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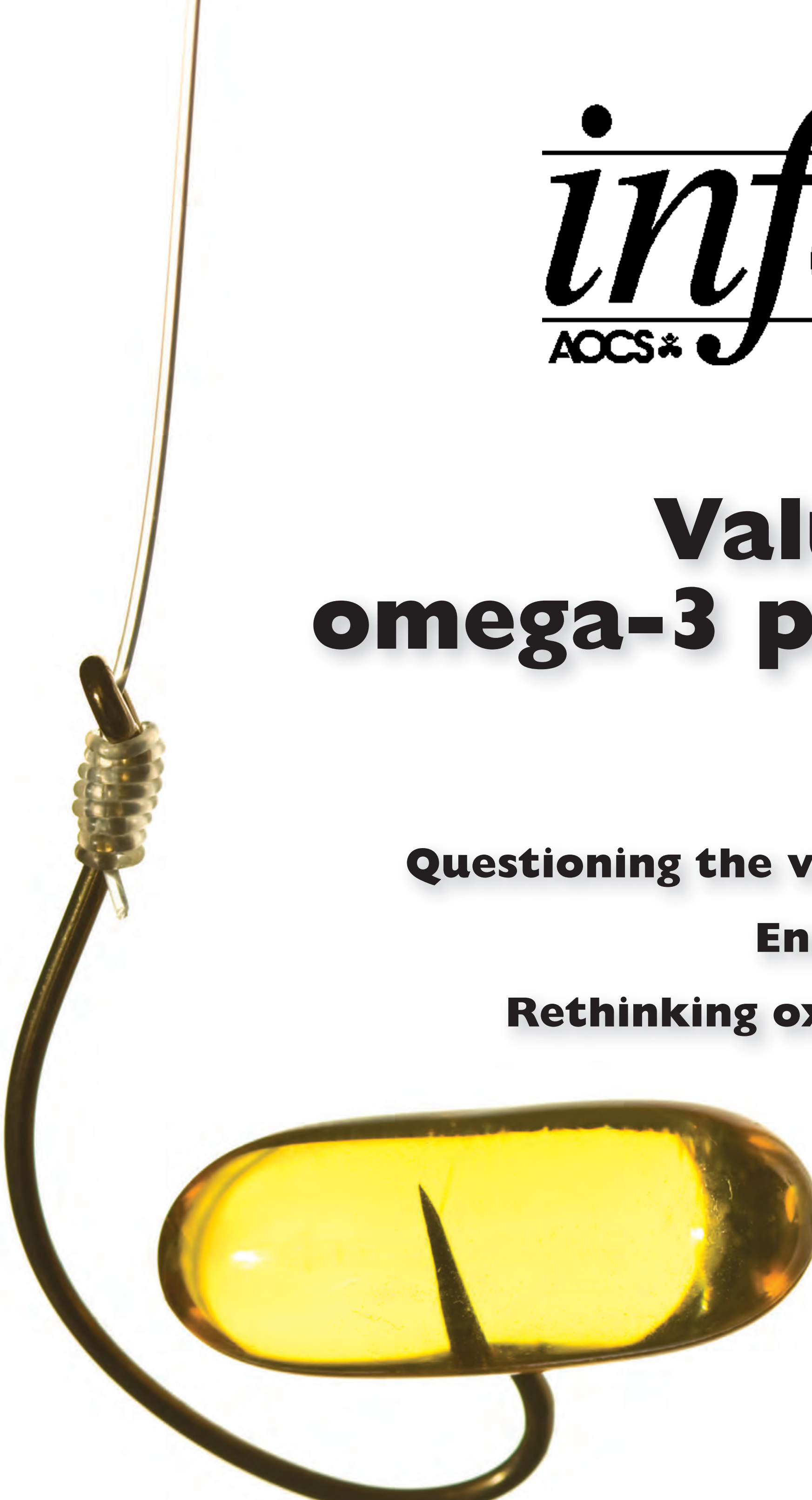
International News on Fats, Oils, and Related Materials



Value-added omega-3 processing

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Departments and Information

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

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Calendar

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

October

October 3–6, 2010. GERLI (Groupe d'Étude et de Recherche en Lipidomique), 7th Lipidomics Congress: Lipids in all states, Club Bellambra, Anglet Biarritz, France. Information: www.cbmn.u-bordeaux.fr/GERLI/index.php?tab=1.

October 3–7, 2010. Practical Short Course on Processing and Products of Vegetable Oil/Biodiesel, Food Protein Research & Development Center, Texas A&M University, College Station, Texas, USA. Information: http://foodprotein.tamu.edu/fatsoils/scvegoil.php.

October 4–6, 2010. 5th Soya & Oilseed Summit/Global Soybean & Grain Transport, Hyatt Regency Minneapolis, Minnesota, USA. Information: http://events.soyatech.com/conferences/GSGTSOS2010.htm.

October 4–7, 2010. 7th World Conference on Detergents: New Strategies in a Dynamic Global Economy, Montreux Music & Convention Centre, Montreux, Switzerland. Information: http://montreux.aocs.org/.

October 6–7, 2010. Jatropha World 2010, Inntels Hotel Rotterdam Centre, Rotterdam, Netherlands. Information: www.cmtevents.com/aboutevent.aspx?ev=101040&.

October 12–14, 2010. World Congress on Emulsions, Cité Centre Congrès, Lyon, France. Information: www.cme-emulsion.com.

October 13–14, 2010. American Fats & Oils Association Annual Meeting, Grand Hyatt Hotel, New York City, New York, USA. Information: www.afoaonline.org/events.html.

October 16–19, 2010. 9th International Symposium on the Role of Soy in Health Promotion and Chronic Disease Prevention and Treatment, Capital Hilton, Washington, DC, USA. Information: www.SoySymposium.org.

October 17–19, 2010. Oilseeds and Oils 2010, Swissotel The Bosphorus, Istanbul, Turkey. Information: APK-Inform Agency, Ukraine; phone: +380 362 320795; email: promo@apk-inform.com, ozip@apk-inform.com; www.agrimarket.info/conferences/oo2010/.

October 17–21, 2010. Federation of Analytical Chemistry and Spectroscopy Societies Annual Conference, Raleigh Convention Center, Raleigh, North Carolina, USA. Information: http://facss.org/facss.

October 18–20, 2010. Sustainable Cosmetics Summit, Paris, France. Information: www.sustainablecosmeticssummit.com.

October 19–20, 2010. 3rd Algae World Asia, Goodwood Park Hotel, Singapore. Information: www.cmtevents.com/aboutevent.aspx?ev=101038&amp.

October 19–21, 2010. European Forum for Industrial Biotechnology 2010, Sheraton Grand Hotel and Spa, Edinburgh, Scotland. Information: www.efibforum.com.

October 20, 2010. Cosmetic Technology Transfer Conference, Woodbridge Hilton, Woodbridge, New Jersey, USA. Information: email: steve@stephen-herman.com; www.nyscc.org/cttc.html.

Index to advertisers

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AOCS Meeting Watch

October 4–7, 2010. 7th World Conference on Detergents: New Strategies in a Dynamic Global Economy, Montreux Music & Convention Centre, Montreux, Switzerland. Information: http://montreux.aocs.org/.

October 16–19, 2010. 9th International Symposium on the Role of Soy in Health Promotion and Chronic Disease Prevention and Treatment, Capital Hilton, Washington, DC, USA. Information: www.SoySymposium.org.

May 1–4, 2011. 102nd AOCS Annual Meeting and Expo, Duke Energy Convention Center, Cincinnati, Ohio, USA. Information: phone: +1 217-359-2344; fax: +1 217-351-8091; email: meetings@aocs.org; http://AnnualMeeting.aocs.org.

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

October 20–22, 2010. OFI Asia 2010, incorporating OFIC 2010 (Oils & Fats International Congress 2010), Kuala Lumpur Convention Centre, Kuala Lumpur, Malaysia. Information: www.oilsandfatsinternational.com/publication.asp?pubid=28&nav=3&exid=160.

October 21, 2010. Jornada de Actualización de Mantenimiento en la Industria Aceitera (Sustainability in the Oil Industry), Holiday Inn Hotel, Rosario, Argentina. Information: email: gabrielapage@asaga.org.ar or www.asaga.org.ar.

October 22, 2010. Jornada de Actualización de Calidad en la Industria Aceitera (Achieving Quality in the Oil Industry), Holiday Inn Hotel, Rosario, Argentina. Information: email: gabrielapage@asaga.org.ar or www.asaga.org.ar.

October 24–27, 2010. American Association of Cereal Chemists, Savannah International Trade & Convention Center, Savannah, Georgia, USA. Information: http://meeting.aaccnet.org/reghotel/Registration.cfm.

October 25–29, 2010. National Renderers Association 77th Annual Convention, Ritz-Carlton, Naples, Florida, USA. Information: email: renderers@nationalrenderers.com; http://convention.nationalrenderers.org.

October 27–29, 2010. North American Industrial Coating Show, Indianapolis Convention Center, Indianapolis, Indiana, USA. Information: www.nace.org or www.powdercoating.org.

October 27–29, 2010. DIREC 2010 (Delhi International Renewable Energy Conference), Expo Centre & Mart, Greater Noida (National Capital Region of Delhi, India). Information: www.direc2010.gov.in.

October 31–November 4, 2010. ASA-CSSA-SSSA (American Society of Agronomy-Crop Science Society of America-Soil Science Society of American) 2010 International Annual Meetings, Long Beach, California, USA. Information: www.acsmeetings.org.

November

November 3–5, 2010. Cleaning Products 2010: Formulation, Innovation, Regulation, Hotel Monaco Alexandria, Alexandria, Virginia, USA. Information: www.cleaningproductsconference.com.

November 7–11, 2010. 30th Practical Short Course on Vegetable Oil Extraction, College Station, Texas, USA. Information: http://foodprotein.tamu.edu/extractionprotein/scvegoil.php.

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November 8–9, 2010. Mini-Symposium on Lipids in a Developmental Perspective, Solstrand Hotel, Bergen, Norway. Information: http://nifes.no/forsiden/arrangement/index.php?page_id=&article_id=3401&lang_id=2.

November 9–10, 2010. Advanced Biofuels Markets, San Francisco, California, USA. Information: www.greenpowerconferences.com/advancedbiofuelsUSA.

November 9–12, 2010. 5th Annual Biofuels 2010 Meeting, Okura Hotel, Amsterdam, Netherlands. Information: www.wraconferences.com/2/4/articles/149.php?.

November 10, 2010. Developing Soy Seminar 2010: Connecting Product Development and Supply, Amsterdam, Netherlands. Information: http://bridge2food.com/Developingsoy2010.asp.

November 10–11, 2010. Bioenergy International Asia Expo & Conference, The Maya Hotel, Kuala Lumpur, Malaysia. Information: www.biofuelsinternationalexpo.com/asia/conf_prog.html.

November 10–12, 2010. 45th Southeastern Regional Lipid Conference 2010, High Hampton Inn & Country Club, Cashiers, North Carolina, USA. Information: www.musc.edu/BCMB/serlc.

November 11, 2010. 15th Soy Symposium: Adapting to New Market Forces, L'Enfant Plaza Hotel, Washington, DC, USA. Information: www.soyfoods.org/2010-soy-symposium.

November 16–18, 2010. Health Ingredients Europe, Madrid, Spain. Information: http://hieurope.ingredientsnetwork.com.

November 16–18, 2010. Food Ingredients Europe, London, United Kingdom. Information: www.fi-events.com.

November 21–24, 2010. 8th Euro Fed Lipid Congress, Munich, Germany. Information: email: info@eurofedlipid.org; www.eurofedlipid.org/meetings/munich.

November 23–24, 2010. Third International Seminar on Oil Seeds and Edible Vegetable Oils [sponsored by the Iranian Vegetable Oil Industry Association], Islamic Republic of Iran Broadcasting International Conference Center, Tehran. Information: email: Ms. Shahnas Banounam, shahnasorchid@yahoo.com; www.ivoi.ir.

November 24–26, 2010. 4th International Conference, Fat and Oil Industry 2010, Palmira Palace Hotel, Yalta, Ukraine. Information: email: promo@apk-inform.com, ozip@apk-inform.com; www.agrimarket.info.

November 25–26, 2010. Protein Summit, Amsterdam, Netherlands. Information: www.bridge2food.com/Mailings/PS2010.html.

November 29–December 1, 2010. 7th Annual Canadian Renewable Fuels Summit, Hilton Lac-Leamy Hotel, Gatineau, Québec, Canada. Information: www.crfs2010.com.

December

December 3–5, 2010. 65th Annual OTAI Convention, International Symposium, and Expo on Oils, Fats & Oleochemicals; Food Security, Green Energy, and Environment, Hotel InterContinental Eros, New Delhi, India. Information: www.otai65agm.org.

December 10–11, 2010. Functional Foods for Heart Health: Continuum Between Science and Commercialization, Winnipeg, Canada. Information: www.bioactivesworld.com/winnipeg.html.

December 11–14, 2010. Pacific Rim Summit on Industrial Biotechnology & Bioenergy, Honolulu, Hawaii, USA. Information: www.bio.org/pacrim.

December 15–20, 2010. International Congress of Pacific Basin Societies (Pacifichem), Honolulu, Hawaii, USA. Information: www.pacifichem.org.

December 16–17, 2010. HPCI [Home and Personal Care Ingredients] Congress, Mumbai, India. Information: www.hpci-congress.com.

January 2011

January 30–February 4, 2011. Gordon Conference on Plant Lipids: Structure, Metabolism & Function, Hotel Galvez, Galveston, Texas, USA. Information: www.grc.org/programs.aspx?year=2011&program=plantlipid.

February 2011

February 6–9, 2011. National Biodiesel Board Conference & Expo, Phoenix Convention Center and Venues, Phoenix, Arizona, USA. Information: www.biodiesel.org.

February 20–22, 2011. 16th National Ethanol Conference, JW Marriott Desert Ridge, Phoenix, Arizona, USA. Information: www.ethanolrfa.org or www.nationalethanolconference.com.

February 26–March 1, 2011. GEAPS [Grain Elevator and Processing Society] Exchange, Portland, Oregon, USA. Information: www.geaps.com/exchange/index.cfm.

February 27–March 4, 2011. Gordon Conference on Signal Transduction within the Nucleus, Four Points Sheraton, Ventura, California, USA. Information: www.grc.org/programs.aspx?year=2011&program=sigtrans.

March 2011

March 13–18, 2011. Pittcon 2011, Georgia World Congress, Atlanta, Georgia, USA. Information: www.pittcon.org/about.

March 14–15, 2011. Biowise 2011: Biofuels from Lab to Finance, The Crowne Plaza Hotel, Kuala Lumpur, Malaysia. Information: www.greenworldconferences.com. ■

Reprocessing of ethyl ester light fraction

Additional benefit from manufacturing process of omega-3 concentrates from fish oil

Martin Ernst

The health-promoting properties of polyunsaturated fatty acids (PUFA) account for the increasing popularity in the food industry of omega-3 concentrates based on fish oil. Their applications range from dietary ingredients up to pharmaceutical preparations. Usually, high-quality fish oils with high concentrations of PUFA, such as eicosapentaenoic acid (EPA) or docosahexaenoic acid (DHA), are used as raw material for this production process. With concentrations of approximately 30% in EPA and DHA, such high-quality fish oils are used as starting material for the production of omega-3 ethyl ester (EE) and triglyceride concentrates. However, since the quantities of these high-quality fish oils are limited, there is an increasing trend to use fish oils with considerably lower concentrations of omega-3 fatty acids as starting materials. To increase the cost effectiveness of such plants, the by-products of the concentration step of the EE phase can be used to produce a biogenic fuel that meets the quality requirements of the applicable ASTM biodiesel standard.

The process for manufacturing EE concentrates is already sufficiently well known. The product yield has a decisive effect on the cost effectiveness of such production plants. While under optimal conditions—depending on the starting EE and the desired product concentration—EE concentrates of approximately 30–40% can be obtained, the yield is reduced especially when using oils with lower EPA/DHA concentrations. In Figure 1 is a quantity-based breakdown of the expected product flows for an EE with low initial concentrations (here 17% EPA/6% DHA) of PUFA.

Based on the starting EE amount of the distillation and shown in Figure 1, BDI-Bioenergy International AG (Graz, Austria) found it could produce approximately 30% concentrates from the specified EE through multiple distillations. However, the largest sidestream of EE, which is described as EE light fraction, is usually only used thermally. However, for a more cost-effective representation of this process, this side flow can contribute to value creation.

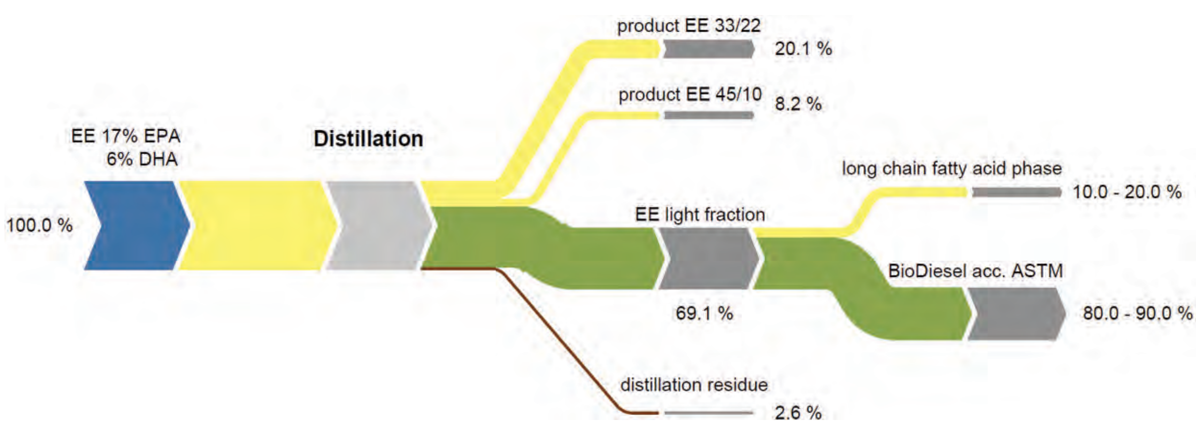


FIG. 1. *Sankey diagram for the distillation of a 17% EPA/6% DHA ethyl ester. Abbreviations: EPA, eicosapentaenoic acid; DHA, docosahexaenoic acid; EE, ethyl ester; acc: according to.*

Using the EE light phase as a source of renewable fuel is an obvious possibility. Besides the conventional use as a replacement for fossil heating oil, we considered its potential for use as biodiesel. Since biodiesel is subject to strict quality standards, the biodiesel made from the EE light fraction must also satisfy applicable standards. The European standard EN 14214 and the American equivalent ASTM D6751 are the most important standards worldwide for biodiesel quality. Based on the quality parameters defined in these standards, only the ASTM standard can be the target standard for biodiesel manufactured from the EE light fraction. By definition, the scope of validity of the current version of the EN standard only covers methyl esters. The use of other alcohols to make biodiesel (e.g., ethanol) therefore automatically leads to a final product that does not conform to the EN standard. Changes in regard to this limitation are under discussion because there is no technical reason to exclude EE. Since this limitation to the alcohols used does not exist in the ASTM standard, that standard was defined as the one to be met.

Analysis showed that the EE light fraction exceeded the applicable limiting values for (i) free glycerine, (ii) distillation residue at atmospheric equivalent temperature (T90 AET), and (iii) carbon residue of the EE. Exceeding the value for free glycerine is explained to residual glycerine from the transesterification process. Based on our experience in the biodiesel sector, the required process steps for the reduction of free glycerine content are well known.

The reason why the parameters of T90 AET and the carbon residue are exceeded can be found in the content of long-chain fatty acids (LCFA) and partial glycerides resulting from incomplete transesterification. Since the EE light fraction has already been distilled once in the process and the majority of the partial glycerides thereby remained in the sump of the first distillation stage, only LCFA EE can cause these limited distillation characteristics. These long-chain EE can only be reduced through an additional distillative separation. Therefore, the extent to which the concentration of LCFA affects the standard parameters according to ASTM D6751 given above was investigated in trials using an EE fraction with a higher concentration of LCFA EE, the better to observe the dependency. The results are shown in Figure 2.

As can be seen in Figure 2, there was a direct dependence of the standard parameter T90 AET on the content of LCFA. Hence, it was possible, in accordance with the given fatty acid distribution, to define an upper limit for the content of LCFA EE to be reached by the separating step, through which it can be ensured that the limit for the T90 AET value can be met. In addition, it was also possible to keep the standard parameter of the carbon residue of the biodiesel below the detectability limit through the distillation. Apart from the biodiesel phase, a concentrated EE phase is created with the procedure described here, in which there are mainly LCFA. Depending on the manufactured product and concentrations of PUFA obtained, this concentrated EE stream can either be fed back into the process or be reprocessed into another product in a separate batch, which increases the product yield of the entire process still further. To ensure that the residual LCFA stream after the distillation was not subjected to extended thermal exposure, the polymer content was measured via the distillation process. With this distillation system, the polymers of the EE light fraction were collected in the LCFA stream, but no additional polymerization of PUFA was observed.

The objective of this work was to find a higher-value application for the EE light fraction that resulted from concentrating the polyunsaturated EE. This was found in the production of biodiesel in accordance with ASTM specifications. To do this, the T90 AET quality parameters defined in the standard and the standard parameter for the carbon residue were brought within the required specification by removing the LCFA EE. Besides the light fraction that is thus upgraded, the PUFA remaining in the light fraction are concentrated in the distillation residue. Based on the content of PUFA in the light fraction, and since the oxidation state, expressed by the polymer content, did not deteriorate, a further usage of this LCFA stream increases the overall product yield.

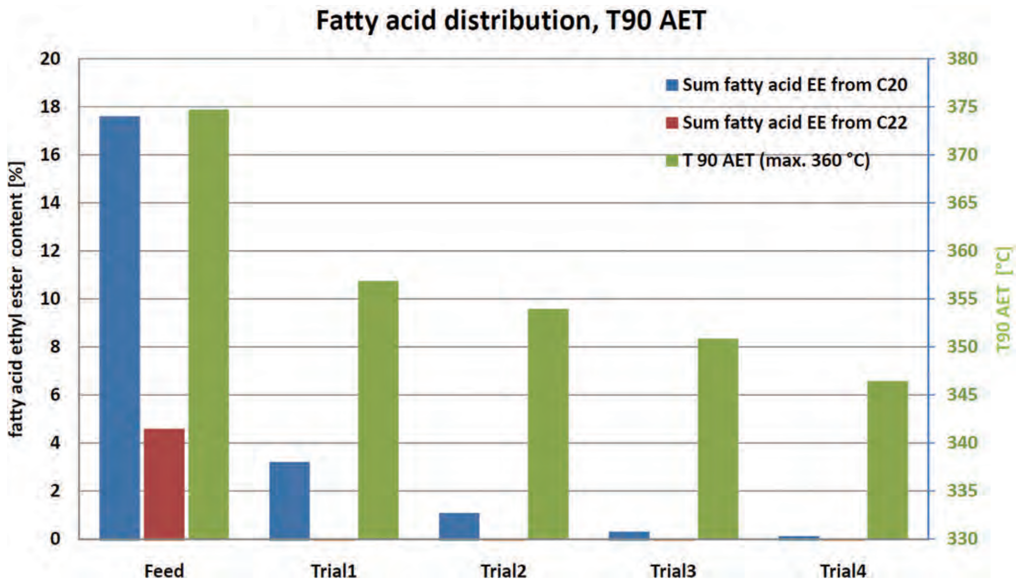


FIG. 2. *Behavior of T90 AET (distillation residue at atmospheric equivalent temperature) and fatty acid distribution. Abbreviations: C20: ethyl esters with fatty acid carbon chain length of 20; C22: ethyl esters with fatty acid carbon chain length of 22; for other abbreviation see Figure 1.*

Martin Ernst is head of the Biofuels Working Group in the research and development department of BDI-Bioenergy International AG (Graz, Austria). Contact him by telephone at +43 (0)3326 54919 or by e-mail at martin.ernst@bdi-bioenergy.com.

Questioning the virginity of olive oils

Catherine Watkins

Is a significant percentage of olive oil labeled as "extra virgin" and imported into the United States for retail sale out of spec with international and US standards?

A recent report from the University of California Davis (UC Davis) Olive Center (http://tinyurl.com/UCDavisOliveOil) suggests just that. A team of scientists led by Edwin N. Frankel found that 69% of imported olive oil samples and 10% of California olive oil samples labeled as extra virgin olive oil (EVOO) failed international chemical and sensory (organoleptic) standards for EVOO. The research team tested 52 samples of 19 brands—14 imported brands and five California brands—purchased in three geographical locations to reach their conclusions. The UC Davis Olive Oil Chemistry Laboratory, which has not yet been accredited by IOC, and the Australian Oils Research Laboratory (Wagga Wagga, New South Wales), which is fully accredited by IOC, conducted the laboratory work.

The laboratory tests also indicated that the International Olive Council (IOC; Madrid, Spain) and US Department of Agriculture (USDA) *chemistry* standards "often do not detect defective olive oils that fail extra virgin *sensory* standards," the UC Davis team said. The group suggested that IOC/USDA standards would be made "more effective" by including German/Australian 1,2-diacylglycerol (DAG) and pyropheophytins (PPP) standards.

"A reduced level of DAG indicates that the samples were oxidized, or poor quality, and/or adulterated with cheaper refined oils, while an elevated level of PPP indicates that the samples were oxidized and/or adulterated with cheaper refined oils," the report suggested.

In addition, the study found that:

- Sixty-nine percent of imported olive oil samples and 10% of California olive oil samples labeled as EVOO failed to meet

Lawsuit filed over UC Davis report

Several weeks after the release of the UC Davis Olive Center report, a number of California restaurateurs and chefs filed suit against certain olive oil distributors and retailers.

The lawsuit was filed in early August 2010 in Orange County (California, USA) Superior Court. It seeks class-action status, punitive damages, and reimbursement for profits made from alleged false marketing and advertising using the extra-virgin label.

A number of major olive oil brands were named in the suit, along with major supermarket chains and big-box superstores that allegedly marketed substandard oil under the extra-virgin label.

Bob Bauer, president of the North American Olive Oil Association (NAOOA), said that although the trade association representing olive oil importers was not named in the suit, NAOOA had talked to legal counsel, which said that some aspects of the suit are likely to be thrown out fairly quickly. "Others will have to play themselves out in court but are not likely to be upheld," Bauer added.

The attorneys for the plaintiffs in the lawsuit widely distributed a news release about their action that appeared to suggest AOCS contributed to the funding, research, and findings of the UC Davis study. In actuality, AOCS—as an international scientific association—does not conduct or fund external scientific research.

"The UC Davis study was not conducted under the auspices of AOCS," AOCS Executive Vice President Jean Wills Hinton emphasized, "nor were we asked to provide any input to the study. Although we have established expert panels—including one on olive oil—they are for the purpose of bringing together groups of internationally recognized scientists to discuss method development and other scientific matters related to fats and oils and specific topics of interest to government, academia, and industry.

"AOCS was not privy to the report results until after its release. We value our impartial role and are proud of our more than 100 years of service to the international fats and oils community," Hinton concluded.

> ### *inform*ation
>
> The issue of regional approaches to extra virgin olive oil quality was examined in a Hot Topic Symposium presented at the 99th AOCS Annual Meeting & Expo on Tuesday, May 20, 2008, in Seattle, Washington, USA. Visit http://tinyurl.com/AOCSOliveOil to download presentations from that session.
>
> More information on olive oil is available in Volume 1 of the AOCS Monograph Series on Oilseeds, *Olive Oil: Chemistry and Technology,* 2nd edition, 2006, ISBN: 978-1-893997-88-2 (list price, $115; member price, $85).

the IOC/USDA sensory (organoleptic) standards for EVOO. The Australian sensory panel found that "each of these samples scored a median of up to 3.5 sensory defects such as rancid, fusty, and musty" and were classified at the lower grade of "virgin." Sensory defects are indicators that these samples are oxidized, of poor quality, and/or adulterated with cheaper refined oils.

- Thirty-one percent of the imported samples that failed the sensory standards also failed the IOC/USDA standards for UV absorbance of oxidation products (K_{232} and K_{268}), which indicates that these samples were oxidized and/or were of poor quality.
- Eighty-three percent of the imported samples that failed the IOC/USDA sensory standards also failed the German/Australian DAG standard. Two additional imported samples that met the IOC/USDA sensory standard for EVOO failed the DAG standard.
- Fifty-two percent of the imported samples that failed the IOC/USDA sensory standards also failed the German/Australian PPP standard. Two additional imported samples that had met the IOC/USDA sensory standard for EVOO failed the PPP standard.

The IOC/USDA chemistry standards confirmed negative sensory results in 31% of cases, whereas the German/Australian DAG and PPP standards confirmed negative sensory results in 86% of cases.

IOC/NAOOA TAKE EXCEPTION

Both the IOC and the North American Olive Oil Association (NAOOA), a trade association representing olive oil importers, took exception to the study. IOC pointed out that the DAG/PPP methods "are not official chemical methods cited in international olive-oil-specific food or trade standards," adding that "they have, however, been adopted by the International Organization for Standardization (ISO)." IOC also called the methods "unreliable."

The methods in dispute were developed by Christian Gertz of the Official Institute of Chemical Analysis in Hagen, Germany. Both are officially approved methods of the Deutsche Gesellschalt für Fettewissenschaft (DGF), or German Society for Fat Science. The German government uses them in its official food inspection program. In addition, members of the Australian Olive Association

(AOA) must meet the DAG and PPP standards to receive AOA certification for EVOO.

The IOC also noted in a statement that it conducts chemical tests on "some 200 samples of imported oils sold in the United States" each year and, according to IOC findings, anomalies are detected in less than 10% of the imported oils analyzed. Bob Bauer, president of NAOOA, pointed out that the market share of the brands with anomalies listed in the UC Davis report averages about 1% of the North American market. "We've never had a problem with any of the brands listed in the report," he said.

Imports account for about 99% of US consumption of olive oil, according to Bauer. Annual supermarket sales run approximately $700 million, not including club stores and other outlets. "Approximately 56% of the unit volume and 60% of the dollar volume is extra virgin," he reported. "Olive oil accounts for 26% of unit volume and 21% of dollar volume and extra light accounts for 13% in both areas," he added.

Dan Flynn, executive director of the UC Davis Olive Center, said in a statement that "UC Davis stands behind the report, which was conducted with an IOC-accredited lab using official IOC tests."

At the same time, Flynn emphasized that "UC Davis values the IOC's role in olive oil standards and tests. We invite the IOC to be a partner in our future research to analyze the quality of olive oil sold in the United States."

Patricia Darragh, executive director of the California Olive Oil Council (COOC; Berkeley, USA) agrees: "It is to the benefit of all to collaborate on research on olive oil quality as well as new methods for establishing that quality. The COOC looks forward to continued testing and research to ensure consumers receive a quality product that is properly labeled and meets grade standards."

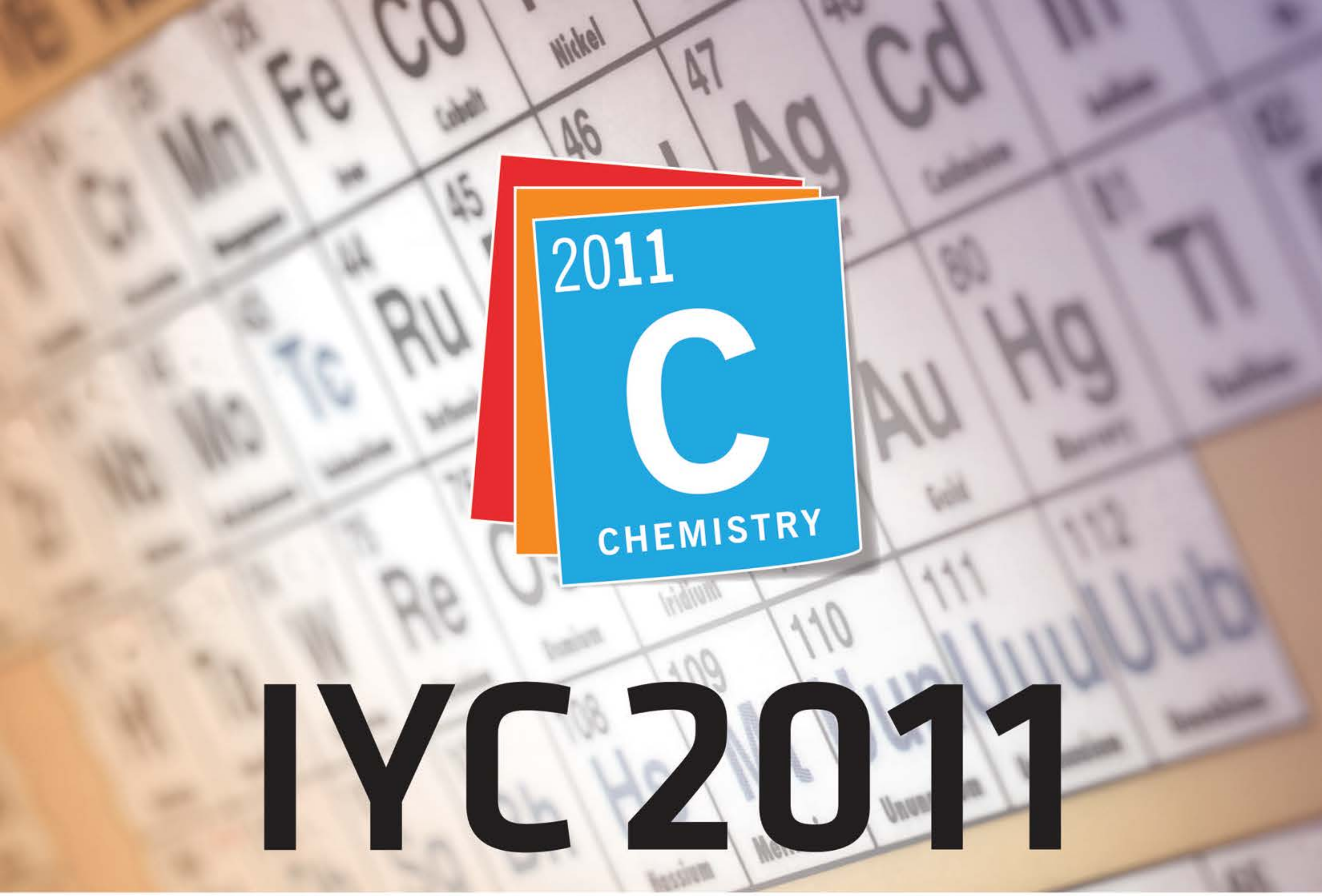
The UC Davis report was written by Edwin N. Frankel, adjunct professor, UC Davis Department of Food Science and Technology; Rodney J. Mailer, principal research scientist, Australian Oils Research Laboratory; Charles F. Shoemaker, professor, UC Davis Department of Food Science and Technology; Selina C. Wang, research associate, UC Davis Olive Oil Chemistry Laboratory; and Dan Flynn. The study was supported by Corto Olive (Stockton, California, USA), California Olive Ranch (Oroville, USA), and the COOC. The group plans to submit the report for peer review and publication, according to Flynn.

MARKET CONTEXT

The United States is the third-largest consumer of olive oil, according to the Reuters news service, but it produces far less than it consumes. Production in 2010/11 is expected to exceed 1 million gallons (about 4 million liters or 3,500 metric tons), Darragh said. At that point, US production will surpass French production. (Global production currently is about 2.7–2.8 million metric tons per year, according to Paul Miller, president of the AOA.)

A new voluntary US standard for olive oil grades goes into effect on October 25, 2010. The USDA will implement the standard and is in the process of training taste testers to conduct sensory tests at the Agricultural Marketing Service Science Specialty Laboratory in Blakely, Georgia.

Catherine Watkins is associate editor of inform *and can be reached at cwatkins@aocs.org.*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Surfactants based on monounsaturated fatty acids for enhanced oil recovery

Paul Berger

The following article is the first in a two-part series. Look for the second part—"New very long-chain fatty acid seed oils produced through introduction of strategic genes into Brassica carinata*" by David C. Taylor—in the October issue of* inform.

The increasing demand for petroleum-based fuels and petrochemicals, along with the diminishing supply of new sources for oil, has escalated interest in improving the extraction of oil from existing reservoirs. Among the most promising processes is enhanced oil recovery (EOR). In one version of the EOR process, various chemicals are injected into the reservoir to overcome capillary pressures and wettability and to remove residual oil that would otherwise remain within the microscopic pores. Chemicals that are used include polymers, surfactants, and alkali. In the alkaline surfactant polymer (ASP) process, an injection solution containing an alkali to reduce adsorption and to form *in situ* surfactant is used, along with one or more surfactants to lower the interfacial tension (IFT) between the injection fluid and the trapped oil, and a polymer to control the mobility ratio and sweep efficiency of the injected fluid.

In most cases, after primary oil recovery methods utilizing the internal pressure from within the reservoir to extract oil have been exhausted, a secondary process employing water or a gas is used to recover additional oil. Primary recovery generally recovers 15–20% of the original oil in place. Secondary recovery may recover 20–30% of the remaining oil after primary recovery. A point is reached where secondary recovery becomes inefficient or ineffective. At this point, tertiary recovery methods such as EOR must be employed.

Figure 1 shows the correlation between the capillary number (Nc) and the residual oil recovery obtained after water flooding. Nc is the ratio of the viscous forces to the interfacial forces and is defined in Equation 1,

$$\text{Nc} = (\text{viscosity})(\text{velocity})/(\text{IFT})(\cos \text{contact angle}) \tag{1}$$

where viscosity refers to the viscosity of the injected fluid containing the surfactant, velocity is the rate at which the injected fluid moves into the reservoir, and contact angle is the angle between the injected fluid and the reservoir rock. The IFT between the injection water and the oil is usually between 10 and 35 mN/m before the addition of surfactants. Surfactants have been developed to give very low IFT values of less than 10^{-2} mN/m, and therefore they can increase the capillary number three to four orders of magnitude, allowing the capillary forces trapping the oil to be overcome.

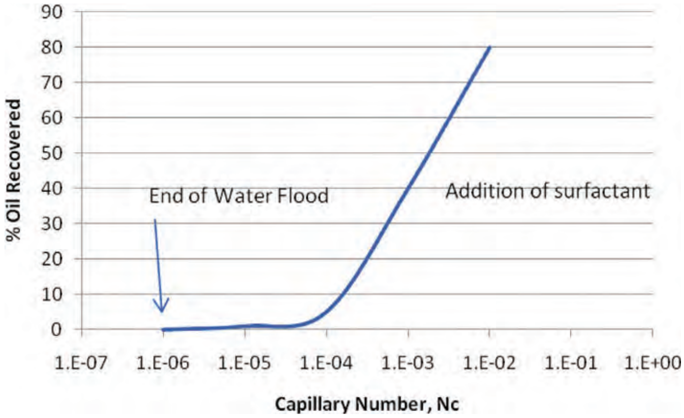


FIG. 1. *Effect of capillary number on oil recovery.*

Recent estimates concerning the amount of surfactant necessary to meet projected future EOR demand indicate that this volume would rival the current use of surfactants in detergents.

Surfactants can be manufactured from various raw materials that are ultimately derived from petroleum or agricultural feedstocks. Currently, most EOR surfactants are based on petrochemical feedstocks. In the future a vicious cycle would be created, as the demand for more petroleum-based surfactants would increase proportionally to the demand for more oil for fuel and petrochemicals. To address this challenge, research is currently under way to develop surfactants, suitable for EOR, that are partially or completely derived from renewable agricultural crops. These offer the advantage of providing green, biodegradable, nontoxic, environmentally friendly alternatives that are not dependent on the availability of petrochemicals.

Surfactants derived from unsaturated fatty acids are among the most effective for EOR applications. The fatty acids are derived from the glycerides present in many common seeds, nuts, and grasses. They can be isolated and further converted to many useful products including alcohols, alcohol ethers, alcohol ether carboxylates, alcohol ether sulfates, alcohol ether sulfonates, alkyl dimethyl betaines, alkyl dimethyl hydroxysultaines, alkyl dimethyl amine oxides, alkylamidopropyl dimethyl betaines, alkyl amidopropyl dimethyl hydroxysultaines, and so on.

The anionic derivatives of these unsaturated fatty acids and alcohols are especially effective in lowering IFT and also have been designed to overcome other obstacles such as high temperatures, high salinities, high divalent cation concentrations, and high adsorption onto the reservoir rock.

TABLE 1. *Sources of unsaturated fatty acids*

Chain length	Source	Typical content[a]
C12$^{=}$	None	
C14$^{=}$	None	
C16$^{=}$	Macadamia	25
C18$^{=}$	Olive, canola	60–90
C20$^{=}$	Meadowfoam	60–65
C22$^{=}$	High erucyl rapeseed	40–50
C24$^{=}$	*Cardamine graeca* transgene	45

[a]Percentage by weight

The limiting factor in the use of various unsaturated fatty acids has been their limited availability and their low concentrations in many agricultural sources. Table 1 shows some of the unsaturated fatty acids and their current sources. Researchers at the National Research Institute of Canada in Saskatoon, Saskatchewan, under the direction of David Taylor, have developed several strains giving extremely high yields of erucic (22:1) and nervonic (24:1) acids. They are looking to add new unsaturated acids containing 12 to 20 carbons, obtained either by genetic modification or yield enhancement techniques, to those already commercially available. Taylor's

CONTINUED ON PAGE 592

Briefs

UK scientists from the Institute of Food Research (Colney, Norwich) have reported the use of an atomic technique to probe the interactions of pectin. Researchers led by Vic Morris used atomic force microscopy to probe the unusual emulsifying properties of sugar beet pectin. The results, published in the journal *Soft Matter* (doi: 10.1039/c0sm00089b), may help to create emulsions with improved quality, the researchers say.

■■■

In July 2010, Unilever was named "Company of the Year" by a UK organization called Business in the Community. The award was given for the "positive impact [Unilever] has on communities, environments, marketplaces, and workplaces around the world."

"Business has a great responsibility and opportunity to create and enable positive change, for both society and the environment, particularly in such turbulent economic times. In the long run, we believe it will be the businesses which do the right thing, in the right way, to the best of their talents, which will ultimately prosper," said Unilever Executive Vice President Amanda Sourry, who accepted the award.

■■■

The UN's Food and Agriculture Organization (FAO) has said in a new policy brief that some regulation of commodities futures markets could help stabilize food prices; too much regulation or an outright ban, however, "could do more harm than good."

■■■

In July 2010, Archer Daniels Midland Co. announced it will open an office in Beijing and plans to invest $100 million in the Agricultural Bank of China. "China's agricultural market is growing in both supply and demand and represents significant growth opportunities for ADM," said ADM Chairman, CEO, and President Patricia Woertz. ■

News & Noteworthy

New vegetable oil-based adhesive

An incidental discovery in a wood products laboratory at Oregon State University (OSU; Corvallis, USA) has produced a new pressure-sensitive adhesive that may revolutionize the tape industry—an environmentally benign product that works very well and costs much less than existing adhesives based on petrochemicals.

The new adhesive can be produced from a range of vegetable oils, and may find applications for duct tape, packaging tape, stick-on notes, labels, even postage stamps—almost any type of product requiring a pressure-sensitive adhesive.

There are thousands of pressure-sensitive tape products, and OSU says it is a $26 billion global industry.

The discovery was made essentially by accident while OSU scientists were looking for something that could be used in a wood-based composite product—an application that would require the adhesive to be solid at room temperature and melt at elevated temperatures.

For that, the new product was a failure.

"We were working toward a hot-melt composite adhesive that was based on inexpensive and environmentally friendly vegetable oils," said Kaichang Li, a professor of wood science and engineering in the OSU College of Forestry. "But what we were coming up with was no good for that purpose; it wouldn't work.

"Then I noticed that at one stage of our process this compound was a very sticky resin," Li said. "I told my postdoctoral research associate, Anlong Li, to stop right there. We put some on a piece of paper, pressed it together and it stuck very well, a strong adhesive."

Shifting gears, the two researchers then worked to develop a pressure-sensitive adhesive, the type used on many forms of tape, labels, and notepads.

"It's really pretty amazing," Li said. "This adhesive is incredibly simple to make, doesn't use any organic solvents or toxic chemicals, and is based on vegetable oils that would be completely renewable, not petrochemicals. It should be about half the cost of existing technologies and appears to work just as well."

Kaichang Li, a wood products researcher at Oregon State University, has developed new vegetable oil-based adhesive products. (Courtesy of Oregon State University)

There have been previous attempts to make pressure-sensitive adhesives from vegetable oils, Li said, but they used the same type of polymerization chemistry as the acrylate-based petrochemicals now used to make tape. They did not cost much less or perform as well, he said.

The new approach used at OSU is based on a different type of polymerization process and produces pressure-sensitive adhesives that could be adapted for a wide range of uses, perform well, cost much less, and would be made from renewable crops such as soybeans, corn ,or canola oil, instead of petroleum-based polymers.

The technology should be fairly easy to scale up and commercialize, Li said.

"OSU has applied for a patent on this technology, and we're looking right now for the appropriate development and commercialization partner," said Denis Sather, licensing associate with the OSU Office of Technology Transfer. "We believe this

Commodities

CACAO/COCOA

For a fascinating look at cacao/cocoa trader Anthony Ward, see http://tinyurl.com/NYTcocoa. This in-depth *New York Times* article examines fears that Ward's control of roughly 7% of the annual cocoa production worldwide will drive up prices.

CANOLA/RAPESEED OIL

Sodrugestvo Group (Kaliningrad, Russia) has entered the US market by acquiring a 26% stake in **North Dakota Oilseed Mills, LLC**, a joint venture with **Northwood Mills, LLP**, a canola crushing plant based in Northwood, North Dakota, near Grand Forks.

FISH OIL

Ocean Nutrition Canada (ONC) has acquired five-year, exclusive global marketing and distribution rights to Austria's **GAT Food Essential** (GAT) omega-3 microencapsulation-emulsion technology. ONC will also take control of GAT's existing fish-oil customers. GAT's flax and algae omega-3 businesses remain unchanged.

OLIVE OIL

The Ambassador of Italy in Pakistan, Vicintzo Parati, told the *Daily Times* newspaper that his country is willing to help Pakistan achieve self-sufficiency in oilseed production. The Italian government plans to promote olive cultivation in Pakistan, Afghanistan, and Nepal, the report noted.

PALM OIL

The **Malaysian Palm Oil Board** said at its recent Palm Oil Familiarization Programme in July 2010 that the 2009 sales of biodiesel from palm oil manufactured in the country earned Malaysia approximately 1.5 billion ringgits (about $475 million). Capacity currently is 2 million metric tons per year.

■■■

Singapore's **Wilmar International Ltd.** announced in July that its subsidiary, **PGEO Group Sdn. Bhd.**, is acquiring 91.38% of **Natural Oleochemicals Sdn. Bhd.** from **Kulim (Malaysia) Bhd.** The transaction is expected to close by November 2010, pending regulatory approvals.

SOYBEAN OIL

Archer Daniels Midland Co. (ADM; Decatur, Illinois, USA) will increase its South American oilseed crush capacity by more than 25% after construction of a major new soybean plant in Paraguay. The new plant, with an anticipated daily crush capacity of 3,300 metric tons, will be located adjacent to an ADM fertilizer-blending plant in Villeta, near the capital city of Asunción. Construction began in June and is expected to be complete in 2012.

New ventures

Cargill introduced its Clear Valley® Omega-3 Oil, a canola/flaxseed oil blend, at the Institute of Food Technologists (IFT) Annual Meeting & Food Expo, July 18–20, 2010, in Chicago. The company recently completed a GRAS (Generally Recognized as Safe) self-determination for the ingredient. The new oil contains up to 30% α-linolenic acid (ALA) and provides a minimum of 160 milligrams of ALA in most applications.

■■■

Unilever says 75% of its paper and packaging will be from sustainably managed forest or recycled materials by 2015, and 100% will be from those sources by 2020. The company says 62% of its current paper and packaging is sustainably sourced.

■■■

As of July 2010, prepackaged organic food made in Europe will have to carry a new logo as part of new food-labeling rules. The "Euro-Leaf" logo will remain optional on nonpacked and imported organic products. ■

innovation has the potential to replace current pressure-sensitive adhesives with a more environmentally friendly formulation at a competitive price."

Li, an expert in wood chemistry, composites, and adhesives, has already changed the face of the wood composites industry. His research created a formaldehyde-free, nontoxic adhesive that can be used in the production of plywood and particle board and that is now becoming more widely used in that industry. That invention was inspired by his observation of mussels clinging tenaciously to rocks despite being pounded by ocean waves. Li later formulated a similar type of compound in the laboratory.

For these advances, Li received a 2007 Presidential Green Chemistry Challenge Award from the Environmental Protection Agency. The award recognized his continued work to reduce toxic chemicals used in manufacturing processes.

FSA gains reprieve

On July 20, 2010—a bit more than a week after a number of news outlets reported that the UK's Food Standards Agency (FSA) was set to be abolished—the Department of Health (DOH), which oversees FSA, said the agency will be retained but with a renewed focus on food safety.

As part of a reorganization, the FSA will focus on food safety policy and enforcement, the DOH will focus on nutrition policy in England, and the Department for Environment, Food and Rural Affairs will focus on country-of-origin labeling and other nonsafety-related food labeling and food composition policies in England.

"Reorganizing in this way will contribute to the government's objectives to improve efficiency, and is paramount to the key priority of improving the health of the nation by creating a public health service," the DOH said. "To achieve this coherence, some policy-based functions can be brought 'in house' to give a more coordinated approach on health and food issues."

Under the new framework, the FSA will:

- Retain a clearly defined departmental function focused on food safety. On crucial issues of food safety, the independent advice from FSA experts will be final.
- Retain current responsibility for nutrition and labeling policy in Scotland, Wales, and Northern Ireland.
- Continue to employ 2,000.

"Food safety and hygiene have always been at the heart of what the agency does," said Lord Rooker, chair of the FSA. "They are our top priorities in protecting the interests of consumers." The FSA was founded in 2000 after the BSE (bovine spongiform encephalopathy) scare in the United Kingdom and Europe.

Argan oil develops market share

Argan oil has seen an increase in product introductions, according to the Innova Database (www.innovadatabase.com).

Although the global market research database recorded the introduction of nearly 1,000 edible oil products in the 12 months ending March 31, 2010, the vast majority were commodity oils such as olive oil, sunflower oil, soy oil, and blended products, in addition to specialty oils such as grapeseed, walnut, avocado, and macadamia oils.

"Product activity is still extremely limited, but there are definite signs of rising interest in the use of argan oil, often also known as Moroccan Gold, and a move out of the cosmetics and supplements market and into the culinary oils sector," the report notes.

Argan oil is made from nuts of the argan tree (*Argania spinosa*), which grows only in southwestern Morocco. Its small and specific growing area makes it one of the rarest oils in the world. Traditionally used by the indigenous Berber population in cooking and in cosmetics, the oil is increasingly of interest elsewhere owing to its potential as a cosmetic and nutritional ingredient.

New product activity in argan oil recorded by Innova Market Insights dates back a number of years, but is notable for the emergence of skin care supplements based on argan oil beginning in the

TYPICAL FATTY ACID COMPOSITION OF ARGAN OIL (%)

14:0	0.1–0.2
16:0	14–16
16:1	0.1
18:0	4–6
18:1	43–50
18:2	30–34
Unassigned 18:3	0.1–0.3
20:0	0.2–0.4

Source: *Physical and Chemical Characteristics of Oils, Fats, and Waxes*, edited by D. Firestone, AOCS Press, Champaign, Illinois, USA, 1999, p. 10.

mid-2000s, particularly in France. This was followed by the appearance of an increasing number of culinary oils in a variety of countries, including the United States, United Kingdom, Germany, France, and Switzerland. All of these products exhibit premium positioning and high pricing, Innova says, with some available only through specialist outlets such as natural and health food stores, specialty shops, or via mail order or the Internet.

Argan oil supplements have generally focused either on anti-aging properties or on the health of hair and nails, whereas the culinary oil has been used as a replacement for other oils, such as olive oil, in salad dressings or dips.

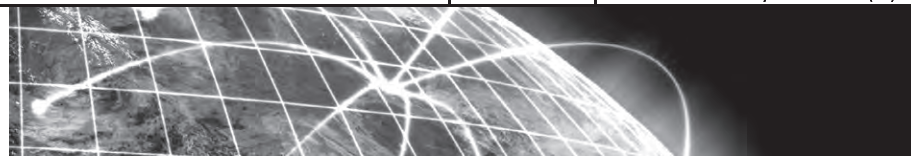
"Alongside growing levels of product activity," Innova Market Insights' Head of Research Lu Ann Williams reports, "there has been a rising level of press coverage on the benefits of argan oil, and this should help to increase levels of awareness and interest, although the high pricing may well prove a barrier to further development."

However, limited supply is likely to be the primary challenge to continued market growth, she believes, despite a UNESCO (United Nations Educational Scientific and Cultural Organization) preservation project for the threatened argan tree in Morocco aimed at helping to maintain and even develop supply there.

Bunge and Caravan receive IFT awards

Five companies received the 2010 IFT Food Expo Innovation Awards at the 2010 Institute of Food Technologists (IFT) Annual Meeting & Food Expo® in June 2010. The winners were Bühler Barth AG and Log5 Corp. (co-recipients), Bunge North America, Caravan Ingredients, and Handary SA. Two of the awards were of particular interest to the fats and oils community.

Bunge North America won the award for its Phytobake Shortening with Phytosterols. This functional shortening for bakery applications enables a decrease in the amount of saturates in plastic shortenings by up to 46%, according to Bunge. "Though phytosterol-enhanced foods have not been very popular with consumers, an ingredient like this expands application and may help bring the ingredient the attention it deserves," declared a juror.



By utilizing Bunge's proprietary phytosterol ester, the company was able to reduce the total saturate content of its Phytobake shortening by 46% as compared to traditional All Purpose Shortening.

Caravan Ingredients was honored for its Trancendim Emulsifiers for Zero *Trans* Shortening—a zero-*trans*, reduced saturated fat alternative for structuring fats and oils that mimics or improves the melting behavior of common fat-based products. Applications include salad dressings, frying oils, margarines, and bakery products. "*Trans* fat replacement is still a tough food science challenge in some products, and this innovation is an interesting application of technology to address this ongoing consumer need," stated a juror.

Magnetic levitation and fat content

Magnetic levitation—the technology that has yet to revolutionize high-speed rail—could provide a quick production-line method for determining fat content.

Harvard University (Cambridge, Massachusetts, USA) researchers led by Katherine Mirica began by developing a palm-sized maglev (magnetic levitation) device to determine densities of various substances. To create the device, the team suspended a fluid-filled vial between two ice cube-sized magnets. Samples of milk, peanut butter, and vegetable oil placed inside the vial levitated a specific distance between the magnets. The distance, measured by a rule, directly correlated with the sample's density.

Based on density, the researchers were able to make quick estimates of the salt content of different water samples and the relative fat content in different types of milk, cheese, and peanut butter.

"Potential applications of maglev may include evaluating the suitability of water for drinking or irrigation, assessing the content of fat in foods and beverages, or monitoring processing of grains," Mirica told Inside-Science.org. "It's extremely versatile and we're still figuring out the most useful applications for this technology."

The study appeared in the *Journal of Agricultural and Food Chemistry* (*58*:6565–6569, 2010).

Sustainability websites open

Two of the world's largest scientific societies have unveiled new websites showcasing information intended to help visitors better understand how the science of chemistry can help solve global challenges such as global climate change, abundant food, safe drinking water, and new energy sources.

The American Chemical Society (ACS) and the Royal Society of Chemistry (RSC) both introduced sites that mirror each other's content. These comprehensive online guides feature links to ACS and RSC resources on creating renewable fuels, fostering safe and sustainable agriculture, combating emerging diseases, confronting climate change, ensuring clean air and water, and promoting a "greener" lifestyle.

The mirrored websites are the first of several planned joint efforts by ACS and RSC to increase public understanding of the challenges facing Earth as well as the chemistry underlying these issues and their possible solutions. The ACS portal can be found at http://tinyurl.com/ACS-RSCsustainability.

Free access to FAO stats

The Food and Agriculture Organization (FAO) of the United Nations is granting free and open access to its central data repository, FAOSTAT, the agency's comprehensive statistical database on food, agriculture, and hunger.

Previously, it was possible to download without charge a limited amount of information from FAOSTAT—which contains over one million data points covering 210 countries and territories—but access to larger batches of statistics required a paid annual subscription.

FAOSTAT includes data on agricultural and food production, usage of fertilizers and pesticides, food aid shipments, food balance sheets, forestry and fisheries production, irrigation and water use, land use, population trends, trade in agricultural products, the use of agricultural machinery, and more.

For more information, visit http://faostat.fao.org/. ■

2010

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Membership dues include a monthly subscription to **inform*. Active membership is "individual" and is not transferable. Membership year is from January 1 through December 31, 2010.***

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

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❑ Biotechnology	$10	❑ Phospholipid	$20	❑ Canadian	$15	❑ USA	FREE
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AOCS: Your international forum for fats, oils, proteins, surfactants, and detergents.
This Code has been adopted by the AOCS to define the rules of professional conduct for its members. As a condition of membership, it shall be signed by each applicant.
AOCS Code of Ethics • Chemistry and its application by scientists, engineers, and technologists have for their prime objective the advancement of science and benefit of mankind. Accordingly, the Society expects each member: 1) to be familiar with the purpose and objectives of the Society as expressed in its Bylaws; to promote its aim actively; and to strive for self-improvement in said member's profession; 2) to present conduct that at all times reflects dignity upon the profession of chemistry and engineering; 3) to use every honorable means to elevate the standards of the profession and extend its sphere of usefulness; 4) to keep inviolate any confidence that may be entrusted to said member in such member's professional capacity; 5) to refuse participation in questionable enterprises and to refuse to engage in any occupation that is contrary to law or the public welfare; 6) to guard against unwarranted insinuations that reflect upon the character or integrity of other chemists and engineers.

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

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

CALL FOR NO

A. Richard Baldwin Distinguished Service

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

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

Deadline: November 1

AOCS Award of Merit

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

Nature of the Award: A plaque.

Deadline: November 1

AOCS Fellow

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

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

Deadline: December 1

Corporate Achievement Award

This award recognizes industry achievement for an outstanding process, product, or contribution that has made the greatest impact on its industry segment.

Nature of the Award: A plaque.

Deadline: November 1

Supelco/Nicholas Pelick-AOCS Research Award

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

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

Deadline: November 1

Stephen S. Chang Award

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

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

Deadline: October 15

AOCS Young Scientist Research Award

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

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

Deadline: November 1

ACI/NBB Glycerine Innovation Award

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

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

Deadline: November 1

Biotechnology Division Lifetime Achievement Award

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

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

Deadline: November 1

USB Industrial Uses of Soybean Oil Award

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

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

Deadline: November 1

CALL FOR NOMINATIONS

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

ELECTRONIC SUBMISSIONS ONLY!

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

OMINATIONS

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

Samuel Rosen Memorial Award

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

Nature of the Award: $2,000 honorarium and a plaque provided by the endowed fund.

Deadline: November 1

Food Structure and Functionality Division Lifetime Achievement Award

The Food Structure & Functionality Division of the AOCS initiated this award to honor outstanding lifetime performance and meritorious contributions to an area of interest to the Food Structure & Functionality Division.

Nature of the Award: $1,500 travel-and expense allowance and a crystal plaque.

Deadline: November 1

Herbert J. Dutton Award

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

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

Deadline: November 1

Timothy L. Mounts Award

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

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

Deadline: November 1

Ralph Holman Lifetime Achievement Award

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

Nature of the Award: $500 honorarium and a signed print.

Deadline: November 1

Thomas H. Smouse Fellowship Award

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

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

Deadline: February 1

Ralph H. Potts Memorial Fellowship

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

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

Deadline: October 15

Honored Student Award

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

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

Deadline: October 15

Kalustian and Manuchehr Eijadi Awards

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

Hans Kaunitz Award

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

Nature of the Award: $1000 honorarium, travel-and-expense allowance, and a certificate.

Deadline: February 1

AOCS Division Awards for Students

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

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

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

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

Deadline: Varies from October 15 to January 15

Alton E. Bailey Award

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

Nature of the Award: An honorarium and a plaque. The award recipient must present an award lecture at the Section's meeting, or the Society's Annual Meeting.

Deadline: November 1

The award recipient must agree to attend the AOCS Annual Meeting & Expo and present an award address. The AOCS Annual Meeting & Expo will be held in Cincinnati, Ohio, USA from May 1–4, 2011.

AOCS Awards contact

Email: awards@aocs.org • **Web:** www.aocs.org/member/awards

Welcome New Members

AOCS Since 1909
Your Global Fats and Oils Connection

The AOCS is proud to welcome our newest members.*

*New and reinstated members joined from May 1, 2010 through July 31, 2010.

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Danilo Badolato, AGT Consultoria e Assesoria Empresarial
Philippe P. Ballet, Monsanto Co
Tetyana A. Barkley, Cotecna Inspection Firm
Herman P. Benecke, Battelle Memorial Institute
Debadeep Bhattacharyya, Oxford Instruments America
Matthew Branham, Alpha MOS America
Patrick H. Bush, GS Clean Tech
Jimmie Cain, Mississippi State University
Candice Calbert, Nutco Inc
Marcelo Carlomagno, Continental Grain Co/ContiParaguay
Mark P. Cartwright, JG Boswell Co
Josemar Castillo, Arizona State University
Keith Clemons, Caravan Ingredients Co
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Danh Do, OmegaPure
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Yehia Elshafei, United Oil Processing & Packaging
Sonja Fehr, TU BS-Inst for Pharm Technology
Dan Flynn, University of California, Davis
Daniel P. French, French Oil Mill Machinery Co
Vilma Galubickaite, Olija
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Graham D. Helmhold, Proteco Pty Ltd
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Muhammad Ibrahim, University of Agriculture
Glenn Ivarson, Ivarson Inc
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Sam Jennett, American Natural Soy Processors
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Rabie Y. Khattab, Alexandria University
Hiirotsugu Kido, Mitsubishi-Kagaku Foods Corp
Tae Yong Kim, Korea Feed Ingredients Assn
Keith Klemm, Sherry Labs
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Stephen Kong
Ga-Seul Kwon, GS Bio Co Ltd
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Mee Ee Lai, National University of Malaysia
Paul Lavella, Metro Biofuels LLC
Michael J Leonard, Solae Co
Meng Li, Beijing Goldfish Technology Co Ltd
Jerry Lindman, Integrated Solutions Inc
Ken Ludwig, Alfa Laval Inc
Jonathan C. Mack, Adams Group Inc
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To become a member of the AOCS, complete, sign, and fax back the membership application in this issue or contact us.

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AOCS CORPORATE MEMBER

Briefs

Green Plains Renewable Energy (Omaha, Nebraska, USA) announced in mid-July that it will implement corn oil extraction technology at its ethanol production plants. The company anticipates completing installation of the technology by the end of the first quarter of 2011 and projects that company operating income will be enhanced by $15 million to $19 million annually. This will represent 75 million to 90 million gallons (280 million to 340 million liters) per year. The oil will be available for making biodiesel and for other nonfood uses.

■■■

Shapoorji Pallonji & Co., a major Indian construction company, has taken a lease on 50,000 hectares of land in Ethiopia for cultivation of *Pongamia pinnata*. Seeds from this leguminous tree can be processed to yield oil for production of biodiesel. Shapoor Mistry, chairman of Eureka Forbes, a part of the Shapooji Pallonji group, told *The Business Standard* (July 17), "The biodiesel fuel that we produce will be exported to India and Europe. But that will happen five years from now."

■■■

The FEDIOL Executive Board decided in June to withdraw its support from the Roundtable on Sustainable Biofuels (RSB). FEDIOL (Fédération de l'Industrie de l'Huilerie de la CEE) became a member of the RSB in March 2009 and took part in discussions held for biofuel producers. FEDIOL said it was withdrawing from the RSB owing to what it called a lack of transparency throughout the work and decision-making process of the RSB. FEDIOL further claimed that feedstock processors and biofuels producers were clearly underrepresented at Steering Board level. FEDIOL continues its involvement in the Roundtable on Responsible Soy and the Roundtable on Sustainable Palm Oil.

The FEDIOL withdrawal follows on the heels of the withdrawals of the European Biodiesel Board and

CONTINUED ON NEXT PAGE

Biofuels News

The Synthetic Genomics Inc.-ExxonMobil algae biofuels program recently moved from a laboratory setting to a greenhouse, an environment that better reflects real-world conditions for algae production. Photo courtesy Business Wire.

ALGAE

ExxonMobil, Synthetic Genomics open greenhouse

On July 14, a year to the day after ExxonMobil Research and Engineering Company and Synthetic Genomics Inc. (SGI; La Jolla, California, USA) announced their five-year research and development agreement for the creation of next-generation biofuels from algae (see *inform 20*:577, 2009), the companies announced the opening of a greenhouse facility for the next step in their research testing of algae.

In the greenhouse facility, researchers will examine different growth systems for algae, such as open ponds and closed photobioreactors; evaluate various algae, including natural and engineered strains, in these different growth systems under varying temperatures, light levels, and nutrient concentrations; and investigate production processes, including harvesting and bio-oil recovery operations.

The companies say they have made "substantial progress" in developing algae as a source of biofuel, including:

- Isolation and/or engineering of a large number of candidate algal strains and development of growth conditions under which these strains could be made more productive
- Identification and testing of some of the preferred design characteristics of the different production systems
- Initiation of life cycle and sustainability studies to assess the impact of each step in the process on greenhouse gas emissions, land use, and water use

Plans are to open an outdoor test facility in mid-2011.

the European Bioethanol Fuel Association from the RSB (*inform 21*:348–349, 2010).

■■■

As a means of strengthening its position within the biodiesel industry, Denmark-based Alfa Laval has acquired the remaining shares of Ageratec AB, its Swedish biodiesel subsidiary. The company will be fully integrated into Alfa Laval—as an Application Center for Biodiesel in the Market Unit Vegetable Oil Technology—continuing in place in Norrköping, Sweden. Alfa Laval is a provider of products and engineering solutions in the areas of heat transfer, separation, and fluid handling.

■■■

The Philippine National Oil Co.-Alternative Fuels Corporation (PNOC-AFC) has entered into an agreement with Dole Philippines and Toyota Tsusho Corp. to establish pilot jatropha plantations, initially totaling about 5 hectares, in the Saranagani province of the Philippines. The three companies will investigate areas for collaboration and cooperation in developing biofuels derived from jatropha. PNOC-AFC will provide technical assistance to both companies and share knowledge it has gained from raising jatropha over the past three years.

■■■

Genetic engineering company Evogene Ltd. (Rehovot, Israel) announced in July that biojet fuel produced from castor varieties under its development meet the major ASTM D7566 fuel specifications requirements for alternative aviation fuels containing synthesized hydrocarbons. The D7566 fuel specification is written for fuels produced using the Fischer-Tropsch process; but specifications for alternative aviation fuels containing biosynthesized paraffinic kerosene (biojet) are expected to be approved for commercial airline use before the end of 2010 or early in 2011, according to BioFuelsBusiness.com. Evogene is focusing on developing high-yielding castor varieties, suitable for cost-efficient growth on semi-arid lands using fully mechanized production. Evogene is currently testing its

Algal Biofuels Technology Roadmap

A year and a half after the National Algal Biofuels Workshop (College Park, Maryland, USA; December 2008) was held, the US Department of Energy, Office of Energy Efficiency and Renewable Energy, Biomass Program has released the National Algal Biofuels Technology Roadmap (www1.eere.energy.gov/biomass/pdfs/algal_biofuels_roadmap.pdf). More than 200 scientists, engineers, industry representatives, research managers, and other stakeholders had input. The Roadmap is intended to summarize the state of technology for algae-based fuels and document the research and development (R&D) challenges associated with producing them at a commercial scale.

The Roadmap lays the groundwork for identifying challenges that likely will need to be surmounted for algae and cyanobacteria to be used in the production of viable, environmentally sound biofuels. It is intended to serve as a resource for researchers, engineers, and decision-makers by providing a summary of progress to date and a direction for future algae R&D decisions.

Topics covered include algal biology; algal cultivation; downstream processing; harvesting and dewatering; extraction of products from algae; algal biofuel conversion technologies; co-products; distribution and utilization; resources and siting; and systems and techno-economic analysis.

New process for dewatering algae

Unitel Technologies (Mt. Prospect, Illinois, USA) announced in mid-July that it has filed a patent application for a new technology for making biofuels from microalgae. The process involves minimal dewatering and completely bypasses the energy-intensive drying and oil-extraction steps. At present, most of the proposed methods require extracting immobilized oil from algal biomass. However, getting to the oil is usually very expensive in terms of capital and energy costs.

In the Unitel process, the feedstock—a slurry of water and cultivated algae (1–20% by weight)—is continuously treated in a special hydrolysis reactor to yield (i) a fatty acid product, (ii) a "sweet water" stream containing glycerol and other solubles, and (iii) deoiled algal biomass. A small fraction of the fatty acid product is fed back into the reactor as catalyst.

The nutrient-rich sweet water is recycled into the algae propagation tanks, where the carbon in the glycerol serves to promote the growth of phytoplankton. The deoiled biomass (consisting primarily of proteins and carbohydrates) is dried as an animal feed ingredient.

The algal fatty acid product is catalytically decarboxylated and converted into paraffinic hydrocarbons, followed by mild hydrocracking and hydroisomerization to make biojet fuel comprising C_{10}–C_{15} branched paraffins.

JATROPHA

FAO cautious on jatropha

Using jatropha for biodiesel production could benefit poor farmers, particularly in semi-arid and remote areas of developing countries, according to a report published by the United Nations' Food and Agriculture Organization (FAO) and the International Fund for Agricultural Development.

But the report stresses that jatropha is still essentially a wild plant sorely in need of crop improvement. Expecting jatropha to substitute significantly for oil imports in developing countries is unrealistic.

"Many of the actual investments and policy decisions on developing jatropha as an oil crop have been made without the backing of sufficient science-based knowledge," the report said. "Realizing the true potential of jatropha requires separating facts from the claims and half-truths."

In 2008, jatropha was planted on an estimated 900,000 hectares (ha) globally—760,000 ha in Asia, 120,000 ha in Africa, and 20,000 ha in Latin America. By 2015, it is estimated that jatropha will be planted on 12.8 million ha. The largest producing country in Asia will be Indonesia. In Africa, Ghana, and Madagascar will be the largest producers, in Latin America it will be Brazil.

The report may be downloaded from www.fao.org/docrep/012/i1219e/i1219e.pdf.

Australian firms ramping up jatropha oil production

In July, Jatoil Ltd. (Pyrmont, New South Wales, Australia) announced the sale of its first commercial quantity of crude jatropha oil. The sale came several months earlier than the timetable the company had set for itself early in 2010.

The oil came from the company's recently purchased joint venture operations with European-backed biofuel producer PT Waterland International. Waterland holds existing jatropha crops on 2,000 hectares in central Java.

Under the terms of the joint venture, all oils produced from the first 1,000 hectares of the project will be used to produce aviation fuel for the first four years. The first shipment constituted 10 metric tons (MT).

Jatoil chief executive officer Phil Hodgson said, "We expect that further harvesting this year will allow us to market larger quantities of crude jatropha oil at more frequent intervals."

Oil output is expected to reach around 700 MT between 12 and 18 months but this will almost double within the next three years. The venture aims to increase total land holdings to 10,000 hectares.

Jatoil's announcement of its sale of jatropha oil follows on the heels of that of Mission NewEnergy (Osborne Park, Western Australia), which announced the sale of about 188 MT of jatropha oil in June.

castor varieties in field trials in the southern United States and northeastern Brazil (see *inform 21*:220, 2010).

■■■

Brazilian energy company Petrobras is building a 542-kilometer pipeline to transport ethanol from the sugarcane-producing areas of Uberaba, Minas Gerais, to Vale do Paraiba, São Paulo, and then connect to other existing pipelines in São Paulo and Rio de Janeiro states. The pipeline will have the capacity to transport up to 12.9 million cubic meters of ethanol annually. The pipeline will use existing pipeline sections to minimize the environmental impact. Two years ago, Petrobras and Japanese conglomerate Mitsui created a conglomerate to supply biofuels, mainly ethanol, to the Japanese market. Construction will begin this year, and Petrobras projects the pipeline will go onstream in the second half of 2011. ■

GENERAL

EPA proposes 2011 RFS

The US Environmental Protection Agency (EPA) has proposed the 2011 percentage standards for the four fuels categories under the agency's Renewable Fuel Standard program, known as RFS2.

The Energy Independence and Security Act of 2007 (EISA) established the annual renewable fuel volume targets, which will reach 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, importer, and non-oxygenate blender of gasoline determines the minimum volume of renewable fuel that it must ensure is used in its transportation fuel.

Proposed overall volumes and standards for 2011 are as follows:

- Biomass-based diesel (0.80 billion gallons/3 billion liters; 0.68%)
- Advanced biofuels (1.35 billion gallons/5.11 billion liters; 0.77%)
- Cellulosic biofuels (5–17.1 million gallons/19–65 million liters; 0.004–0.015%)
- Total renewable fuels (13.95 billion gallons/52.8 billion liters; 7.95%)

Based on its analysis of market availability, the EPA is proposing a 2011 cellulosic volume that is lower than the 2007 EISA target. The EPA will continue to evaluate the market as it works to finalize the cellulosic standard in the coming months.

For further information see http://tinyurl.com/24pfc7y.

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Biodiesel production in Europe

Marguerite Torrey

In a report released July 22, the European Biodiesel Board (EBB) presented statistics on annual biodiesel production and capacities for the European Union (EU) Member States. The full report is available at www.ebb-eu.org/EBBpress.php.

Biodiesel output in 2009 totaled 9 million metric tons (MMT), an increase of 16.6% over the production in 2008 (see Table 1). For comparison, output increased 35% between 2007 and 2008.

In considering individual countries, production fell in 2009 in Germany, Greece, and the United Kingdom as well as Ireland, Portugal, Romania, and Slovakia. There were notable increases, however, in Austria, Belgium, Finland, Italy, Netherlands, Poland, and Spain. In 2009, Spain overtook Italy as the third-largest producer of biodiesel in the EU.

Although the rate of increase in biodiesel production in 2009 fell in comparison with 2008, the EU remains the leading biodiesel-producing region worldwide, representing about 65% of total world output, according to the EBB.

As of July 2010, the EBB reports there were 245 biodiesel plants in Europe, a slight decrease from 2009 that was attributed to sector reorganization. Biodiesel production capacity in Europe, calculated as of January 2010, is about 22 MMT annually (Table 1). The EBB pointed out, though, that a large part of installed capacity should be considered as idle.

The EBB attributes the lower growth rate of biodiesel production in 2009 and the underutilization of capacity to unfair practices on the worldwide biodiesel market. B99 (99% biodiesel + 1% petrodiesel), made in the United States and supported by a government subsidy, was sold in the EU at prices lower than the original price of the component soybean oil until March 2009, when the European Commission imposed anti-dumping measures (see *inform 20*:219, 2009).

Shortly after these anti-dumping/anti-subsidy rules were instituted, the EBB says trans-shipment of US bioiesel via non-EU destinations (mainly Canada) started to occur. A specific instance of trans-shipment was documented in March 2010 (see *inform*

TABLE 1. *Production (2008 and 2009) and capacity (2009 and 2010) estimates for European Union biodiesel*[a]

	Production[b] (MMT)		Capacity[c] (MMT)	
Country	**2008**	**2009**	**2009**	**2010**
Austria	0.213	0.310	0.707	0.560
Belgium	0.277	0.416	0.705	0.670
Bulgaria	0.011	0.025	0.435	0.425
Cyprus	0.009	0.009	0.020	0.020
Czech Republic	0.104	0.164	0.325	0.427
Denmark/Sweden	0.231	0.233		
Denmark			0.140	0.250
Estonia	0	0.024	0.135	0.135
Finland[d]	0.085	0.220	0.340	0.340
France	1.815	1.959	2.505	2.505
Germany	2.819	2.539	5.200	4.933
Greece	0.107	0.077	0.715	0.662
Hungary	0.105	0.133	0.186	0.158
Ireland[d]	0.024	0.017	0.080	0.076
Italy	0.595	0.737	1.910	2.375
Latvia	0.030	0.044	0.136	0.156
Lithuania	0.066	0.098	0.147	0.147
Luxemburg	0	0	0	0
Malta	0.001	0.001	0.008	0.005
Netherlands	0.101	0.323	1.036	1.328
Poland	0.275	0.332	0.580	0.710
Portugal	0.268	0.250	0.468	0.468
Romania	0.065	0.029	0.307	0.307
Slovakia	0.146	0.101	0.247	0.156
Slovenia	0.009	0.009	0.100	0.105
Spain	0.207	0.859	3.656	4.100
Sweden			0.212	0.277
UK	0.192	0.137	0.609	0.609
TOTAL	7.755	9.046	20.909	21.904

[a] Data compiled by the European Biodiesel Board (www.ebb-eu.org/EBBpress.php, dated July 22, 2010) and used with permission.
[b] Subject to a ±5% margin of error. MMT, million metric tons.
[c] Calculation based on (i) 330 working days per year, per plant and (ii) capacities on January 7, 2009, and January 7, 2010. NB: The term "capacity" stands for the potential production a biodiesel plant could deliver if it were able to run at full production rate for a whole year.
[d] Data include hydro-diesel production.

21:348–349, 2010), when Italian customs authorities seized 10,000 metric tons of biodiesel in the ports of Venice and Trieste that came from the United States via Canada, according to the EBB.

Argentina also is being accused of damaging the ability of EU biodiesel producers to operate in a fair trade environment. The EBB says that Argentina imposes differential export taxes that strongly favor the export of biodiesel over the export of crude soybean oil. Further, the EBB stated, "Argentina, together with prominent biodiesel producers such [as] Malaysia and Indonesia, is enjoying a disputable import duty free access to the EU market under the Generalized System of Preferences."

Italian biodiesel. Reuters news agency reports that biodiesel output in Italy may fall 60–70% in 2010, after having fallen 50% in the first six months of the year. Maria Rosaria Di Somma, director general of the industry body Assocostieri-Unione Produttori Biocarbuantai, attributed the fall to cheap imports (*c.f. inform 21*:348–349, 2010).

Assocostieri data indicate that Italy's biodiesel production capacity is 2.5 MMT annually. [Note that the method used by the Assocostieri to calculate production is not the same as that used by the EBB in Table 1.] In 2008 actual production was 0.67 MMT, and in 2009 it was 0.69 MMT. Imports were 0.24 MMT in 2008 and 0.46 MMT in 2009.

Spanish biodiesel. The biofuels section of the Spanish Association of Renewable Energy Producers released a report in July stating that 60% of the biodiesel used in Spain during the first quarter of 2010 had been imported, mostly from Argentina. Moreover, 75% of Spain's 46 biodiesel plants have virtually stopped production.

inform *Technical Projects Editor Marguerite Torrey can be reached at mtorrey@acos.org.*

BIODIESEL

Truckers object to increasing use of biodiesel

Richard Moskowitz, vice president and regulatory affairs counsel for the American Trucking Associations (ATA), was quoted in *Transport Topics* (July 19), a publication specializing in trucking and freight transportation news, as saying, "In 2011, if the refining industry must blend 800 million gallons of biomass-based diesel [see preceding story]—and we know that biomass diesel costs $1.50 more [per gallon] than petroleum diesel—that would represent a $1.2 billion cost increase on diesel fuel consumed in the United States. So we have a federal requirement to use this alternative fuel but an economic disincentive to use it."

Biodiesel producers have said that production of biodiesel may not meet this requirement if the US Congress does not retroactively extend the $1 per gallon biodiesel tax credit that expired December 31, 2009. The credit allows biodiesel to be competitive in price with petrodiesel. At the beginning of August, the credit had still not passed Congress.

According to the National Biodiesel Board, the US biodiesel industry lost about 12,000 jobs with the expiration of the credit, and 40–50 of the 173 biodiesel production plants in the country are now idle or else out of business.

First enzymatic biodiesel plant opens in North Carolina

Piedmont Biofuels, in partnership with the Biofuels Center of North Carolina, enzyme producer Novozymes (Franklinton, North Carolina), and the Chatham County Economic Development Corporation, opened its pilot enzymatic biodiesel plant on July 16 in Pittsboro, North Carolina, the first of its kind in the United States.

"This new process of using enzymes to produce biodiesel [from low-quality waste grease] will increase yields, decrease waste and allows producers to use lower-cost feedstocks," said Greg Austic, a Piedmont representative, in a company statement. "This groundbreaking technology will create more valuable co-products and will allow existing producers to double their biodiesel output."

The pilot plant will be able to generate about 12,600 gallons of biodiesel per year, but Techpulse360.com (July 20) speculates it could lead to the establishment of similar facilities with capacities of about 6 million gallons per year serving local communities if it is successful.

ETHANOL

Questions arising on E15

On July 26, a group of 36 environmental and industry groups sent a letter to majority and minority leaders in the US Senate opposing any increase in the content of ethanol in gasoline above 10% (E10) for use in conventional gasoline-powered engines. According to Sail-World.com (July 27), the letter said that increases should not be instituted in advance of the scientific review by the Environmental Protection Agency, mandated by Section 22(f) of the Clean Air Act, before new fuels, additives, or fuel blends are introduced into commerce.

Sail-World.com quoted the letter as saying, "We collectively urge you to reject any attempt to attach a mid-level ethanol authorization amendment during the Senate's consideration of energy legislation in the coming weeks and months."

Signers of the letter included the American Lung Association, the American Petroleum Institute, a number of boating organizations, the Grocery Manufacturers Association, several organizations representing owners of small businesses, the National Resources Defense Council, and the Sierra Club. The complete letter and the list of signatories are available at http://tinyurl.com/24rfag8.

Growth Energy, a group of ethanol producers and supporters, had proposed in 2009 that the EPA consider a waiver to raise the

ethanol content in fuel to 15% as a means to increase demand for ethanol

House Energy and Commerce Committee chairman Henry Waxman (D, California) and committee members Edward Markey (D, Massachusetts), Joe Barton (R, Texas), and Fred Upton (R, Michigan) responded by sending a letter to EPA Administrator Lisa Jackson that said, in part, "Allowing the sale of renewable fuel in a way that damages equipment, shortens its life, or requires costly repairs will likely cause a backlash against renewable fuels. It could also seriously undermine the agency's credibility in addressing fuel and engine issues in the future." The letter may be downloaded from http://tinyurl.com/28llc73.

Yield projections for switchgrass

Researchers from Oak Ridge National Laboratory (Tennessee, USA) and Dartmouth College (Hanover, New Hampshire, USA) compiled data from peer-reviewed publications to evaluate switchgrass yield as it relates to site location, plot size, stand age, harvest frequency, fertilizer application, climate, and land quality.

A total of 1,190 biomass yield observations for both lowland and upland types of switchgrass came from 39 field sites, representing 17 states across the United States. Statistical analysis showed that much of the variation in yield could be accounted for by variation in growing season precipitation, annual temperature, nitrogen fertilization, and the type of switchgrass.

Lowland switchgrass outperformed upland varieties at most locations, except at northern latitudes. Annual yields averaged 12.9 metric tons per hectare (MT/ha) for lowland and 8.7 MT/ha for upland ecotypes. Lowland cultivars Kanlow and Alamo yielded more than 28 MT/ha at some sites in Alabama, Texas, and Oklahoma.

A model projected maximal yields in a corridor westward from the mid-Atlantic coast to Kansas and Oklahoma. Low precipitation west of the Great Plains limited yields in that region. The research appeared in the *Agronomy Journal 102*:1158–1168 (2010).

BP acquires Verenium's cellulosic biofuels business

BP Biofuels North America and Verenium Corporation (Cambridge, Massachusetts, USA) announced in mid-July their agreement for BP to purchase Verenium's cellulosic biofuels business, including the company's facilities in Jennings, Louisiana, and San Diego, California, for $98.3 million.

Verenium retains its commercial enzyme business, including its biofuels enzymes products, and has the right to develop its own lignocellulosic enzyme program. Verenium also retains select research and development (R&D) capabilities and rights to access select biofuels technology developed by BP using the technology it is acquiring from Verenium through this agreement.

BP will become the sole investor in Vercipia Biofuels, a 50:50 joint venture formed by BP and Verenium in February 2009, and will independently manage all of Vercipia's activities going forward. Similarly, Galaxy Biofuels, a joint development company owned by BP and Verenium, will be owned 100% by BP.

In a company statement, Philip New, chief executive officer of BP Biofuels, said, "This acquisition demonstrates BP's intent to be a leader in the cellulosic biofuels industry in the US." He added, "By acquiring Verenium's cellulosic biofuels technologies, BP Biofuels should be well placed to accelerate the delivery of low cost, low carbon, sustainable biofuels, at scale."

The Verenium-BP joint venture has signed a long-term lease for 20,000 acres (8,000 hectares) near its future 36-million-gallon (136-million-liter)-per-year cellulosic ethanol plant in Highlands County, Florida (USA) to grow energy cane and forage sorghum to help meet feedstock requirements.

The transaction between BP and Verenium is expected to close in the third quarter of 2010.

RENEWABLE DIESEL

Syntroleum achieves mechanical completion

In mid-July, Syntroleum Corporation, headquartered in Tulsa, Oklahoma, USA, announced the mechanical completion of its Dynamic Fuels LLC plant, located in Geismar, Louisiana, USA. Work is now under way to prepare for the start of plant operation. Commissioning activities in progress include flushing of all lines, verifying operation of the control system, and installation of catalysts and absorbents.

Dynamic Fuels, a joint venture of Syntroleum Corporation and Tyson Foods (Springdale, Arkansas, USA), will produce renewable fuels from animal fats and greases supplied by Tyson Foods, one of the world's largest processors and marketers of chicken, beef, and pork. The first shipments of animal fats have been delivered to the plant. The facility has been designed to produce as much as 75 million gallons (280 million liters) of renewable fuels per year.

According to BiofuelsDigest.com (http://tinyurl.com/277cuz6), the Dynamic Fuels project becomes, by a factor of 18, the largest operating advanced biofuels plant in North America. And in combination with Neste Oil's 109 million gallons per year renewable diesel plant in Porvoo, Finland, the two plants together will represent 94% of the world's advanced biofuels capacity once Dynamic reaches full production in the third quarter of 2010.

Chicken fat and waste greases are trading around \$0.25 per pound, compared with \$0.39 per pound for soybean oil, or a difference of about \$1 per gallon in feedstock costs. ■

Briefs

A small study funded by Mars Inc. (McLean, Virginia, USA) suggests that consumption of cocoa flavanols could improve poor blood vessel function in patients with coronary artery disease (CAD). The work, which was led by Christian Heiss of Heinrich-Heine University in Germany, appeared in the *Journal of the College of Cardiology* (doi:10.1016/j.jacc.2010.03.039). In a randomized, controlled, double-masked, crossover trial, 16 CAD patients aged between 61 and 67 years received a dietary high-flavanol cocoa drink or a low-flavanol, nutrient-matched control cocoa drink twice a day for 30 days. The researchers found that blood vessel function in the high-flavanol group improved by 47% compared with the low-flavanol group.

■■■

The first longitudinal analysis of vitamin D status and the risk of Parkinson's disease concluded that high circulating blood levels of vitamin D may reduce the risk of developing the degenerative disease by 67%. A team from the National Institute for Health and Welfare in Helsinki analyzed data from 3,173 Finnish men and women aged between 50 and 79 years and free of Parkinson's at baseline. Over 29 years of follow-up, the researchers documented 50 cases of Parkinson's disease. The study appeared in *Archives of Neurology* (*67*:808–811, 2010).

■■■

Have fast-food chains in the United States decreased their use of cooking oil high in *trans* fatty acids? At least three have, according to a study from the University of Minnesota School of Public Health: McDonald's, Burger King, and Wendy's significantly decreased the amount of *trans* and saturated fatty acids in French fries (crisps) between 1997 and 2008. The study was presented at the National Nutrient Database Conference in Grand Forks, North Dakota, USA, in July 2010. ■

Health & Nutrition

Fish oil vs. breast cancer

A new epidemiological study is the first to propose a link between fish oil consumption and a lower risk of breast cancer, according to co-author Emily White of the University of Washington (Seattle, USA).

The large survey included more than 35,000 postmenopausal women aged 50 to 76 who did not have breast cancer at the beginning of the study. Subjects who reported taking fish oil at the start of the research were about half as likely to develop ductal carcinoma of the breast during the follow-up years. Those taking fish oil did not exhibit reduced risk of the less-common lobular breast cancer.

The team also looked at use of several specialty supplements and found that they were not associated with breast cancer risk: Specifically, use of supplements sometimes taken for menopausal symptoms (black cohosh, dong quai, soy, or St. John's wort) was not associated with risk.

"Short of a randomized trial, this is . . . about as [good a study] as you can do," Timothy Rebbeck, an epidemiologist at the University of Pennsylvania in Philadelphia (USA), told www.sciencenews.org. "This is really something that has to be followed up."

The study appeared in *Cancer Epidemiology, Biomarkers and Prevention* (*19*:1696–1708, 2010).

In related news, new analysis from market research firm Frost & Sullivan (food.frost.com)— Strategic Analysis of the European Marine and Algae Oil Omega-3 Ingredients Market—finds that the market earned revenues of $323 million in 2008. The firm estimates this figure will reach $525.6 million in 2013.

"Industry associations have been successfully formed to protect their interests and voice their opinions to government agencies charged with regulating food ingredients," says Frost & Sullivan Research Consultant Christopher Shanahan. "These associations play a critical role in addressing crucial legislative challenges facing the industry and in providing opportunities that benefit the overall growth of the market."

The projected 10% compound annual growth rate from 2008 to 2013 in the marine and algae oil omega-3 ingredient market in Europe is likely to jumpstart key condition-specific health markets such as cognitive health, joint health, and immune health. However, the omega-3 industry is facing an increasingly complex set of technological, environmental, and regulatory changes, Frost & Sullivan notes.

"On February 12, 2010, the European Parliament approved nutrition claims for omega-3s, allowing food products to claim they are either a 'source of omega-3 fatty acids' or that they contain 'high omega-3 fatty acids'," says Shanahan. "This is a positive development because it will enhance both consumer awareness and usage across Europe, in countries where consumers already understand the value of omega-3s."

Meanwhile, in the United States, the Global Organization for EPA & DHA Omega-3 (GOED; Salt Lake City, Utah) says the draft *Dietary Guidelines for Americans* ignores the role EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid) long-chain polyunsaturated fatty acid supplements and fortified foods can play in the prevention of heart disease and other chronic illnesses in healthy people.

In comments submitted during the regulatory guideline comment period, GOED said the draft guidelines need to give greater credence to the role dietary supplements and functional foods can play in promoting health and making up for nutrient shortfalls in the diets of millions of Americans.

"The *Dietary Guidelines* are intended for healthy Americans first and foremost. If, indeed, the threshold of cardiovascular benefit to be achieved from EPA+DHA consumption is higher than 250 milligrams/day (mg/d) in the general population, then final recommendations should reflect 250 mg/d as a minimum rather than an optimal intake recommendation," GOED wrote.

"Furthermore, if intakes greater than 250 mg/d are associated with reduced risk of nonfatal events, then final recommendations should be broadened to reflect a range of benefits between 250–500 mg/d as suggested by the evidence available to the Committee."

Higher-protein diets and bone density

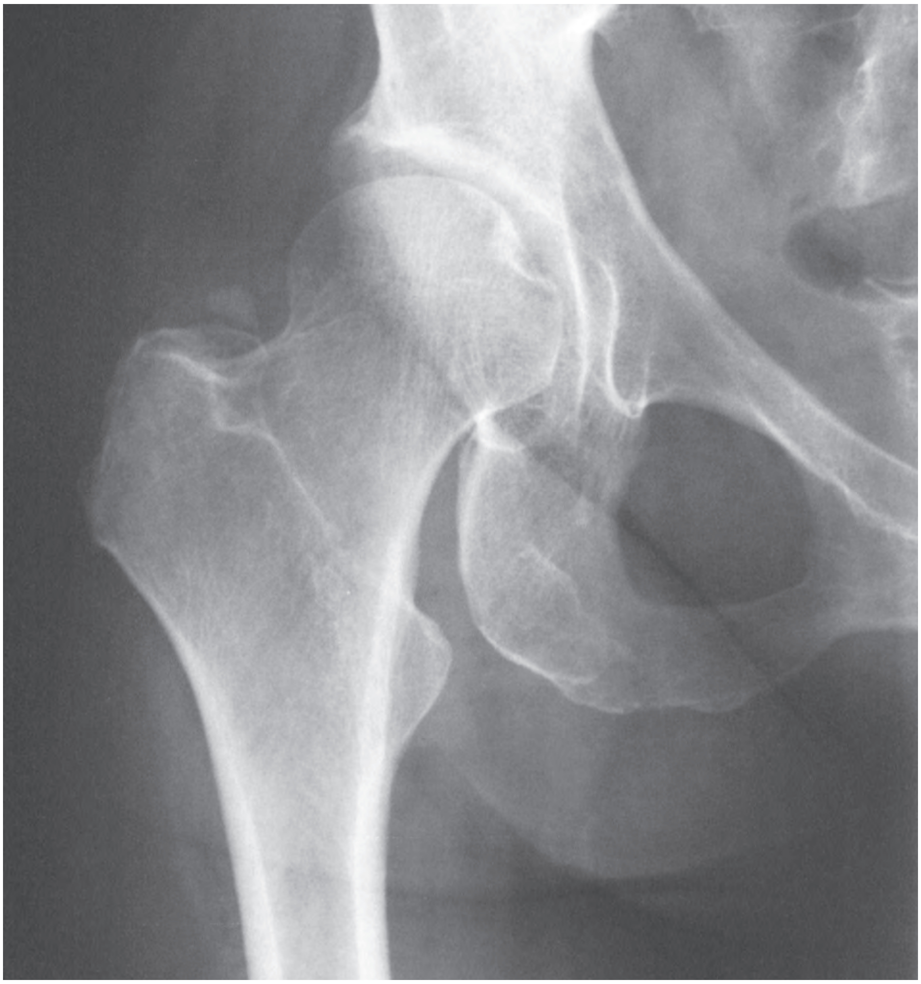
Overweight and moderately obese postmenopausal women using diets based on higher protein intake need to be aware of potential bone loss, according to new research from Purdue University in West Lafayette, Indiana, USA.

"We know that when overweight, postmenopausal women reduce their energy intake to successfully lose weight, they can lose less lean body mass when they consume higher amounts of protein and include lean meats, such as pork loins, ham, beef, and chicken, in their diet," said Wayne W. Campbell, professor of foods and nutrition. "However, we also found that these older women lost bone mineral density faster than women who consumed normal protein diets that did not contain any meats. This finding is of concern for this age group that is susceptible to osteoporosis."

Campbell and doctoral student Minghua Tang analyzed data from two controlled diet studies. In the first study, they reduced 28 women's individual daily diets by 750 calories to achieve a one-and-one-half-pound weight loss each week for 12 weeks. These postmenopausal women ranged in age from 43 to 80. Fifteen women consumed meat-free diets with protein from vegetarian, dairy, and egg sources, comprising 18% of each woman's energy intake. This amount of protein was comparable to the recommended dietary allowance of 0.36 grams of protein per pound of body weight per day.

The diets for the other 13 women were composed of 30% of energy from protein, with 40% of the protein from lean pork, such as loin and ham, and 60% of the protein from vegetarian, dairy, and egg sources. The women, on average, lost about 19 pounds each, but those who ate the higher-protein, meat-containing diet lost bone mineral density.

In the second study, 43 postmenopausal women each ate a 1,250-calorie diet for nine weeks. All participants consumed the same 1,000-calorie vegetarian diet, but 15 women received 250 calories from chicken breast meat, 14 women received 250 calories from beef tenderloin, and 14 women received 250 calories from shortbread cookies and sugar-coated chocolates. Another 11 women



served as the control group. The researchers saw again that all of the women who ate the energy-reduced diets successfully lost weight, but the groups that consumed the higher-protein meat-containing diets also lost bone mineral density compared to the control group.

The bone mineral density was measured using a dual-energy X-ray absorptiometer.

"Purposeful, moderate weight loss is an effective way for overweight postmenopausal women to improve their health and well-being," Campbell said. "However, research shows that older women are at risk of losing bone when they lose weight, and our findings highlight that amount and sources of protein are important to consider when choosing a weight-loss diet. Each individual needs to evaluate, or consult with a dietitian about how to achieve and sustain a healthy body weight and body composition, including muscle and bone."

Campbell and Tang indicate that more research is needed to better understand how different amounts and sources of protein affect bone when people lose weight.

"The impact of dietary protein on bone remains controversial, and information about dietary protein and bone from studies with weight-stable subjects might not be applicable to weight loss," Campbell said. "We know that bone is constantly forming and breaking down, and how fast these two processes occur determines the density of your bones. We don't have the data at this time to know the mechanisms involved with these changes in bone density.

"It is also important to note that these two studies were relatively short—nine to 12 weeks—so studies to evaluate how protein intakes impact body composition and bone beyond the period of active weight loss would be helpful."

The National Pork Board supported the first study, and the second study was supported by the US National Institutes of Health and the Beef Checkoff program, through the National Cattlemen's Beef Association. The findings appeared in the *Journal of Gerontology: Medical Sciences* (doi: 10.1093/gerona/glq083).

Genes and high triglyceride levels

Patients with high levels of triglycerides in their blood—a disease known as hypertriglyceridemia or HTG—face an increased risk for heart disease and stroke. HTG is also associated with obesity, diabetes, and pancreatitis. However, physicians are often uncertain about how best to treat patients with this condition, so understanding the genetic underpinning of HTG could provide clues to newer, better treatments.

In a new study published in *Nature Genetics* (*42*:684–687, 2010), Robert Hegele of the Robarts Research Institute, Schulich School of Medicine & Dentistry at The University of Western Ontario (London, Canada) and coworkers have shown that it is a combination of both common and rare variants or "misprints" in several genes that add up and put a patient at risk of developing HTG. Working with graduate student Christopher Johansen, Hegele used two different methods to uncover the complex genetic basis of HTG in more than 500 patients.

First, the researchers used DNA microarrays (gene chips) and found that commonplace variants in four different genes are strongly related to a person's developing HTG. Next, using detailed DNA sequence analysis, they found that patients with HTG also had an excess of rare variants—ones found only in one or two people—in these same four genes. Cumulatively, the rare variants were found in 28% of HTG patients, or about twice the rate seen in healthy controls.

"This is one of the first studies that combined gene chips with DNA sequencing to examine the genomes of patients," explains Hegele, an endocrinologist and professor in the Departments of Biochemistry and Medicine at the University of Western Ontario. "It was fortunate that we used both methods. Gene chip studies are popular nowadays and are effective at finding relationships between common genetic variants and disease. But gene chips cannot detect rare variants. For that, you need to do the more expensive and time-consuming method of DNA sequencing."

Scientists have long suspected that both common and rare genetic variants contribute to many diseases, but the study from the Robarts group now definitively shows that this is the case in HTG.

"It is also instructive that one single gene is not solely responsible for high triglyceride levels but rather a mosaic of both common and rare variations in several genes." Hegele adds that these rare variants now help explain the missing heritability of lipid traits. "It means that to get a full picture of a patient's genetic risk, you need to consider both common and rare variants in many genes simultaneously, and to use methods that will detect both types of variation."

Low saturated fat associated with stroke

Very low intakes of saturated fats may lead to an increased risk of death from stroke, according to new research from Japan.

The study, published by the *American Journal of Clinical Nutrition* (doi: 10.3945/ajcn.2009.29146), was designed to test the correlation between saturated fatty acids (SFA) intake and the risks of cardiovascular disease mortality in Japan. The study is part of the much larger Japan Collaborative Cohort Study for Evolution of Cancer Risk (JACC Study)—a continuing population study of over 110,000 people.

Of the 110,000 subjects in the main study, 58,453 also completed a food-frequency questionnaire, and were followed up for just over 14 years to check for associations between dietary SFA intake and stroke mortality.

The researchers found that SFA intake was inversely associated with overall stroke mortality, with associations especially strong for intraparenchymal hemorrhage and ischemic stroke.

In addition, the population study also observed that decreasing SFA intake by increasing polyunsaturated fatty acids (PUFA) was "significantly positively associated with stroke mortality."

The lowest incidence of stroke mortality was observed in people with SFA intake of between 18 and 40 g SFA per day (n = 148 deaths); reducing SFA intake to below 18 g was seen to increase the relative risk of stroke by nearly 20% (n = 177 deaths for between 15.4 and 17.9 grams per day). An intake of less than 11g of SFA per day was associated with an increased risk of almost 66% (n = 245 deaths).

In their paper, the researchers hypothesize that saturated fats could have different impacts in larger arteries compared to small vessels. Thus, low SFA levels in smaller vessels could lead to angionecrosis through a reduction of smooth muscles cells and increased fragility of vascular walls. ■

Biotechnology News

Briefs

Scientists from VIB (Flanders Institute for Biotechnology, Belgium) and Ghent University (Belgium) have developed a technology that may contribute to the increase of crop yields in agriculture. The technology platform based on Tandem Affinity Purification (TAP) was developed to map the basic machinery of cell division in plants much faster than possible with existing techniques.

The results of the research, published in the journal *Molecular Systems Biology* (*6*:397, 2010), were obtained through close collaboration with researchers from the University of Antwerp (Belgium) and include a complete map of the machinery behind cell division in the model plant *Arabidopsis thaliana*. "The major driving force behind plant growth is cell division," says Geert De Jaeger, group leader at VIB and Ghent University. "If you understand the machinery that governs this process, you have the key to increase agricultural yield." During their experiments, the researchers discovered more than 100 new proteins involved in the process.

■■■

Researchers in the University of York's (UK) Centre for Novel Agricultural Products (CNAP) have found a gene that plays a significant role in the growth rate of the model plant *Arabidopsis thaliana*. The study, published in *Current Biology* (*20*:1493–1497, 2010), reveals that plants without the SPATULA (SPT) gene grow at a faster rate at lower temperatures, but nevertheless have the same tolerance to freezing as plants that have the gene.

The research also shows that daytime temperatures have a particular influence on plant growth and that the SPT gene allows plants to measure temperature in the morning. CNAP's Steve Penfield, who led the research team, said: "There is potential for this discovery to be used to increase crop yields by extending the growing season particularly in spring and autumn." The research also involved scientists from the Institute of Molecular Plant Sci-

GM corn varieties granted EU regulatory approval

Reuters reported in late July that the European Commission (EC), the executive arm of the European Union (EU), cleared six genetically modified (GM) varieties of corn for import. The six approvals came on the heels of the EU's proposal to allow member states to "restrict or ban genetically modified crops, even after an EU approval procedure based on health and environment risk assessment has given a green light" (see *inform 21*:494, 2010, for more). Reuters reported that the decision, in force for 10 years, includes "imports for food and animal feed, not for cultivation."

The approvals included corn varieties from Syngenta (Basel, Switzerland) and Monsanto Co. (St. Louis, Missouri, USA), as well as two developed by DuPont business Pioneer Hi-Bred and Dow AgroSciences LLC, a wholly owned subsidiary of The Dow Chemical Company. The DuPont/Dow products approved were maize products containing the Herculex® I insect protection and the Herculex RW trait stack (also known as 1507×59122 stack or as Herculex Xtra®), and maize products containing the Herculex RW, Herculex I, and Roundup Ready® Corn 2 trait stack (also known as 59122×1507×NK603 stack). Authorization for the Monsanto corn technology combinations included Genuity VT Double PRO (MON 89034 × NK603) and YieldGard VT Triple (MON 88017 × MON810). Syngenta's approvals included the renewal of insect-resistant Bt11 maize that had expired in 2007.

"These approvals show promising movement in the EU for biotech approvals," said Pioneer Hi-Bred President Paul E. Schickler. "We are encouraged by these approvals and urge the Commission and EU Member States to similarly approve biotech crops for cultivation so Europe's farmers have access to the same technologies as other farmers around the world."

"These authorizations will also enable shipment of grain and its derivatives from these products for use as feed ingredients by European livestock industry," Jerry Hjelle, Monsanto global regulatory lead, noted.

QUESTIONS ABOUT EU GM PROPOSAL

Opposition persisted, though, to the EU's proposal to allow its member states final ences in the School of Biological Sciences at the University of Edinburgh.

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Substantial growth in the adoption rate of biotech soybeans, corn, and cotton in Brazil—this is the projection for the 2010/11 growing season based on the first survey of agribiotechnology in the country by Celeres, an agrobusiness consultancy group. Highlights of the report, as reported by the Inter-

national Service for the Acquisition of Agri-biotech Applications (ISAAA), estimate that: (i) farmers will plant 17.2 million hectares with genetically modified (GM) soybean cultivars, or 76.6% of the total harvested area; (ii) a total of 250,000 hectares will be planted to GM cotton; (iii) area planted for the summer corn crop will reach 7.6 million hectares, or 42% of the total area reserved for biotech corn; and (iv) total area harvested of biotech corn is expected to reach 7.1 million hectares, or 55.6% of the total area. For more details, email Anderson Galvao, chief editor of the report at agalvao@celeres.com.br.

■■■

Syngenta Seeds, Inc. (Minnetonka, Minnesota, USA) announced it has received approval from regulatory authorities in both Mexico and the Philippines for both the Agrisure Viptera 3111 trait stack and the Agrisure Viptera 3110 trait stack. The Agrisure Viptera 3111 trait stack combines the Agrisure Viptera trait with the Agrisure 3000GT trait stack to control insects in corn. The Agrisure Viptera 3110 trait stack combines the Agrisure Viptera trait with the Agrisure GT/CB/LL trait stack to provide broad-spectrum lepidopteran control and herbicide tolerance in areas where rootworm management is not a primary concern. These regulatory approvals allow the

say in the approval or ban of GM crops, and called into question the validity of such EC decisions. The Earth Times Online Newspaper reported that the United States opposed the EU proposal because it would likely "complicate efforts to end a years-long dispute over US food imports to the continent." US Trade Representative Ron Kirk suggested that a "transparent and science-based process" for approving and evaluating GM crops in the EU would be difficult to accomplish if member states were allowed to make their own decisions independent of the official EU position.

Associations representing European industry in "the entire food chain" drafted and sent a letter expressing "deep concern" over the EC's proposal, Reuters also reported.

"The new approach on GM cultivation sets a dangerous legal precedent, jeopardizing the internal market for authorized products," the letter read.

EFSA AND THE ALLERGENICITY OF GMO

Also in July, the European Food Safety Authority (EFSA), through its Genetically Modified Organisms (GMO) Panel, adopted a scientific opinion on strategies for assessing the risk of allergenicity of GM plants and microorganisms and derived food and feed. This opinion is part of EFSA's ongoing effort to ensure that its risk assessment reflects the latest scientific developments and addresses the widest range of potential concerns. Recommendations in the opinion are provided to update and complement EFSA's allergenicity assessment of GM plants and microorganisms and derived food and feed.

The final opinion takes into consideration a total of 181 comments, received during a 10-week public consultation, from 17 interested parties including national assessment bodies, nongovernmental organizations, business associations, and universities as well as individuals. Comments mostly addressed the issue of how to implement the general approach for assessing the allergenicity of GMO, as well as how to interpret the results of the methods discussed in the opinion. Some comments also covered more technical aspects and are addressed in a series of specific annexes to the opinion.

In its opinion, the Panel concluded that, as there is no single test to assess the allergenicity of a GM food or feed, a case-by-case evaluation based on a weight-of-evidence approach is the most appropriate way to do this. For more information, as well as a PDF copy of the opinion, visit www.efsa.europa.eu/en/scdocs/scdoc/1700.htm.

Wild canola plants containing GM found in US

Scientists at the University of Arkansas (UofA; Fayetteville, USA) and their colleagues have found populations of wild plants with genes from GM canola in the United States. Globally, canola can interbreed with 40 different weed species, and 25% of those weeds can be found in the United States. These findings raise questions about the regulation of herbicide-resistant weeds and about how these plants might compete with others in the wild.

The research originated when UofA graduate student Meredith Schafer and UofA professor of biological sciences Cynthia Sagers spotted some "pretty yellow flowers" in a ditch near Warehouse Foods in Langdon, North Dakota. As part of another research project, they had with them some portable strips that test for GM proteins found in canola, proteins that convey herbicide resistance to crop plants. The strips work much like those in a pregnancy test; Schafer and Sagers crushed plant leaves in water and added the test strip, which would develop one line if it tested negative for the modified gene and two lines if it tested positive for a modified protein. Their test strips could detect the protein that conveys Roundup resistance; they also could detect the protein that conveys resistance to Liberty Link, another herbicide used on canola. Schafer and Sagers determined at once that the parking lot weeds contained transgenic genes.

Schafer and Sagers expanded their research over 5400 km and found wild canola in about 46% of the sites along the highway, either growing on the side of the road or in cracks in the highway. About 83% of the weedy canola plants they tested contained transgenic material, that is, they contained herbicide resistance genes from GM canola. Further, some of the plants contained resistance to both herbicides, a combination of transgenic traits that had not been developed in canola crops.

"That's not commercially available. That has to be happening in the wild," Schafer said. "That leads us to believe that these wild populations have become established populations. Technically, these plants are not supposed to be able to compete in the wild."

US canola associations downplayed the significance of the discovery:

"Because 85 to 90% of the US and Canadian canola crop is grown from biotech seeds, we would expect the same percentage to be reflected in 'volunteer' canola [defined in this case as GM plants found outside the agricultural fields they were planted in]," said Barry Coleman, executive director of the Northern Canola Growers Association (Bismarck, North Dakota) and a canola grower in North Dakota. "As with conventional canola production, it is not unusual or concerning that volunteer biotech canola was found on roadsides due to occasional seeds being misplaced during transport or harvesting."

According to the US Canola Association (Washington, DC), when biotech canola was originally evaluated by the US Department of Agriculture (USDA) and Canadian Food Inspection Agency (CFIA), they recognized that, like traditional canola, biotech canola would volunteer and might require management in some areas. The USDA found no evidence that biotech canola would be more apt than traditional canola to outcompete other plant species. The agencies also considered the possibility that canola would breed with other species. The CFIA concluded that such crosses would not be invasive, nor result in increased weediness or invasiveness, and could be managed by current agronomic practices.

"Volunteer biotech canola is easily managed through mowing, tillage, or one of several herbicides that do not contain the active ingredient (glyphosate or glufinosate) to which the canola is resistant," said Dale Thorenson, assistant director of the US Canola Association and a former canola grower in North Dakota. "What's concerning on roadsides and in other areas is invasive species like leafy spurge that cannot be controlled by these methods.

"When planting canola, especially biotech varieties, farmers are expected to keep good records of fields and watch for volunteer plants," added Thorenson. "If they occur, they should till or use any herbicide currently registered for control of volunteer canola. This is part of routine crop management."

While the issue has been discovered in North Dakota, UofA's Sagers says the message is a global one. The world recently hit a milestone, where more than 50% of the earth is covered in crops used for food or forage. Domesticated plants have wild cousins that often are considered weeds, and sometimes these plants can still cross breed, creating a high potential for herbicide and pesticide resistance to show up where it isn't wanted.

"We really don't know the consequences of the gene escape," added Schafer. "We don't know what these plants are going to do."

Advances in aphid-resistant soybeans

Two lines of pest-resistant soybean developed by a Michigan State University (East Lansing, USA) scientist may promise healthier harvests for growers afflicted by soybean aphids.

"Sparta—the Soybean Aphid Shield" is the new trade name for genetics developed by Dechun Wang. The associate professor of crop and soil science tested some 2,000 strains of soybeans against aphids to isolate four with different resistant genes. From those he developed germplasm, or seeds to breed into varieties suited to Michigan's shorter growing season.

"The final goal," Wang said, "would be to have one variety that has all those resistant genes," maximizing protection against different biotypes of aphids and perhaps other pests such as Japanese beetle. Soybean aphids suck plant sap and secrete sticky honeydew that promotes the growth of sooty black mold, and when the insects sprout wings they can transmit plant viruses widely. Fifteen generations of aphid can live on a soybean plant in the summer, with eggs overwintering on nearby buckthorn.

"In the field, we will inoculate a plant with just two aphids, and the entire plant will be totally covered by aphids in a few weeks," Wang said. "It takes aphids just five days to produce more babies, and aphids are born pregnant, so the regeneration cycle is incredibly fast."

Tiny soybean aphids, also native to Asia, were first identified in Wisconsin in 2000, but quickly cut a wide swath until beaten back mostly with chemical pesticides. Unchecked, aphids can lay waste to half the output of a field, but one application

importation of US corn grown from hybrids containing either the Agrisure Viptera 3111 trait stack or the Agrisure Viptera 3110 trait stack into Mexico and the Philippines for food, feed, or processing use.

Additionally, Syngenta Seeds announced it had received import approvals from Japanese and Taiwanese regulatory authorities for its Enogen corn amylase trait (Event 3272), which has demonstrated improved productivity and sustainability in the manufacture of ethanol from corn in tests conducted at ethanol plants.

■■■

ISAAA reported in August that Monsanto Co. is seeking approval from the Office of Gene Technology, Australia, to conduct a field trial of canola genetically modified for herbicide tolerance. The GM canola proposed for release is similar to the commercially approved Roundup Ready® canola. The trial will be conducted to evaluate the agronomic performance of the herbicide-tolerant line under field conditions in two sites in the first year, eight sites in the second and third years, and up to 20 sites in the fourth year. The identified sites may include 46 possible local government areas in New South Wales, 28 in Victoria, and 53 in Western Australia. There will be a maximum of 10 ha, and the trial will be conducted from March 2011 to December 2014.

■■■

In August Bloomberg reported that Tanzania was slated to begin growing GM cotton, according to the Tanzania Cotton Board. "The timeline for introduction of Bt [cotton] has not been charted but the legal framework is in place," Marco Mtunga, a regulation officer for the Tanzania Cotton Board, was quoted as saying. "Results from the pilot indicate that productivity will go up as farmers will receive inputs on credit, reliable extension services will be provided in collaboration of the private sector and the government." According to Food and Agriculture Organization statistics, Tanzania is Africa's fifth-largest lint-cotton producer by volume, after Egypt, Nigeria, Burkina Faso, and Benin. ■

of insecticide might add 10% to the cost of production, and kill beneficial insects as well.

The germplasm already is the subject of growing interest among seed companies, which will cross it with their own varieties. "With one exception, all the major soybean genetics companies have licensed his germplasm because the level of resistance to soybean aphids is very high," Department of Crop and Soil Sciences Chairperson James Kells said.

In related news, Monsanto Co. (St. Louis, Missouri, USA) announced that it would introduce new Genuity® Roundup Ready 2 Yield® soybean varieties with aphid tolerance in 2011. "Monsanto's new aphid tolerant soybeans will be introduced initially in maturity groups I and II in the upper Midwest, the areas where aphid populations are typically the highest," said Aaron Robinson, Monsanto soybean traits technical manager.

Drought resistance in plants

In a study published in the *Proceedings of the National Academy of Sciences* (doi: 10.1073/pnas.1007879107), researchers identified the protein targets in cells of a key hormone that controls how plants respond to environmental stresses such as drought, excessive radiation, and cold.

"Since they cannot walk or run, plants have developed an interesting and complicated system for sensing and responding very quickly to dehydration and other stresses," says Michael Sussman, a University of Wisconsin-Madison (USA) professor of biochemistry and the senior author of the study. He noted that, on average, a plant is composed of 95% water. "Most plants have what's called a permanent wilting point, where if water content goes below 90% or so, they don't just dehydrate and go dormant, they dehydrate and die."

Working in the model laboratory plant *Arabidopsis*, the team explored the influence of abscisic acid, a long-studied hormone that, in addition to influencing how plants respond to environmental stress, controls the naturally occurring processes of seed dormancy and germination. The hormone has been known to science for 50 years, and was believed to influence certain proteins in cells in a complicated cascade of events that aided the ability of a plant to survive such stresses as dehydration, excessive radiation, and cold temperatures. But any plant cell, Sussman explains, contains at least 30,000 different proteins, and the identity of the few proteins activated by the hormone was a mystery.

Figuring out how to trigger a dormant state, such as exists naturally in seeds, which are 10% water and can in some cases remain viable for hundreds of years, could be key to creating plants that survive drought in the field, Sussman explains.

The team utilized a new stable isotope technology and mass spectrometry to comb through 5,000 candidate proteins in the cells of living plants and found 50 that were influenced by the abscisic acid hormone. The survey is the first of its kind in a living plant and many of the proteins identified were previously not known to be influenced at all by abscisic acid. Surprisingly, the hormone was found to regulate some of the plant proteins in a completely different way than was known before, by inhibiting their ability to have a phosphate moiety removed from an amino acid, by a type of enzyme called a protein phosphatase. Protein phosphatases are the opposite side of the coin that catalytic enzymes known as protein kinases occupy. In many important biological processes, such as cancer, it is the protein kinases that are the dominant actors.

Tracking second-generation GM crops

Research by a team of government and university crop scientists from across Canada includes a scientific framework for monitoring the release of second-generation GM crops. The framework was designed to assess the risks of novel genes entering wild populations.

First-generation GM/transgenic crops with novel traits have been grown in a number of countries since the 1990s. Most of these crops had a single gene that allowed them to tolerate herbicide application, giving them an advantage over wild species. Second-generation transgenic crops are now being tested in confined field trials around the world. Some of these traits will allow crops to tolerate environmental stress such as drought, cold, salt, heat, or flood. Other traits being developed may lead to increased yield or lower nutrient requirements, or increase tolerance to disease and pathogens.

With novel traits from first-generation transgenic crops now being discovered in the wild (see "Wild canola plants containing GM found in US," page 564, this issue), accurately estimating the environmental impact of these new crops is becoming increasingly important.

The review and interpretation article by the team of scientists—Hugh Beckie, Linda Hall, Marie-Josée Simard, Julia Leeson, and Christian Willenborg—was published in *Crop Science* (*50:*1587–1604, 2010).

Before crops with new traits can be released, the developer must conduct an environmental risk assessment on the crop. According to the authors, these trials are generally too small to uncover the uncertainties inherent in the second-generation crops before they are released. The post-release monitoring procedure the research team developed is designed to provide additional risk management. Concrete steps are outlined for each of the four phases of the framework: (i) defining the problem; (ii) project management and monitoring procedure; (iii) implementation; and (iv) regulatory decision.

Using drought-tolerant canola as a case-specific example of how to use the framework, the researchers identified several potential environmental risks associated with cultivation of this crop. The primary concern was the increase of invasiveness of wild, self-perpetuating populations, and hybridizations between transgenic crops and weedy relatives. Also identified was backcrossed progeny in noncropped disturbed and natural areas next to transgenic fields, resulting in loss of abundance or biodiversity of native plant species.

The authors concluded that post-release monitoring, through a comprehensive, pragmatic, and science-based framework, can effectively address the greater uncertainties in the environmental risk assessment of these second-generation vs. first-generation transgenic crops and thereby enhance environmental protection and security of the food supply. ■

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People News/ Inside AOCS

AOCS members recognized

Two AOCS members were recognized for their research at the Institute of Food Technology 2010 Annual Meeting + Food Expo, held in Chicago, Illinois, USA, in July, 2010.

Levente Diosady, who is with the University of Toronto (Canada) Department of Chemical Engineering and Applied Chemistry, received the 2010 Babcock-Hart Award for innovative food engineering technologies, which have improved public health through nutrition, especially in developing countries. The award statement said, in part, "Diosady's interest in applying the principles of chemical engineering and food chemistry to the large-scale processing of food has resulted in improved processes of edible oil refining, vegetable protein extraction, and nitrite-free meat curing systems."

David Julian McClements, who is with the University of Massachusetts (Amherst, USA) Department of Food Science, received the 2010 Marcel Loncin Research Prize, which provides research funding to a scientist or engineer conducting basic chemistry, physics, or engineering research applied to food processing and the improvement of food quality. His proposed research will focus on developing food-grade delivery systems to encapsulate, protect, and release bioactive lipophilic components for incorporation into food products. Over the course of the research project, he will help young scientists to develop their skills through mentorship and exposure to the health and wellness field.

Grime joins IntertechPira

IntertechPira, an events organizer, publisher, and consultancy in the home and personal care (HPC) industry, headquartered in Leatherhead, UK, appointed AOCS President **Keith Grime** as associate consultant in July. He will help develop IntertechPira's cleaning product events, act as expert contributor to its publications and membership services, and help expand its consultancy offering.

A former R&D vice president at the Procter & Gamble Co., Grime is president of JKG Consulting LLC. For the last two years he has also been an adjunct professor at Northwestern University (Evanston, Illinois, USA) teaching technical management and innovation strategy.

Grime will co-chair IntertechPira's 4th annual Cleaning Products event November 3–5, 2010 (www.cleaningproductsconference.com) and present a keynote address on the first day.

As well as organizing events, IntertechPira publishes market intelligence studies in the HPC space and offers a full range of consultancy services including quantitative market sizing and forecasting, new product development, strategic analysis, and technology forecasting.

New Malaysian palm oil appointments

Mohd Bakke Salleh became acting president and group chief executive of palm oil plantation corporation Sime Darby Bhd. (Kuala Lumpur, Malaysia) on July 15, 2010. His appointment came two months after then-president and group chief executive **Ahmad Zubir Murshid** took a leave of absence pending an investigation into Sime Darby's large financial losses. Acting group chief executive **Azhar Abdul Hamid** was redesignated as special adviser to Bakke.

In a statement, Sime Darby said Bakke's first task is to implement a new groupwide organization and reporting structure; his second responsibility is to continue the ongoing review of gaps in the management, organization, and reporting structure at the energy and utilities division.

Also on July 15, **Sabri Ahmad**, the ex-Sime Darby plantation integration advisor and former group chief executive of Golden Hope Plantations Bhd. (which became part of Sime Darby in 2008), was named successor to Bakke, who until July 14 had been group president and chief executive officer of Felda Globai Ventures Holdings Sdn. Bhd., which is among the world's largest palm oil producers. He is under a two-year contract. Sabri was chairman of the Malaysian Palm Oil Board from 2007 to 2010.

What's new with you?

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

In Memoriam

NORMAN H. WITTE

AOCS Emeritus Member Norman Witte died on June 3, 2010, in Fort Wayne, Indiana, USA, at the age of 88.

Witte was born in Fort Wayne, and completed his B.S. in chemical engineering at Purdue University (West Lafayette, Indiana) in 1942. He worked for Solvay Process Co., part of Allied Chemical, then joined the US Navy in 1944 as an ensign. He served on a destroyer in the Pacific campaign of World War II.

Following his separation from the Navy in 1946, Central Soya hired Witte for an opening in their technical department. He remained there for his entire career. He was associated with the commercialization and further development of the desolventizer toaster, which revolutionized the solvent extraction industry. His work led to a number of US patents. Witte retired from Central Soya at the end of 1986 after 40 years with the company.

He then worked as a consultant in the soybean and vegetable oil processing business, pursued his hobbies in computers, and continued his participation in church activities.

Witte joined AOCS in 1952 and took part in many aspects of the organization. His published articles in the *Journal of the American Oil Chemists' Society* dealt with processing, including one (*34*:113–116, 1957) on plant safety, a life-long interest. He served as a member of the AOCS technical safety and engineering and environmental control committees, a session chairman for the 1976 World Conference on Oilseed and Vegetable Oil Processing Technology, program chairman for the 1982 World Conference on Edible Oil Processing, a speaker at the 1985 World Conference on Emerging Technologies in the Fats and Oils Industries, and a Governing Board member in 1982. The Processing Division of AOCS recognized Witte in 2006 with its Distinguished Service Award.

Gerald Fawbush, who is also an AOCS member, worked with Witte for 25 years at Central Soya. He described his boss as "an exceptional engineer, a fantastic person, a real family man . . . he was part of what made Central Soya a good place to work."

Witte is survived by Aileen, his wife of 63 years; 6 children; 20 grandchildren; and 4 great-grandchildren.

ALLEN FORSTER

AOCS has received word that Allen Forster of Hull, England, has died. He had been a member of AOCS since 1989.

Forster received HNCs (Higher National Certificates, roughly equivalent in the United States to a two-year university program) in chemistry and in chemical engineering.

Forster started in 1968 as a shift chemist with Marfleet Refining Co. (now Seven Seas, Ltd.) in Hull, England. The company was in the business of providing fish oil and cod liver oil. He moved to Simon-Rosedown Ltd., also in Hull, in 1971, where he was marketing director. The company, which was later purchased by DeSmet, designed and supplied vegetable oil extraction and refining equipment.

He was an inventor on several patents dealing with solvent extraction processes while he was with Simon-Rosedown, and he was a presenter on Physical Refining at the World Conference on Oilseed and Edible Oil Processing sponsored by AOCS and held in The Hague, Belgium, in October 1982.

Forster started Afco Advisory Services, a consultancy, in 1989, and at the time of his passing he was with Research and Development Plant Ltd., in Hull.

He is survived by his wife, Christine.

Extracts & Distillates

Comprehensive blood plasma lipidomics by liquid chromatography/quadrupole time-of-flight mass spectrometry

Sandra, K., *et al.*, *J. Chromatogr. A 1217*:4087–4099, 2010.

A lipidomics strategy, combining high-resolution reversed-phase liquid chromatography (RPLC) with high-resolution quadrupole time-of-flight mass spectrometry (QqTOF), is described. The method has carefully been assessed in both a qualitative and a quantitative fashion utilizing human blood plasma. The inherent low technical variability associated with the lipidomics method allows measurement of 65% of the features with an intensity RSD [relative standard deviation] value below 10%. Blood plasma lipid spike-in experiments demonstrate that relative concentration differences smaller than 25% can readily be revealed by means of a *t*-test. By utilizing an advanced identification strategy, it is shown that the detected features mainly originate from (lyso)phospholipids, sphingolipids, mono-, di-, and triacylglycerols, and cholesterol esters. The high resolution offered by the up-front RPLC step further allows the discrimination of various isomeric species associated with the different lipid classes. The added value of utilizing a Jetstream electrospray ionization (ESI) source over a regular ESI source in lipidomics is for the first time demonstrated. In addition, the application of ultra high-performance LC up to 1,200 bar to extend the peak capacity or increase productivity is discussed.

Desorption electrospray ionization imaging mass spectrometry of lipids in rat spinal cord

Girod, M., *et al.*, *J. Am. Soc. Mass Spectrom. 21*:1177–1189, 2010.

Imaging mass spectrometry allows for the direct investigation of tissue samples to identify specific biological compounds and determine their spatial distributions. Desorption electrospray ionization (DESI) mass spectrometry has been used for the imaging and analysis of rat spinal cord cross sections. Glycerophospholipids and sphingolipids, as well as fatty acids, were detected in both the negative and positive ion modes and identified through tandem mass spectrometry (MS/MS) product ion scans using collision-induced dissociation and accurate mass measurements. Differences in the relative abundances of lipids and free fatty acids were present between white and gray matter areas in both the negative and positive ion modes. DESI-MS images of the corresponding ions allow the determination of their spatial distributions within a cross section of the rat spinal cord, by scanning the DESI probe across the entire sample surface. Glycerophospholipids and sphingolipids were mostly detected in the white matter, while the free fatty acids were present in the gray matter. These results show parallels with reported distributions of lipids in studies of rat brain. This suggests that the spatial intensity distribution reflects relative concentration differences of the lipid and fatty acid compounds in the spinal cord tissue. The "butterfly" shape of the gray matter in the spinal cord cross section was resolved in the corresponding ion images, indicating that a lateral resolution of better than 200 μm was achieved. The selected ion images of lipids are directly correlated with anatomic features on the spinal cord corresponding to the white and the gray matter.

Determination of phospholipids in soybean (*Glycine max* (L.) Merr) cultivars by liquid chromatography-tandem mass spectrometry

Lee, S.J., *et al.*, *J. Food Comp. Anal. 23*:314–318, 2010.

Special interest has been focused on the variation in the composition and content of phospholipids (PL) in soybeans following genetic modification, due to their beneficial effects on human health. As part of the attempt to discover PL-rich soybeans, a total of 12 cultivars were bred and their PL contents were determined by LC-MS/MS (liquid chromatography-mass spectrometry). In the LC, 0.1 M ammonium formate in methanol was essential to obtain good peak separation with minimum tailing. The LC-MS/MS method operating in the multiple reaction monitoring (MRM) mode, with two transitions monitored for each PL, provided good selectivity and sensitivity for the determination of PL. All the calibration curves were linear, with correlation coefficients higher than 0.990. The extraction recoveries ranged from 75.6% to 89.9%. The limit of quantitations (LOQ) was within the range of 0.16–16.7 μg/kg. The average content of total PL in the 12 soybean cultivars was about 75.7 mg/kg. The total PL and phosphatidylcholine contents were highest in the Gaechuck#2 cultivar. From the viewpoint of the PL content, Gaechuck#2 was demonstrated to be the most improved variety in the 12 cultivars investigated.

A rapid separation technique for overcoming suppression of triacylglycerols by phosphatidylcholine using MALDI-TOF MS

Emerson, B., *et al.*, *J. Lipid Res. 51*:2428–2434, 2010.

Phospholipids and triacylglycerols (TAG) are important classes of lipids in biological systems. Rapid methods have been developed for their characterization in crude samples, including matrix-assisted laser desorption ionization (MALDI) time-of-flight mass spectrometry (MS). For mixtures, MALDI often selectively shows only some components. For example, phosphatidylcholine (PC) suppresses detection of other lipids. Most rapid MS methods detect either TAG or phospholipids but not both. Herein, we demonstrate a simple approach to rapidly screen mixtures containing multiple lipid classes. To validate this approach, reference lipids [PC, tripalmitin (PPP), and phosphatidylethanolamine (PE)] and real samples (beef, egg yolk) were used. In a binary mixture with a strong suppressor (PC), PPP was greatly suppressed. After a simple separation, suppression was virtually eliminated. A mixture of nominally non-suppressing lipids (PE and PPP) was not adversely affected by separation. Ground beef and egg yolk were used to demonstrate detection of known lipid compositions where other methods have missed one or more lipids or lipid classes. Separation was performed using solid phase extraction with a PrepSep florisil column. A 10 min separation allows rapid screening for lipids and changes in lipids. It is sufficient to clearly detect all lipids and overcome suppression effects in complex lipid mixtures.

Predicting the fatty acid composition of milk: A comparison of two Fourier transform-infrared sampling techniques

Afseth, N.K., *et al.*, *Appl. Spectr. 64*:700–707, 2010.

In the present study a novel approach for Fourier transform-infrared (FT-IR) characterization of the fatty acid composition of milk based on dried film measurements has been presented and compared to a standard FT-ER approach based on liquid milk measurements. Two hundred sixty-two milk samples were obtained from a feeding experiment, and the samples were measured with FT-IR as dried films as well as liquid samples. Calibrations against the most abundant fatty acids, conjugated linoleic acid (CLA; i.e., 18:2*cis*-9, *trans*-11), 18:3*cis*-9, *cis*-12, *cis*-15, and summed fatty acid parameters were obtained for both approaches. The estimation errors obtained in the dried film calibrations were overall lower than the corresponding liquid sample calibrations. Similar and good calibrations (i.e., R^2 ranges from 0.82 to 0.94 (liquid samples) and from 0.88 to 0.97 (dried films) for short-chain fatty acids (6:0–14:0), 18:1*cis*-9, saturated fatty acids, monounsaturated fatty acids, and iodine value were obtained by both approaches. However, the dried film approach was the only approach for which feasible calibrations (i.e., R^2 ranges from 0.78 to 0.93) were obtained for the major saturated fatty acids 16:0 and 18:0, the minor fatty acid features 4:0, CLA (i.e., 18:2*cis*-9, *trans*-11), polyunsaturated fatty acids, and the summed 18:1 *trans* isomers. For the dried film approach, logical spectral features were found to dominate the respective fatty acid calibration models. The preconcentration step of the dried film approach could be expected to account for a major part of the prediction improvements going from predictions in liquid milk to predictions in dried films. The dried film approach has a significant potential for use in high-throughput applications in industrial environments and might also serve as a valuable supplement for determination of genetic and breeding factors within research communities.

Novel biomarkers of 3-chloro-1,2-propanediol exposure by ultra performance liquid chromatography/mass spectrometry based metabonomic analysis of rat urine

Li, Y., *et al.*, *Chem. Res. Toxicol. 23*:1012–1017, 2010.

To select early, sensitive biomarkers of 3-chloro-1,2-propanediol (3-MCPD) exposure, a single dose of 30 mg/kg/day 3-MCPD was administered to male Wistar rats for 40 days. Significant elevations of serum creatinine and blood urea nitrogen concentrations were observed on day 40, and urine *N*-acetyl-β-D-glucosaminidase and β-galactosidase (β-Gal) activities were observed on day 20. Slight renal tubule hydropic degeneration and spermatozoa decreases were observed on day 10. The endogenous metabolite profile of rat urine was investigated by ultra performance liquid chromatography/mass spectrometry with electrospray ionization (ESI). Principal component analysis and partial least-squares enabled clusters to be visualized, with a trend of clustering on day 10 in ESI^- and the greatest differences on days 30 and 40. Galactosylglycerol, a marker contributing to the clusters, which had earlier variations than conventional biomarkers and the most significant elevations as compared to other novel biomarkers, was first considered to be an early, sensitive biomarker in evaluating the effect of 3-MCPD exposure. The identification of galactosylglycerol was carried out by β-Gal catalysis, and the possible mechanism of urine galactosylglycerol variation was elucidated.

High throughput screening of mutants of oat that are defective in triterpene synthesis

Qin, B., *et al.*, *Phytochemistry 71*:1245–1252, 2010.

The triterpenes are a large and diverse group of plant natural products that have important functions in plant protection and food quality, and a range of pharmaceutical and other applications. Like sterols, they are synthesized from mevalonate via the isoprenoid pathway, the two pathways diverging after 2,3-oxidosqualene. During triterpene synthesis 2,3-oxidosqualene is cyclized to one of a number of potential products, the most common of these being the pentacyclic triterpene β-amyrin. Plants often produce complex mixtures of conjugated triterpene glycosides, which may be derived from a single triterpene skeleton. The delineation, functional analysis, and exploitation of triterpene pathways in plants therefore represent a substantial challenge. Here we have carried out high-throughput screening to identify mutants of diploid oat (*Avena strigosa*) that are blocked in the early steps of triterpene synthesis. We also show that mutants that are affected in the first committed step in synthesis of β-amyrin-derived triterpenes, and so are unable to cyclize 2,3-oxidosqualene to β-amyrin (*sad1* mutants), accumulate elevated levels of primary sterols. The major differences were in Δ-7-campesterol and Δ-7-avenasterol, which both increased several-fold relative to wild-type levels. This is presumably due to accumulation of squalene and 2,3-oxidosqualene and consequent feedback into the sterol pathway and is consistent with previous reports in which specific oxidosqualene cyclase inhibitors and elicitors of triterpene biosynthesis were shown to have inverse effects on the flux through the sterol and triterpene pathways.

Determination of antioxidant capacity, phenolic acids, and fatty acid composition of rapeseed varieties

Szydłowska-Czerniak, A., *et al.*, *J. Agric. Food Chem. 58*:7502–7509, 2010.

Three different analytical methods—ferric-reducing antioxidant power (FRAP), 2,2′-diphenyl-1-picrylhydrazyl (DPPH), and oxygen radical absorbance capacity (ORAC)–were used for determination of antioxidant capacity of seven rapeseed varieties. Antioxidant capacity and levels of the total phenolic content, individual phenolic acids, fatty acid composition, and the selected physicochemical properties of the studied rapeseed cultivars were determined. Mean ORAC values for methanolic extracts of rapeseeds (4,092–12,989 mmol of Trolox/100 g) were significantly higher than FRAP and DPPH values (6,218–7,641 and 6,238–7,645 µmol of Trolox/100 g, respectively). Although FRAP and DPPH results were lower than ORAC values for all studied rapeseed varieties, there are linear and significant correlations between these three analytical methods (correlation coefficients ranged between 0.9124 and 0.9930, $P < 0.005$). Also, total phenolic compounds in rapeseeds correlated with antioxidant capacity (correlation coefficients ranged between 0.8708 and 0.9516, $P < 0.01$). Total phenolic acids determined by high-performance liquid chromatography varied from 20.3 to 40.7 mg per 100 g of rapeseed flour, and the main phenolic acid was sinapic acid (17.4–36.4 mg/100 g). Fatty acid composition (saturated fatty acids = 7.2–8.6%, monounsaturated fatty acids = 58.5–68.0%, polyunsaturated fatty acids = 24.7–33.9%) and the absence of *trans*-fatty acids indicate that the studied rapeseed varieties can be a source of unsaturated fatty acids and have a positive impact on human health.

Butter as a feedstock for biodiesel production

Haas, M.J., *et al.*, *J. Agric. Food Chem. 58*:7680–7684, 2010.

Fatty acid methyl esters (FAME) were produced from cow's milk (Bostaurus) butter by esterification/transesterification in the presence of methanol. The product was assayed according to the Standard Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels (ASTM D 6751). The preparation failed to meet the specifications for flash point, free and total glycerin contents, total sulfur, and oxidation stability. Failures to meet the flash point and free/total glycerin specifications were determined to be due to interference with standard assays for these parameters by short-chain-length fatty acid esters. The oxidation stability of the butterfat FAME was improved by supplementation with a commercial antioxidant formulation. Approximately 725 ppm of antioxidant was required to meet the ASTM-specified stability value for biodiesel. This work indicates that, without further purification to reduce a slightly excessive sulfur content, fatty acid ester preparations produced from butter are unacceptable as sole components of a biodiesel fuel. However, it is possible that even without further purification a butter-based ester preparation

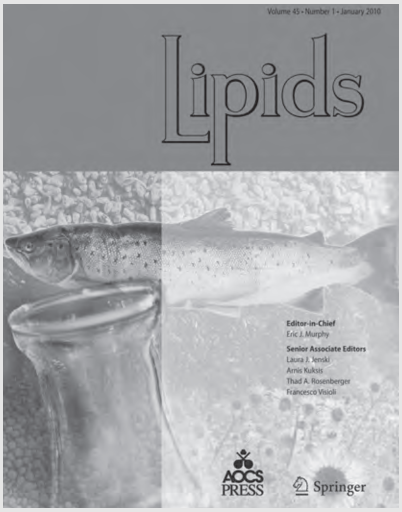
AOCS Journals

Journal of the American Oil Chemists' Society (August)

- Characterization and authentication of significant Chinese edible oilseed oils by stable carbon isotope analysis, Guo, L.-X., X.-M. Xu, J.-P. Yuan, C.-F. Wu, and J.-H. Wang
- Supercritical carbon dioxide extraction of sorghum bug (*Agonoscelis pubescens*) oil using response surface methodology, Mariod, A.A., S.I. Abdelwahab, M.A. Gedi, and Z. Solati
- Gene expression profiles of soybeans with mid-oleic acid seed phenotype, Upchurch, R.G., and M.E. Ramirez
- Comparison of oils originating from olive fruit by different production systems, Pehlivan, B., and E. Yılmaz
- The influence of growing region, cultivar, and harvest timing on the diversity of Australian olive oil, Mailer, R.J., J. Ayton, and K. Graham
- Fat-soluble bioactives, fatty acid profile, and radical scavenging activity of *Semecarpus anacardium* seed oil, Ramadan, M.F., S.G. Kinni, M. Seshagiri, and J.-T. Mörsel
- The composition of crude corn oil recovered after fermentation via centrifugation from a commercial dry grind ethanol process, Moreau, R.A., K.B. Hicks, D.B. Johnston, and N.P. Laun
- Parametric study of jatropha seeds for biodiesel production by reactive extraction, Kaul, S., J. Porwal, and M.O. Garg
- Plastics from an improved canola protein isolate: Preparation and properties, Manamperi, W.A.R., S.K.C. Chang, C.A. Ulven, and S.W. Pryor
- Fractionation of short and medium chain fatty acid ethyl esters from a blend of oils via ethanolysis and short-path distillation, Vázquez, L., and C.C. Akoh
- Mechanical and abrasive wear studies on biobased jatropha oil cake incorporated glass–epoxy composites, Satheesh Kumar, M.N., Z. Yaakob, N. Mohan, Siddaramaiah, and S.P. Kymaresh Babu
- Synthesis and physical properties of potential biolubricants based on ricinoleic acid, Yao, L., E.G. Hammond, T. Wang, S. Bhuyan, and S. Sundararajan
- Synthesis and characterization of canola oil alkyd resins based on novel acrylic monomer (ATBS), Nimbalkar, R.V., and V.D. Athawale

Lipids (August)

- Repletion of n-3 fatty acid deficient dams with α-linolenic acid: Effects on fetal brain and liver fatty acid composition, Harauma, A., N. Salem, and T. Moriguchi
- Effects of seal oil and tuna-fish oil on platelet parameters and plasma lipid levels in healthy subjects, Mann, N.J., S.L. O'Connell, K.M. Baldwin, I. Singh, and B.J. Meyer
- Decreasing the linoleic acid to α-linolenic acid diet ratio increases eicosapentaenoic acid in erythrocytes in adults, Wien, M., S. Rajaram, K. Oda, and J. Sabaté
- *trans*-Fatty acid isomers in adipose tissue have divergent associations with adiposity in humans, Smit, L.A., W.C. Willett, and H. Campos
- Enhanced aortic macrophage lipid accumulation and inflammatory response in LDL receptor null mice fed an atherogenic diet, Wang, S., D. Wu, N.R. Matthan, S. Lamon-Fava, Jaime L. Lecker, and A.H. Lichtenstein
- Purified canola lutein selectively inhibits specific isoforms of mammalian DNA polymerases and reduces inflamma-



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- Increased lipid peroxidation in LDL from type-2 diabetic patients, Colas, R., V. Pruneta-Deloche, M. Guichardant, C. Luquain-Costaz, C. Cugnet-Anceau, M. Moret, H. Vidal, P. Moulin, M. Lagarde, and C. Calzada
- Isomerization of 9c11t/10t12c CLA in triacylglycerols, Christy, A.A.
- RP-HPLC/MS-APCI analysis of branched chain TAG prepared by precursor-directed biosynthesis with *Rhodococcus erythropolis*, Schreiberová, O., T. Krulikovská, K. Sigler, A. Čejková, and T. Řezanka
- Development of a novel sandwich ELISA for measuring cell Lysate ABCA1 protein levels, Troutt, J.S., W.E. Alborn, M.A. Bellinger, K.L. Cox, M.E. Ehsani, X. Wang, Y.-w. Qian, J.H. Sloan, M.B. Willey, G. Cao, and R.J. Konrad

could be mixed with biodiesel from other feedstocks to produce a blend that meets the current quality standards for biodiesel. The results presented here also illustrate some potential weaknesses in the accepted methods for biodiesel characterization when employed in the analysis of FAME preparations containing mid- and short-chain fatty acid esters.

Characterization of fatty alcohol and sterol fractions in olive tree

Orozco-Solano, M., *et al.*, *J. Agric. Food Chem. 58*:7539–7546, 2010.

The determination of sterols and fatty alcohols is a part of the study of the metabolomic profile of the unsaponifiable fraction in olive tree. Leaves and drupes from three varieties of olive tree (Arbequina, Picual, and Manzanilla) were used. The content of the target compounds was studied in five ripeness stages and three harvesting periods for olive drupes and leaves, respectively. A method based on ultrasound-assisted extraction and derivatization for the individual identification and quantification of sterols and fatty alcohols, involving chromatographic separation and mass spectrometry detection by selected ion monitoring, was used. The concentrations of alcohols and sterols in the drupes ranged between 0.1 and 1,086.9 μg/g and between 0.1 and 5,855.3 μg/g, respectively, which are higher than in leaves. Statistical studies were developed to show the relationship between the concentration of the target analytes and variety, ripeness stage, and harvesting period.

Characterization of rapeseed (*Brassica napus*) oils by bulk C, O, H, and fatty acid C stable isotope analyses

Richter, E.K., *et al.*, *J. Agric. Food Chem. 58*:8048–8055, 2010.

Rapeseed (*Brassica napus*) oils differing in cultivar, sites of growth, and harvest year were characterized by fatty acid concentrations and carbon, hydrogen, and oxygen stable isotope analyses of bulk oils ($\delta^{13}C_{bulk}$, $\delta^{2}H_{bulk}$, $\delta^{18}O_{bulk}$ values) and individual fatty acids ($\delta^{13}C_{FA}$). The $\delta^{13}C_{bulk}$, $\delta^{2}H_{bulk}$, and $\delta^{18}O_{bulk}$ values were determined by continuous flow combustion and high-temperature conversion elemental analyzer–isotope ratio mass spectrometry (EA/IRMS, TC-EA/IRMS). The $\delta^{13}C_{FA}$ values were determined using gas chromatography–combustion–isotope ratio mass spectrometry (GC/C/IRMS). For comparison, other C_3 vegetable oils rich in linolenic acid (flax and false flax oils) and rich in linoleic acid (poppy, sunflower, and safflower oils) were submitted to the same chemical and isotopic analyses. The bulk and molecular $\delta^{13}C$ values were typical for C_3 plants. The $\delta^{13}C$ value of palmitic acid ($\delta^{13}C_{16:0}$) and n-3 α-linolenic acid ($\delta^{13}C_{18:3n\text{-}3}$) differed ($P < 0.001$) between rape, flax, and poppy oils. Also within species, significant differences of $\delta^{13}C_{FA}$ were observed ($P < 0.01$). The hydrogen and oxygen isotope compositions of rape oil differed between cultivars ($P < 0.05$). Major differences in the individual $\delta^{13}C_{FA}$ values were found. A plant-specific carbon isotope fractionation occurs during the biosynthesis of the fatty acids and particularly during desaturation of C_{18} acids in rape and flax. Bulk oil and specific fatty acid stable isotope analysis might be useful in tracing dietary lipids differing in their origin.

Oxidative stability and *in vitro* digestibility of fish oil-in-water emulsions containing multilayered membranes

Gudipati, V., *et al.*, *J. Agric. Food Chem. 58*:8093–8099, 2010.

The oxidative stability and lipid digestibility of fish oil-in-water emulsions (d_{43}; 5.26–5.71 μm) laminated by primary, secondary, and/or tertiary layers of interfacial membranes have been investigated. The primary emulsion (5 and 0.5% wt% of fish oil and Citrem in acetate buffer) was produced through a membrane homogenizer. The second and tertiary emulsions were prepared by electrostatic deposition of chitosan and sodium alginate on the surfaces of the oil droplets, respectively. The lamination of biopolymers was measured by zeta potential. The lipid oxidative stability was assessed with peroxide value, thiobarbituric acid-reactive substances, and headspace aldehydes of the emulsions stored at 20°C for 40 days. The positively charged secondary emulsions (+56.27 ± 2.5 mV) were more stable to lipid oxidation compared to negatively charged primary (–45.13 ± 1.7 mV) and tertiary emulsions (–24.8 ± 1.2 mV). An *in vitro* digestion model was used to study the impact of different layers on the digestibility of oil droplets. Lipid digestion was decreased with multilayer coating, and chitosan coating further reduced the digestion. These findings have implications for the design of structured emulsions to achieve better oxidative stability with more controlled digestibility of lipids.

Improvement of fuel properties of cottonseed oil methyl esters with commercial additives

Joshi, H., *et al*., *Eur. J. Lipid Sci. Technol. 112*:802–809, 2010.

The low-temperature operability and oxidative stability of cottonseed oil methyl esters (CSME) were improved with four anti-gel additives as well as one antioxidant additive, gossypol. Low-temperature operability and oxidative stability of CSME were determined by cloud point (CP), pour point (PP), cold filter-plugging point (CFPP), and oxidative stability index (OSI). The most significant reductions in CP, PP, and CFPP in all cases were obtained with Technol®, with the average reduction in temperature found to be 3.9°C. Gunk®, Heet®, and Howe's® were progressively less effective, as indicated by average reductions in temperature of 3.4, 3.0, and 2.8°C, respectively. In all cases, the magnitude of CFPP reduction was greater than for PP and especially CP. Addition of gossypol, a polyphenolic aldehyde, resulted in linear improvement in OSI (R^2 = 0.9804). The OSI of CSME increased from 5.0 to 8.3 h with gossypol at a concentration of 1000 ppm.

The HDL hypothesis: Does high-density lipoprotein protect from atherosclerosis?

Vergeer, M., *et al*., *J.Lipid Res. 51*:2058–2073, 2010.

There is unequivocal evidence of an inverse association between plasma high-density lipoprotein (HDL) cholesterol concentrations and the risk of cardiovascular disease, a finding that has led to the hypothesis that HDL protects from atherosclerosis. This review details the experimental evidence for this "HDL hypothesis." *In vitro* studies suggest that HDL has a wide range of anti-atherogenic properties, but validation of these functions in humans is absent to date. A significant number of animal studies and clinical trials support an atheroprotective role for HDL; however, most of these findings were obtained in the context of marked changes in other plasma lipids. Finally, genetic studies in humans have not provided convincing evidence that HDL genes modulate cardiovascular risk. Thus, despite a wealth of information on this intriguing lipoprotein, future research remains essential to prove the HDL hypothesis correct.

Rapid reverse phase-HPLC assay of HMG-CoA reductase activity

Mozzicafreddo, M., *et al*., *J. Lipid Res. 51*:2460–2463, 2010.

Radioisotope-based methods and mass spectrometry coupled to chromatographic techniques are the conventional methods for monitoring hydroxymethylglutaric acid-CoA reductase (HMGR) activity. Irrespective of offering adequate sensitivity, these methods are often cumbersome and time-consuming, requiring the handling of radiolabeled chemicals or elaborate *ad-hoc* derivatizing procedures. We propose a rapid and versatile reverse phase-high-performance liquid chromatography (HPLC) method for assaying HMGR activity capable of monitoring the levels of both substrates (HMG-CoA and NADPH) and products (CoA, mevalonate, and $NADP^+$) in a single 20 min run with no pretreatment required. The linear dynamic range was 10–26 pmol for HMG-CoA, 7–27 nmol for NADPH, 0.5–40 pmol for CoA and mevalonate, and 2–27 nmol for $NADP^+$, and limit of detection values were 2.67 pmol, 2.77 nmol, 0.27 pmol, and 1.3 nmol, respectively.

Composition and physical properties of arugula, shepherd's purse, and upland cress oils

Moser, B.R., *et al*., *Eur. J. Lipid Sci. Technol. 112*:734–740, 2010.

The fatty acid, tocopherol, and phytosterol profiles of arugula (AO; *Eruca vesicaria* (L.) Cav. subsp. *sativa* (Mill.) Thell.), upland cress (UCO; *Barbarea verna* (Mill.) Asch.), and shepherd's purse (SPO; *Capsella bursa-pastoris* (L.) Medik.) oils are reported, along with their physical properties. The tocopherol content of SPO (770 mg/kg) was higher than detected in AO (656 mg/kg) and UCO (430 mg/kg). UCO contained a higher concentration of phytosterols (8.47 mg/g) than SPO (7.19 mg/g) and AO (6.60 mg/g). The oil contents of AO, SPO, and UCO were 27.0, 26.6, and 24.2 wt%, respectively. The acid values of AO (0.54 mg KOH/g) and UCO (0.32 mg KOH/g) were lower than obtained for SPO (3.19 mg KOH/g). The principal fatty acid in AO and UCO was erucic acid (41.7 and 36.8 wt%), whereas SPO contained primarily linolenic (32.4 wt%) and linoleic (20.5 wt%) acids. AO and UCO were more stable to oxidation than SPO, as indicated by induction periods (110°C; EN 14 112) of 16.5, 7.9, and 2.2 h. SPO exhibited lower kinematic viscosity and higher viscosity index values than AO and UCO. UCO displayed the lowest pour point (–29°C), followed by AO (–22°C) and SPO (–14°C).

Dietary lipids may protect the retina against age-related macular degeneration

Stanley, J., *Lipid Technol. 22*:159–161, 2010.

Age-related macular degeneration (AMD) is the leading cause of visual loss in the Western world. It is a disease of the retina probably initiated by the highly oxidizing environment of this tissue. The Age-Related Eye Disease Study (AREDS) demonstrated in 2001 that a supplement of the antioxidants β-carotene, vitamin E, vitamin C, and the minerals zinc and copper can slow the progression of AMD. The use of this supplement should be standard practice in all countries. It is known that the carotenoids lutein and zeaxanthin and the very long chain n-3 polyunsaturated fatty acid docosahexaenoic acid (DHA) play special roles in protecting the retina against oxidative damage, and there is some evidence from epidemiological studies that these nutrients slow the progression of AMD. AREDS 2, a randomized controlled trial, is testing the ability of DHA, lutein, and zeaxanthin to slow the progression of AMD. Until this study is complete in 2012, AMD patients should consider taking a supplement corresponding to the AREDS 2 formulation as a precaution. ■

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Rethinking oxidation in bulk oils: Role of physical structures

Bingcan Chen, D. Julian McClements, and Eric A. Decker

The following article is based on the talk given by Eric Decker during the Lipid Oxidation and Quality Division Luncheon at the 101st AOCS Annual Meeting & Expo, held in Phoenix, Arizona, USA, May 16–19.

Efforts to improve the nutritional value of foods by increasing the concentrations of unsaturated fatty acids are often limited by oxidative rancidity. Unfortunately, this situation has not changed dramatically over the past few decades as very few new antioxidant technologies have been developed, and utilization of many effective synthetic antioxidants is being limited by consumer desires for all-natural foods. While there are literally hundreds, if not thousands, of research reports on antioxidants from plant, animal, and microbial sources, this research has not produced many new commercial antioxidants—probably because these antioxidant extracts are not dramatically better than currently available antioxidants and/or the antioxidant extracts have other detrimental properties such as color, flavor, instability, and high costs. Since the search for new food antioxidants has been largely unsuccessful, new approaches are needed to help stabilize fats in foods. In order to find novel antioxidant technologies, a better understanding of the mechanisms of lipid oxidation in foods needs to be achieved so that a rational approach to protective systems can be developed.

Recent research on oil-in-water emulsions indicates that the physical and chemical properties of oil-water interfaces play a critical role in lipid oxidation kinetics and antioxidant activity. Lipid oxidation chemistry in bulk oils has traditionally been viewed as occurring in a homogeneous system, unlike that in oil dispersions, which is considered to occur heterogeneously, with a well-defined water-oil interface. However, refined oils contain surface-active lipids such as mono- and diacylglycerols, phospholipids, free fatty acids, and antioxidants. In addition, refined oils contain small amounts of water that, in combination with surface-active molecules, will spontaneously form physical structures called association colloids. Therefore, refined bulk oils should also be considered as food dispersions and in particular, as water-in-oil emulsions in which the water droplets are present on a nanoscale, do not scatter light, and thus produce optically clear systems. These association colloid systems could be a major site of lipid oxidation reactions; therefore, understanding their physical properties and composition could provide new insights into methods to inhibit oxidation.

Evidence for the existence of physical structures in bulk oil can be obtained from a combination of techniques. Both spectrophotometric and interfacial techniques can show that surface-active lipids such as phospholipids and diacylglycerols can spontaneously form physical structures in stripped soybean oil when their concentrations exceed their critical micelle concentrations. Small-angle X-ray scattering shows that phospholipids form reverse micelles, and these micelles change in size and shape as water concentrations in the oils are increased. For example, phospholipids will form symmetrical or isotropic reverse micelles in the presence of small amounts of water, but when water concentrations are increased the micelles become larger and change to anisotropic shapes (Fig. 1). Finally, fluorescent probes can be used to show that phospholipids concentrate at the oil-water interface and that the exposure of the phospholipid head group is influenced by both lipid- and water-soluble antioxidants. Overall, this information shows that physical structures do exist in oils at the concentrations of surface-active material and water commonly found in refined oils.

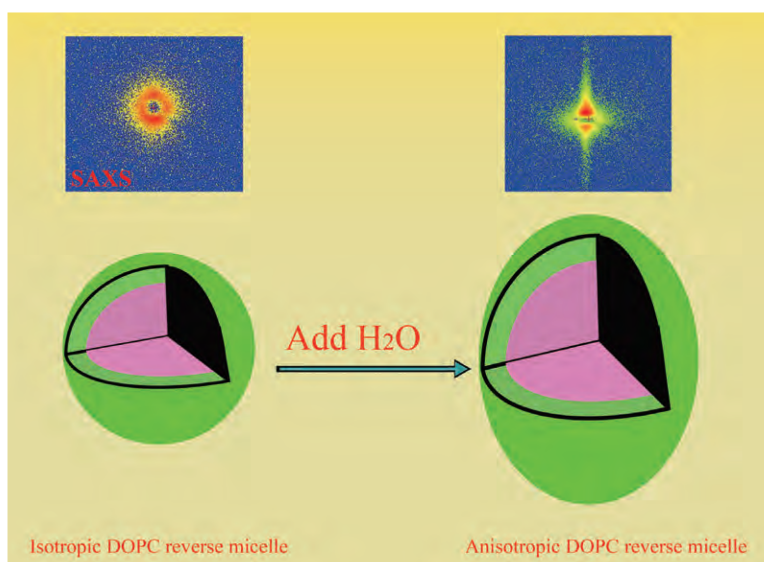

FIG. 1. *Changes in the shape of dioleoyl phosphatidylcholine (DOPC) reverse micelles in stripped soybean oils with increasing water concentrations. The upper pictures are the small-angle X-ray scattering (SAXS) patterns, while the figures below show the hypothetical change in shape.*

As evidence continues to grow that there are physical structures in bulk oils, the next question is whether these physical structures impact lipid oxidation chemistry. Numerous indirect lines of evidence point to the importance of physical structures in the oxidation of lipids. For example, studies have shown that hydrophilic antioxidants are more effective than lipophilic antioxidants in bulk oils, perhaps owing to the ability of hydrophilic antioxidants to concentrate at the oil-air interface where oxygen concentrations are high. However, air is less polar than oil, suggesting that there is no driving force for hydrophilic antioxidants to migrate to the air-oil interface. This can be shown experimentally by the inability of hydrophilic antioxidants to decrease the surface tension of an oil-air interface. Conversely, hydrophilic antioxidants do concentrate at water-lipid interfaces, suggesting that they would concentrate in the association colloids formed by the surface-active molecules and water found in refined oils.

Metal-catalyzed decomposition of lipid hydroperoxides is an important pathway of lipid oxidation in bulk oils as can be seen by the antioxidant activity of the metal chelator citric acid. Metal-lipid interactions can occur at water-oil interfaces, as recent evidence has shown that the surface activity of free fatty acids allows them to migrate to oil-water interfaces where they can bind metals and increase oxidation rates. The surface activity of phospholipids and their ability to impact lipid oxidation can also be seen when they are present in combination with tocopherols. Koga and Terao (1995) published some very interesting data that showed that the presence of phospholipid increased the exposure of α-tocopherol to the water phase in bulk oil where it then was a more effective scavenger of water-soluble free radicals. Interaction of α-tocopherol with water-soluble free radicals decreased when the phospholipid was altered to contain short-chain fatty acids such that it was no longer able to form association colloids. Recent work in our laboratory indicates that the ability of phospholipids to impact lipid oxidation is not highly dependent on their phosphate head group but instead on their ability to form physical structures. For example, phosphatidylcholine with oleic acid promoted lipid oxidation, whereas phosphatidylcholine with butyric acid had no impact on oxidation. This is likely due to differences in the type of structures formed. Dioleoyl phosphatidylcholine produced reverse micelles while dibutyryl phosphocholine formed lamellar structures. How these different types of association colloids alter lipid oxidation kinetics is under investigation.

Current research shows strong evidence that association colloids will spontaneously form at the concentrations of surface-active molecules and water typically found in refined vegetable oil. These physical structures are on a nanoscale so they don't scatter light and thus refined oils are optically clear. Due to the complexity of the large number of different surface-active molecules in refined oils that would likely form multicomponent association colloids, it is currently impossible to exactly characterize naturally occurring physical structures in oils. However, by starting with simple model systems and then building up to increasing levels of complexity, we can gain valuable insights into how association colloids impact both pro-oxidants and antioxidants. Then, by comparing these model systems to real commercial oils it should be possible to find technologies to use existing antioxidants more effectively and/or inhibit pro-oxidants more efficiently. If better technologies can be developed to inhibit lipid oxidation, then many products could be reformulated to contain higher levels of unsaturated fatty acids, thus improving the nutritional profile of our food supply.

*inform*ation

FOR FURTHER READING:

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- Koga, T., and J. Terao, Phospholipids increase radical-scavenging activity of vitamin E in a bulk oil model system, *J. Agric. Food Chem. 43*:1450–1454 (1995).

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Beyond Google: Challenges and opportunities in teaching information literacy

Crystal L. Snyder

The following article is based on a presentation given by Crystal Snyder during the Hot Topic titled Challenges and Opportunities in Lipids and Oil/Fats Education and Curriculum Development, held at the 101st AOCS Annual Meeting & Expo, in Phoenix, Arizona, USA, May 16–19.

At the AOCS Annual Meeting & Expo in May, the Professional Educators Common Interest Group held its first-ever Hot Topic session to discuss challenges and opportunities in lipid science education and curriculum development. Several speakers on the panel, myself included, highlighted the importance of developing students' information literacy skills, discussing strategies to help students wade through an often overwhelming amount of information and apply their knowledge to real-world problems. There's no question today's students are Internet savvy, and with such a wide range of resources just a few mouse clicks away, accessing information has never been easier. Yet, as anyone who has ever scorned students' reliance on Wikipedia can attest, finding information is just one part of the information equation. Students not only need to be able to efficiently locate relevant information, they must also develop the skills to critically evaluate what they find and use it as a basis for synthesizing their own ideas. But with so much material to cover in a semester and the information landscape continually changing, how do we effectively equip students with the skills to keep up?

The simple answer: Ask a librarian.

Since we have become accustomed to the convenience of doing most of our research online, we may not immediately think of turning to librarians for help, but as professionals in information science, librarians are our most valuable allies in promoting information literacy in the classroom. Virtually all libraries will offer at least a basic orientation for students in how to access and use library resources, and most libraries go a lot further, working actively with faculty to engage students and provide subject-specific advice on finding and using information appropriate for particular courses or assignments.

The key, says Wanda Quoika-Stanka, liaison librarian for the Faculty of Agricultural, Life and Environmental Sciences at the University of Alberta (Edmonton, Canada), is to help students overcome their initial reluctance to ask questions. "In this world of technology where they're texting their friends and phoning, they don't think to ask someone . . . they do it all themselves. There's almost a stigma on asking for help."

Asking questions can be particularly daunting to students adjusting to life at a large university for the first time or to foreign students who may face additional language or cultural barriers. Quoika-Stanka stresses that one of the simplest and most important

QUICK TIPS FOR ENHANCING INFORMATION LITERACY

- Always provide students with the contact information for their liaison librarian, so they know where to go for help. Better yet, introduce the librarian to the class so students can associate the name with a person.
- Maximize opportunities to reinforce information literacy skills by working with your liaison librarian to develop courses and assignments.
- Begin the semester with an informal assessment of students' information literacy skills, then work to fill in the gaps.
- Design assignments that require critical thinking, not just information retrieval and recall.
- Teach by example. Use a variety of information sources (peer-reviewed articles, newspaper articles, information from websites, etc.) to illustrate the inherent differences in their authoritativeness. The world of information doesn't consist entirely of peer-reviewed literature, and students need to be able to evaluate the range of information available to them.

things instructors can do is introduce students to their liaison librarian. "They need to see that there is a person there for them who will answer their questions and that there's no shame in asking."

Quoika-Stanka and other liaison librarians frequently visit classes to provide students with information about how to use the library's online catalog, efficiently navigate subject-specific databases, and appropriately cite different types of sources. Although visits to first-year classes often help establish the fundamentals, students can benefit from library instruction at any stage of their university experience. "Information literacy doesn't stop at the first year with just an introduction to the catalog and the website, but actually carries on at different levels of specificity and complexity," adds Christina Hwang, instruction librarian at the University of Alberta.

Similarly, strategies for reinforcing information literacy skills through individual assignments may change depending on the level and size of a particular class. While bulky term papers requiring research into a specific topic may be the norm for more advanced classes, there are plenty of alternative options that are more manageable for larger first- and second-year courses. For example, smaller assignments such as book reviews, abstracts, or technical reports may be designed to force students to search the primary literature and critically evaluate their findings. More interactive possibilities include debates or journal club-like discussions of an assigned reading, where students may be required to find related information to support their assertions. Even larger assignments such as term papers can be broken down into smaller chunks, which help walk students through the process of finding and evaluating relevant information.

*inform*ation

FOR FURTHER READING:

- Gaunt, J., *et al.* (2009) Handbook for Information Literacy Teaching, Cardiff University, Wales, www.cardiff.ac.uk/insrv/educationandtraining/infolit/hilt/index.html (accessed June 27, 2010).
- Rangachari, P.K., and U. Rangachari, Information literacy in an inquiry course for first-year science undergraduates: A simplified 3C approach, *Advan. Physiol. Edu. 31*:176–179 (2007).
- Flaspohler, M., E.M. Rux, and J.A. Flaspohler, The annotated bibliography and citation behavior: Enhancing student scholarship in an undergraduate biology course, *CBELife Sci. Educ. 6*:350–360 (2007).

"The common assumption is that this particular generation has a very short attention span," notes Hwang, who suggests that breaking down assignments in this way may help students visualize how all the pieces come together in the final paper. Such an approach might also give students a greater opportunity to solicit and respond to feedback throughout the process, whether through refining their topic and search strategy further, finding help with their

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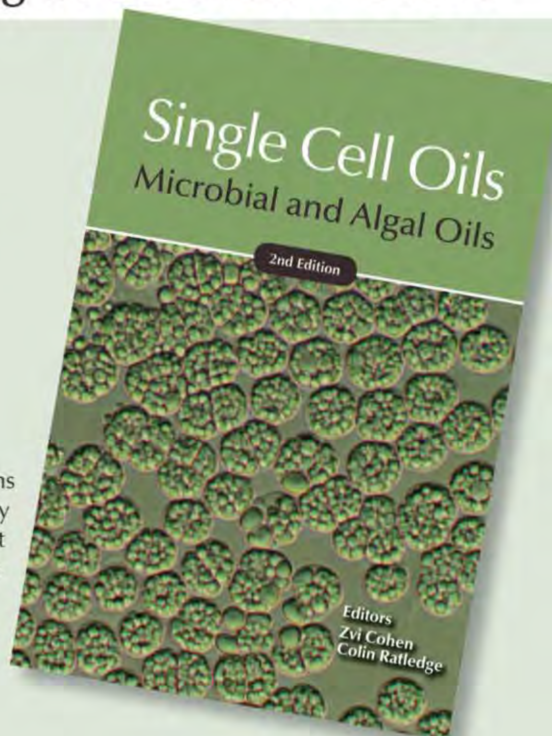

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Nutrient variation of common ingredients—Part I

Dale Hill, Jolene Hoke, Ryan Taylor, and Tom Sliffe

Editor's note: Computers have changed the world in ways that are both visible and less visible.

An example of the latter is the effect of high-throughput computer programs used for the formulation of livestock and pet foods. Formulation software uses complex mathematical equations requiring input of specific nutrient values for macro- and micronutrients found in feed ingredients.

The nutrient content of feed ingredients, however, can vary tremendously from lot to lot. Different soil types and growing conditions can produce variations in nutrient content. This fact has increased the importance of laboratory testing in support of better formulation, which leads to better production of both feed and the animals consuming the feed.

Feed formulators make decisions daily based on the testing of individual lots. For example, corn (or maize) may be high in protein one day, in which case, less is needed. The net result is a better dollar/protein ratio.

Many formulators, however, test each lot only for protein, fiber, and fat in the interests of time and cost savings. In this case, the biological variation inherent in crop production comes into play. The tables below represent results from the Archer Daniels Midland (ADM) Alliance Nutrition Laboratory in Quincy, Illinois, USA, who used methods listed in the Analytical Methods sidebar.

Formulators and pet food manufacturers use these tables to see which macro- or micronutrients have exhibited the greatest variability over time. Each day's feed run can then be "tweaked" accordingly. For example, the amount of zinc in barley (see first table) has a standard deviation of 22 per million (ppm), ranging from 26.3 parts to 73.5 ppm. The formulator, noting that fact, can decide whether to supplement the feed formula with more zinc.

This article has been adapted from the talk given by Dale Hill on May 17, 2010, at the AOCS Annual Meeting & Expo in Phoenix, Arizona, USA.

Some ingredients are summarized in the accompanying tables over a period of five years, whereas other high-volume samples, such as corn, represent one crop year. Sample descriptions did not allow for identification by variety, processing, geographic area, or crop year. Wet chemistry methods include nitrogen combustion for protein and mineral analysis by inductively coupled plasma analysis. Lipid analyses were carried out using petroleum ether, ethyl ether, or acid-hydrolysis methods.

Data are presented as average (Ave), standard deviation (sd), number of samples (N), lowest value, and highest value for that analysis. ADF = acid detergent fiber; NDF = neutral detergent fiber; NSC = nonstructural carbohydrates; DM = dry matter.

Barley (air-dry basis)

Lab test	Ave	sd	N	Low	High
ADF, %	8.7	2.8	11	5.5	14.6
Calcium, %	0.06	0.02	23	0.03	0.09
Chloride, %	0.09	0.04	4	0.04	0.14
Crude protein, %	11.8	1.7	32	8.4	17.4
Magnesium, %	0.13	0.03	19	0.09	0.23
Moisture, %	9.8	2.0	43	6.3	15.1
Phosphorus, %	0.35	0.05	33	0.25	0.45
Potassium, %	0.46	0.10	19	0.36	0.75
Zinc, ppm	48.9	22.0	4	26.3	73.5

Calcium carbonate (air-dry basis)

Lab test	Ave	sd	N	Low	High
Calcium, %	38.73	0.78	29	36.4	39.9
Copper, ppm	4.2	2.0	20	1.0	8.2
Iron, ppm	701.5	381.5	20	355	1820
Magnesium, %	0.37	0.18	23	0.01	0.76
Manganese, ppm	154.6	272.9	21	17.7	1330
Phosphorus, %	0.02	0.04	20	0.01	0.18
Potassium, %	0.07	0.06	23	0.02	0.36
Zinc, ppm	45.6	46.0	24	1	172

Canola meal (air-dry basis)

Lab test	Ave	sd	N	Low	High
ADF, %	17.2	2.2	66	13.1	27.4
Ash, %	7.8	0.6	18	6.6	8.9
Calcium, %	0.86	0.34	55	0.51	1.60
Copper, ppm	7.9	2.4	19	4.8	12.2
Crude fiber, %	9.3	0.9	31	6.6	10.7
Crude protein, %	38.6	1.8	109	33.1	43.7
Ether extract, %	4.0	2.4	34	1.3	13
Iron, ppm	311.5	150.6	14	127	593
Magnesium %	0.54	0.09	57	0.46	1.00
Manganese, ppm	64.2	5.9	14	57.8	78.8
Moisture, %	10.2	1.4	95	6.2	14.0
NDF, %	22.9	1.6	18	19.8	25.9
NSC, %	20.4	0.9	10	18.3	21.2
Phosphorus, %	0.99	0.08	55	0.83	1.30
Potassium, %	1.22	0.13	57	0.96	1.60
Sodium, %	0.06	0.04	11	0.01	0.12
Sulfur, %	0.67	0.08	11	0.48	0.75
Zinc, ppm	62.7	18.7	19	44.4	114

Corn distillers grains (100% DM basis)

Lab test	Ave	sd	N	Low	High
ADF, %	17.2	4.5	19	6.1	26.8
Calcium, %	0.07	0.05	19	0.01	0.22
Crude protein, %	30.7	2.6	20	23.8	33.7
Magnesium, %	0.34	0.15	21	0.12	0.75
Phosphorus, %	0.88	0.34	21	0.32	1.73
Potassium, %	1.08	0.45	21	0.34	2.13

Corn gluten meal (air-dry basis)

Lab Test	Ave	sd	N	Low	High
ADF, %	4.8	2.2	137	1.1	10.7
Ash, %	3.85	2.55	132	0.30	10.4
Calcium, %	0.03	0.05	124	0.01	0.45
Copper, ppm	11.1	2.8	117	4.4	22.8
Crude fiber, %	1.7	0.6	70	0.7	3.2
Crude protein, %	63.9	5.2	197	57.6	69.2
Ether extract, %	1.7	0.7	140	0.6	5.0
Iron, ppm	96.8	28.6	116	42.9	251
Magnesium, %	0.07	0.03	124	0.02	0.31
Manganese, ppm	7.2	5.5	116	2.1	46
Moisture, %	9.7	1.6	190	5.0	15.2
NDF, %	3.4	1.2	127	1.0	7.0
NSC, %	18.0	3.0	108	9.7	25.4
Phosphorus, %	0.47	0.12	124	0.12	0.90
Potassium, %	0.17	0.09	124	0.05	0.92
Sodium, %	0.02	0.02	113	0.01	0.14
Sulfur, %	0.78	0.12	110	0.41	1.00
Zinc, ppm	39.0	45.3	111	14.5	88.2

ANALYTICAL METHODS[a]

Analyte	AOAC Chemical Reference Method number
Crude fiber	978.10
Crude protein	990.03
Fat	920.39
Fat (acid hydrolysis)	954.02
Moisture	930.15
ADF[b]	973.18
NDF[b]	2002.04
Lysine	975.44
Minerals	985.01
Near-infrared[c]	989.03
Starch	[d]

[a] See the AOAC International website (www.aoac.org) for further details on these methods.

[b] ADF, acid detergent fiber; NDF, neutral detergent fiber.

[c] Near-infrared assys may include protein, fiber, moisture, non-structural carbohydrates (NSC), ADF and NDF, and fat. NSC is calculated from NIRS [Near-Infrared Spectroscopy] Consortium equations.

[d] Starch is determined with a YSI Select Biochemistry Analyzer (www.ysilifesciences.com).

Corn grain (air-dry basis)

Lab test	Ave	sd	N	Low	High
ADF, %	3.1	0.5	131	1.8	5.6
Ash, %	1.4	0.2	78	1.1	2.1
Calcium, %	0.06	0.04	139	0.01	0.29
Copper, ppm	2.8	1.3	52	1.0	7.9
Crude fiber, %	1.7	0.4	159	0.08	3.1
Crude protein, %	7.3	0.7	317	4.6	9.5
Ether extract, %	3.5	0.4	161	1.5	5.6
Lysine, %	0.25	0.01	9	0.23	0.28
Magnesium, %	0.09	0.01	74	0.06	0.15
Manganese, ppm	8.5	2.0	8	5.0	11.8
NDF, %	7.8	0.8	78	6.7	9.7
Phosphorus, %	0.23	0.03	138	0.16	0.31
Potassium, %	0.29	0.04	69	0.20	0.37
Zinc, ppm	20.6	8.1	45	11.4	50.6

Dicalcium phosphate (air-dry basis)

Lab test	Ave	sd	N	Low	High
Calcium, %	16.42	1.67	20	15.0	20.9
Copper, ppm	7.1	20.0	18	0.01	86.9
Iron, ppm	9760	2023	16	5920	13,100
Magnesium, %	0.70	0.58	16	0.39	2.90
Manganese, ppm	427.4	175.3	18	307	1130
Phosphorus, %	20.37	1.30	20	16.9	21.4
Potassium, %	0.21	0.07	16	0.14	0.39
Zinc, ppm	149.1	143.6	17	39.2	627

Fish meal (air-dry basis)

Lab test	Ave	sd	N	Low	High
Ash, %	19.0	2.7	7	15.4	24.7
Calcium, %	5.72	2.52	96	3.20	14.3
Copper, ppm	10.7	6.4	6	4.2	23.6
Crude protein, %	61.7	6.2	108	43.3	74.7
Ether extract, %	9.2	1.5	68	3.0	12.8
Magnesium, %	0.21	0.02	6	0.18	0.24
Moisture, %	7.6	2.1	38	4.1	13.9
Phosphorus, %	3.45	1.18	96	2.3	7.8
Sodium, %	0.66	0.26	66	0.23	1.50
Zinc, ppm	107.3	40.4	12	55.4	223.0

Flaxseed (air-dry basis)

Lab test	Ave	sd	N	Low	High
Crude protein, %	23.0	1.0	5	21.0	23.7
Ether extract, %	35.2	2.2	5	31.9	38.6
Zinc, ppm	56.1	5.0	5	43	79.5

Meat and Bone Meal (pork) (air-dry basis)

Lab test	Ave	sd	N	Low	High
Calcium, %	10.39	2.05	178	4.0	15.1
Chloride, %	0.50	0.11	15	0.36	0.77
Copper, ppm	16.2	5.3	25	5.4	24
Crude fiber, %	1.9	0.7	14	0.2	3.0
Crude protein, %	53.2	3.7	181	39.1	60.9
Ether extract, %	11.4	1.3	120	8.8	15.9
Iron, ppm	296.1	109.2	25	160	605
Magnesium, %	0.22	0.02	26	0.15	0.26
Manganese, ppm	23.2	15.2	26	6.8	72.0
Moisture, %	4.4	1.1	127	1.2	7.5
Phosphorus, %	4.86	0.91	177	2.00	7.00
Potassium, %	0.60	0.08	25	0.44	0.82
Sodium, %	0.69	0.13	127	0.37	1.10
Zinc, ppm	202.2	80.3	26	117	449

Oats (air-dry basis)

Lab test	Ave	sd	N	Low	High
ADF, %	15.8	1.8	7	13.5	19.0
Calcium, %	0.13	0.06	8	0.07	0.23
Crude Protein,%	12.0	1.3	15	10.1	14.8
Magnesium, %	0.12	0.01	7	0.10	0.14
Moisture, %	9.7	1.9	15	6.0	12.1
Phosphorus, %	0.34	0.08	8	0.24	0.48
Potassium, %	0.40	0.09	7	0.26	0.51

Potassium chloride (air-dry basis)

Lab test	Ave	sd	N	Low	High
Copper, ppm	5.5	3.3	5	1.6	11.0
Iron, ppm	564.4	177.2	5	400	895
Magnesium, %	0.17	0.06	5	0.06	0.25
Manganese, ppm	20.7	20.2	5	4.6	59.8
Potassium, %	50.3	1.4	11	48.7	52.2
Zinc, ppm	77.8	122.1	5	5.1	321.0

Poultry and poultry by-product meal (air-dry basis)

Lab test	Ave	sd	N	Low	High
Ash, %	14.1	7.2	8	5.1	21.6
Calcium, %	4.34	1.98	39	1.0	6.9
Chloride, %	0.57	0.15	6	0.28	0.77
Cobalt, ppm	8.9	7.0	5	1.0	19.3
Crude fiber, %	0.4	0.5	4	0.1	1.3
Crude protein, %	62.3	5.3	38	47.5	68.5
Ether extract, %	19.8	6.6	36	11.3	39.2
Magnesium, %	0.13	0.01	4	0.12	0.15
Moisture, %	6.2	1.8	32	1.2	10.1
Phosphorus, %	2.47	0.98	39	0.74	3.9
Potassium, %	0.83	0.27	6	0.45	1.11
Sodium, %	0.52	0.20	38	0.26	1.00
Sulfur, %	0.82	0.13	7	0.68	1.00

Rice bran (air-dry basis)—stabilized and raw rice bran samples

Lab test	Ave	sd	N	Low	High
ADF, %	16.9	13.6	5	7.3	43.8
Calcium, %	1.07	0.93	25	0.05	2.2
Copper, ppm	19.7		3	7.9	42.0
Crude fiber, %	6.8	1.2	26	4.8	9.8
Crude protein, %	13.5	1.3	43	7.1	15.6
Ether extract, %	19.0	3.2	35	8.9	25.1
Magnesium, %	0.77	0.21	4	0.55	1.10
Moisture, %	7.2	2.5	33	3.5	11.6
NDF, %	31.0	14.2	3	16.9	50.4
Phosphorus, %	1.63	0.32	25	0.79	2.3
Potassium, %	1.45	0.40	4	1.0	2.1
Zinc, ppm	68.7	17.1	5	52.8	93.1

Rice hulls (air-dry basis)

Lab test	Ave	sd	N	Low	High
ADF, %	64.7	3.9	4	59.8	70.1
Calcium, %	0.08	0.03	24	0.05	0.18
Copper, ppm	5.9	7.0	31	2.0	33.4
Crude fiber, %	39.1	2.4	5	34.8	41.5
Crude protein, %	3.8	3.4	27	1.8	13.6
Iron, ppm	93.7	166.8	28	23.3	920
Magnesium, %	0.05	0.06	30	0.02	0.33
Manganese, ppm	133.2	85.31	29	27.2	515
Moisture, %	8.6	0.2	4	8.4	8.8
Phosphorus, %	0.06	0.02	24	0.03	0.13
Potassium, %	0.29	0.34	30	0.12	1.90
Zinc, ppm	27.9	42.8	29	1.0	173.0

Soybean meal (air-dry basis)

Labtest	Ave	sd	N	Low	High
ADF, %	6.4	1.8	30	4	12.6
Ash, %	5.8	0.7	6	4.3	6.4
Calcium, %	0.35	0.10	62	0.19	0.68
Chloride, %	0.02	0.01	5	0.01	0.04
Copper, ppm	19.8	19.2	61	11.9	163
Crude fiber, %	3.5	0.8	68	2.2	7.4
Crude protein, %	46.7	2.2	146	36.1	51.0
Ether extract, %	1.5	1.0	71	0.5	7.0
Iron, ppm	187.8	143.4	57	72.5	1060
Magnesium, %	0.29	0.06	84	0.20	0.69
Manganese, ppm	47.2	59.5	58	26.5	493
Moisture, %	9.5	1.7	119	3.4	14.5
NDF, %	9.3	1.4	8	7.6	11.3
Phosphorus, %	0.61	0.05	62	0.44	0.72
Potassium, %	1.99	0.21	85	1.20	2.40
Sulfur, %	0.32	0.09	9	0.08	0.40
Zinc, ppm	68.2	57.9	60	37.8	484

CONTINUED ON NEXT PAGE

Sunflower meal (air-dry basis)

Lab test	Ave	sd	N	Low	High
ADF, %	25.3	3.4	14	20.9	32.5
Ash, %	6.8	0.3	13	6.3	7.6
Copper, ppm	34.3	6.5	6	28.1	47.8
Crude fiber, %	16.6	2.2	34	12.6	22.5
Crude protein, %	35.6	2.4	47	28.2	40.7
Ether extract, %	1.8	0.6	36	0.9	3.6
Iron, ppm	262.5	125.9	6	124.0	504.0
Magnesium, %	0.59	0.05	8	0.49	0.66
Manganese, ppm	54.8	3.0	6	52.1	60.1
Moisture, %	9.1	1.1	44	6.5	10.8
Potassium, %	1.60	0.14	6	1.40	1.80
Zinc, ppm	100.0	5.4	6	91.7	109.0

Tomato pomace, pulp and granules (air-dry basis)

Lab test	Ave	sd	N	Low	High
Ash, %	5.0		2	3.4	7.7
Calcium, %	0.17		3	0.14	0.27
Copper, ppm	14.4		3	10.3	18.7
Crude fiber, %	24.7		2	15.1	34.3
Crude protein, %	16.8		3	12.4	20.0
Iron, ppm	1019.3		3	128	2790
Magnesium, %	0.46		3	0.15	1.20
Manganese, ppm	50.8		3	25.3	77.1
Moisture, %	9.0		2	6.3	11.7
Phosphorus, %	0.39		3	0.31	0.49
Potassium, %	1.10	0.91	4	0.22	2.60
Sodium, %	0.16		2	0.15	0.16
Zinc, ppm	267		3	31.1	706

Wheat midds (air-dry basis)

Lab test	Ave	sd	N	Low	High
ADF, %	11.8	1.2	36	8.1	13.8
Ash, %	4.7	0.9	22	1.4	5.6
Calcium, %	0.13	0.06	74	0.05	0.41
Copper, ppm	14.1	3.3	121	9.2	28.3
Crude fiber, %	8.5	1.5	91	5.5	20.1
Crude protein, %	16.7	1.3	254	7.1	20.8
Ether extract, %	3.9	0.6	103	1.1	5.8
Iron, ppm	136.0	31.4	92	89.3	272.0
Magnesium, %	0.38	0.05	129	0.23	0.49
Manganese, ppm	158.3	44.4	88	108	489
Moisture, %	10.8	1.5	185	6.0	14.2
NDF, %	35.6	3.1	22	23.5	38.7
Phosphorus, %	0.85	0.13	75	0.54	1.10
Potassium, %	10.6	0.15	129	0.57	1.40
Starch, %	18.9	6.7	11	2.4	24.4
Sulfur, %	0.17	0.02	11	0.11	0.18
Zinc, ppm	102.4	49.5	119	4.5	502

Those of us who work with biological variation on a daily basis are familiar with typical nutrient values and know that nutrient testing is part of daily business. Commercial livestock feed manufacturers generally take advantage of nutrient variability and frequently adjust complete diets based on the nutrient levels of incoming ingredients. By primarily focusing and formulating on the major nutrients, there is still some degree of uncertainty and variability in the micronutrient levels. Pet food manufacturers work from fixed formulas and have less opportunity to adjust manufacturing formulas to maintain specific multiple nutrient levels within a very narrow range. Thus, there is a greater degree of uncertainty and variability of nutrient levels in complete diets when fixed formulas are used.

Dale Hill and Jolene Hoke are with ADM Alliance Nutrition, Inc., Quincy, Illinois, USA. Ryan Taylor and Tom Sliffe are with Perten Instruments, Springfield, Illinois. Hill may be contacted at Dale.Hill@adm.com.

INFORMATION LITERACY (CONTINUED FROM PAGE 580)

writing skills, or tweaking their citation styles. Ideally, the end result is a more cohesive paper that is well developed rather than hastily patched together shortly before the due date.

When you are designing assignments that require students to do research, it is also helpful to inform your liaison librarian, so he/she can be prepared for specific inquiries from students and ensure that the library has the appropriate resources to support your class. "We're there for the profs too," says Hwang, adding that the library may also support the range of online and interactive tools now available to instructors, such as eClass, clicker technology, online videos or tutorials, and even social media such as Facebook.

Finally, regardless of what level course you are teaching, it is important to regularly assess where students are with their information literacy skills, since they have likely had different degrees of exposure from their previous courses. It's a good idea even in senior classes to ask students what they know about using databases and finding peer-reviewed literature, and then fill in the gaps as necessary. "Never assume," warns Quoika-Stanka.

The bottom line is that whatever your teaching or course development needs may be, your liaison librarian can provide services to assist and point you toward resources that can save you time and improve student learning outcomes. All you have to do is ask.

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Colonial Williamsburg hosts IOMSA convention

Historic Virginia site served as backdrop for the 116th Annual Summer Convention of the International Oil Mill Superintendents Association

Jack Wolowiec

The first day of the convention's technical program began with a presentation by Ben Morgan, executive vice president of the National Cottonseed Products Association (NCPA). Morgan described NCPA's efforts to raise the profile of cottonseed oil, beginning with the development of talking points for the media, trade industry audiences, industry experts, and researchers. The focus of his presentation was NCPA's "Cottonseed Oil Comeback Tour" (www.cottonseedoiltour.com), a nationwide campaign highlighting restaurants, food processors, and bakeries that have reformulated their products to include cottonseed oil. Morgan estimated that the tour was worth more than a half million dollars in public relations value for NCPA.

Kathleen Warner, an industry consultant specializing in the quality and stability of edible vegetable oils, spoke on the functional characteristics of the more common vegetable oils. Drawing on her more than 30 years as lead scientist for edible oil research at the US Department of Agriculture (USDA) National Center for Agricultural Utilization Research in Peoria, Illinois, she described the chemistry at work in the frying process and compared the various vegetable oils commonly used in a variety of food products. Although there have been notable improvements in oxidative stability and functionality over the past 50 years, she commented that additional research is needed to develop oils with functional characteristics that combine stability with the deep fried flavor that is much sought after by food manufacturers and consumers.

In his review of issues affecting the edible fat and oil industry, Robert Collette, president and secretary of the Institute of Shortening and Edible Oils, described the status of food/feed safety legislation currently being considered by the US Congress. He indicated that a coalition of industry organizations are focusing their efforts to clarify the roles of the USDA and the US Food and Drug Administration (FDA) with respect to food safety; other refinements being sought include the requirement for a federal recall coordinator, protection against inappropriate disclosure of sensitive business information, and decreased frequency of inspection for low-risk facilities. Commenting on the work under way to revise the *Dietary Guidelines for Americans* (DGA), Collette observed that, for the first time, the DGA's advisory committee is looking at the effect of fat and cholesterol intake on the increased incidence of type 2 diabetes. He also reported on some of the proposed revisions to the Child Nutrition Act. Two revisions are aimed a school meals; one would, for the first time, recommend that foods served in school meals contain zero *trans* fat, while another would ban the use of partially hydrogenated vegetable oil. He concluded with an overview of the FDA's current focus on revisions to front-of-pack labeling and the possible implications for the food processing industry.

William Wark, board member of the United States Chemical Safety and Hazard Investigation Board, was one of the presenters at the International Oil Mill Superintendents Association (IOMSA) Convention, held June 13–15, 2010, in Williamsburg, Virginia, USA.

Robert Byrnes, managing director of Nebraska Screw Press, Lyons, Nebraska, USA, gave convention attendees an overview of decentralized oilseed processing, emphasizing the advantages it affords to produce food, feed, and fuel from locally grown feedstocks. Pointing out that decentralized oilseed processing facilities present "tremendous" opportunities for rural economic development, Byrnes noted that locally available synergies, innovations, and resources can be effectively leveraged in a vertically integrated process. This vertical integration, according to Byrnes, is the key

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For more information about the International Oil Mill Superintendents Association (IOMSA), including selected presentations featured at the summer convention as well as articles from *Oil Mill Gazetteer*, visit the IOMSA website, www.iomsa.org.

to the success of the decentralized rural processing plant. He then listed the best practices essential to a decentralized facility: (i) size the facility to access target markets and use local materials; (ii) integrate the ability to process multiple oilseed types into pretreatment; (iii) use simple and durable technology (much of which, Byrnes stated, is not new—"it's a case of back to the future"); (iv) provide thorough operator training and oversight; (v) design expansion in from the start if needed; and (vi) maintain final product diversity and the ability to shift between food, feed, and fuel markets. "Small is beautiful," Byrnes concluded, "and profitable."

Monday's luncheon speaker was Chief Richard Picciotto of the New York Fire Department, author of the best-selling book *Last Man Down*. The highest-ranking firefighter to survive the World Trade Center collapse on September 11, 2001, Chief Picciotto gave a gripping, first-hand account of his experiences that day, describing his entrapment in the debris, his eventual escape, and how those experiences led to a soul-searching reappraisal of the values and priorities in his own life.

The first speaker on Monday afternoon was William Wark, board member of the United States Chemical Safety and Hazard Investigation Board (CSB). After providing an overview of the CSB's role in investigating accidents in the chemical industry (stressing that its role is prevention; unlike OSHA and the EPA, the CSB is not a regulatory or enforcement agency), Wark's presentation focused on the July 2007 incident at the Barton Solvents facility in Valley Center, Kansas, USA. The explosion caused extensive damage to the facility and led to the evacuation of nearly 6,000 nearby residents. With only 17 investigators on its staff, Wark remarked that the agency is currently "stretched to the limit" and that its investigation of the Deepwater Horizon incident in the Gulf of Mexico will likely be its largest, posing a significant challenge to the CSB's resources. He concluded by advising attendees to "be vigilant and maintain a sense of vulnerability."

Bill Davis, crane safety expert for Zurich Services Corp. and a Certified Safety Professional, described the common causes of crane accidents and noted that, in basic terms, cranes wreck "because somebody did something dumb." The number of crane accidents in the United States—roughly 8,000 per year—has remained unchanged for decades, a fact he attributed to operators "doing the same dumb stuff over and over again." The introduction of computerized controls, which, theoretically, should reduce the number of accidents, has had little effect, mainly because they are often improperly programmed and/or overridden by the operator. Davis noted that OSHA has started to pay increased attention to crane incidents (Note: OSHA has issued a new rule addressing the use of cranes in construction that will take effect November 8, 2010; for the text of the rule, see http://www.osha.gov/FedReg_osha_pdf/FED20100809.pdf).

The afternoon session drew to a close with a presentation by John Campbell, senior vice president for government relations and industrial products at Ag Processing Inc. (AGP), Omaha, Nebraska. Campbell gave an overview of the current environment facing the renewable fuels industry in the United States, with emphasis on the Renewable Fuel Standard 2 of the Environmental Protection Agency (EPA). Commenting on the ongoing topic of land use change, he observed that each year, the United States loses 2 million acres (800,000 hectares) of agricultural land to development. He concluded by setting forth five "guiding principles" for the biofuels industry: (i) biofuels will not be allowed to "significantly" displace food/feed demand; (ii) biofuels *will* be allowed to consume *surplus* food and feed supplies; (iii) federal budget deficits are likely to motivate a shift in the biofuel subsidy from the taxpayer to the consumer; (iv) consumers will tolerate some small price premium for renewables—but not much; and (v) mandates are a double-edged sword (they provide a guaranteed market—unless they don't; they provide a target for opponents even when they have no market benefit; and they can be waived for any reason—but especially if they violate principles i and iv).

Three presenters addressed the topic of "Sustainability in Oilseed Processing" in the opening session on Tuesday morning. Warren Barnes, vice president of Frazier, Barnes & Associates, Memphis, Tennessee, USA, discussed the origins of the concept of sustainability, how it is used in the oilseed processing industry generally, and how it will impact a company's business model and mission. He noted that an increasing number of companies are now disclosing their sustainability performance in their "sustainability" or "corporate performance" reports and concluded that sustainability "is not a passing fad—it is here to stay." The next presenter, Loren Polak, director of environmental management, Bunge North America, Inc., St. Louis, Missouri, USA, outlined Bunge's sustainability program. Polak described how Bunge developed and is implementing its corporate sustainability policy, beginning with modest goals for reducing CO_2 emissions, water use, and landfill waste, with more aggressive goals planned for the longer term. Essential to developing a sustainability culture, Polak commented, is buy-in and an ongoing commitment from high-level management. The final speaker on sustainability, Mike Boyer, president of Agribusiness and Water Technology, Inc., Atlanta, Georgia, USA, addressed the challenges and opportunities of implementing the corporate sustainability plan at the plant level. Economic considerations, Boyer suggested, are one of the factors behind the increased interest in sustainability: "There's money in it." Echoing Loren Polak's remarks, he observed that enthusiastic senior staff at the plant level are critical in driving change and recommended the designation of a sustainability "czar" at each facility. "This isn't rocket science," Boyer said. "It's just a better way of organizing what you already may be doing." The key elements of the effort, he explained, are clear guidance from corporate, early high-visibility successes, effective communication, and an engaged and committed team.

Stephen King, public affairs specialist for FDA's Baltimore District Office, concluded the convention's technical program with a presentation that focused on food safety and food defense. King gave an overview of the FDA's current initiatives, which highlight the critical role of employees in ensuring safety throughout the food chain, provided an update on the agency's Reportable Food Registry, and described the FDA's recall and alert mechanisms.

Company-specific presentations highlighting new products and services of interest to the processing industry were featured in a Vendors' Forum. Closing out the day's events was the annual IOMSA business meeting with comments by President Mark Ebeling and First Vice President Kent Davidson, and the selection of Doug Kennedy of PYCO Industries, Lubbock, Texas, USA, as second vice president.

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SURFACTANTS BASED ON MONOUNSATURATED FATTY ACIDS (CONTINUED FROM PAGE 543)

work will be described in detail in the October 2010 issue of *inform*.

Monounsaturated fatty acids have two functional groups that can be further derivatized to give useful surfactants. The double bond can be sulfonated to give strong anionic properties such as thermal stability. The carboxylate can be converted to an alcohol and subsequently alkoxylated and carboxylated to give electrolyte and divalent cation tolerance. The alcohol, glyceride, or fatty acid can be used to produce tertiary amines that can subsequently be converted to betaines, amine oxides, sultaines, and the like.

Figure 2 summarizes some of the many reactions that have been successfully carried out using unsaturated fatty acid derivatives.

Hybrid surfactants containing both petrochemical and agrichemical feedstocks have also been developed. Some of these make use of the reaction of a terminally sulfonated alkylaromatic. It has been found that this type of molecule readily reacts with unsaturated aliphatics such as unsaturated acids, unsaturated alcohols, and olefins to form surfactants that can be designed to have a wide variety of properties.

Unsaturated fatty acids provide a useful starting point for the synthesis of many surfactants. Because these surfactants are based on renewable resources, they can help meet the challenge of the future demand for EOR surfactants in large quantities. In certain cases, they offer alternatives that cannot be found using petrochemicals such as unsaturated alcohols and internal olefin ethers that can be converted to many useful surfactants for EOR and other applications. Current research shows promise in developing crops yielding sufficient quantities of various chain lengths of these acids to meet the anticipated future demand.

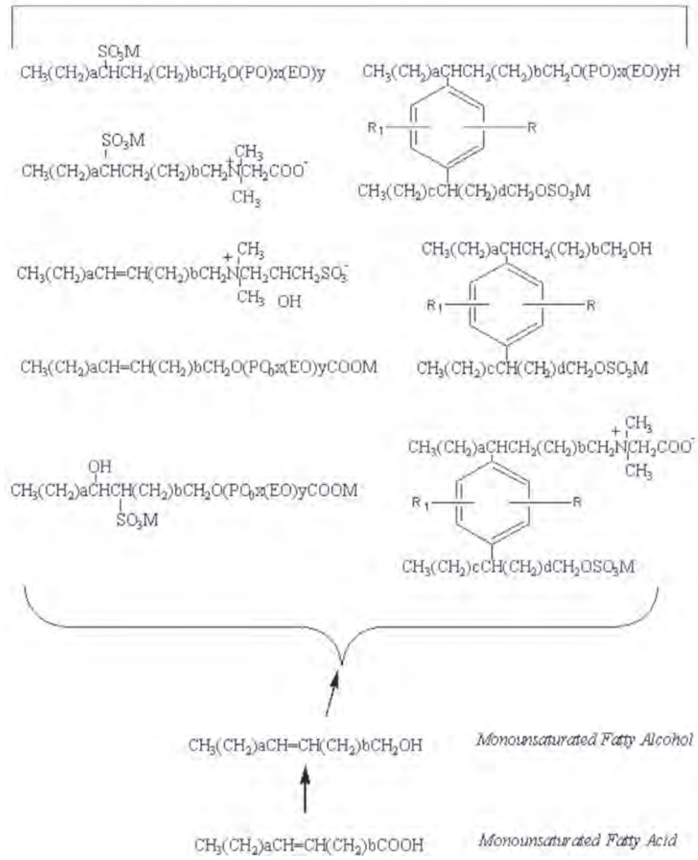

FIG. 2. *Surfactants derived from unsaturated fatty acids.*

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FOR FURTHER READING:

For more on enhanced oil recovery, see Catherine Watkins' article "Chemically enhanced oil recovery stages a comeback" (*inform 20*:682–685, 2009).