The Substation and Shanghai, while popular bar/lounges for tourists include Boat Quay and Clarke Quay. For even more excitement, check out St James Power Station, an entertainment complex with 10 venues, each of which features a different music genre.

4. Art

Singapore is well known for its art scene, with museums, galleries, and exhibitions scattered throughout the city. Most recognized is the

Singapore 2012 at a Glance

29–31 October, 2012, Shangri-La Hotel, Singapore

View the meeting schedule, register, and make hotel reservations online at singapore.aocs.org.

Questions? Contact the AOCS Meetings & Exhibits Department at +1 217-693-4821 or meetings@aocs.org.

Singapore Art Museum, which hosts a large collection of modern and contemporary Southeast Asian art. Other places to check out include the Red Dot Design Museum (innovative design concepts), the NUS Art Museum (social history and the art of Asia), and the Art Retreat (modern Asian and European art).

5. Shopping

World-class shopping is abundant. Whether you're looking for bargains or just like to browse, Singapore will not disappoint. The main shopping district, Orchard Road, is in walking distance of the Shangri-La Hotel and features shopping centers with high-end items and the latest trends. Those who are looking for cultural shopping should check out the districts of Kampong Glam, Little India, and Chinatown.

6. Attractions

Sentosa Island is a great destination for fun, as it is home to popular attractions such as Universal Studios Singapore, Songs of the Sea, Tiger Sky Tower, MegaZip Adventure Park, and Sentosa Wave House. For a panoramic view of the city, check out the Singapore Flyer, the tallest Ferris wheel in the world, or take a ride on Singapore's cable car.

7. History

Those interested in learning about Singapore's history will find several options. Five heritage centers—Chinatown, Chinese, Civil Defence, Eurasian, and Malay—allow visitors to experience different eras and key historical moments. Museums to look into include the National Museum of Singapore, Peranakan Museum, Asian Civilisations Museum, and the Army Museum of Singapore.

8. Nature

The island of Pulau Hantu is home to lagoons and sheltered beaches, while Bukit Timah Nature Reserve is considered Singapore's oldest rainforest with over 500 species of animals and over 840 species of flowering plants. Another popular destination is Bukit Batok Nature Park, with walking trails and lookout points to breathtaking views. The Singapore Botanic Gardens are internationally renowned and a tourist hot spot.

9. Business

Singapore is a global leader in several areas. It has the third-largest petroleum refining center, is the world's fourth-leading financial center, and offers the second-largest market for casino gambling. Singapore's port is the busiest transshipment port in the world, and the country is home to the largest number of millionaire households per capita in the world.

10. Architecture

Singapore's famous skyline features several architectural highlights. The Esplanade—Theatres on the Bay is a unique structure with two spiked shells that are said to look from afar like the eyes of a fly or a giant durian fruit. The Arts House, the oldest government building in Singapore, was originally built in 1827 and features a bronze elephant in front. The Helix Bridge is a modern marvel, as the pedestrian bridge is curved—the first of its kind.

As you can see, there is plenty to see and do in Singapore. We are looking forward to visiting this one-of-a-kind destination and hope you will join us for Singapore 2012, the World Conference on Fabric and Home Care.

Visit singapore.aocs.org for travel tips and helpful sightseeing links.

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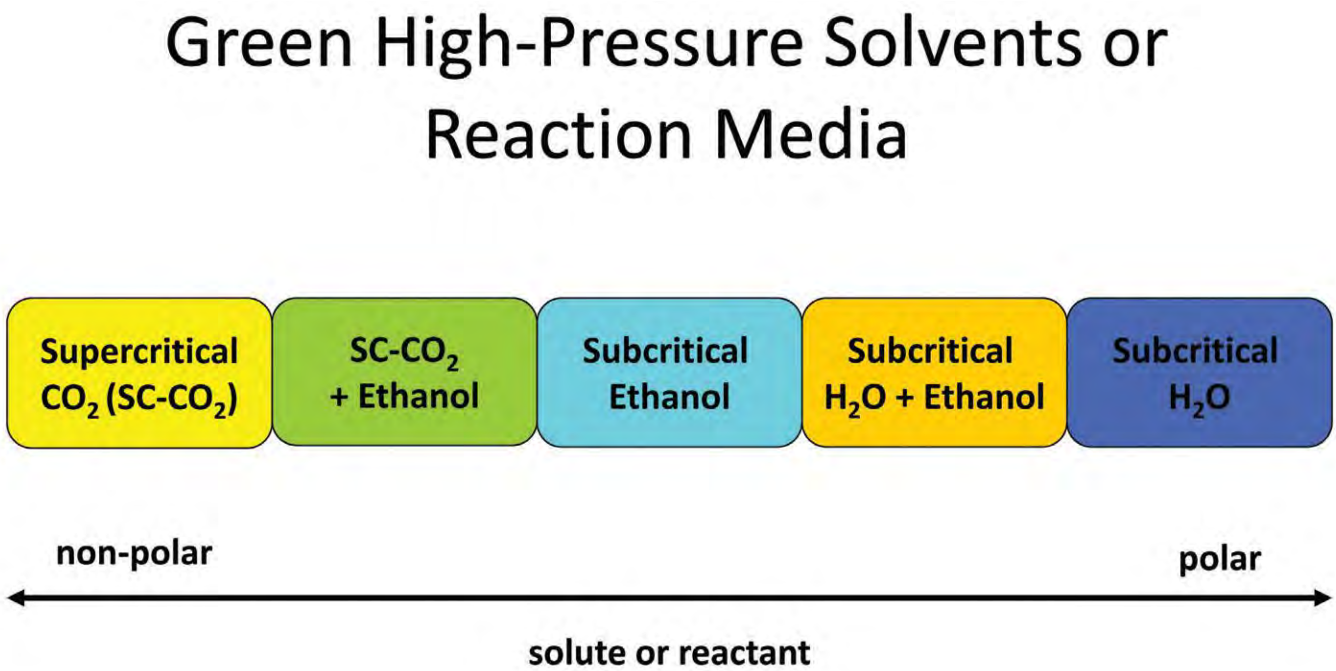

FIG. 1. *Critical fluid sol ents or reaction media.*

Supercritical fluid-based extraction/ processing: then and now

Jerry W. King

The term "supercritical fluid extraction" (SFE) in the field of oils and fats processing often brings to mind a technology that emerged in the early 1980s as a potential replacement for hexane extraction of commodity seed oils [1]. Despite promising laboratory and pilot plant-scale tests, the technology's application to seed oils languished owing to high capitalization costs and the inability to develop a consistent solids feed system comparable to those used in conventional organic solvent-based processes. Industrial adoption waned in ensuing years even though several novel approaches to feeding solids into high-pressure extractors, such as high-pressure lock hoppers or auger-based screw conveyors, were developed [2].

Despite this setback, SFE is alive and well and being applied to many substrates that contain lipid matter. If a "production plant" is defined as a process that produces a product for sale, then it has been estimated that there are over 125 plants worldwide using critical fluids. Most of these facilities use supercritical carbon dioxide (SC-CO_2) since CO_2 is environmentally benign and readily available from the atmosphere, geological deposits, and fermentation processes (such as bioethanol production). Indeed, in this author's 40 years of association with this field, the concept of locating an SFE-based processing facility next to a bioethanol production facility has often been mentioned.

Both sub- and supercritical propane have also been used to produce food products, particularly those with a lowered fat content. SC-CO_2 and propane are GRAS-approved (i.e., are Generally Recognized As Safe by the US Food and Drug Administration) for contact with foodstuffs; and the use of food-compatible co-solvents with SC-CO_2, such as ethanol, extends the range of SFE for processing substrates that can contain polar lipids (such as phospholipids) and related compounds [3].

Figure 1 illustrates the spectrum of critical fluid-based solvents that can be applied to lipophilic substrates to produce food and nutraceutical ingredients from lipid-containing feedstocks. In applying SFE to foods and agricultural materials processing, issues such as the degree of comminution and substrate water content have a significant effect on the resultant extract and must be controlled to ensure the desired result. A prime example is the often-cited SFE of water-tempered coffee beans and teas that have been used to produce commercial products for some time now using SC-CO_2 extraction.

Expanding the role of supercritical fluids

It is interesting to examine the developmental eras of critical fluid-based technology (Fig. 2) and their relevance to lipids processing. From the early 1980s, the processing technology expanded into modes other than just SFE. The rise of supercritical fluid fractionation (SFF) methodology, embracing columnar-based schemes using distillation-type towers, as well as production-scale supercritical fluid chromatography (SFC), is documented in the literature [4], but these techniques have faced stiff competition from technologies such as molecular distillation and high-performance liquid chromatography (HPLC). Columnar fractionation-based methods, based on longitudinal temperature gradients along the column, can be operated in either concurrent or countercurrent modes with respect to substrate feeds vs. flow of the critical fluid. Such an approach can enrich lipid-containing mixtures with respect to their concentration in the natural oil matrix, resulting in extracts or raffinates with potential value as nutraceutical ingredients or functional food additives. Toward that end, production plants have evolved to concentrate lipids such as tocopherols, pigments, and sterols.

During the late 1980s and early 1990s, critical fluid-based techniques were gradually adopted by analytical chemists. Regulatory pressures to reduce the use of organic solvents in laboratory environments made SFE attractive to chemists because SC-CO_2 is a virtually solventless extraction medium. Considerable effort was made to develop extraction and cleanup techniques [5]. With respect to lipid matter and food analysis, three main themes emerged: (i) application for total fat/oil content as a replacement for Soxhlet-based methods, (ii) extraction of trace analytes followed by fractionation of lipid-containing material, and later (iii) assays compatible with the demands of the US Nutritional Labeling and Education Act of 1990. Although many sophisticated methods and types of instrumentation were developed during this period, competition from reduced solvent-based techniques lessened the use and impact of SFE in analytical chemistry. Nevertheless, many SFE techniques became standard operating procedures both in the United States and abroad, and these instrumental approaches continue to be used in support of process research and development.

Likewise, supercritical fluid chromatography (SFC) has found a particular niche in the pharmaceutical industry for the rapid characterization of chiral compounds. From the perspective of current applied lipid analysis, SFC is a very complementary and perhaps preferred technique to gas chromatography and HPLC for the rapid characterization of the major groups in biodiesel synthesis, as demonstrated in the early 1990s [6]. Within 30 minutes or less, SFC can break down the major functional lipid groups such as fatty acids, mono-, di-, and triglycerides found in biodiesel so they can be quantified.

Reactions of interest to the oils-fats-lipids community have been developed using sub- and supercritical fluid media. Although there are exceptions, most reaction scenarios fall into one of three categories: (i) enzymatic-initiated reactions, (ii) hydrogenation of oils and oleophilic derivatives, and (iii) hydrolysis-based transformations produced in the presence of subcritical water and SC-CO_2—both neat and in the presence of various catalysts. Initial studies using primarily lipases in the presence of predominantly SC-CO_2 appeared in the early 1990s [7]. Enzymatic catalysis in the presence of supercritical fluids may not be practical for large-scale transformation of the lipids because of the sensitivity of enzymes to the presence of water, their denaturation at high temperatures and pressures, and their cost. However, niche applications in the synthesis of specialty chemicals or aroma compounds, in which avoidance of organic solvents is desired and consumer safety a concern, appear more feasible.

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Developments in CF Technology

1970 – Supercritical Fluid Extraction (SFE – Foods)
1977 – Energy Applications (Fermentation, Fuels, etc.)
1980 – Analytical Applications (SFE + SFC)
1982 – Supercritical Water Oxidation
1988 – Supercritical Fluid Fractionation (SFF)
1993 – Supercritical Fluid Reactions (SFR – Enzymatic, Hydrogenation)
1993 – Applications in Material Science + Cleaning Technology
1996 – Fine Particle Production
1997 – Renaissance of SFE/SFF (Nutraceuticals, Herbals, etc.)
1997 – Green Chemistry/Engineering (Integrated Processing)
2000 – Sustainability/Bioenergy/Biomass

FIG. 2. *Sequence of developments in critical fluid technology. SFC, supercritical fluid ch omatography.*

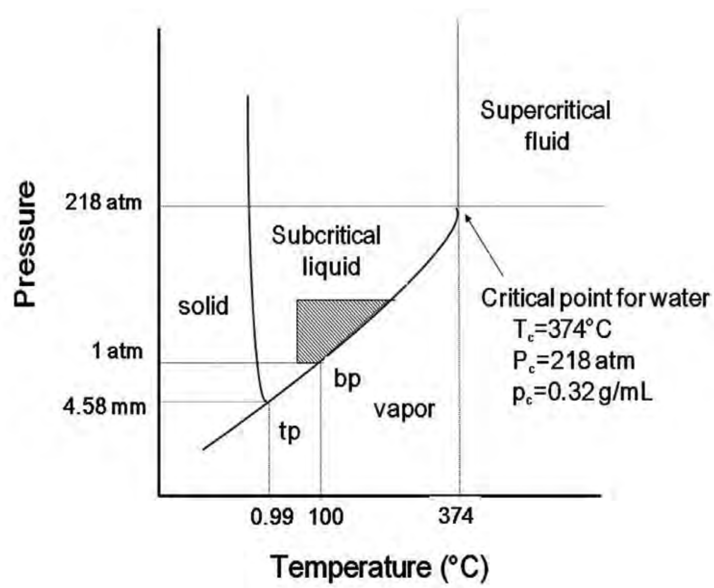

FIG. 3. *The phase diagram for water as a function of temperature and pressure. Abbreviation: tp, triple point; bp, boiling point.*

FIG. 4. *Osaka, Japan: "Eco-Town" subcritical water hydrolysis plant.*

Hydrogenation in the presence of supercritical fluids offers some interesting possibilities since the kinetics for such reactions can be accelerated by 500–1000 times and offer benefits in product selectivity and postreaction isolation of products [8]. The synthesis of oleochemical derivatives such as fatty alcohols, using either SC-CO_2, propane, or *n*-butane, can be more environmentally benign, as demonstrated by van den Hark *et al.* [9] on a pilot plant scale, and by others.

Hydrolysis of fats or oils—traditionally called "fat splitting"—has been accomplished since the 1940s in the presence of subcritical water above its boiling point but under pressure as illustrated in Figure 3. Although traditional fat splitting is often recognized as a hydrolysis process, it actually is using water in its subcritical state, and actually offers a "green," catalyst-free method for the hydrolysis of oils-fats and related materials. By exploiting the temperature dependence of water's hydrolysis constant (K_w), acid-base chemistry becomes possible even at modestly elevated pressures and temperatures, in contrast to the higher pressures required in supercritical fluid-based processes. In terms of biofuels, the treatment of recycled synthetic and bio-derived wastes using subcritical water for hydrolysis has been demonstrated as an appropriate method for the conversion of waste fats into biodiesel, or for the production of methane and methanol fuels from mixed biowaste streams, and it is appropriate for integration in a sequential manner with a liquid or SC-CO_2-based unit process [10].

One large-scale example of a subcritical water-based processing plant is shown in Figure 4, located in "Eco-Town" in Osaka, Japan, which is capable of processing industrial and biowaste into useful energy-related products, such as methane, methanol, and fatty acids for conversion to biodiesel.

CO_2 and water for lipids?

The mixing of CO_2 both at low and high pressures with water as well as the addition of CO_2 to organic liquids has fostered some unique chemistry that is green and sustainable and that often results in superior products. The addition of CO_2 to water, of course, results in its acidification below a pH~3.0, depending on the CO_2 pressure and temperature of the aqueous solution. As noted previously, these conditions can be exploited for acid hydrolysis of lipid moieties. Even oil and fat mixtures containing low levels of moisture are not immune to an autocatalytic effect in the presence of CO_2. The glycerolysis or methanolysis of oil-/fat-containing materials can be accomplished in the mere presence of CO_2 without resorting to the addition of a catalyst to initiate the reactions. Such an approach is very attractive from a green synthesis perspective. The addition of pressurized CO_2 to some conventional organic liquids results in a gas-expanded fluid that exhibits properties intermediate between those of a gas and liquid. Wyatt and Haas [11] as well as others have demonstrated the applicability of this approach for the methanolysis of oils-fats to methyl esters.

SFE redux and a plethora of products

There has been considerable progress in developing CO_2-assisted expellers that permit continuous SFE. Though this concept dates back to the mid-1980s when an auger-type screw press was used to assist in the SFE of oils from seeds [2], it has only recently been realized on a plant production scale. In this hybrid system, the SC-CO_2 contacts the oil seed matrix in the expeller barrel. The supercritical fluid phase is created by the hydraulic compression of the feed matrix–fluid mixture, which results in an increase in the temperature and pressure in the expeller barrel. This compression process also enhances the fluidity of liquids, thereby enhancing the extraction of oil as the seeds are expelled. This concept is being tested for the extraction of oil from seeds by several US companies on a pilot scale. This commercial system, as offered by Crown Iron Works, is known as the HIPLEX process and is due largely due to the efforts of Foidl [12]. High oil yields have been obtained from soybean and canola oilseed. These have produced functional meals for incorporation into foods; further de-oiling of press cakes is also possible using this approach. More details on CO_2-assisted expelling can be found in the chapter by Srinivas and King in *Functional Food Product Development* [13].

SFE continues to find applications too numerous to mention in this update. As judged from the variety of lipophilic extracts available as commercial products, including those that explicitly state they are "supercritical" in origin, the future continues to look bright for SFE in the high-value lipophilic extractives marketplace. Specialty products such as polyunsaturated fatty acid esters derived from fish oils, neat and roasted sesame oil, cranberry seed-based oils, oils high in n-3- and n-6 fatty acid content, pumpkin seed and sea-buckthorn seed-derived extracts, mustard seed oil, SC-CO_2-derived chia seed oil, and fiber for nutraceutical use join the traditional SFE-derived products, including decaffeinated coffee, hops extract, ginseng, and spice and antioxidant extracts. The lipophilic extract, using predominantly SC-CO_2, from saw-tooth palmetto berry is a proven treatment for prostate problems. Often these extracts are advertised as "hexane-free," as are the expeller-based products. Newer niche products have emerged in the past two years such as ayurvedic medicine extractives that are produced by extraction with SC-CO_2 followed by a hydro-ethanolic pressurized solvent extraction.

An array of critical fluid-based processing operations can be applied to a common agricultural commodity such as rice or rice bran. Hence, SFE can be applied to derive the oil, which can then be fractionated using SC-CO_2 or hydrolyzed into its constituent fatty acids by using subcritical water. Several plant-scale facilities now exist in Asia for treating rice to retard the development of rancidity and extend the rice product's shelf life, as described by King *et al.* [14].

In the late 1980s, the cosmetic industry paid little attention to lipophilic extractives derived by SC-CO_2 extraction. This has changed somewhat with the incorporation of SC-CO_2-derived jojoba extracts, lutein esters for topical applications, and SFE-derived Job's tears extracts for the Asian cosmetics marketplace. There is even an SC-CO_2-derived "organic sexual lubricant" called "Nude."

These new marketplace developments are important since current schemes for processing algae-derived oils for biodiesel use advocate the removal of higher-value lipophilic components such as antioxidants and pigments prior to conversion to methyl esters for use as biodiesel.

The most recent knowledge in this field will be presented at the 10th International Symposium on Supercritical Fluids (ISSF), to be held May 13–16, 2012, in San Francisco, California, USA. This series of ISSF symposia highlights the latest developments in the field with topical sessions on biomass and energy-related conversions, reactions in critical fluids, natural products/nutraceuticals/food-related materials, industrial applications of critical fluids, green chemistry/engineering, supercritical fluids, and more. For information, visit issf2012.com.

A member of inform*'s editorial advisory committee, Jerry W. King currently holds the Ansel & Virginia Condray Endowed Professorship in Biochemical and Chemical Separations in the Department of Chemical Engineering at the University of Arkansas (Fayetteville, USA). He has over 40 years of experience in supercritical fluid technology and separation science, is the author of 240 publications, holds three patents, and has received numerous scientific awards. He is chairman of the 10th International Symposium on Supercritical Fluids being held in San Francisco, California, USA, May 13–16, 2012.*

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RECYCLED COOKING OIL IN CHINA (CONTINUED FROM PAGE 115)

can be used to differentiate gutter oil quickly and easily. No satisfactory suggestions have been obtained thus far. Meanwhile, some people may think that forbidding the use of recycled cooking oil is not based on risk analysis. So, assessing the risks of gutter oil in the kitchen could be a tough task for professionals.

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More on China (CONTINUED FROM PAGE 115)

According to a *New Scientist* article that appeared online at tinyurl.com/NewSci-China on August 2, 2011, China's Food Safety Commission (FSC) has responded by ramping up its law enforcement. About 2,000 people have been arrested, and nearly 5,000 businesses shut down. Since the incident in April 2011, nearly six million food businesses have been inspected.

The central government has also strengthened food safety laws. The penalty for some infringements that formerly carried fines have been increased and now carry the possibility of imprisonment. In July 2011, the Chinese state-run news agency Xinhua reported that one man was given a suspended death sentence for producing and distributing clenbuterol, which speeds muscle growth in pigs but is poisonous to humans.

Yet, an article that appeared in Food Navigator-asia.com (tinyurl.com/FoodNav-Asia-safety) on November 23, 2011, pointed out that while China has revamped its food safety laws, inconsistent methods, procedures, equipment, and resources as well as poor coordination between provincial and national governments make enforcement extremely challenging.

Interestingly, the December 2011 issue of the *The Atlantic* included an extensive feature article by Orville Schell (tinyurl.com/Atlantic-Schell-China) about how the world's largest retailer, Walmart Stores, Inc., is improving safety and the environment in China—by insisting that the companies it does business with implement higher standards.

Meanwhile, Food Production Daily.com reported on December 5, 2011, that 5,575 International Organization for Standardization (ISO) 22000: 2005 food safety management systems standard certifications were awarded to food sector businesses in China in 2010—more than doubling the certifications awarded to Chinese food sector businesses in 2009, and accounting for almost a third of the 18,630 certificates issued worldwide in 2010 (see http://tinyurl.com/7cfu8sw).

HOME AND PERSONAL CARE (CONTINUED FROM PAGE 121)

Another novel product is Berol HD, a concentrated liquid surfactant product that provides an environmentally friendly cleaning alternative to heavy-duty degreasers containing high-VOC petrochemical solvents, according to AkzoNobel. Readily biodegradable, Berol HD mixes easily with builders and water to form efficient, aqueous degreasing formulations for heavy-duty, low-VOC cleaning performance.

Two new launches at BASF include Dehypon Wet, an optimized surfactant that is said to provide quick and easy cleaning due to its excellent wetting behavior, resulting in a fast-action feature. Cleaners requiring this fast action together with low foam behavior such as automatic cleaners, floor cleaners, and cleaning wipes are the target application areas for Dehypon Wet.

Plantacare 818 UP is a sugar surfactant for personal care applications. Raw materials for the Plantacare 818 UP are fatty alcohols from coconut or palm kernel oil and glucose of corn. Plantacare 818 UP shows excellent performance in foaming, cleaning, and mildness, which makes it ideal for mild shampoo, bath, and shower gels applications.

During the past two years, Lubrizol launched three new materials. Chembetaine ACB is a naturally derived, biobased amphoteric surfactant that builds excellent viscosity and boosts foam in hard or soft water. It reduces irritation when formulated with anionic surfactants and is ethylene oxide- and formaldehyde-free.

In 2010, Lubrizol launched Carbopol Aqua SF-2 polymer, a rheology modifier that delivers exceptional clarity, elegant flow properties, and suspension of insoluble ingredients in surfactant systems formulated at pHs below 6. It is said to be ideal for use in cleansing systems that incorporate food-grade preservative systems.

Most recently, in June 2011, Lubrizol launched Glucamate VLT thickener, a naturally derived associative thickener that delivers enhanced mildness and exceptional clarity in surfactant cleansing systems. Due to its exceptional mildness and ability to mitigate irritation of common surfactants, Glucamate VLT thickener is ideal for use in products for babies, children, and the elderly, according to Lubrizol.

Sea-Land has introduced Tomamine Amphoteric 12, environmentally friendly hydrotropes with multifunctionality. According to Lundell, use levels are only 25% as much as traditional hydrotropes, yet they provide added detergency, are already DfE-approved, and cost less than current hydrotroping surfactants.

By introducing new products, offering total solutions and expanding their footprints, surfactant suppliers are meeting the needs of their customers around the world.

Tom Branna is editorial director of HAPPI *magazine. Reprinted from the September 2011 issue of* HAPPI. *For more information, visit www.happi.com*