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inform • International News on Fats, Oils, and Related Materials
ISSN: 0897-8026 IFRMEC 23 (8) 481–544

Calendar

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

September

September 30–October 2, 2012. AOAC International Annual Meeting & Exposition, Las Vegas, Nevada, USA. Information: www.aoac.org

September 30–October 3, 2012. American Association of Cereal Chemists International Annual Meeting, Hollywood, Florida, USA. Information: www.aaccnet.org

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

September 30–October 5, 2012. SCIX2012 (national meeting of the Society for Applied Spectroscopy), Kansas City, Missouri, USA. Information: www.scixconference.org

October

October 1–3, 2012. Oilseeds & Oils 2012, Istanbul, Turkey. Information: www.apk-inform.com

October 2–3, 2012. Aviation Biofuels Development Conference, Washington, DC, USA. Information: www.aviation-biofuels.com

October 2–4, 2012. Practical Trouble Shooting—What Can Go Wrong and How to Resolve It, Leatherhead, Surrey, UK. Information: www.leatherheadfood.com/training-and-conferences

October 3–5, 2012. Food Ingredients Asia, Jakarta, Indonesia. Information: http://tinyurl.com/Food-Ingred

October 3–5, 2012. Cleaning Products 2012, Baltimore, Maryland, USA. Information: www.cleaningproductsconference.com

October 7–11, 2012. Practical Short Course on Vegetable Oil Processing and Products of Vegetable Oil/Biodiesel, College Station, Texas, USA. Information: www.foodprotein.tamu.edu

October 10–11, 2012. American Fats & Oils Association Annual Meeting, Grand Hyatt Hotel, New York. Information: www.phone: +1 803-252-7128 or email: afoa@afoaonline.org

October 11–12, 2012. Process Safety Training, Burr Ridge, Illinois, USA. Information: www.fauske.com

October 9–11, 2012. Emulsions and Emulsifiers—Scientific Principles and Application, Leatherhead, Surrey, UK. Information: www.leatherheadfood.com/training-and-conferences

October 17–19, 2012. Lipids and Metabolic Disease, Paris, France. Information: www.gerli.com

October 17–19, 2012, Algae Europe 2012, Milan, Italy. Information: www.algaeurope.eu/en_lfm/index_alg.asp

October 23, 2012. Preservatives, Newark, New Jersey, USA. Information: www.scconline.org

October 21–25, 2012. ASA-CSSA-SSSA (American Society of Agronomy-Crop Science Society of America-Soil Science Society of American) 2012 International Annual Meetings, Cincinnati, Ohio, USA. Information: www.acsmeetings.org/meetings

October 24–25, 2012. Oils and Fats—Production, Properties and Uses, Leatherhead, Surrey, UK. Information: www.leatherheadfood.com/training-and-conferences

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AOCS Meeting Watch

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

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

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

August 20–23, 2013. 15th AOCS Latin American Congress and Exposition on Fats and Oils, Sheraton Santiago Hotel and Convention Center, Santiago, Chile. Information: email: meetings@aocs.org ; phone: +1 217-693-4821; fax: +1 217-693-4865; www.aocs.org/meetings

May 4–7, 2014. 105th AOCS Annual Meeting & Expo, The Henry B. Gonzalez Convention Center, San Antonio, Texas, USA. Information: phone: +1 217-693-4821; fax: +1 217-693-4865; email: meetings@aocs.org; aocs.org/meetings

May 3–6, 2015. 106th AOCS Annual Meeting & Expo, Rosen Shingle Creek, Orlando, Florida, USA. Information: phone: +1 217-693-4821; fax: +1 217-693-4865; email: meetings@aocs.org; aocs.org/meetings

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October 29–30, 2012. Basic Polymers (October 29) and Advanced Polymers (October 30), Newark, New Jersey, USA. Information: www.scconline.org

October 29–31, 2012. Advanced Biofuels Markets, San Francisco, California, USA. Information: www.advancedbiofuelsmarkets.com

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

November

November 1–2, 2012. 2nd ICIS Asian Surfactants Conference, Marina Bay Sands, Singapore. Information: www.icisconference.com

November 4–8, 2012. 32nd Practical Short Course on Vegetable Oil Extraction, Texas A&M University, Food Protein R&D Center, College Station, Texas, USA. Information: Rich Clough, phone: +1 979-862-2262; fax: +1 979-845-2744; email: rclough@tamu.edu; www.foodprotein.tamu.edu

November 5–9, 2012. WMF meets IUPAC: 7th Conference of The World Mycotoxin Forum and the XIIIth IUPAC International Symposium on Mycotoxins and Phycotoxins, Rotterdam, Netherlands. Information: www.wmfmeetsiupac.org

November 6, 2012. Foundation Certificate in Sensory Principles, Leatherhead, Surrey, UK. Information: www.leatherheadfood.com/training-and-conferences

November 7–8, 2012. MassSpec 2012: New Horizons in MS Hyphenated Techniques and Analyses, Biololis, Singapore. Information: www.sepscience.com

November 11–15, 2012. SETAC North America, Long Beach, California, USA. Information: www.longbeach.setac.org

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Formerly published as *Chemists' Section, Cotton Oil Press*, 1917–1924; *Journal of the Oil and Fat Industries*, 1924–1931; *Oil & Soap*, 1932–1947; news portion of *JAOCS*, 1948–1989. The American Oil Chemists' Society assumes no responsibility for statements or opinions of contributors to its columns.

inform (ISSN: 0897-8026) is published 10 times per year in January, February, March, April, May, June, July/August, September, October, November/December by AOCS Press, 2710 South Boulder Drive, Urbana, IL 61802-6996 USA . Phone: +1 217-359-2344. Periodicals Postage paid at Urbana, IL, and additional mailing offices. POSTMASTER: Send address changes to *inform*, P.O. Box 17190, Urbana, IL 61803-7190 USA.

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November 13–14, 2012. Predicting and Controlling the Shelf-Life of Foods, Leatherhead, Surrey, UK. Information: www.leatherheadfood.com/training-and-conferences

November 13–15, 2012. Health Ingredients Europe and Natural Ingredients, Messe Frankfurt, Germany. Information: www.hieurope.ingredientsnetwork.com

November 14–15, 2012. Novel Sources for Omega-3 for Food and Feed, Copenhagen, Denmark. Information: www.eurofedlipid.org

November 15–16, 2012. 10th Practical Short Course: Omega-3 and Nutritional Lipids, Frankfurt am Main, Germany. Information: www.smartshortcourses.com

November 19–20, 2012. World Cocoa Conference, Abidjan, Côte d'Ivoire. Information: www.icco.org

November 20–23, 2012. 2012 European Federation of Food Science and Technology Annual Meeting, Montpellier, France. Information: www.effostconference.com

November 23–24, 2012. 67th Annual Convention of the Oil Technologists' Association of India, Mumbai, India. Information: www.otai.org

November 23–24, 2012. International Conference and Exhibition on Cosmetology & Cosmetics, Hyderabad, India. Information: www.omicsonline.org

November 27–29, 2012. Chocolate Confectionery Production, Leatherhead, Surrey, UK. Information: www.leatherheadfood.com/training-and-conferences

November 27–29, 2012. National Advanced Biofuels Conference & Expo, Houston, Texas, USA. Information: www.advancedbiofuelsconference.com

December

December 4–5, 2012. International Algae Conference, Berlin, Germany. Information: http://algaecongress.com

December 4–5, 2012. 12th Practical Short Course: Trends and Markets in Aquaculture Feed Ingredients, Nutrition, Formulation and Optimized Feed Production and Quality Management, Ghent, Belgium. Information: www.smartshortcourses.com

December 5, 2012. Cosmetic Raw Materials, New York, New York, USA. Information: www.scconline.org

December 5–7, 2012. Algae Technology Europe, Ghent, Belgium. Information: www.smartshortcourses.com

December 6–9, 2012. World Congress on Clinical Lipidology, Budapest, Hungary. Information: www.clinical-lipidology.com

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NANOSCALE oil confinement in fat crystal networks

Why puff pastries are a new frontier for theoretical physicists

David A. Pink
David Pink is a theoretical physicist and research professor at St. Francis Xavier University (Antigonish, Nova Scotia, Canada) and an adjunct professor at the University of Guelph (Ontario, Canada). He makes mathematical models of phospholipid bilayers, bacterial surfaces, biofilms, cationic antimicrobial peptides, magnetically ordered materials, colloids, and, lately, fat crystal networks. He can be contacted at scorpiocarla@gmail.com.

At first glance, puff pastry might not seem like a suitable material for studying the physics of complex fluids. Yet upon closer inspection, puff pastries derive their light and flaky texture from underlying oil and fat crystal networks. These oil and fat crystal networks are essentially complex fluids whose structures and dynamics involve weak van der Waals and electrostatic interactions. Such interactions are key to understanding and controlling the oil-binding capacity of triacylglycerol (TAG) fat networks—a challenge that is especially interesting to a theoretical physicist, because it likely requires the addressing of an essentially unsolved problem: understanding and being able to predict the hierarchy of self-assembled fat crystal networks in oils.

A related challenge for food scientists has been to produce products free of *trans* fats and low in saturated fats with the proviso that they are essentially indistinguishable from the products being replaced. This requires an understanding of functionality: Which oil is best for a given use? "By and large, a practical definition of functionality is that it comprises the insight, wisdom and prejudices of the fraternity of cooks of this planet accumulated over the last ~30,000 years" (Peyronel, personal communication, 2012).

Significant attempts to quantify functionality—and the oil-binding capacity of fat crystal networks—have been made. All involve meso- or macroscopic properties of oils such as creating ingeniously thoughtful *ad hoc* "magic" mixtures or deducing structures via examining the chemical potentials of the components. However, as Michel and Sagalowicz (2010) say, "Currently we are far from being able on a routine basis to relate food structures to functionality, and only in rare cases is it possible to establish a direct relationship." Recently, a different approach has been taken by reframing the question: How do oils behave on the nanoscale? The philosophy of this approach is that, ultimately, it is at the nano- or molecular scale where the action begins and it is on this scale that the basis for meso- and macroscale structures is established.

The current view of the hierarchy of fat crystal networks is that the basic components are highly anisotropic fat nanoplatelets (Acevedo *et al.*, 2011; Marangoni *et al.*, 2012), hundreds of nanometers (nm) in two dimensions and less than 100 nm in the third, ultimately giving rise to "needles," fractal aggregates, spherulites (approximately 10^4–10^5 nm), and other structures.

Studying a multicomponent oil on the nanoscale involves addressing two

questions: (i) Does any separation of components arise at the surface of a fat particle in the oil, and (ii) what is the effect on the oil of confining it between fat surfaces separated by a few nanometers? Experimental data is not easy to come by and is frequently indirect. In recent years, however, advances in computing capabilities have made modeling and computer simulation of TAG oils feasible.

Confinement of molecules in spaces possessing length scales that are comparable to the dimensions of the molecules themselves gives rise to features that differ from bulk properties and that depend on the confinement dimension, n ($n = 1, 2, 3$), with the other $d - n$ dimensions unconfined, where d is the dimension of the system (Shen and Cheung, 2010).

Modeling an oil confined between two surfaces a few nanometers apart requires that we explicitly represent the atomic details of the oil molecules. We must create an appropriately dense mix of such oil molecules and then use a computer simulation procedure, atomic scale molecular dynamics, to compute thermodynamic functions, such as chemical potentials and molecular distributions, as functions of parameters such as relative surface orientation and temperature. Figure 1a (page 488) shows idealizations of two nanoplatelets (1) possessing flat surfaces and arbitrarily oriented in oil (2). This is simplified by requiring them to be of equal size and parallel (Fig. 1b), and finally to become infinitely large so that edge and thickness effects are eliminated (Fig. 1c) thus yielding a confinement dimension of $n = 1$.

Figure 1 (next page) shows results of using the atomic scale molecular dynamics code GROMACS to simulate triolein oil between two tristearin nanoplatelets in no particular phase (α, β, β′). It is unlikely that a choice of solid phase would have a significant effect upon the conclusions. There are two results to note: (i) the oil density oscillates (A–C) between the two solid surfaces, and (ii) the average oil density (**D**, red dots) decreases as the platelets become closer. The

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density oscillations indicate the "layers" of oil molecules so that, when $d = 1.5$ nm, for example, there are three layers between the plates, with two of them relatively tightly bound. Note that the average oil density has decreased by ~30% compared to the bulk oil density, when the platelets are 2 nm apart. In that case, there are four oil layers (**C**, $d = 2.0$) between the platelets. These results are not astonishing: Similar results for analogous systems have been known for years. What is of particular interest, however, is that we can begin to see a molecular basis for oil-binding capacity.

The assertion that pure tristearin nanoplatelets will exhibit very poor oil-binding capacity for triolein oil is hardly a revelation. What is interesting, however, is that we can understand why: The "match" of triolein molecules with a tristearin surface is not good, and two tristearin surfaces prefer to stick together rather than retain triolein oil between them.

We can go further. We can ask: Suppose we had an oil component that possessed elaidic (*trans*) hydrocarbon chains instead of oleic (*cis*) chains? Would that component preferably stick to the solid surface? We simulated a mix of oils, 80% triolein and 20% dielaidic-monoolein, and showed that the minor component underwent nanoscale phase separation so that it was strongly bound to the surface of solid tristearin (MacDougall *et al*., 2012). This result enabled us to propose a molecular algorithm for controlling oil-binding capacity by using an oil that permits a graded nanophase separation at the surface of nanoplatelets.

Finally, one might ask: "Nanoplatelets may or may not like to have oil between them, depending on the composition of the oil. Suppose we have nanoplatelets that don't like to have oil between: then what happens—what happens next in the hierarchy of structures?"

We have carried out Monte Carlo simulations, with periodic boundary conditions, of such model nanoplatelets (Pink, 2012). Our model nanoplatelet (Fig. 2A) is not particularly original. Although we were unaware of it, two other works have represented solid objects as rigid aggregates of spheres. If the concentration of nanoplatelets is not too high, then the answer to what happens was unexpected but pleasing (Fig. 2B): We found essentially linear self-assembling aggregates composed of layers of model nanoplatelets. These structures resemble dagwoods—those iconic multilayered sandwiches named after Dagwood Bumstead, a central character in the comic strip *Blondie* (http://tinyurl.com/Blondie-Wiki) who is frequently illustrated making enormous multilayer sandwiches.

A dagwood composed of nanoplatelets possesses a width corresponding to the lateral dimensions of a

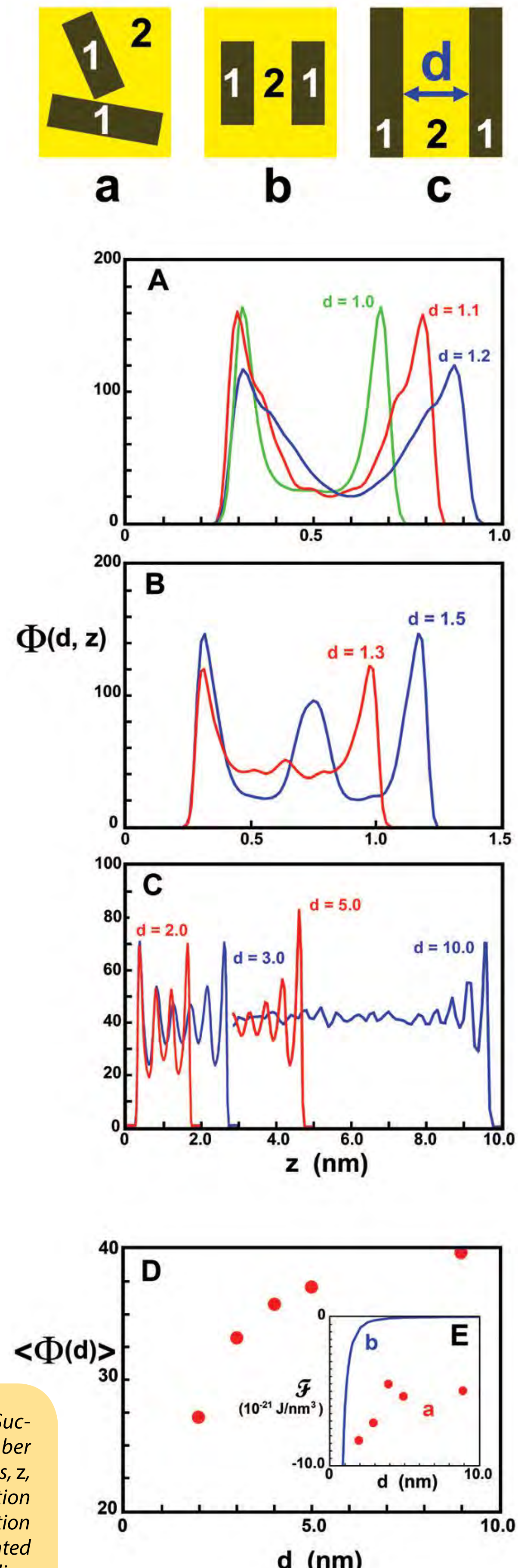

FIG. 1. *Oil (2) confined between two crystalline nanoplatelets (1). Successive simplification of the system (a, b, c). Results: A-C: Oil number density, Φ(*d, z*), as a function of position between the nanoplatelets, z, for separation,* d. *D: Average oil number density, <Φ(*d*)>, as a function of nanoplatelet separation,* d. *E: Free energy density, F, (a), as a function of* d. *Curve b shows the result if one assumes the oil can be represented as a continuum. The difference between them as* d $\rightarrow \infty$ *is the binding energy density of triacylglycerols to the platelets.*

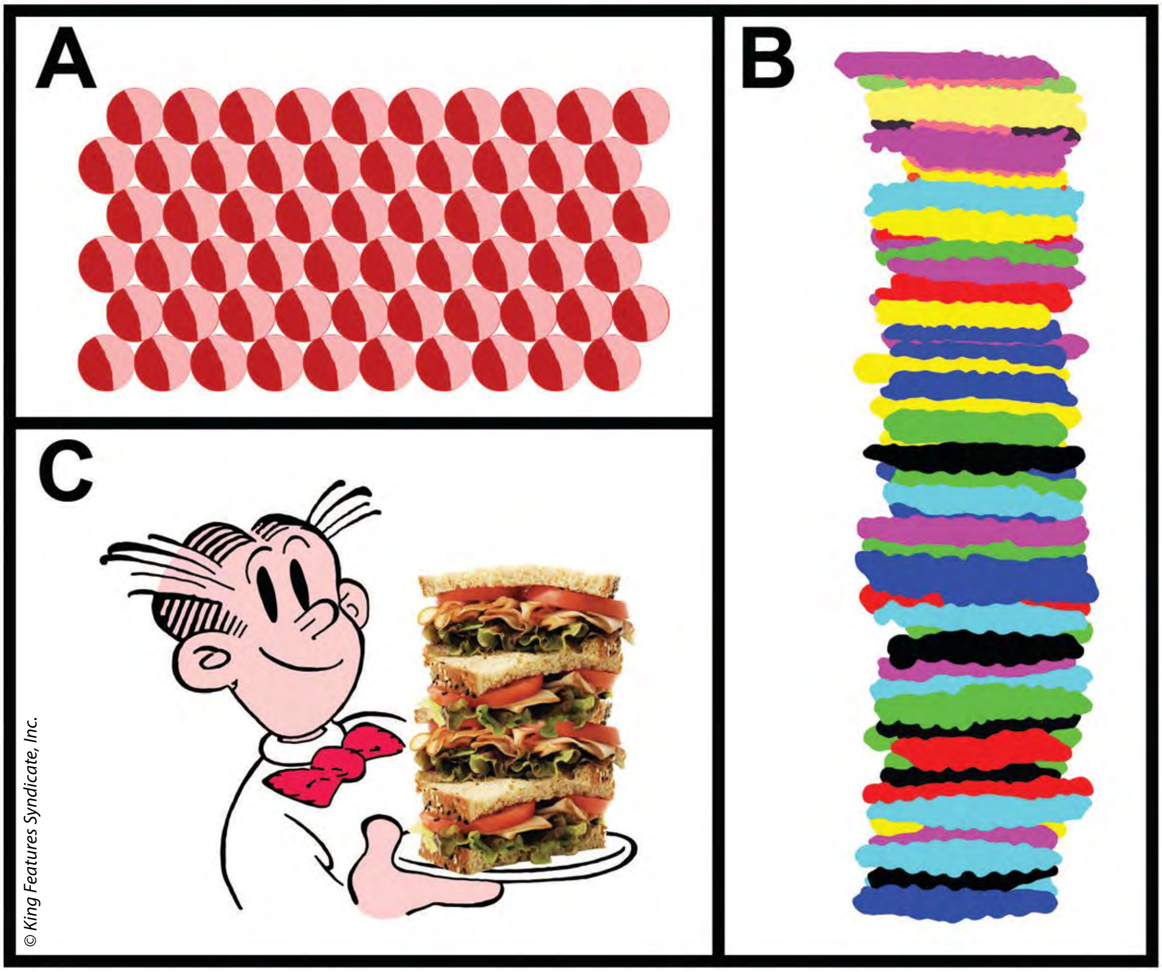

FIG. 2. *A: A model anisotropic nanoplatelet comprising six rows of 10 spheres, and one sphere thick. B: Snapshots of the results of a Monte Carlo simulation of interacting nanoplatelets with periodic boundary conditions. The nanoplatelet concentration was 6% of the total volume, and they have been colored for easy identification This self-assembling multilayer sandwich aggregate is a "dagwood." C: Dagwood Bumstead (http://tinyurl.com/Dagwood-Sand).*

nanoplatelet, which can range from ~10^2 nm to ~10^3 nm. Its length will depend upon nanoplatelet concentration and other factors. It is possible that dagwoods could be identified, in lower resolution images, as "needles." If they are shown actually to exist, then one can move to the next stage of self-assembly of fat crystal networks: dagwood aggregation.

These are stimulating times for understanding the hierarchy of the self-assembly of fat crystalline networks, oil-binding capacity, and, ultimately, functionality. That nanoscale mathematical modeling and computer simulation might contribute is an exciting extension of food studies. One can ask, "Is this a new frontier for soft condensed matter theoretical physicists?" As health concerns make growing impacts on culinary processes and the oils in fat crystal networks play an essential role in defining the texture and taste of food, the answer is a definite "yes." Theoretical physicists would be wise to get in while the field is open; it is where some smart research money will be going.

The author acknowledges the financial support of the Natural Sciences and Engineering Research Council of Canada (NSERC), the Advanced Food and Materials Network (AFMnet) and the Atlantic Canada Supercomputing Network (ACEnet).

information

- Peyronel, F., Personal communication, May 2012.
- Michel, M., and L. Sagalowicz, Probing food structure, in *Food Materials Science*, edited by J.M. Aguilera and P.J. Lillford, Springer, New York, 2008, Chapter 11, p. 203.
- Acevedo, N.C., F. Peyronel, and A.G. Marangoni, 2011 Nanoscale structure and intercrystalline interactions in fat crystal networks, *Curr. Opin. Coll. Interface Sci. 16*:374–383 (2011).
- Marangoni, A.G., N.C. Acevedo, F. Maleky, E. Co, F. Peyronel, G. Mazzanti, B. Quinn, and D.A. Pink, Structure and functionality of edible fats, *Roy. Soc. Chem. Soft Matter 8*:1275–1300 (2012).
- Shen, A.Q., and P. Cheung, The freedom of confinement in complex fluids, *Physics Today 63*:30–35 (2010).
- MacDougall, C.J., M.S.G. Razul, E. Papp-Szabo, F. Peyronel, C.B. Hanna, A.G. Marangoni, and D.A.Pink, Nanoscale characteristics of triacylglycerol oils: phase separation and binding energies of two component oils to crystalline nanoplatelets, *Roy. Soc. Chem. Faraday Disc. 158* (in press).
- Pink, D.A., Intercrystalline interactions, in *Structure–Function Analysis of Edible Fats*, edited by A.G. Marangoni, AOCS Press, Urbana, Illinois, USA, 2012, pp. 173–206.

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TABLE 1. Canola oil and high-oleic canola oils[a,b]

		Fatty acid content (%)				
Oils	**Features**	**Sat.**	**Oleic**	**Linoleic**	**Linolenic**	**OSI (hr)**
Canola	Commodity	7	60	20	10	9
Clear Valley® 65 (CV65)	Low-linolenic	7	65	24	3	15
Clear Valley® 75 (CV75)	High-oleic	7	75	14	3	19
Omega-9 canola oils	High-oleic	7	73	15	<3	17
Clear Valley® 80 (CV80)	Highest oleic	7	80	9	3	26

[a]Abbreviations: Sat., saturated fatty acids; OSI, oxidative stability index.
[b]Cargill owns the Clear Valley brand; Dow AgroSciences owns the Omega-9 brand.

High-oleic canola oils and their food applications

Linsen Liu and Diliara Iassonova

High-oleic canola oils are among the major healthful oils replacing *trans* fat in food processing and foodservices in North America. Through breeding, levels of linolenic and linoleic acids can be selectively reduced to increase oil oxidative stability and deliver preferred sensory profiles. A desirable frying oil, for instance, should be low in linolenic acid and adequate in linoleic acid for high stability and high intensity of fried flavors. A desirable ingredient oil, however, should be low in both linolenic and linoleic acids to prevent rancidity in storage, resulting in shelf-stable food products. The newest generation of high-oleic canola oil contains as much as 80% oleic acid and delivers the highest oxidative stability and lowest saturated fat content on the market. Its extraordinarily high stability can maintain preferred flavors in storage, extend shelf life, reduce packaging, and enable new applications.

Canola is rapeseed that was bred by Canadian scientists in the 1950s to reduce the plant's erucic acid content. Since then, its oil has been mainly used for cooking, sautéing, and saucing. With 7–10% linolenic acid, canola oil is not stable enough for commercial frying and manufacturing of shelf-stable food. Instead, partially hydrogenated soybean oil had been the preferred working oil for many decades owing to its high stability contributed mainly by *trans* fat. During the past two decades, concerns about the health implications of *trans* fat and the need to improve the oxidative stability of commodity oils prompted industry, government, and research institutions to develop oils having naturally high stability. Because linolenic and linoleic acids are higher in oxidation rate than oleic acid, research and development have focused on reducing the level of the former through plant breeding or bioengineering. The reduction of polyunsaturated fatty acid content in plants has been scientifically managed to increase oleic acid accordingly to produce high-oleic oils. Oxidation of linolenic acid produces off-flavors in foods to which humans are sensitive. These have been described as painty, grassy, and fishy. Similarly, oxidation of linoleic acid at high concentrations produces beany and rancid odors. Within a certain range, however, linoleic acid enables high-quality frying with desirable fried food flavors.

After decades of efforts, the edible oil industry has commercialized high-oleic sunflower, high-oleic canola, and high-oleic safflower oils and is now testing two different high-oleic soybean oils. Nevertheless, high-oleic canola is the most widely used high-stability oil and dominates the high-oleic oil market due to its clean flavor, lowest saturated fat content, sustainable supply chain, and large crop production scale in North America. With implementation of a regulatory requirement for labeling *trans* fat on packaged foods in the United States in 2006, the demand for high-oleic canola oils has been steadily growing and is expected to reach 1.3 billion pounds (590,000 metric tons) in 2012.

Table 1 lists canola oil and high-oleic canola oils developed by Cargill and Dow AgroSciences along with their typical fatty acid profiles and oxidative stability indexes (OSI). As shown, reduction of linolenic acid alone, from 10% in canola oil to 3% in Clear Valley® 65 (CV65), results in a significant increase of OSI from 9 to 15 hours. It is interesting to note that linoleic acid increases from 20 to 24% at the same time. The reduction in linolenic acid improves oil stability while the increased level of linoleic acid provides for an ideal frying oil. A series of studies conducted in the US Department of Agriculture

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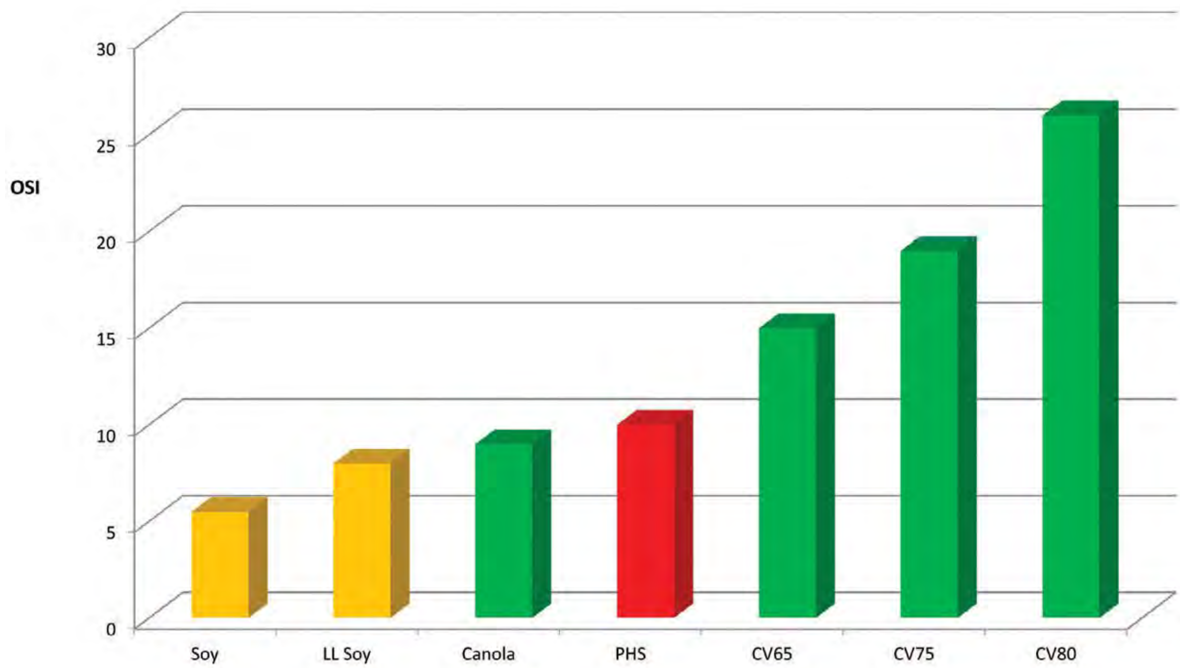

FIG. 1. *Oxidative stability index comparison of canola and soybean oils. Abbreviations: OSI, oxidative stability index; LL soybean low-linolenic soybean; PHS, partially hydrogenated soybean oil; CV65, -75, -80, Clear Valley containing 65, 75, and 80% oleic acid, respectively.*

laboratory in Peoria, Illinois, by Warner *et al.* (1997) showed that high-oleic oils with ideal linoleic acid range—that is, 23 to 37%—produced better flavor stability than those oils with either higher or lower levels of linoleic acid. Further reduction in linoleic acid through breeding can increase oleic acid effectively to over 70% and reduce linoleic acid to below 20%. As shown in Table 1, CV75 and Omega-9 contain about 75% oleic and can have OSI values of 17–19 hours. Clear Valley® 80 (CV80) is the highest in oleic acid and can have OSI values up to 26 hours. High-oleic oils with less than 20% linoleic acid are typically not recommend for frying because of their bland taste and flavor. They are better suited as ingredient oils for manufacturing shelf-stable foods for high stability.

Figure 1 compares OSI of various canola and soybean oils including the commonly used partially hydrogenated soybean oil (PHS). PHS has an OSI value of 10 hours, which is the minimum requirement for flavor stability in frying and food manufacturing. As shown, all high-oleic canola oils have OSI values greater than 10 hours and are able to replace *trans* fat in those food applications. In comparison, soybean, canola, and low-linolenic soybean (LL Soy) oils have relatively lower OSI values than PHS and have more limited market acceptance as *trans* replacements. While OSI is a common stability measure, the true test of stability is obtained from sensory analysis of the food products.

Adequate linoleic acid content is critical to achieve optimal frying flavors. Indeed, Figure 2 shows CV65, with 23–25% linoleic acid, delivers the best Overall liking score in the French fries study among the tested oils including CV75, HoSun (high-oleic sunflower), and Soy (soybean oil). This result is consistent with the findings by Warner *et al.* (1,2). Table 2 lists typical fatty acid profiles of additional commercially important oils and their OSI hours for comparison.

CONTINUED ON PAGE 494

TABLE 2. Typical fatty acid compositions (%) and OSI (hr) of soybean oils and high-oleic sunflower oil[a]

Oils	Oleic	Linoleic	Linolenic	Sat.	OSI
Soybean	23	54	7	15	6
LL soybean	26	56	3	15	9
High-oleic sunflower	82	9	0	8	24
High-oleic soy	75	15	3	7	25

[a]For abbreviations see Table 1.

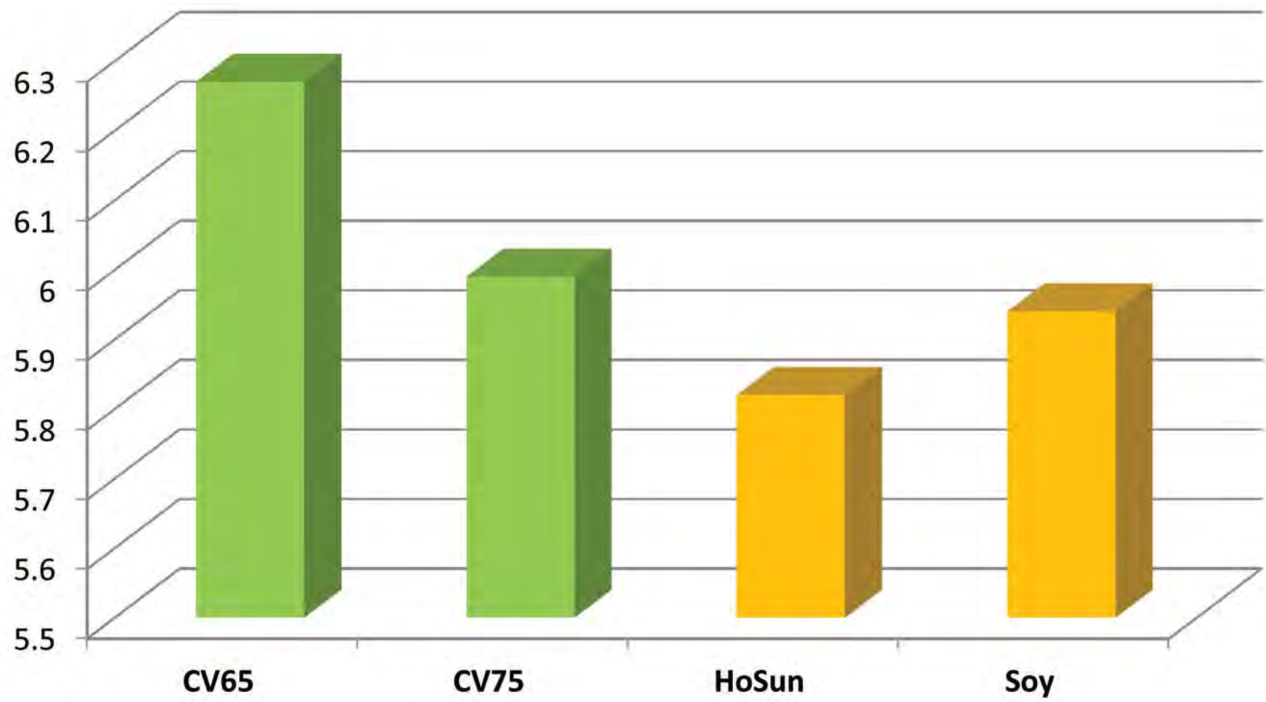

FIG. 2. *Overall liking scores of French fries. HoSun, high-oleic sunflower oil; for other abbreviations see Figure 1.*

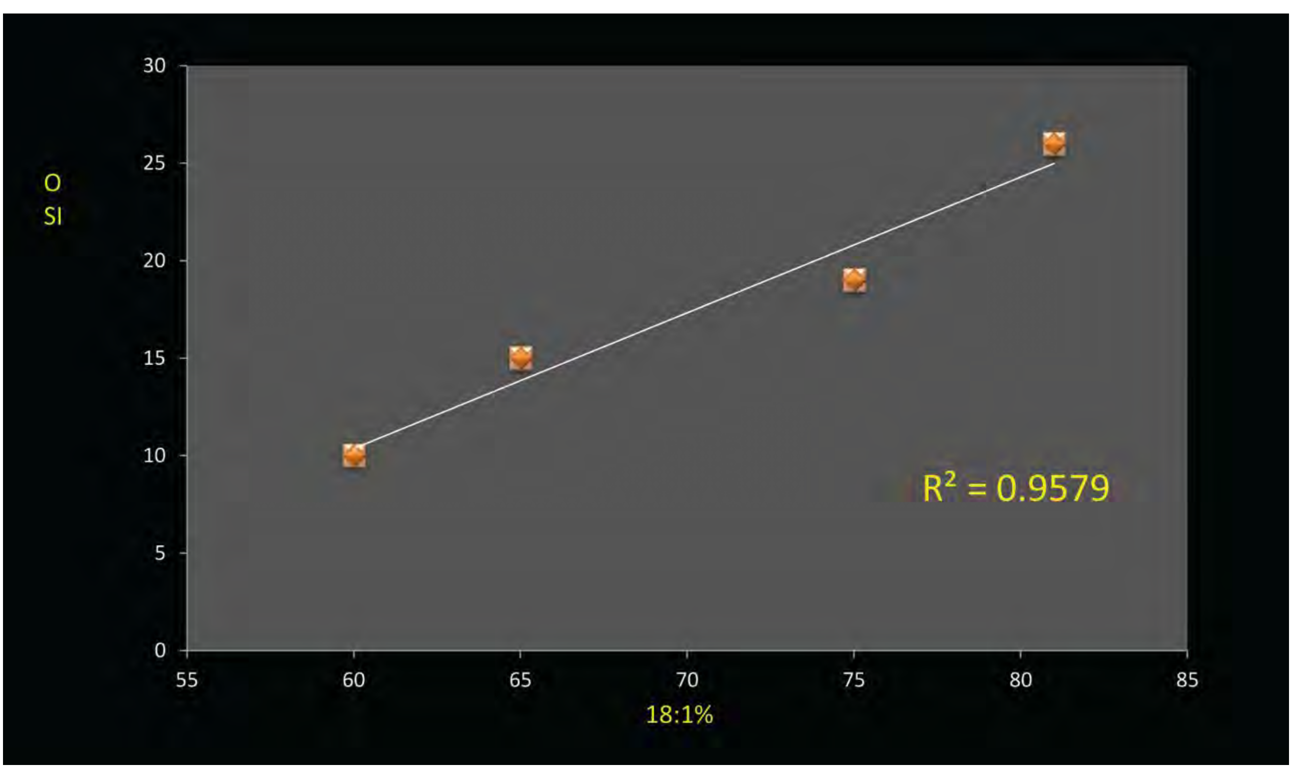

FIG. 3. *Correlation of OSI with oleic acid content of high-oleic canola oils.R^2, coefficient of determination>*

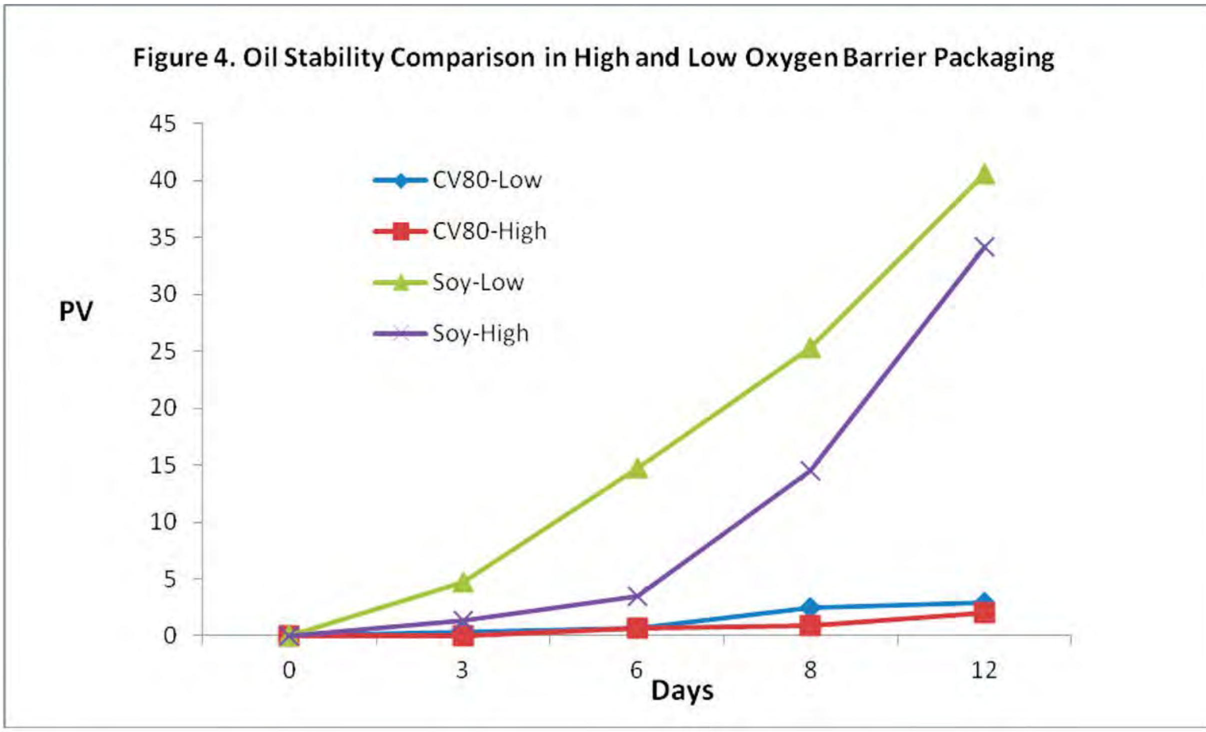

FIG. 4. *Oil stability comparison in high- and low-oxygen barrier packaging. PV, peroxide value.*

The OSI of high-oleic canola oils is linearly correlated with the oleic acid content as shown by Figure 3 (on page 493). CV80, having the highest oleic acid content, is particularly useful for shelf-stable product formulation to deliver long shelf life, and it enables packaging cost reduction. Figure 4 shows the results from a shelf-life study for cereals containing CV80 and soybean oil packed in high- or low-oxygen barrier bags. Cereals were aged at 60°C for 12 days and their oils were extracted for peroxide value (PV) analysis. It is clear that soybean oil has no stability in either high- or low-oxygen barrier bags although the high-oxygen barrier may delay oxidation initially. In contrast, CV80 had almost no PV increase in 12 days of aging at 60°C under both packaging materials, which demonstrated its robust stability. This result suggests that CV80 may reduce packaging cost while providing flavor stability and long product shelf life.

Like other trait-enhanced products, high-oleic canola oils are specialty agricultural products produced under identity preservation. For that reason, large customers of high-oleic canola oils have to contract crop production for reliable oil supply. Therefore, suppliers must be carefully screened for their capabilities in managing risk, controlling the supply chain, and ensuring quality and consistency. Cargill has a fully integrated closed loop production system, from trait development and plant breeding through to oil production and formulation technology, to ensure product quality and supply. High-oleic canola oil can be further formulated into reduced saturate shortenings, extending the

KFC switches to high-oleic canola oil in Australia

The fast-food chain Kentucky Fried Chicken (KFC) announced in May 2012 that its Australian restaurants had switched from imported palm oil to high-oleic canola oil. KFC tested the high-oleic canola oil, which is entirely sourced from Australian farmers, for almost two years in its Tasmanian stores before making the switch. The company has since partnered with reputable canola suppliers such as Cargill, Integro Foods, and MSM Milling to supply the oil nationally.

information

- Warner, K., P. Orr, and M. Glynn, Effects of fatty acid composition of oils on flavor and stability of fried foods, *J. Am. Oil Chem. Soc. 74*:347–356 (1997).
- Warner, K., P. Orr, L. Parrott, and M. Glynn, Effect of frying oil composition on potato chip stability, *J. Am. Oil Chem. Soc. 74*:1123–1128 (1994).

TABLE 3. Typically preferred food applications of canola and high-oleic canola oils

Canola oils	Preferred applications	Features
Canola	Cooking oil	Short shelf life, low cost
CV65	Frying oil, ingredient oil	Fry flavors; to enrich flavors
CV75	Ingredient oil	Clean food flavors
CV80	Ingredient oil	Clean food flavors; lower packaging cost

applications in broad food formulation such as bakery goods where extended shelf life is desired.

High-oleic canola oils are being widely used in North America to replace *trans* fat in frying and food manufacturing mainly due to their functionalities and supply scale. CV65 is optimal for frying owing to its low linolenic acid content for oxidative stability and to its ideal linoleic acid level for fried flavor. Actually, CV65 has been the dominant high-oleic canola oil in foodservice for the past 20 years. CV80 is typically used as an ingredient oil for shelf-stable food formulation, and its highest oxidative stability can potentially reduce packaging cost for the food industry. Table 3 summarizes features and preferred applications of canola and high-oleic canola oils.

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Briefs

Royal DSM (Herleen, Netherlands) announced in May 2012 that it has entered into a definitive agreement with Clearwater Fine Foods and funds managed by Richardson Capital to acquire Ocean Nutrition Canada for a total value of about $526 million. The transaction is scheduled to close in the second half of 2012.

■■■

Corn Products International, Inc. has a new name, as of June 2012: Ingredion Inc. The firm, based in Westchester, Illinois, USA, feels the new name better reflects its "global presence and focus on ingredient solutions."

■■■

In June 2012, the Ministry of Health of the People's Republic of China released a five-year plan aimed at upgrading its food safety regulations. China "will improve national food safety standards by revamping outdated standards, reviewing and abolishing any contradicting or overlapping standards, and working out new regulations," the government said in a news release. The ministry will set priorities for safety standards for dairy products, infant food, meat, alcohol, vegetable oil, seasoning, health products, and food additives, according to the plan. Implementation is expected by 2015. (See tinyurl.com/ChinaSafety.)

■■■

Germany's BASF has purchased Equateq Ltd., which manufactures highly concentrated omega-3 fatty acids. Equateq will be integrated into the Pharma Ingredients & Services unit, which is part of BASF's Nutrition & Health division. The integration is expected to be completed by the end of 2012. The companies have agreed not to disclose financial details of the transaction.

■■■

DuPont announced in mid-May 2012 that it has acquired full ownership of the Solae, LLC joint venture from Bunge Ltd. DuPont previously owned 72% of the joint venture; Bunge owned the remaining 28%. Solae, which is based on St. Louis, Missouri, USA, manufactures soy-based ingredients.■

News & Noteworthy

How does your sensory panel compare?

What do the words musty, fusty, winey, metallic, rancid, fruity, bitter, and pungent have in common?

They are all either standard sensory defects (fusty, musty, winey, metallic, and rancid) or positive attributes (fruity, bitter, and pungent) of true extra virgin olive oils (EVOO). As such, they are found on the standard profile sheet used by olive oil-tasting (sensory) panels recognized by the International Olive Council (IOC; Madrid) as proficient to certify EVOO quality. The use of tasting panels is mandated by the IOC olive oil standards because they help determine an olive oil's grade as extra virgin, virgin, or lampante.

"It is interesting to note that even with sophisticated laboratory analysis, the most sensitive sensory tool available is the human taster," writes Paul Vossen of the University of California (Davis, USA; see http://tinyurl.com/Vossen-sensory).

The IOC sensory panel recognition program involves two collaborative tests, each of which involves analysis of five samples. IOC also requires, according to its website, that "sensory labs must be accredited by a national accreditation body, which has to submit the application for recognition on behalf of the lab" (see http://tinyurl.com/sensory-IOC).

Olive oil sensory tasting panels around the world that cannot comply with the IOC requirement for their national government's endorsement have a new way to gauge their proficiency: the AOCS Olive Oil Sensory Panel Proficiency Testing Series. This new AOCS Laboratory Proficiency Program series was announced in July 2012 and was developed based on input from the AOCS Olive Oil Expert Panel.

"AOCS does not intend to draw away participants from the established IOC sensory proficiency program by creating a competing program," said AOCS Technical Director Richard Cantrill. "But because olive oil quality is an issue that is important to our membership, we were asked by industry to develop a panel-testing series. We anticipate that some panels will join both the IOC and AOCS schemes, thus providing a bridge between the two programs."

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Identification as an AOCS-Recognized Olive Oil Sensory Panel will give the top-performing sensory panels an opportunity to demonstrate to olive oil producers, retailers, and importers that they are accurately assessing olive oil quality.

The importance of olive oil quality standards was highlighted by the North American Olive Oil Association (NAOOA) in a news release dated July 17, 2012. It announced that NAOOA had submitted an updated petition to the US Food and Drug Administration (FDA) calling for a detailed standard of identity for olive oil and olive-pomace oil products. NAOOA is a trade association and is based in Neptune, New Jersey, USA.

"The US olive oil industry has made significant progress related to standards in recent years," said Eryn Balch, NAOOA executive vice president. "This progress sets a solid foundation for application at a nationally mandated level which would provide a smooth route for enforcement." Connecticut was the first state to adopt a detailed standard of identity for olive oil and olive-pomace oil in 2008, Balch noted in the statement, followed soon after by California. The next year, similar standards were adopted in New York and Oregon. Most recently, the US Department of Agriculture updated its voluntary standard in 2010.

A key feature of all of these standards is the requirement for sensory evaluation, thus increasing the need for proficient sensory panels. The new AOCS sensory proficiency series will consist of two rounds of testing in the first year, with participation dates of October 2012 and January 2013. Each testing round will consist of four samples of 500 milliliters each. Panels will be tested and scored according to IOC guidelines COI/T20/Doc. No 15/Rev. 4 (November 2011). Qualifying panels will be promoted as being AOCS-Recognized Olive Oil Panels.

"In introducing the AOCS program, AOCS recognizes the great value of the work done by IOC in establishing criteria for olive oil sensory analysis, and so we will require that panels use the relevant IOC standards," added Cantrill. "Calculation of proficiency will also be according to the relevant IOC standards, thus ensuring comparability and transparency."

Enrollment for the October 2012 round of the new program closed on August 20, 2012. To register for the January 2013 round, visit www.aocs.org/sensory or email dawns@aocs.org.

"AOCS wishes to act collaboratively with IOC and other proficiency testing entities in providing additional service to help train chemists in both the sensory and chemical analysis of different grades of olive oil," said Cantrill. "As always, our aim is to improve the level of competence and expertise to the benefit of the oils and fats industry worldwide."

JECFA acts on mineral oil

The Joint FAO/WHO Expert Committee on Food Additives (JECFA) of the Codex Alimentarius Commission (CAC) recently acted on mineral oil hydrocarbons (MOH). The JECFA action followed a June 2012 opinion by the European Food Safety Authority (EFSA) on mineral oil hydrocarbons in food (see *inform* 23:417, 2012).

At its meeting in June 2012, JECFA withdrew the temporary acceptable daily intake (ADI) consumption levels for medium- and low-viscosity mineral oil, classes II and III.

"It is important to recognize that the EFSA and JECFA evaluations addressed very different questions," a spokeswoman for UK's Food Standards Agency (FSA), who asked to remain anonymous, noted.

EFSA, she stressed, considered all sources of mineral oils in food. The agency review assessed dietary exposure based on data on levels of MOH detected in various foods, which do not distinguish whether the source is natural or from contamination, migration from food contact materials, or from food additives.

JECFA, on the other hand, was asked to evaluate a specific type of food grade MOH referred to as "mineral oil (medium- and low-viscosity) classes II and III." The temporary ADI for this class of MOH was withdrawn because industry had not provided data that allowed a full ADI to be set. "It will be for industry to decide if they wish to provide additional data in the future with a view to allowing JECFA to set a full ADI," said the FSA source. "It is not for JECFA to seek such information."

Mineral oils (medium- and low-viscosity) classes II and III are not currently listed in the Codex General Standard for Food Additives (GSFA), so the withdrawal of the temporary ADI has no implications for that. "However, it is possible this class of mineral oils is being used as processing aids in some countries," the FSA source continued, adding that the use of processing aids is not harmonized at the international level.

The decision by JECFA to withdraw the temporary ADI could lead national authorities to reconsider the acceptability of the use of these MOH as processing aids, the source noted. "For example, within the United Kingdom, we currently have national regulations controlling the use of mineral hydrocarbons in food, which we are due to review anyway: as part of that review we will include consideration of the JECFA decision."

There is no regulatory impact for other classes of MOH that currently have established ADI and are permitted for addition to food, she added. These include:

- Mineral oils (medium- and low-viscosity) class I,
- Mineral oil (high-viscosity), and
- Microcrystalline wax

Similarly, the JECFA conclusion does not have any implication for MOH in food packaging material, the source said. For a full chemical definition of medium- and low-viscosity MOH, see http://tinyurl.com/MOH-definition.

USDA study on *trans* fats

A study on *trans* fats in the US food supply chain is available at www.ers.usda.gov/publications/eib95. The study was published by the US Department of Agriculture's Economic Research Service (ERS).

The study found that most new food products contain no *trans* fats or contain less than 0.5 grams per serving and so do not contain enough to require reporting *trans* fats on the Nutrition Facts panel. Further, trends over recent years show that *trans*-fat content in food products has been falling.

The review of the Mintel Global New Products Database also found that:

- New food products displaying package claims about the absence of *trans* fats began appearing in substantial numbers in 2004 and increased every year through 2009. (Products were required to include *trans* fat content on the Nutrition Facts label beginning on January 1, 2006.)
- The two categories of foods where front-of-package statements appear most frequently are foods that had substantial *trans* fats in the past (bakery products, prepared meals, and

desserts) and in foods that are nearly free of *trans* fats (baby foods and cereals).

- Most new foods that contain no *trans* fats do not make package claims about the absence of *trans* fats.

The study also looked at the success rates of new products; products were deemed successful if they were available in at least 1% of the stores in the ERS sample. "Success rates for new products that contain *trans* fats have been about the same as for products that do not contain *trans* fats," an ERS statement noted. However, success rates for products that are free of *trans* fats and that also carry the "no *trans* fats" front-of-package statement have been higher than for *trans* fats-free products that lack the "no *trans* fats" statement.

New products without *trans* fats, including those that have front-of-package statements and those that do not have them, are likely to be lower in calories, sodium, and saturated fats than those containing *trans* fats. This suggests that food companies, when reformulating products to avoid *trans* fats, are generally substituting more healthful ingredients for them, ERS said.

2012 Green Chemistry Challenge Awards

The US Environmental Protection Agency (EPA) has recognized innovative chemical technologies and leading researchers and industrial innovators who create safer and more sustainable chemical designs, processes, and products that reduce the need to use chemicals that pollute the environment and threaten Americans' health.

The winners of the 17th Annual Green Chemistry Challenge Awards are a diverse group of scientists, who were honored in June 2012 at a ceremony in Washington, DC, USA.

The Presidential Green Chemistry Challenge Awards include five categories: Academic, Small Business, Greener Synthetic Pathways, Greener Reaction Conditions, and Designing Greener Chemicals.

In the small-business category, Elevance Renewable Sciences Inc. of Woodridge, Illinois, was recognized for the production of high-performance, green specialty chemicals at advantageous prices. These green chemicals are produced with less energy, significant reductions in greenhouse gas emissions compared with petrochemical technologies, and are used in a range of consumer and industrial products and processes, EPA said. ■

Sustainability watch

A new peer-reviewed journal with a focus on advancing research that aims to minimize environmental harm and achieve sustainable processes, *ACS Sustainable Chemistry & Engineering,* will publish its first issue in January 2013. The journal will be available only online and will be led by Editor-in-Chief David T. Allen of the University of Texas at Austin (USA). Allen is the Gertz Regents professor and chair of Chemical Engineering and the director of the Center for Energy and Environmental Resources of the Cockrell School of Engineering.

■■■

Almost 300,000 metric tons (MT) of Round Table for Responsible Soy (RTRS)-certified soybeans have been sold since June 2011 and demand is rising from across the world, according to the group, which met in London in May 2012. The first 85,000 MT of certified soybeans were sold in 2011, and key users of certified soybeans include Unilever, FrieslandCampina, Arla, Marks & Spencer, and Waitrose, according to an RTRS statement.

■■■

BASF Canada Inc. has introduced a new method to measure agricultural sustainability in Canada. The company's new proprietary tool, AgBalance™, uses a set of 69 indicators to calculate the social, economic, and environmental impact of various farming practices. BASF will collaborate with a number of Canadian organizations to study the sustainability of Canadian canola. That study is expected to be complete in the second quarter of 2013. The research will compare today's more intensive canola production with the standard from 1995. Similar research has been conducted on soybeans and sugarcane in Brazil and is in the process of being conducted in the United States, France, and China. ■

The new Algal Biomass Organization (ABO) blog (www.algalbiomass.org/blog) offers perspectives and updates on algae industry news in markets that ABO expects to influence, including food, fuel, and chemicals. There is also information on events, policy developments, and research and development opportunities.

■■■

CompaniesAndMarkets.com, which prepares market research reports and company profiles, has indicated that Europe represents 70% of the global biodiesel market. It will remain the largest market until at least 2015. The United States market is growing at a rate of 12.8% (2010 figures) and is likely to increase its market share. By 2015, the global biodiesel market value is likely to reach $62 billion, which represents a growth rate of 26% per annum between 2005 and 2015. For more information see www.tinyurl.com/Companies-Markets-biodiesel.

■■■

The Renewable Fuels Association said on April 23, 2012, that the US ethanol industry had, after three years, satisfied all federal requirements for E15 (made from 15% ethanol and 85% petroleum-based fuel) commercial sales as set by the partial E15 waiver granted by the US Environmental Protection Agency. The waiver allows the use of E15 in light-duty vehicles manufactured in 2001–2006 and later. Ninety-nine ethanol producers have funded a nationwide fuel survey, as required by the partial waiver, which represents the final federal hurdle to E15 availability. The fuel survey is required annually and is designed to assist stakeholders with meeting their regulatory fuel compliance needs.

■■■

The Global Renewable Fuels Alliance (GRFA; Toronto, Canada) released data in May showing that the biofuels industry contributed $277.3 billion to the global economy in 2010 (www.globalrfa.com/pr_050812.php). According to the GRFA, global biofuel production was 110 billion liters in 2010 and

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Biofuels News

Mislabeled biodiesel in Europe

The annual report for 2011 of the European Anti-Fraud Office (a part of the European Commission) appeared on July 3, 2012 (http://ec.europa.eu/anti_fraud/). The OLAF Report, as it is called, found that significant consignments of biodiesel of US origin had been shipped "from the USA to a company in India." The start date for these shipments coincides with the entry into force in 2009 of European Union (EU) anti-dumping duties for biodiesel of US origin.

The OLAF report also says the same Indian company had exported similar quantities of biodiesel to the EU, which were declared on importation as being of Indian origin. Therefore, no import duties were charged. It was suspected the biodiesel exported by the Indian company was of US origin.

OLAF started an investigation of the charges in December 2011 and found substantial evidence of fraud from national authorities and economic operators, other than the suspect company, such as storage and inspection companies. OLAF established that the company in India had imported biodiesel from the United States, stored it temporarily in a warehouse, and then re-exported it to the EU.

The Indian company, which also produces biodiesel, had added minor quantities of its biodiesel to the biodiesel of US origin and then misled Indian authorities about the origin and the composition of the product. The company was then able to obtain fraudulent certificates of preferential Indian origin, which are not subject to the payment of any import duties on importation into the EU.

In another case, the Indian company transported US biodiesel to its factory and alleged that it reprocessed it to improve its properties to meet EU standards. However, OLAF said, the biodiesel exported from the United States to India had already met those standards. Because the process allegedly carried out by the Indian company did not actually result in a new product, it still retained its nonpreferential US origin.

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supported nearly 1.4 million jobs in all sectors of the global economy. The amount of ethanol produced globally has doubled since 2005 and increased threefold in the last decade. By 2020 the global biofuel industry is forecasted to grow to produce over 196 billion liters.

■■■

Gemma Reguera, a microbiologist with Michigan State University, and her student, Allison Speer, have developed microbial electrolysis cells (MEC) that use bacteria to break down and ferment agricultural waste into ethanol (*Environ. Sci. Technol. 46*:7875–7881, 2012). A second bacterium, added to the mix, removes all the waste fermentation by-products or nonethanol materials while generating electricity. Despite the energy invested in chemically pretreating corn stover before initiating the fermentation, energy recovered from the fermentation process averaged 35–40%. Previously investigated processes using MEC have achieved about 3.5% recovered energy.

Work is now proceeding to scale up MEC so that they can be used on a commercial basis.

■■■

On July 16, 2012, Cuba's first production factory for biofuel began operations in the eastern province of Guantánamo (http://tinyurl.com/AFP-Cuba). The facility has been funded by the Cuban government and the Swiss Agency for Development and Cooperation. According to Jose Sotolongo, director of the Center for Applied Technology for Sustainable Development in Guantánamo, the factory will produce more than 100 metric tons of biofuel a year from jatropha seeds. One hundred thirty hectares of jatropha have been planted to provide feedstock. ■

ANCIENT CHOCOLATE MOLE?

Mass spectrometry analysis of 2,500-year-old broken plates found in Yucatan, Mexico, have provided the first evidence that the Maya ate cacao with food. It was previously believed that these early chocoholics did not eat cacao but only drank it in a fermented version of hot chocolate. http://www.latimes.com/news/science/sciencenow/la-sci-sn-maya-chocolate-20120803,0,5012936.story?track=rss

OLAF provided evidence to Belgium and Spain, which imported the mislabeled fuel. This will allow those countries to recover import duties of more than €32 million.

Jatropha on hold in India

As head of the Ministry of Rural Development, Jairam Ramesh, minister of rural development for the Government of India, has put on hold the jatropha plantation program for biofuel developed by the Planning Commission.

The Ministry's decision not to proceed is based on a 2010 government-sponsored study by The Energy Research Institute (TERI; New Delhi), which found planting of jatropha was not financially viable and also posed a threat to food security. Subject to favorable reports based on jatropha plantations already extant in the country, the Ministry had planned to undertake 300,000 hectares of jatropha on degraded forest land. However, the TERI report found that the energy harvested from jatropha grown on wastelands or unirrigated lands did not exceed that which had gone into planting and harvesting the crop.

The negative recommendation rendered by the TERI report has cast doubts on the proposed National Mission on Bio-fuels, which is aimed at promoting the crop as an alternative to fossil fuels. The Rural Development Ministry decided to declare a moratorium on proceeding and referred it to the Cabinet for further decision. Thus, provision for the demonstration phase of the project was eliminated from the 2012–2013 budget, according to the New Delhi *Daily Pioneer* newspaper (www.tinyurl.com/jatropha-India).

Effects of ethanol incorporation on US gasoline prices

The Center for Agricultural and Rural Development at Iowa State University (ISU; Ames, USA) released an update in May of an ongoing study of the impact of ethanol production on US and regional gasoline markets. The work is being carried out by Xiaodong Du and Dermot J. Hayes, the former with the University of Wisconsin-Madison and the latter with ISU.

Results from the period January 2000 to December 2011 showed that the growth in ethanol production and blending with gasoline to create E10 (10% ethanol plus 90% gasoline) reduced wholesale gasoline prices by $0.29 per gallon on average across all regions, or a 17% reduction over what gasoline prices would have been without blended ethanol. The Midwest region experienced the largest decrease—$0.45/gallon—while the West Coast, East Coast, and Gulf Coast regions experienced lower prices of similar magnitudes, about $0.20/gallon.

Based on 2011 data only, the marginal impacts on gasoline prices were much higher, given the increasing ethanol production and higher crude oil prices. The average cost reduction across all regions increased to $1.09/gallon, and the regional impact ranged from $0.73/gallon in the Gulf Coast to $1.69/gallon in the Midwest.

Discussing the 2011 results, Du and Hayes wrote: "The surge in ethanol production in recent years has essentially added 10% to the volume of fuel available for gasoline-powered cars and in so doing it has allowed the United States to switch from being a major importer of finished gasoline to a major exporter of both gasoline and ethanol. Countries that switch trade patterns in this way will see dramatic price impacts because internal prices switch from world prices *plus* transportation costs to world prices *minus* transportation costs."

The report is available at www.tinyurl.com/CARD-EtOH-pdf.

Cattle munch on algae biofuel by-product

Tryon Wickersham, an animal nutrition scientist with AgriLife Research, part of the Texas A&M University System, and his graduate student Merritt Drewery are nearly done with their tests of a new cattle feed. Supported by the US Department of Energy, they have been feeding co-products from the production of biofuel from marine algae, along with both medium- and low-quality forages, to Angus steers and evaluating outcomes.

The co-product from the algae is a powder and represents what remains once the oil has been removed from the algal cells.

The researchers reported the animals used in the study were not picky eaters—

they widely accepted the algal residue in its processed form (http://tinyurl.com/cattle-algae).

The first experiment tested palatability. According to Drewery, "We offered 12 different supplements with different levels of algae inclusion." The time it took for the animals to finish eating the entire allotted supplement was then recorded. The algae co-product, which is 20% crude protein, was blended in various percentages with dried distiller's grains at 31% crude protein or with cottonseed meal at 52% crude protein. The cattle slowed their consumption when algae co-product was blended at 60% or higher.

In the second experiment, Angus steers had free choice of low-quality hay with 4% crude protein, and supplements were administered rumenally. Forage intake and utilization were similar for algae and for cottonseed meal. In the third experiment, cattle were offered the algae supplement as food that was available for the whole day. In the latter case, steers would eat half the supplement within 10 minutes and then finish the rest sometime during the afternoon. In this experiment, Drewery commented, "They would also eat hay and drink a lot of water." Water consumption may have been related to the salt content of the algae.

One of the questions that this study has not address is the price that the beef cattle industry would be willing to pay for algae co-product compared to distiller's grains and cottonseed meal.

UMass Amherst seeks to increase oil in *Camelina*

An interdisciplinary research team at the University of Massachusetts-Amherst (USA) recently started a $2 million project to increase the oil content in seeds from *Camelina*, a nonfood oilseed crop related to canola. Biochemist Danny Schnell said the goal of the project is "to double the current maximum seed and fuel yield from *Camelina* while requiring less than 1 million acres (400,000 hectares) to achieve the 100 million gallons (380 million liters) per year target for commercial viability" (http://tinyurl.com/camelina-UMass).

Schnell and colleagues plan to genetically engineer *Camelina* chloroplasts, where photosynthesis takes place, to increase carbon photosynthesis capture and fixation rates. They also intend to engineer the plant to produce less sugar and more seed oil and terpenes, the building blocks of liquid fuels. The scientists hope to increase the ratio of oil in the seeds from the present 40% to as much as 80%, or increase the number of seeds produced, or both.

The research team plans to introduce systems from cyanobacteria and algae that move CO_2 directly to ribulose-1,5-bisphosphate carboxylase/oxygenase (RuBisCo) into *Camelina* to increase carbon fixation and generate more biomass.

According to the information released by UMass Amherst, altering genes in *Camelina*'s chloroplasts rather than in the nucleus avoids passing genetic modifications to the next plant generation. Schnell says, "Changes are not passed down through pollen to new plants, which eliminates the risk for genetic drift."

He added, "Unlike other genetic modifications that alter the plant's genome, our method will just enhance what the plant already does."

US biodiesel production statistics

US production of biodiesel in April 2012 was 92 million gallons (350 million liters). Biodiesel production from the Midwest region was 67% of the US total. Production came from 105 biodiesel plants with operable capacity of 7.9 billion liters per year. Biodiesel production during January–April 2012 was 1.3 billion liters, compared with 780 million liters during January–April 2011.

Producer sales of biodiesel during April 2012 included 260 million liters sold as B100 (100% biodiesel) and an additional 120 million liters of B100 sold in biodiesel blends with diesel fuel derived from petroleum.

Soybean oil was the largest biodiesel feedstock during April 2012 with 158 million kilograms consumed. The next three largest biodiesel feedstocks during the period were canola oil (51 million kilograms), yellow grease (28 million kilograms), and corn oil (20 million kilograms).

Total US biodiesel production was 1.950 billion liters in 2009, 1.30 billion liters in 2010, and 3.66 billion liters in 2011.

The US Energy Information Administration released these data on June 28, 2012 (http://tinyurl.com/EIAbiodiesel-prodn). ■

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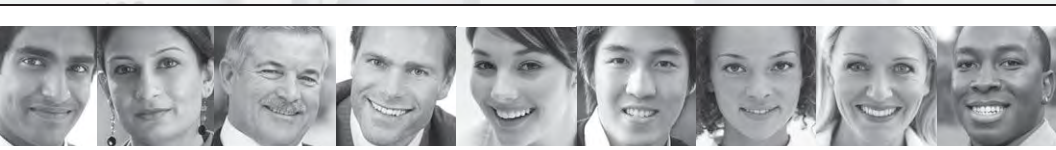


All members contribute to the success of the Society while furthering their professional goals.

Health & Nutrition News

Here is an interesting twist on the so-called French paradox, or the observation that the French have a low incidence of heart disease despite a high intake of saturated fatty acids. Apparently, a lack of knowledge about current thinking on the relative health merits of dietary fats does not lead to a greater incidence of obesity. A quiz on nutritional recommendation regarding dietary fats was left unanswered by 43% of participants in France, compared to 4% of those taking the quiz in the United States. Nonetheless, the French are much less likely to be obese (12% obesity in France vs. 35% in the United States), according to researchers at the University of Laval in Canada. Their study appeared in the *British Food Journal* (doi:10.1108/00070701211197392, 2012).

■■■

A gene in fat cells may help protect against type-2 diabetes, say researchers from the Harvard Medical School (Cambridge, Massachusetts, USA), publishing in *Nature* (doi:10.1038/nature10986, 2012). Their study showed how the gene ChREBP converts glucose into fatty acids and increases sensitivity to insulin. The findings supports previous research, based on 123 fat samples from nondiabetic people, that showed the gene was more active in those better able to metabolize sugar.

■■■

A meta-analysis shows "insufficient evidence of a secondary preventive effect of omega-3 fatty acid supplements against overall cardiovascular events among patients with a history of cardiovascular disease," the authors from the Korean Meta-analysis Study Group write in the *Archives of Internal Medicine* (doi:10.1001/archinternmed.2012.262, 2012). A statement by GOED countered that "the totality of the publicly available scientific evidence demonstrates a cardiovascular benefit of EPA [eicosapentaenoic acid] and DHA [docosahexaenoic acid] in healthy populations, as well as in the majority of populations with pre-existing cardiovascular ailments." GOED—the Global Organization for EPA and DHA—is a trade group based in Salt Lake City, Utah, USA. ■

Why omega-3 fats help at the cellular level

New findings in mice may help explain the mechanisms behind the presumed health benefits of dietary long-chain polyunsaturated omega-3 fatty acids (LC-PUFA). The findings may also suggest ways to manipulate these processes to short-circuit inflammation before it begins, or at least help to resolve inflammation before it becomes detrimental, the researchers say.

Knowledge of the therapeutic benefits of LC-PUFA dates back at least to the 1950s, when cod liver oil was found to be effective in treating ailments such as eczema and arthritis. In the 1980s, research reported that Eskimos eating a fish-rich diet enjoyed better coronary health than counterparts consuming mainland foods did.

"There have been tons of epidemiological studies linking health benefits to omega-3 oils, but not a lot of deep science," said Edward A. Dennis, distinguished professor of pharmacology, chemistry, and biochemistry at the University of California, San Diego (USA). "This is the first comprehensive study of what fish oils actually do inside a cell."

The scientists fed mouse macrophages three different kinds of LC-PUFA: eicosapentaenoic acid (EPA), docosahexaenoic acid (DHA), and arachidonic acid (AA). Cells typically incorporate fatty acids as phospholipids in their membranes. When cells are stimulated, however, the fatty acids may be released, provoking a cascade of inflammatory response. Acute or limited inflammation is, of course, a vital immunological response to physical damage or invasive pathogens. But chronic inflammation is harmful and a common element of almost every disease, from diabetes to cancer.

After supplementing the mouse macrophages with fatty acids, the scientists stimulated them to produce an inflammatory response. They discovered that LC-PUFA inhibited cyclooxygenase (COX), which produces the prostaglandin hormones that spark inflammation. The action is similar to what happens when one takes an aspirin, which disrupts the COX-2 signaling pathway, thus reducing inflammation and pain.

On the other hand, Dennis and coauthor Paul C. Norris, a graduate student, discovered that EPA and DHA do not inhibit lipoxygenases (LOX), which are also

CONTINUED ON NEXT PAGE

produced by stimulated macrophages. One type of LOX enzyme produces the fat-signaling molecules known as leukotrienes, which are pro-inflammatory. But Norris noted that LOX enzymes may also generate anti-inflammatory compounds called resolvins from EPA and DHA.

These observations, he said, are also helpful in identifying potential adverse effects from taking fish oil. Since LC-PUFA possess overlapping functions with COX-inhibitor drugs—which have well-known side effects—using both in combination can produce unexpected consequences.

It is this parsing of what is happening inside cells that Dennis called "ground-breaking."

"We've been able to look inside a cell, see what fish oils do, and determine that the process of inflammation at this level may be manipulatable," he said. "Now, we need to learn if we can fine-tune that process so we can use omega-3 oils to reduce the production of pro-inflammatory prostaglandins and boost the production of anti-inflammatory resolvins."

Funding for this research came, in part, from the LIPID MAPS Large Scale Collaborative Grant and from the National Institutes of Health. The work appeared in the *Proceedings of the National Academy of Sciences* (doi:10.1073/pnas.1200189109, 2012).

Our brains on food

Neuroscientists say they have for the first time found that how the human brain responds to food differs across a spectrum of eating behaviors—from extreme overeating to food deprivation.

"This body of work not only increases our understanding of the relationship between food and brain function but can also inform weight-loss programs," says Laura Martin of the Hoglund Brain Imaging Center at the University of Kansas Medical Center (USA), one of several researchers whose work was presented in April 2012 at a meeting of cognitive neuroscientists in Chicago, Illinois, USA.

"One of the most intriguing aspects of these studies of the brain on food," Martin says, is that they show "consistent activations of reward areas of the brain that are also implicated in studies of addiction." That observation is not new (see *inform 16*:129–131, 2005). However, how those reward areas respond to food differs among people depending on their eating behaviors, according to a new brain imaging study by Laura Holsen of Harvard Medical School and Brigham and Women's Hospital (both in Cambridge, Massachusetts, USA) and colleagues.

Holsen's team conducted functional MRI (fMRI) brain scans of individuals with one of three eating conditions—anorexia nervosa, simple obesity, and Prader-Willi syndrome (extreme obesity)—as well as healthy control subjects. When hungry, those with anorexia, who severely restrict their food intake, showed substantially decreased responses to various pictures of food in regions of their brains associated with reward and pleasure. Responses in those same brain regions in those who chronically overeat increased significantly.

"Our findings provide evidence of an overall continuum relating food-intake behavior and weight outcomes to food reward circuitry activity," Holsen says. Her work also has implications, she says, for everyday eating decisions in healthy individuals. "Even in individuals who do not have eating disorders, there are areas of the brain that assist in evaluating the reward value of different foods, which in turn plays a role in the decisions we make about which foods to eat."

Kyle Simmons of the Laureate Institute for Brain Research in Tulsa, Oklahoma, USA, studies the neural mechanisms that govern such everyday eating decisions. His work with fMRI scans has found that as soon as people see food, their brains automatically gather information about how they think it will taste and how that will make them feel. The brain scans show an apparent overlap in the region of the insula that responds to seeing food pictures and the region of the insula that processes taste, the "primary gustatory cortex."

Simmons is currently expanding this work to better understand the differences in taste preferences between lean, healthy individuals and obese ones. "We simply don't know yet if differences exist between lean and obese participants," he says. "And knowing which brain regions underlie inferences about food taste and reward is critical if we are going to develop efficacious interventions for obesity and certain eating disorders, both of which are associated with enormous personal and public health costs."

To view the abstracts from the meeting, visit tinyurl.com/Brain-on-Food.

Natural vs. industrial *trans* fats

Are natural ruminant *trans* fats, unlike industrial *trans* fats, beneficial (or at least not harmful)? That was the question behind a symposium on the health implications of natural *trans* fats at the 10th Congress of the International Society for the Study of Fatty Acids & Lipids (ISSFAL), May 26–30, 2012, in Vancouver, British Columbia, Canada.

Jean-Michel Chardigny of France's National Institute for Agricultural Research presented a meta-analysis of 13 human intervention studies at the meeting. These studies examined the effect of natural *trans* fats on cardiovascular health risk factors. Although a great deal of research suggests the negative effects of industrial *trans* fats, there is no association between natural *trans* fats intake and cholesterol-dependent cardiovascular risk factors, Chardigny said.

This conclusion was bolstered by a review of observational epidemiologic studies presented by Uhre Jakobsen of Aarhus University, Denmark.

"The findings indicate that intake of natural *trans* fats is not associated with coronary heart disease within the range of intake in the general population," she noted.

"We are learning there is a very important public health message to convey about ruminant natural *trans* fats and how these are different from the industrial *trans* fats that have been targeted as harmful to health," said Spencer Proctor, director of the University of Alberta's Metabolic and Cardiovascular Diseases Laboratory, who chaired the ISSFAL session.

"The research indicates that consuming these natural *trans* fats as part of a balanced diet is not a health concern. On the contrary, there is increasing evidence these are 'good fats' and could be fundamentally health-enhancing. They should not be an unintended target of the bid to rid the diet of *trans* fats."

Cell protein interactions favor fats

What role do lipids play in regulating cellular protein interactions?

Proteins perform their work by forming complex and tightly regulated interaction networks. Until recently, most scientists thought cellular protein interactions were very tight and specific. But research now indicates that is not the case.

University of Illinois at Chicago (USA) chemistry professor Wonhwa Cho has studied cell membranes for more than two decades and has long hypothesized that membrane lipids play a critical role in regulating cellular protein interactions. To convince skeptics, he and his team conducted a genomic-scale investigation into if, and how, lipids play this role.

"Cellular protein interactions are mediated by so-called protein interaction domains, or PID. These are small molecular structural units within large proteins that specialize in recognizing interaction partners," he said.

"We decided to characterize PID in the whole genome and determine how many are regulated, by which membrane lipids, and how it is done."

For their pilot study, they selected the PDZ domain, one of the most abundant in human cells and a target for drug development. (The PDZ domain is a common structural domain of 80–90 amino-acids found in the signaling proteins of bacteria, yeast, plants, viruses, and animals, including mammals.) Developing therapies based on protein interactions is a major field of biomedical research, but a better understanding of protein interaction networks is needed.

Cho said the group found that "an unexpectedly large number" of PDZ domains—more than 30%—interact with various membrane lipids, and that lipids control their cellular location and interaction with other protein partners.

Cho and his group have since used their PDZ approach to study the other major protein interaction domains. He said they have collected substantial data and will soon report findings showing that lipids control cellular location and function in the other domains as well.

Cho said his next major step is to develop a novel class of small molecules that specifically modulate lipid binding activity of protein interaction domains to control diverse, dysfunctional cellular signaling pathways that contribute to cancer, diabetes and other inflammatory and metabolic diseases.

The work appeared in *Molecular Cell* (*46*:226–237, 2012).

Coordinating the circadian clock

The 24-hour internal clock controls many aspects of human behavior and physiology, including sleep, blood pressure, and fat metabolism. Disruption in circadian rhythms leads to increased incidence of many diseases, including metabolic disease and cancer. Each cell of the body has its own internal timing mechanism, which is controlled by proteins.

One of these proteins, called Rev-erbα, was thought to have a subordinate role because the clock runs fairly normally in its absence. New work led by Mitchell Lazar, director of the Institute for Diabetes, Obesity, and Metabolism at the Perelman School of Medicine, University of Pennsylvania (Philadelphia, USA), found that a closely related protein known as Rev-erbβ serves as a back-up for Rev-erbα. When both are not functioning, the cellular clock loses its time-keeping function.

In addition, Rev-erα and Rev-erbβ work together to control fat metabolism, and in their absence, the liver fills with fat. These findings establish Rev-erbα and -erbβ as major regulators of both clock function and metabolism.

Lazar, postdoctoral fellow Anne Bugge, and their team knocked out Rev-erbα in mice and did not see a large effect on the liver. When they knocked out both Rev-erbα and Rev-erbβ, however, they saw a loss of the rhythmic cycling of the clock protein Bmal 1's messenger RNA. They concluded that the Rev-erb system is an integral and not ancillary part of the human clock.

Prior to this paper, the Lazar team discovered molecules that act as "shift workers" to maintain the daily rhythm of fat metabolism. When those molecules do not do their jobs, the liver also fills with fat.

In normal mice, the team of molecules migrates to the genome of liver cells during the daytime. Rev-erbα and -β deliver the molecular workers to thousands of specific locations in the liver genome, many of which are near genes involved in the production of fat. Another team member, histone deacetylase 3 (HDAC3), does construction work on the protein scaffold (the epigenome) surrounding the genome to dampen the activity of the fat-related genes.

During the night, the day-shift molecules depart the liver genome, and fat production increases owing to other regulatory molecules. The fat production is kept in check when the Rev-erb construction team returns to the genome the next day. However, if HDAC3 is absent, the cycles do not occur, and the liver fills with fat.

The absence of both Rev-erα and Rev-erbβ prevents HDAC3 from doing its job, since the two proteins serve as the shuttle delivering HDAC3 to target genes. Sure enough, fat accumulates in the liver to a much great extent when both Rev-erα and Rev-erbβ are missing compared with when one is still available.

"This work shows that if we want to manipulate the human clock we would likely need to affect both Rev-erbα and Rev-erbβ," explains Lazar. "Circadian rhythm of metabolism is important because disruption of this rhythm leads to a fatty liver. This may explain, in part, why altered circadian rhythms in people who do shift work are associated with metabolic disorders."

The study appeared in *Genes and Development* (*26*:657–667, 2012). ■

Biotechnology News

Briefs

A report out of Elgin, Texas, USA, that linked the deaths in early June 2012 of 15 out of a herd of 18 cattle to eating what was described as "Tifton 85 grass, a genetically modified product," was widely splashed across the Internet. The report, originating with CBS News, was updated two days later. According to the Texas A&M AgriLife Extension service, Tifton 85 is a hybrid—not a genetically modified product—between an African Bermuda grass and Tifton 68, a different hybrid out of Tifton, Georgia, USA. The deaths were attributed to the production by the grass of hydrogen cyanide (HCN), which poisoned the animals. They had just been turned out onto a previously ungrazed pasture of Bermuda grass, which is known to be high in HCN. The toxin may be concentrated in the grass during times of drought. Texas is still contending with a drought of several years' duration.

■■■

The National Agriculture Research Organisation (NARO) in Entebbe, Uganda, said in April 2012 that it expects to market its first genetically modified (GM) crop in 2014, when a regulatory framework to guide production comes into effect. According to the East African news service, a senior research officer at NARO said ongoing trials on bananas, cassava, maize, cotton, and potatoes are promising and, once licensed, GM crops have the potential to increase the country's food security and widen the export base (www.tinyurl.com/GMOinUganda).

■■■

The US Department of Animal and Plant Health Inspection Service (APHIS) announced on July 19, 2012, its determination of nonregulated status for a variety of sugar beet genetically engineered to be resistant to the herbicide glyphosate, or Roundup. APHIS found that, from the standpoint of plant pest risk, RoundupReady sugar beets are as safe as traditionally bred sugar beets (www.aphis.usda.gov/biotechnology/news.shtml). ■

GM cotton doing well in India

During 2002–2008, data on the cotton-planting practices of 533 farm households in central and southern India were collected and analyzed. Researchers wanted to identify the economic impacts and impact dynamics of planting *Bt* cotton (cotton containing genetic materials from *Bacillus thuringiensis*, which renders the cotton resistant to the cotton bollworm caterpillar).

Compared with plots planted with conventional cotton, plots planted with *Bt* cotton exhibited a 24% increase in yield per acre through reduced pest damage. By carrying the analysis further, the researchers showed this increase in yield corresponded to a 50% increase in profits (Kathage, J., and M. Qaim, *Proc. Nat. Acad. Sci.*, doi: 10.1073/pnas.1203647109, insert year?). Families that adopted *Bt* cotton spent 18% more money than conventional farming households, reflecting an increase in living standards.

Transgenics produce advantages for Brazilian farmers

The environmental consulting firm Céleres Ambiental (Uberlândia, Minas Gerais, Brazil) carried out its fifth study for the Brazilian Seed and Seedling Association (Associação Brasileira de Sementes e Mudas, or ABRASEM) on the impact of genetically modified (GM) seed on Brazilian farms in 2011. Celeres found that for every US dollar spent on GM seed, the farmer profited an additional $2.61 in increased corn production, $1.59 in soybean seed production, and $3.59 in cotton.

The study also assessed the benefits of biotechnology for the environment and the sustainability of Brazil's agribusiness. The report indicated the adoption of GM crops will lead to a decrease in the amount of water used because fewer applications of

CONTINUED ON PAGE 510

Mechanism for regulating plant oil production identified

Scientists at the US Department of Energy's Brookhaven National Laboratory (Upton, New York) have identifi d key elements in the biochemical mechanism plants use to limit the production of fatty acids. The results suggest ways scientists might target those biochemical pathways to increase the production of plant oils as a renewable resource for biofuels and industrial processes.

"Now that we understand how this system operates—how plants 'know' when they've made enough oil and how they slow down production—we can look for ways to break the feedback loop so they keep making more oil," said Brookhaven biochemist John Shanklin, leader of the group publishing the work in the *Proceedings of the National Academy of Sciences* the week of June 4, 2012 (Andre, C., R.P. Haslam, and J. Shanklin, Feedback regulation of plastidic acetyl-CoA carboxylase by 18:1-acyl carrier protein in *Brassica napus,* doi:10.1073/pnas.1204604109).

Similar biochemical feedback loops regulate a wide range of metabolic processes in living things. They work similarly to the way a thermostat maintains a relatively constant temperature in a home: When it gets too warm, the heating system turns off until the temperature falls to the set point, at which time it turns on again.

"There were hints that such a feedback system might exist for plant oil production," said Shanklin, who credits Carl Andre—a former postdoctoral research fellow now working at BASF Plant Science in North Carolina, USA—with designing and carrying out the intricate biochemical detective work that uncovered the details.

"It's very difficult to work on developing oilseeds because they are very tiny," Shanklin explained. So the scientists performed their biochemical tests using a plant embryo cell culture to simulate what goes on in the seeds.

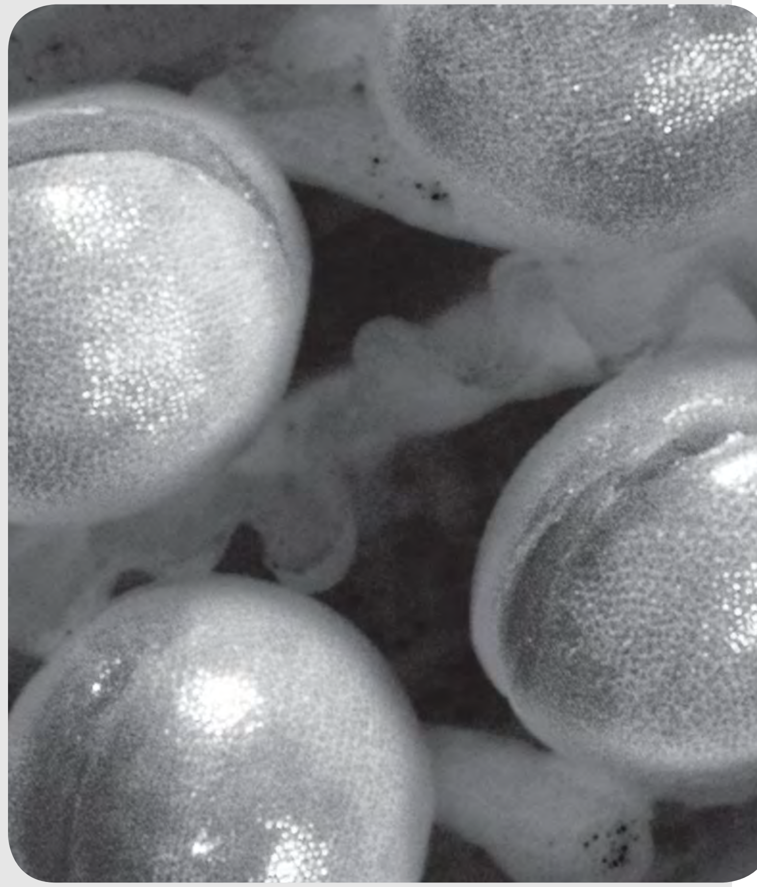
With assistance from the Radiotracer Chemistry and Biological Imaging group at Brookhaven (www.bnl.gov/medical/RCIBI), Andre synthesized radiocarbon-labeled forms of the fatty acids that occur as intermediates along the metabolic pathway that leads to oil production. He fed these, one at a time, to the plant cell cultures, measuring the labeled metabolites with the help of analytic chemist Richard Haslam of Rothamsted Research in the UK. They also looked to see which added intermediates would inhibit oil production.

Andre's work pointed to a fatty acid that occurs fairly late in the production process, coupled to a carrier protein (essential to making the oily substance soluble in water), as the key intermediate that puts the brakes on oil production. It is the first desaturated fatty acid—the first one with a double bond between two of the carbon atoms, formed after all 18 carbon atoms are added to the chain [i.e., oleic acid].

Then, knowing that this intermediate somehow sent the "slow-down" signal, the team sought to determine its target—how it actually inhibits oil synthesis. They knew from other biochemical feedback loops that the likely target would be an enzyme early in the synthesis pathway. But they wanted to figure out exactly which one.

To do this, they monitored the production process by labeling the intermediates one at a time with ^{14}C while also feeding the cells an excess of the "slow-down" signaling fatty acid. If the label from the intermediate ended up in the oil product, the slow-down signal had to have its effect prior to that step.

The first two experiments gave them the answer: When they labeled the first compound in the synthesis pathway, which is acetate, very little labeled carbon ended up in the oil and oil production was strongly reduced. But if they fed the second compound, labeled malonate, the labeled carbon quickly entered the oil.



Brassica napus *seeds—the oil accumulating tissue of canola. The authors characterized a rapid and reversible feedback inhibition of fatty acid biosynthesis that occurs when the end product inhibits the first committed step in the pathway.*

"From these findings we concluded that the accumulation of the first desaturated fatty acid in the synthesis process inhibits the enzyme that operates at the first step, which converts acetate to malonate," Shanklin said. "That enzyme is acetyl-CoA carboxylase, or ACCase."

The next step was to make extracts of the tissue culture and directly measure ACCase activity in the test tube. Addition of the suspected slow-down signal provided independent proof that both the signal and target of the signal were correctly identified.

To establish that this feedback mechanism operates in seeds and is not just a weird quirk of the cell-culture setup, the scientists isolated developing canola embryos to test the process. "It worked precisely the same way," Shanklin said.

With the details of the oil production feedback mechanism in hand, Shanklin's team is now exploring how they might interfere with the process, including biochemical schemes to keep the slow-down signaling metabolite from accumulating, ways to block its effects on ACCase, and more.

"If we can interrupt this process, we hope to fool the cells so they won't be able to gauge how much oil they have made and will make more," Shanklin said.

This article, by Karen McNulty Walsh, appears courtesy of Brookhaven National Laboratory. Walsh may be contacted at kmcnulty@bnl.gov.

agricultural chemicals are required, and because of varieties that are most resistant to pests. About 149 billion liters of water could be saved over a span of 10 years based on the current availability of biotechnologies in Brazilian agriculture, enough to supply 3.4 million people (http://tinyurl.com/Brazil-GMsoy).

DuPont and Monsanto in the courts

DuPont and Monsanto continue to battle in the courts over their respective shares of the market for genetically modified seeds. A trial began on July 9, 2012, in St. Louis, Missouri, USA, over control of a financially valuable seed technology. Monsanto contends that DuPont, through its Pioneer Hi-Bred International unit, has violated a 2002 licensing agreement giving DuPont the right to use Monsanto's glyphosate (Roundup)-tolerant RoundupReady™ soybean trait. DuPont's response is that Monsanto acted fraudulently in obtaining the patent. The trial, unresolved at press time, was expected to last about three weeks.

Also, the *St. Louis Post-Dispatch* newspaper reported that Monsanto sued Pioneer Hi-Bred for patent infringement on June 18, 2012, accusing the company of infringing on its "seed chipper" technology. The Monsanto technology allows researchers to derive genetic information from a seed without destroying it. Monsanto says that DuPont's seed chipper, called "Laser-Assisted Seed Selection," violates 12 patents that Monsanto holds on its technology. Monsanto is asking the court to force Pioneer not to use the technology and to prohibit selling any products developed through it.

US plantings of GE crops

Based on US Department of Agriculture (USDA) survey data, plantings of herbicide-tolerant (HT) soybeans went from 17% of US soybean acreage in 1997 to 68% in 2001 and 93% in 2012 (http://tinyurl.com/USDA-HTandBTplantings). Plantings of HT cotton expanded from about 10% of US acreage in 1997 to 56% in 2001 and 80% in 2012. The adoption of HT corn was 4% of US acreage in 1996, 9% in 2001, and 73% in 2012.

Insect-resistant crops containing the gene from the soil bacterium *Bt* (*Bacillus thuringiensis*) have been available for corn and cotton in the United States since 1996. These bacteria produce a protein that is toxic to specific insects, protecting the plant over its entire life. Plantings of *Bt* corn and cotton have varied somewhat over the last decade, and the Economic Research Service of the USDA predicts that use of *Bt* corn will likely continue to fluctuate over time, based on expected infestation levels of European corn borer and the corn rootworm, which are the main pests targeted by *Bt* corn.

Adoption of "stacked" varieties of cotton and corn, which have both HT and *Bt* traits, has accelerated in recent years. Stacked cotton reached 63% of cotton plantings in 2012. Plantings of stacked corn made up 52% of corn acres in 2012.

Adoption of all genetically engineered (GE) cotton, taking into account the acreage with either or both HT and *Bt* traits, reached 94% of cotton acreage in 2012, vs. 93% for soybeans (soybeans have

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Brazil's Ultrapar Holdings Inc. has made its way into the US chemicals market by purchasing a $15 million plant in Pasadena, Texas, through its subsidiary, Oxiteno (also based in Brazil). According to the *Houston Business Journal* newspaper, Ultrapar plans to invest another $15 million to retrofit the plant to produce specialty surfactants. Look for the plant to be operational by the beginning of 2013 and to have a production capacity of 32,000 metric tons of surfactants per year.

■■■

Scientists in the UK, Germany, and China had previously made a liquid surfactant that could be moved by a magnet (*inform 23*:237, 2012). The work meant that surfactants could be directed toward specific points or removed from a mixture just by applying a magnet. Now, the team has expanded the use of the surfactant by making magnetically responsive emulsions with magnetic surfactant stabilizers (*Soft Matter*:doi:10.1039/c2sm26077h, 2012). The authors say that a major advantage of these magnetic surfactants—compared to nanoparticle-stabilized magnetic emulsions—is their simple synthesis and purification, which offers new possibilities for molecular design of specialty surfactants. For example, replacing the surfactant alkyl tails with fluorocarbons could result in supercritical CO_2-compatible magnetic-responsive emulsions for oil- and gas-field flooding.

■■■

The US Environmental Protection Agency has issued registrations for two new products for use against bedbugs: TER-TRU1, containing 5.5% cold-pressed neem oil, is a ready-to-use formulation for spot treatment by residential and commercial users. TER-CX1, containing 22.0% cold-pressed neem oil, is a concentrated formulation for commercial use in the treatment of whole rooms. Cold-pressed neem oil is pressed directly from seeds of the neem tree (*Azadirachta indica*), a tropical evergreen tree found in Southeast Asia and Africa. The oil contains various compounds that have insecticidal and medicinal properties. It is also used in making products including shampoos, toothpastes, soaps, and cosmetics. ■

Surfactants, Detergents, & Personal Care News

Reusing enzymes in home care

Scientists are reporting development and successful testing of a way to reuse—hundreds of times—the expensive enzymes that boost the cleaning power of laundry detergents and powdered bleaches and that currently disappear down the drain with the rinse water.

The discovery, reported in *Industrial & Engineering Chemistry Research* (doi:10.1021/ie202053r, 2012) by C.S. Pundir and Nidhi Chauhan of Maharshi Dayanand University in Haryana, India, opens the door to new laundry products, such as special scrub brushes or reusable enzyme-coated plastic flakes and strips that might be added to cheaper detergents and then saved for reuse.

In previous research, the scientists showed it was possible to attach individual enzymes to various surfaces so they could be reused. Now, for the first time, the researchers bound four enzymes onto a plastic surface. They adhered the enzymes to the inside surface of a polyvinyl chloride (PVC) bucket and to the PVC bristles of a scrub brush. Then, they washed white cotton cloths stained with starch, grass, egg, or mustard oil in the bucket or with the brush. Less expensive, non-enzyme laundry detergents, used in the bucket or with the scrub brush, cleaned just as well or better than using the more-expensive enzymatic detergent by itself. The PVC-attached enzymes remained active when used as many as 200 times over three months. The new method "makes cheaper detergents better than expensive detergents for washing purposes," say the researchers.

ACI Distinguished Paper Award

Iranian and Swedish researchers have identified a group of surfactants that are highly effective in acid-cleaning formulations used to prevent the corrosion of steel surfaces.

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Their work brought them the 2012 American Cleaning Institute (ACI) Distinguished Paper Award, which recognizes the best paper published during the previous year in AOCS' *Journal of Surfactants & Detergents*.

"Acid cleaning is a well-accepted industrial method to remove the rust, contaminations, and mill scale from mild [low-carbon] steel surfaces," said Mohammad Mahdavian, assistant professor in the Polymer Engineering Department at Sahand University in Tabriz, Iran. "However, the strong corrosivity of acid cleaning formulations could cause corrosion and material loss. Corrosion inhibitors are, therefore, often used in such formulations."

Mahdavian and his colleagues compared the corrosion inhibition efficiency of two different cationic surfactants: a gemini (dimeric) surfactant (known as "12-4-12") and a monomeric surfactant, dodecyltrimethylammonium bromide (DTAB).

"The 12-4-12 surfactant showed an extremely high corrosion inhibition efficiency at very low concentrations as revealed through electrochemical studies," said Mahdavian. "We believe that the excellent performance is related to higher surface activity and charge density of this surfactant, as demonstrated by surface tension studies.

"The result of the work can assist the formulators of acid-cleaning solutions in selecting the optimal surfactants and open the door for a new generation of surfactants with higher performance."

Mahdavian was honored along with his co-authors, Ali Reza Tehrani-Bagha and Krister Holmberg, professor of applied surface chemistry at Chalmers University of Technology, Göteborg, Sweden.

The award was presented at the 103rd AOCS Annual Meeting & Expo in Long Beach, California, USA, April 29–May 2, 2012. The paper, Comparison of a cationic gemini surfactant and the corresponding monomeric surfactant for corrosion protection of mild steel in hydrochloric acid, was published in the October 2011 *Journal of Surfactants and Detergents* (*14*:605–613).

ACI, formerly known as The Soap and Detergent Association, is a trade association based in Washington, DC, USA.

Novel surfactant formulation for oilfield applications

A new generation of high-performance surfactants has proven successful in mobilizing residual oil in two mature fields in Oklahoma through a project supported by the US Department of Energy's National Energy Technology Laboratory (NETL; Morgantown, West Virginia, USA).

The University of Oklahoma, in partnership with a small independent producer, demonstrated the use of a novel surfactant formulation on two high-water-cut stripper wells—wells that produce less than 10 barrels of oil per day and produce significantly more water than oil—located in the Bartlesville formation in northeast Oklahoma. The Bartlesville formation, which to date has produced more than a billion barrels of oil, was targeted because it has thousands of active wells and hundreds of active water floods.

The investigators completed two single-well tests in the third quarter of 2011. The first step in each was a tracer test to measure the amount of existing residual oil—oil that remains in the ground after the easy-to-produce oil has been recovered. The next step was a chemical flood using three different surfactants combined with a polymer at 2,000 parts per million. Surfactant and polymer were mixed with reservoir brine, rather than fresh water, to reduce costs. Following the injection of additional brine to help the chemicals flood the reservoir, another tracer test was performed on each well to measure any change in residual oil due to the chemical flood.

In the first well, a chemical flood with a total surfactant concentration of 0.5% mobilized 75% of the residual crude oil. In the second well, with the total surfactant concentration of the chemical flood lowered to 0.23%, approximately 80% of the residual crude oil was mobilized. Subsequent laboratory experiments showed that surfactant concentrations could be reduced to 0.11% and still effectively mobilize crude oil, which could further reduce costs and improve environmental performance. Investigations also indicated that polymer costs may be reduced by up to 50% by mixing various polymers.

Based on these results, two pilot projects in northeast Oklahoma are being designed for implementation in the third quarter of 2012, after the NETL-sponsored project ends. NETL estimates that widespread application of these techniques could result in economic production of an additional billion barrels of oil from the Bartlesville formation.

Demand for "enhanced cosmetics" builds

Growing demand among baby boomers and others for "enhanced cosmetics" that marry cosmetics and active ingredients to smooth wrinkled skin and otherwise improve appearance is fostering research on microcapsules and other technology to package those ingredients in creams, lotions, and other products.

In an article in *Chemical & Engineering News* (*90*:13–18, 2012), Senior Correspondent Marc S. Reisch explains that major chemical companies such as BASF, Dow Chemical, and Air Products & Chemicals are acquiring or partnering with makers of beauty and personal care ingredients to take advantage of a global market valued at $425 billion in 2011. Active ingredient delivery systems already are incorporated into 10–20% of cosmetics on the market today, a number predicted to grow to 35–45% in five years. To meet that demand, chemical companies are looking for better ways to encapsulate these additives—which can reduce inflammation, repair hair, or prevent wrinkles—to stop them from breaking down in the package or to help deliver them to the skin and hair more effectively.

Reisch describes several new approaches. For example, Air Products & Chemicals, which produces gases like oxygen and helium, as well as adhesives and electronic chemicals, has adapted an insulin delivery system to make better sunscreen. Microcapsules help coat the skin with protective ingredients, while another capsule system carries vitamins C and E beneath the skin as a second line of defense. Another product, from German specialty chemical maker Evonik Industries, uses water droplets coated in silica to make a "dry water." When combined with a powder containing fragrances or vitamins and rubbed on skin or in hair, the water is released to form a cream that delivers the ingredients.

New US energy efficiency standards

The US Department of Energy recently announced new energy efficiency standards for residential dishwashers and clothes washers that it says will save consumers $20 billion in energy and water costs.

"As a result of the standards for dishwashers, home dishwashers will use approximately 15% less energy and more than 20% less water, directly providing consumers with savings on monthly bills," DOE said in a news release.

The new standards—developed in partnership with companies such as Whirlpool, General Electric, and LG Electronics, industry advocates, national environmental organizations, consumer groups, and other stakeholders—build on previous minimum energy efficiency requirements for dishwashers and clothes washers and go into effect starting in 2013 and 2015, respectively.

Today, dishwashers and clothes washers account for approximately 3% of residential energy use and more than 20% of indoor water use in homes across the United States, DOE says. The new standards for clothes washers will reduce the energy consumption of front-loading clothes washers by 15% and reduce water consumption by 35%, while top-loading washers will save 33% on energy and 19% on water use.

A full list of appliance efficiency standards is available at www.eere.energy.gov/buildings/appliance_standards.

Killer stainless steel

Stainless steel is perceived as being the epitome of cleanliness for home and commercial kitchens, restaurants, hospitals, and other settings, but it can collect disease-causing bacteria just like other surfaces if not cleaned often. New research in *Langmuir* (doi:10.1021/la3003965, 2012) discusses a practical way to make stainless steel that disinfects itself.

Christophe Detrembleur and colleagues at University of Liège and the Center of Biomedical Integrative Genoproteomics (also in Liège) explain that while stainless steel is prized for its durability, resistance to corrosion, and ease of cleaning, it readily collects bacteria over time. The bacteria can form invisible colonies or biofilms—collections of colonies bound tightly to a surface—that can spread disease. Existing ways of making stainless steel with an antibacterial surface are complicated, expensive, and require the use of potentially toxic chemical substances.

The authors sought an easier, "greener" way to make an antibacterial coating for stainless steel. They describe development of a process for giving stainless steel a coating that killed all *E. coli* bacteria present within two hours in laboratory tests. It involves applying a layer of a biobased adhesive to the steel, then four alternating layers of a negatively-charged polymer and positively-charged polymer micelles containing silver-based particles, which are highly bactericidal. The process takes only 10 minutes and uses water instead of potentially toxic substances. "This novel water-based approach is convenient, simple, and attractive for industrial applications," the researchers say.

The authors acknowledge funding from the Region Wallonne, ArcelorMittal, the University of Liège, the National Fund for Scientific Research, and Belspo.

Beyond stain resistance

Australian scientists are reporting development and successful testing of a fabric coating that would take an active role in sloughing off grease, dirt, strong acids, and other gunk. The report, which shows that the coating is even more water repellent than car wax or Teflon, appears in the journal *Langmuir (doi:10.1021/la300281q, 2012)*.

Tong Lin and colleagues at Deakin University (Geelong, Victoria, Australia) explain that a method called layer-by-layer (LbL) self-assembly produces films and coatings for fabrics, sensors, drug-delivery devices, and many other products. LbL involves setting down alternate layers of positively and negatively charged materials that are held together by electric charges. With this approach, coatings can be custom-designed for specific applications by selecting the composition of each layer. The downside: These multilayer films are not very stable and eventually come apart. Lin and colleagues wanted to develop a way to stabilize those layers with ultraviolet light to form a "superhydrophobic" coating, one that uses natural surface forces to repel water and other materials.

Laboratory tests showed that the new coating, applied to cotton fabric, repelled water, acids, bases, and organic solvents. The coating also was durable, remaining intact on the cotton fabric after 50 trips through a home washing machine. When the researchers applied several layers of the coating on the fabric, the contact angle (a measure of water repellency) was about 154°, making it even more repellent than car wax (90° contact angle), Teflon (95° contact angle) or products that repel rainwater from car windshields (110° contact angle). ■

WHAT LIPID PLAYS A KEY ROLE IN FAT DEPOSITION IN THE LIVER?

Until recently, it was assumed that most hepatic triaglycerols are derived from fatty acids released from adipose tissue. However, a paper published in the July 6 issue of the *Journal of Biological Chemistry* demonstrated that up to 65 percent of triaglycerols in the liver are derived from phosphatidylcholine in the high-density lipoproteins of cell membranes. (The membrane lipid phosphatidylcholine is an unexpected source of triacylglycerol in the liver, van der Veen, J.N. *et al.*, *J. Biol. Chem. 287*: 23418-23426, 2012, doi:10.1074/jbc.M112.381723). The finding may bring into question many other assumptions about the factors that are involved in the development of obesity and fat deposition in the liver.

People News/ Inside AOCS

Emken honored

AOCS Past President **Edward Emken** will receive the Kaufmann Memorial Lecture award at the 2012 World Congress on Oleo Science & 29th ISF Congress (JOCS/AOCS/KOCS/ISF Joint Meeting), which will be held September 30 to October 4, 2012, in Sasebo, Japan. The International Society for Fat Research (ISF) created this award to honor ISF's founder, Hans P. Kaufmann, and it is presented biennially to a person with an international reputation in the field of fats and oils science. The award recognizes Emken's pioneering research accomplishments related to the metabolism, synthesis, and analysis of dietary fats and lipids. His investigation of the metabolic fate of dietary fatty acids in human subjects using stable isotope tracers provided definitive answers and insights to many health and nutrition-related questions. Results from these studies will be summarized in his award lecture, titled "Human studies using isotope labeled fatty acids: answered and unanswered questions." Emken is an AOCS Fellow and has previously received a number of awards, including the US Department of Agriculture Superior Service Award, the AOCS Alton E. Bailey Award, and the Supelco/Nicholas Pelick–AOCS Research Award.

Emken

Gingras new CEO at Oberon FMR

AOCS member **Leo Gingras** was named chief executive officer (CEO) of Oberon FMR, Inc., an Aurora, Colorado, USA-based biotechnology company, in June 2012. Prior to joining Oberon FMR, Gingras served as president and chief operating officer at NutraCea, a nutraceutical and rice bran ingredient supplier, and senior vice president at Riceland Foods. Oberon FMR is an early-stage company with proprietary technology to use single-cell organisms to convert nutrients in food/beverage plant process waters into high-quality protein meal that is used to replace or supplement fish meal in animal diets, therefore providing a renewable and sustainable alternative to meal produced from depleted wild fish stocks.

FEDIOL elects officers

The General Assembly of FEDIOL, the federation representing the European Vegetable Oil and Proteinmeal Industry, elected **Alain Brinon** as its president for a two-year term, 2012–2014, at its meeting on June 22. Brinon is director general of SAIPOL, a subsidiary of Sofiproteol, the financial arm of the French oilseed farmers' association. Involved in FEDIOL working groups for over 20 years, he has been a member of the board of FEDIOL representing SAIPOL since 1998 and was elected vice president in June 2011.

Rob Freeriks was elected vice president of FEDIOL for a one-year term. He is managing director, Grain & Oilseed Supply Chain Western & Eastern Europe with Cargill. He held the position of FEDIOL president from 2010 to 2012.

New officers for Algal Biomass Organization

Algal Biomass Organization (ABO), a non-profit organization whose mission is to promote the development of viable commercial markets for renewable and sustainable commodities derived from algae, announced on April 26 the results of elections for eight seats on the ABO's 15-member board of directors. The terms of the new directors will run through May 2014. The new members include: **Mark Allen**, Accelergy Corp.; **John Benemann**, Benemann Associates; **Tom Byrne**, Byrne & Co., Ltd.; **Bill Glover**, Boeing Commercial Airplanes; **Greg Mitchell**, Scripps Institution of Oceanography; **Joel Murdock**, FedEx Express; **Phil Pienkos**, National Renewable Energy Laboratory; and **Jim Rekoske**, Honeywell UOP.

Management changes at AAK and AAK USA

Peter Korsholm became the chief financial officer and a member of the executive committee of AarhusKarlshamn AB (AAK) on June 1, 2012. He came to AAK from EQT Partners, and before that from Morgan Stanley. Korsholm replaces Anders Byström, who has moved to the position of director of external accounting in AAK.

Hal Grant became interim president of AAK USA and a member of the AAK Executive Committee as of May 29, 2012. He came to AAK USA from 21 years with Schneider Electric, where he held a number of senior management positions. The department president of AAK USA is Jean-Marc Rotsaert. During his three-year tenure in that position he expanded the production facilities of AAK USA and integrated the acquisition of Golden Foods/Golden Brands.

ILSI news

On July 2, 2012, **Diána Bánáti** became executive and scientific director of ILSI (International Life Sciences Institute) Europe. She comes to the position from the Hungarian Ministry of Rural Development, where she was Ministerial Commissioner for food safety and international scientific cooperation and chief scientific advisor. Before that, she was director general of the Central Food Research Institute in Hungary. She has also served as a professor of food safety, food policy, food regulatory sciences, and consumer science.

Upon her appointment, Bánáti commented, "ILSI Europe has a crucial role to play in helping to find science-based answers to the nutrition challenge, obesity epidemic, food safety, environmental, and resource constraints."

Keller's duties redefined

Wilf Keller made his role as president and chief executive officer (CEO) of Ag-West Bio (Saskatoon, Saskatchewan, Canada) a fulltime position in June 2012. At the same time, he stepped down as president and CEO of Genome Prairie. Keller had held the dual roles since April 2010, when a management agreement was struck between the two organizations.

Ag-West Bio, whose goal is to work with innovators and investors to start biobased businesses, and Genome Prairie have a long history of collaboration and cooperation. Ag-West Bio was instrumental in bringing Genome Prairie to Saskatoon when it restructured in 2005 and relocated its head office from Calgary. Since the move, the two companies have shared office space at Innovation Place Research Park in Saskatoon.

Brent Zettl, chair of the Ag-West Bio board of directors, said the decision was made because there is so much activity in the biosciences. "With so much happening in Saskatchewan's biosciences today, it is important for the president and CEO to have the time needed to take advantage of the many new opportunities, for example, in the health and the agri-food sectors."

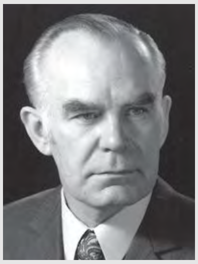
IOI Loders Croklaan announces changes

IOI Group, a global player in the palm oil market, announced changes within its IOI Loders Croklaan senior management team. **Julian Veitch** is now its chief executive officer, and **Vincent Geerts** is group chief financial officer. **Michael van Sallandt** assumed the position of chief operating officer for Loders Croklaan Asia on July 1, 2012, filling the position held by **U.R. Sahasranaman**, who then became senior group director of special projects. ■

IN MEMORIAM

Helmut K. Mangold

AOCS has received word that Helmut K. Mangold died on April 11, 2012, in Münster, Germany. His widow survives him.



Mangold

Mangold received early notice for his work at the Hormel Institute, Austin, Minnesota, USA, where he took part in the development of lipid analysis using thin-layer chromatography with ^{14}C-labeled fatty acids. Stemming from this work, he went on to write, with G. Zweig and J. Sherma, the two-volume set *CRC Handbook of Chromatography: Lipids*, which appeared in 1984. He also wrote *Ether Lipids* (with F. Paltauf, Academic Press, 1983) and *Biologically Active Ether Lipids* (Karger, 1988).

Leaving Hormel in 1969, Mangold became director of the H.P. Kaufmann Institute at the Federal Center for Fat Research in Münster, Germany. He won the Heinrich Wieland Prize, sponsored by Boehringer Ingelheim, in 1977 for his work on the synthesis and biosynthesis of alkoxylipids.

Mangold was the founding editor of the Elsevier journal *Chemistry and Physics of Lipids*, where much of his research was published. He also served on the Editorial Advisory Board for the AOCS journal *Lipids* from October 1986 until his death.

BIOTECHNOLOGY NEWS (CONTINUED FROM PAGE 510)

only HT varieties). Adoption of all biotech corn accounted for 88% of corn acreage in 2012.

Effects of *Bt* corn on soil organisms

A study out of Portland State University (Oregon, USA) investigated the effects of *Bt* corn on soil organisms (Cheeke, T.E., *et al.*, *American Journal Of Botany* 99:700–707, 2012). The purpose was to identify any changes in arbuscular mycorrhizal fungi (AMF) colonization of corn. [Arbuscular mycorrhizae are a type of mycorrhizae (a fungus that grows in association with the roots of a plant in a symbiotic relationship) in which the fungus penetrates the roots of a vascular plant.]

Plants supply the mycorrhizae with carbon, and the fungi increase the host plant's ability to take up nutrients and water from the surrounding soil.

The researchers planted seeds from several different lines of both *Bt* corn and non-*Bt* corn in local agricultural soil containing native mycorrhizal fungi to simulate a natural agricultural system. They found that colonization of plant roots by symbiotic soil fungi was lower in the *Bt* corn than in the control lines. However, they also found no difference in root or shoot biomass between the two types of corn at the time of harvest.

Furthermore, they found that the *Bt*-protein was not directly toxic to the fungi, since soybeans subsequently planted in the soil in which the *Bt* corn was grown–as would occur in a corn-soybean rotation in a farm setting—showed no effects in AMF colonization.

Monsanto's SDA soybean no longer regulated

The US Animal and Plant Health Inspection Service (APHIS) announced in the *Federal Register* on July 13, 2012, its determination that a soybean line developed by the Monsanto Co., designated as event MON 87769, which has been genetically engineered to produce stearidonic acid (SDA), an omega-3 fatty acid not found in conventional soybean, is no longer considered a regulated article under APHIS regulations governing the introduction of certain genetically engineered organisms. This determination was based on APHIS's evaluation of data submitted by the Monsanto Company in its petition for a determination of nonregulated status, analysis of available scientific data, and comments received from the public in response to APHIS's previous notice announcing the availability of the petition for nonregulated status and its associated environmental assessment and plant pest risk assessment (http://tinyurl.com/APHIS-SDA). ■

Extracts & Distillates

Glycolipids improve lutein bioavailability and accumulation in eyes in mice

Gorusupudi, A., and B. Vallikannan, *Eur. J. Lipid Sci. Technol. 114*:710–717, 2012.

Intestinal carotenoid absorption is greatly affected by dietary factors. In this study, it was hypothesized that lipids with varying functional groups may influence differentially lutein bioavailability. Hence, the influence of glyco-, phospho-, neutral, crude (mixture of lipids) lipids, or mixed micelles (control) on the percent lutein micellarization *in vitro* and its postprandial plasma, liver, and eye response in mice was investigated. Results show that the percent micellarization of lutein with crude lipids and glycolipids was higher (91.4 and 45.7%) than control, while no significant difference was found between phospho- and neutral lipids. The mean plasma response of lutein was higher for crude- (6 times), glyco- (3 times), phospho- (2.7 times), and neutral (2 times) lipid than control (12.4 ± 1.18 nmol/mL 8 h^{-1}) group. Lutein levels (pmol/g) in liver were higher in crude (7.4 ± 1) and phospho- (3.6 ± 0.8) lipid groups while in eyes it was higher in glyco- (54.0) and neutral (21.2) lipid groups than control. The influential effect of glyco- and phospholipids may be due to smaller micellar size (glyco-: up to 3.43 μm, phospho-: up to 5.78 μm) than the neutral lipids (up to 66 μm). Ingestion of lutein with glycolipid or phospholipids may improve lutein bioavailability.

CLA prevents alterations in glycolytic metabolites induced by a high fat diet

Andreoli, M.F., *et al.*, *Eur. J. Lipid Sci. Technol. 114*:718–725, 2012.

CLA has been reported to have beneficial and controversial effects on glucose and lipid metabolism. Besides, high fat (HF) diets induce alterations in liver and muscle lipid deposition, which could be associated with anomalous glucose utilization. Therefore, our aim was to evaluate whether the intake of CLA could prevent alterations in glycolytic

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AOCS Journals

Journal of the American Oil Chemists' Society (July)

- Biodiesel/diesel blends classification with respect to base oil using NIR spectrometry and chemometrics tools, Silva, G.W.B., A. A. Gomes, P. da Silva, G.B. Costa, D.D.S. Fernandes, *et al.*
- Classification of geographical origin by PNN analysis of fatty acid data and level of contaminants in oils from Peruvian anchovy, Standal, I.B., J. Rainuzzo, D.E. Axelson, S. Valdersnes, K. Julshamn, *et al.*
- A dynamic light scattering study on the complex assembly of glycinin soy globulin in aqueous solutions, Ruiz-Henestrosa, V.M.P., M.J. Martinez, J.M. R. Patino, and A.M.R. Pilosof
- Triacylglycerols oxidation in oils and fats monitored by easy ambient sonic-spray ionization mass spectrometry, Simas, R.C., D. Barrera-Arellano, M.N. Eberlin, R.R. Catharino, V. Souza, *et al*.
- Characterization of free and bound lipids among four corn genotypes as affected by drying and storage temperatures, Rezaei, K., T. Beta, C.J. Bern, and P.J. White
- Development and validation of an HPLC–DAD method for analysis of the six major isoflavones in extracts from soybean processing, Gasparetto, J.C., F.S.F. Smolarek, T M.G. de Francisco, L.C. Miranda, R. Pontarolo, *et al.*
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- Crystallization behavior of diacylglycerol-rich oils produced from rapeseed oil, Saitou, K., Y. Mitsui, M. Shimizu, N. Kudo, Y. Katsuragi, *et al.*
- Characterization of Iranian virgin olive oil from the Roodbar region: a study on Zard, Mari and Phishomi, Kharazi, S.H., R.E. Kenari, Z.R. Amiri, and M. Azizkhani
- DNA detection by conventional and real-time PCR after extraction from vegetable oils, Debode, F., E. Janssen, A. Marien, and G. Berben
- Enzymatic synthesis of diacylglycerols enriched with conjugated linoleic acid by a novel lipase from *Malassezia globosa*, Xu, D., L. Sun, H. Chen, D. Lan, Y. Wang, *et al.*
- Increasing stearidonic acid (SDA) in modified soybean oil by lipase-mediated acidolysis, Kleiner, L., L. Vázquez, and C.C. Akoh
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- Optimized production of MLM triacylglycerols catalyzed by immobilized heterologous *Rhizopus oryzae* lipase, Nunes, P.A., P. Pires-Cabral, M. Guillén, F. Valero, and S. Ferreira-Dias
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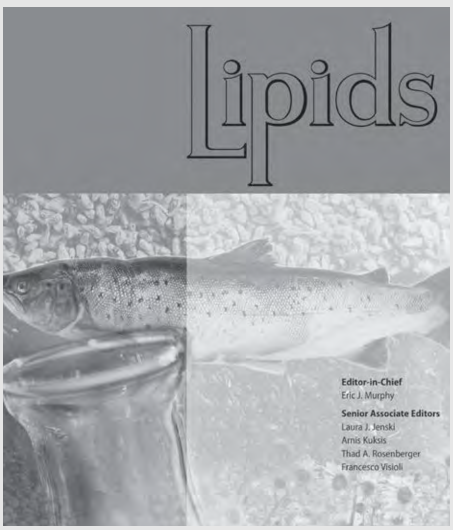
- Evaluation of agronomic and seed characteristics in elevated oleic acid soybean lines in the south-eastern US, Fallen, B.D., K. Rainey, C.E. Sams, D.A. Kopsell, and V.R. Pantalone
- Ethanol production from soybean fiber, a co-product of aqueous oil extraction,

using a soaking in aqueous ammonia pretreatment, Karki, B., D. Maurer, S. Box, T.H. Kim, and S. Jung

- Kinetics of the transesterification of castor oil with maleic anhydride using conventional and microwave heating, Mazo, P., D. Estenoz, M. Sponton, and L. Rios
- Optimization of phytosterols recovery from soybean oil deodorizer distillate, Yan, F., H. Yang, J. Li, and H. Wang



Lipids (July)

- *trans* Fatty acids: induction of a pro-inflammatory phenotype in endothelial cells, Harvey, K.A., C.L. Walker, Z. Xu, P. Whitley, and R.A. Siddiqui
- Trans isomers of EPA and DHA in omega-3 products on the European market, Sciotto, C., and S.A. Mjøs
- Oral supplementation of butyrate reduces mucositis and intestinal permeability associated with 5-fluorouracil administration, Ferreira, T.M., A.J. Leonel, M.A. Melo, R.R.G. Santos, D.C. Cara, *et al.*
- Lipid transfer to HDL is higher in marathon runners than in sedentary subjects, but is acutely inhibited during the run, Vaisberg, M., A.L.L. Bachi, C. Latrilha, G.S. Dioguardi, S.P. Bydlowski, *et al.*
- 8-[2-(2-Pentyl-cyclopropylmethyl)-cyclopropyl]-octanoic acid and its diastereomers improve age-related cognitive deterioration, Kanno, T., T. Yaguchi, T. Shimizu, A. Tanaka, and T. Nishizaki
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- The fatty acid 8,11-diol synthase of *Aspergillus fumigatus* is inhibited by imidazole derivatives and unrelated to PpoB, Jernerén, F., and E.H. Oliw
- Improved extraction of saturated fatty acids but not omega-3 fatty acids from sheep red blood cells using a one-step extraction procedure, Clayton, E.H., C. E. Gulliver, J.W. Piltz, R.D. Taylor, R.J. Blake, *et al.*
- LC–ESI–MS/MS identification of polar lipids of two thermophilic *Anoxybacillus* bacteria containing a unique lipid pattern, Řezanka, T., M. Kambourova, A. Derekova, I. Kolouchová, and K. Sigler
- Analysis of fatty acids in 12 Mediterranean fish species: advantages and limitations of a new GC-FID/GC–MS based technique, Nevigato, T., M. Masci, E. Orban, G. Di Lena, I. Casini, *et al.*
- Erratum to: Daily intake of cod or salmon for 2 weeks decreases the 18:1n-9/18:0 ratio and serum triacylglycerols in healthy subjects, Telle-Hansen, V.H., L.N. Larsen, A.T. Høstmark, M. Molin, L. Dahl, *et al.*

WHAT MOLECULES OTHER THAN CHOLESTEROL ESTERS CONTAIN BOTH CHOLESTEROL AND FATTY ACID MOIETIES?

Proteolipids, such as the so-called hedgehog proteins (http://lipidlibrary.aocs.org/Lipids/protlip/index.htm#chol), are intimately involved in the signaling pathways that govern the development of multicellular organisms. In such proteolipids, cholesterol is linked to the C-terminal end and a palmitoyl moiety is attached to a cysteine residue at the N-terminus. Both components are essential for the proper tissue distribution and function of the attached proteins. The cholesterol moiety in particular is required to cause the proteins to form multimeric complexes, perhaps by targeting them to specific raft domains in membranes. This may also facilitate interaction with other membrane-associated molecules. While the protein moiety lacking cholesterol maintains some of their signalling capacity, loss of palmitoylation abolishes the signalling activity entirely. It appears that that palmitate facilitates the cleavage of the N-terminal amino acid by membrane proteases and thus opens up the active sites on the proteins. (Hedgehog secretion and signal transduction in vertebrates, Ryan, K.E. and C.J. Chiang, *J. Biol. Chem.*, *287*:17905-17913, 2012. , doi:10.1074/jbc.R112.356006).

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intermediate metabolites and glycogen deposition induced by a HF diet. For this purpose, growing mice were fed a control diet (7% corn oil), an HF diet (20% corn oil), or an HF diet containing 17% corn oil + 3% CLA for 30 days. Liver and muscle glucose intermediate metabolites and glycogen were assessed. Liver glycolysis was inhibited by HF, reflected by a decreased flow of substrates through phosphofructokinase-1α linked to elevated citrate. CLA at HF diet prevented these alterations while increasing the lactate and glycogen synthesis. In the muscle, the HF diet emphasized the reduction of the flux through phosphofructokinase-1α, without additional changes in total glycogen levels. In conclusion, dietary CLA partially prevented glycolytic pathway alterations in the liver but not in the muscle of mice fed a HF diet, associated with adverse effects as sustained hyperglycemia and hepatic lactate accumulation.

Jatropha oil and karanja oil as carbon sources for production of sophorolipids

Wadekar, S.D., *et al.*, *Eur. J. Lipid Sci. Technol. 114*:823–832, 2012.

Biosurfactants such as sophorolipids (SL) are mild and environmentally friendly surfactants to be used in cosmetics and health care products. In addition to surfactant properties, SL also possess antimicrobial and skin-healing properties. SL are produced by microbial fermentation using refined vegetable oils with glucose as a carbon source. This affects the economics of the production of SL. In the present work, nontraditional oils such as jatropha oil, karanja oil, and neem oil were used as newer feedstock for fermentative production of SL using *Starmerella bombicola* (ATCC 22214). In the fermentation, jatropha oil and karanja oil gave 6.0 and 7.6 g/L of SL (mainly lactonic form), respectively. High-performance liquid chromatography, liquid chromatography–mass spectrometery, and ^{1}H nuclear magnetic resonance of crude SL obtained from fermentation broth showed lactonic form of two major SL. Oleic acid and linoleic acid were preferentially consumed over other fatty acids by the organism. Neem oil gave lower yield, i.e., 2.63 g/L of SL (mainly acidic form).

Mitigation of MCPD-ester and glycidyl-ester levels during the production of refined palm oil

Craft, B.D., and K. Nagy, *Lipid Technol. 24*:155–157, 2012.

In recent years, process contaminants called MCPD and glycidyl esters have been found to be present in refined edible oils. On average, they have been found in higher levels in refined palm oils than typical seed-oil crops. The reasons behind the increased occurrence of these contaminants in palm oils have now been traced all the way back to raw materials such as crude palm oil. This manuscript attempts to summarize some recent breakthroughs in the area of mitigation of MCPD-ester and glycidyl-ester levels during refined palm oil production. It is clear that renovation of the palm oil production process is necessary to further improve the quality and safety of this important commodity.

Lipase-catalysed biodiesel production from Jatropha curcas oil

Soumanou, M.M., *et al.*, *Lipid Technol. 24*: 158–160, 2012.

Biodiesel as fatty acid alkyl esters has become attractive because of its environmental benefits. A nonedible oil as starting material for biodiesel production appears desirable and does not compromise the edible oils used mainly for food and feed. The present article discusses the enzymatic alcoholysis of crude *Jatropha curcas* oil in solvent-free medium for the production of valuable fatty acid alkyl esters for use as biodiesel. Among various microbial lipases commonly tested in the literature, the highest initial rate (>18 μmol h^{-1} mg^{-1}) with different alcohols was observed with immobilized lipase from *Pseudomonas cepacia*, but the activity depends on the amount of water. The best conversion (93%) to produce ethyl esters was achieved with lipase immobilized on the polypropylene carrier Accurel 1282 after 16 h at low enzyme concentration (3% w/w). Moreover, the transesterification could be conducted for at least 160 h during 10 batch runs without significant loss of activity. This reduces the costs for immobilized lipase and can thus make the enzymatic biodiesel production commercially more viable, especially starting from a nonedible plant oil.

Lipid droplet-based storage fat metabolism in *Drosophila*

Kühnlein, R.P., *J. Lipid Res. 53*:1430–1436, 2012.

The fruit fly *Drosophila melanogaster* is an emerging model system in lipid metabolism research. Lipid droplets are omnipresent and dynamically regulated organelles found in various cell types throughout the complex life cycle of this insect. The vital importance of lipid droplets as energy resources and storage compartments for lipoanabolic components has recently attracted research attention to the basic enzymatic machinery, which controls the delicate balance between triacylglycerol deposition and mobilization in flies. This review aims to present current insights in experimentally supported and inferred biological functions of lipogenic and lipolytic enzymes as well as regulatory proteins, which control the lipid droplet-based storage fat turnover in *Drosophila*.

Regulation of inflammatory and lipid metabolism genes by eicosapentaenoic acid-rich oil(s)

Gillies, P.J., *et al.*, *J. Lipid Res. 53*:1679-1689, 2012.

Omega-3-polyunsaturated fatty acids (PUFA), eicosapentaenoic acid (EPA), and docosahexaenoic acid (DHA), are associated with prevention of various aspects of metabolic syndrome. In the present studies, the effects of oil rich in EPA on gene expression and activation of nuclear receptors was examined and compared with other ω3-PUFA. The EPA-rich oil (EO) altered the expression of FA metabolism genes in THP-1 cells, including stearoyl CoA desaturase (SCD) and FA desaturase-1 and -2 (FASDS1 and -2). Other ω3-PUFA resulted in a similar gene expression response for a subset of genes involved in lipid metabolism and inflammation. In reporter assays, EO activated human peroxisome proliferator-activated receptor α (PPARα) and PPARβ/γ with minimal effects on PPARγ, liver X receptor, retinoid X receptor, farnesoid X receptor, and retinoid acid receptor γ (RARγ); these effects were similar to that observed for purified EPA. When serum from a 6-week clinical intervention with dietary supplements containing olive oil (control), DHA, or two levels of EPA were applied to THP-1 cells, the expression of SCD and FADS2 decreased in the cells treated with serum from the ω3-PUFA-supplemented individuals. Taken together, these studies indicate regulation of gene expression by EO that is consistent with treating aspects of dyslipidemia and inflammation.

Effect of heating oils and fats in containers of different materials on their *trans* fatty acid content

Amrutha Kala, A.L., *et al.*, *J. Sci. Food Agric. 92*:2227–2233, 2012.

The nature of the container material and temperature employed for deep-frying can have an influence on the development of *trans* fatty acids (TFA) in the fat used. The present study was undertaken to determine the effect of heating vegetable oils and partially hydrogenated vegetable fats with different initial TFA content in stainless steel, Hindalium (an aluminum alloy), cast iron, and glass containers. Ground nut oil (oil 1), refined, bleached and deodorized (RBD) palmolein (oil 2) and two partially hydrogenated vegetable oils with low (fat 1) and high (fat 2) TFA content were uniformly heated at 175–185°C over a period of 12 h. An increase in TFA content to 20 g kg^{-1} was observed in oil 2 in the cast iron container, while a decrease in TFA content of 20–30 g kg^{-1} was observed in fat 2 in all containers. The heating process of fats and oils also led to an increase in Butyro refractometer reading and color values. This study showed that the TFA 18:1*t* content of oil 1, oil 2 and fat 1 increased with repeated or prolonged heating. The cast iron container showed the highest increase in TFA 18:1*t* for RBD palmolein (oil 2). The amount of linoleic acid *trans* isomers formed in the heating process was negligible. Fat 2 with high initial TFA content showed a decrease in TFA 18:1 and 18:2 on heating in all containers. Oils heated in glass and stainless steel containers showed less TFA 18:1*t* formation.

The effect of cocoa, soy, oats and fish oil on metabolic syndrome in rats

Barrios-Ramos, J.P., *et al.*, *J. Sci. Food Agric. 92*:2349–2357, 2012.

The effect of functional foods alone or in combination (cocoa + soy + oats + fish oil) on hepatic damage in rats affected with metabolic syndrome was investigated. Rats that were given cocoa showed a decrease in the levels of triglycerides (TG) and glucose (63 and 32% respectively) as well as a decrease in blood pressure (15%). Animals fed with soy showed a reduction of 21% in total cholesterol, 15% in blood pressure, and 44% in TG, while feeding oats reduced the concentration of TG by 53% ($P < 0.5$). Fish oil caused a reduction in TG (56%) and glucose (26%). The effect on blood pressure was statistically significant for the groups supplemented with cocoa, soy, cocoa + oats, and the total mix. The main finding was a reduction in liver steatosis in animals supplemented with cocoa + oats (from 30 to 4.7% steatosis). Cocoa or fish oil alone did not protect the liver from damage, while cocoa + fish oil did. The most relevant effects were that the cocoa + oats mix decreased steatosis by a very large percentage, as did the cocoa + fish oil mix and the mix of all four functional foods.

Parenteral lipid administration to very-low-birth-weight infants—early introduction of lipids and use of new lipid emulsions: a systematic review and meta-analysis

Vlaardingerbroek, H., *et al.*, *Am. J. Clin. Nutr. 96*:255–268, 2012.

The use of intravenous lipid emulsions in preterm infants has been limited by concerns regarding impaired lipid tolerance. As a result, the time of initiation of parenteral lipid infusion to very-low-birth-weight (VLBW) infants varies widely among different neonatal intensive care units. However, lipids provide energy for protein synthesis and supply essential fatty acids that are necessary for central nervous system development. The objective was to summarize the effects of initiation of lipids within the first 2 d of life and the effects of different lipid compositions on growth and morbidities in VLBW infants. A systematic review and meta-analysis of publications identified in a search of PubMed, EMBASE, and Cochrane databases were undertaken. Randomized controlled studies were eligible if information on growth was available. The search yielded 14 studies. No differences were observed in growth or morbidity with early lipid initiation. We found a weak favorable association of non–purely soybean-based emulsions with the incidence of sepsis (relative risk: 0.75; 95% confidence interval: 0.56, 1.00). The initiation of lipids within the first 2 d of life in VLBW infants appears to be safe and well tolerated; however, beneficial effects on growth could not be shown for this treatment nor for the type of lipid emulsion. Emulsions that are not purely soybean oil–based might be associated with a lower incidence of sepsis. Large-scale randomized controlled trials in preterm infants are warranted to determine whether early initiation of lipids and lipid emulsions that are not purely soybean oil–based results in improved long-term outcomes.

Food in an evolutionary context: insights from mother's milk

Hinde, K., and J.B. German, *J. Sci. Food Agric. 92*:2219–2223, 2012.

In the emergence of diverse animal life forms, food is the most insistent and pervasive of environmental pressures. As the life sciences begin to understand organisms in genomic detail, evolutionary perspectives provide compelling insights into the results of these dynamic interactions between food and consumer. Such an evolutionary perspective is particularly needed today in the face of unprecedented capabilities to alter the food supply. What should we change? Answering this question for food production, safety, and sustainability will require a much more detailed understanding of the complex interplay between humans and their food. Many organisms that we grow, produce, process, and consume as foods naturally evolved adaptations in part to avoid being eaten. Crop breeding and processing have been the tools to convert overtly toxic and antinutritious commodities into foods that are safe to eat. Now the challenge is to enhance the nutritional quality and thereby contribute to improving human health. We posit that the Rosetta stone of food and nourishment is mammalian lactation and 'mother's milk.' The milk that a mammalian mother produces for her young is a complete and comprehensive diet. Moreover, the capacity of the mammary gland as a remarkable bioreactor to synthesize milk, and the infant to utilize milk, reflects 200 million years of symbiotic co-evolution between producer and consumer. Here we present emerging transdisciplinary research 'decoding' mother's milk from humans and other mammals. We further discuss how insights from mother's milk have important implications for food science and human health.

Seed oil bodies from *Gevuina avellana* and *Madia sativa*

Acevedo, F., *et al.*, *J. Agric. Food Chem. 60*:6994–7004, 2012.

In this study, oil bodies (OBs) from *Gevuina avellana* (OBs-G) and *Madia sativa* (OBs-M) were isolated and characterized. Microscopic inspection revealed that the monolayer on OB-G was thinner compared to that on OB-M. Cytometric profiles regarding size, complexity, and staining for the two OB sources were similar. Fatty acid to protein mass ratio in both OBs was near 29, indicating high lipid enrichment. OBs-G and OBs-M showed a strong electrostatic repulsion over wide ranges of pH (5.5–9.5) and NaCl concentration (0–150 mM). Proteins displaying highly conserved sequences (steroleosins and aquaporins) in the plant kingdom were identified. The presence of oleosins was immunologically revealed using antibodies raised against *Arabidopsis thaliana* oleosins. OBs-G and OBs-M exhibited no

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Patents

Published Patents

Structured fluid detergent compositions comprising dibenzylidene polyol acetal derivatives and detersive enzymes

Boutique, J.-P., *et al.*, Procter & Gamble Co., US8153571, April 10, 2012

Fluid detergent compositions comprising an external structurant comprising dibenzylidene polyol acetal derivatives for providing desired rheological benefits such as product thickening, shear thinning behavior, as well as particle suspension capabilities, and a detersive enzyme such as lipase.

Synthesis of glycerolipid carbamates and dicarbamates and their use as an antitumor compounds

Bittman, R., *et al.*, US8153615, April 10, 2012

The syntheses and *in vitro* antitumor properties of carbamate-containing, dicarbamate-containing, and ureido-containing phospholipid compounds that have an ether linkage at the C-1 position of a glycerol backbone, a carbamate, dicarbamate, or ureido moiety at the C-2 position of the glycerol backbone, and a phosphocholine, phosphonocholine, or glycoside moiety at the C-3 position of the glycerol backbone are described. The synthesis and antiproliferative activity of ether lipids with a naphthol moiety at the C-1 position are also described. These compounds were shown to be potent inhibitors of cancer cell growth. These compounds are useful for killing cancer cells and treating cancer.

Modified vegetable oil-based polyols

Petrovic, Z., *et al.*, Cargill, Inc., US8153746, April 10, 2012

Methods of making unsaturated modified vegetable oil-based polyols are described. Also described are methods of making oligomeric modified vegetable oil-based polyols. An oligomeric composition having a modified fatty acid triglyceride structure is also described. Also, methods of making a polyol including hydroformylation and hydrogenation of oils in the presence of a catalyst and support are described.

Antimicrobial and antiviral composition

Willimann, J.A., and W. Chandler, Global Life Technologies Corp., US8158163, April 17, 2012

An antimicrobial and antiviral barrier composition for topical application to the proximal anterior nares includes an antiseptic solution in combination with *Cocos nucifera* (coconut oil) and one or more citrus oils such as, for example, *Citrus sinensis* (orange oil). Various embodiments may also include one or more of the following additional ingredients: lauric acid; *d*-limonene; soy oil; emu oil; grapefruit seed extract; *Glycine soja*; *Simmondsia chinensis* (jojoba); *Aloe vera*; and a preservative, such as sodium benzoate, BHT [butylated hydroxytoluene], benzalkonium chloride, vitamin E.

Emulsification system for use in cosmetics

Fares, H., *et al.*, L'Oreal, US8158136, April 17, 2012

Disclosed are cosmetic compositions containing water, at least one non-polar and/or polar oil, and an emulsification system comprising a polyoxyethylene oxide C_{12}–C_{24} fatty acid ester; a sucrose fatty acid ester of vegetable origin, and a glyceryl and/or sorbitan C_{12}–C_{24} fatty acid ester, and methods of making and using the compositions.

Structured lipid containing compositions and methods with health and nutrition promoting characteristics

Nakhasi, D.K., and R.L. Daniels, Bunge Oils, Inc., US8158184, April 17, 2012

Medium-chain triglyceride oils are interesterified with long-chain domestic oils in order to form interesterified structured lipids. These structured lipids find special application in combination with phytosterols to provide compositions and methods for enhancing health and nutrition characteristics. The compositions preferably have a structured lipid content of between about 92 and about 96 wt% and a phytosterol ester content of between about 4 and about 8 wt%, based on the total weight of the health and nutrition-promoting composition.

Controlled viscosity oil composition and method of making

Nakhasi, D.K., and R.L. Daniels, Bunge Oils, Inc., US8158185, April 17, 2012

The present invention relates to a sprayable oil composition comprising a blend of an oil, an edible solvent selected from the group consisting of triacetin, tripropionin, tributyrin, and ethyl acetate; and a preferably an emulsifier such as a lecithin. Advantageously, the viscosity of the blend can be controlled without interesterification of the solvent with the oil. Furthermore, such oil compositions can be effective sprayable oils such as for pan release applications while being substantially free of alcohols.

Methods and catalysts for making biodiesel from the transesterification and esterification of unrefined oils

Yan, S., *et al.*, Wayne State University, US8163946, April 24, 2012

A method of forming a biodiesel product and a heterogeneous catalyst system used to form said product that has a high tolerance for the presence of water and free fatty acids (FFA) in the oil feedstock is disclosed. This catalyst system may simultaneously catalyze both the esterification of FAA and the transesterification of triglycerides present in the oil feedstock. The catalyst system according to one aspect of the present disclosure represents a class of zinc and lanthanum oxide heterogeneous catalysts that include different ratios of zinc oxide to lanthanum oxides (Zn/La ratio) ranging from about 10:0 to 0:10. The Zn/La ratio in the catalyst is believed to have an effect on the number and reactivity of Lewis acid and base sites, as well as the transesterification of glycerides, the esterification of fatty acids, and the hydrolysis of glycerides and biodiesel.

Coating oil comprising by-products from the manufacture of fatty acid alkyl esters and/or biodiesel

Tran, B.L., *et al.,* Nalco Co., US8163059, April 24, 2012

A coating oil composition and methods of using the composition for dust control is provided. The coating oil comprises utilizing a by-product from the manufacture of biodiesel and/or fatty alkyl esters, wherein the by-product comprises C_6–C_{24} saturated and unsaturated fatty acids, C_6–C_{24} saturated and unsaturated fatty acid salts, methyl esters, ethyl esters and combinations thereof.

Yogurt with a two-phase structure and method for production thereof

Crepel, P., *et al.*, Compagnie Gervais Danone, US8163316, April 24, 2012

The invention relates to a yogurt with a two-phase structure, comprising fat globules connected to a mixed system of protein material and fatty material and globules of free fat into which a flavor preparation can be incorporated. The invention further relates to a yogurt with a two-phase structure into which a chocolate preparation or a vanilla preparation containing chocolate chips has been incorporated and, furthermore, a method for production of such a yogurt with a two-phase structure.

Triglyceride plasticizers having low average levels of branching and process of making the same

Colle, K.S., *et al.*, ExxonMobil Chemical Patents Inc., US8163825, April 24, 2012

Triglyceride PVC plasticizers can be produced by recovery of C_5 to C_{10} aldehydes having low average levels of branching from a hydroformylation product, oxidizing the aldehydes with oxygen and/or air to form an acid, recovery of the resulting acid, and esterification with glycerol. Plasticizer compositions including such products or linear triglycerides combined with a secondary plasticizer and articles made therefrom are disclosed.

Photoluminescent heat-shrinkable films

Maruo, M., *et al.*, Gunze Ltd., US8169601, May 1, 2012

A primary object of the present invention is to provide a multi-layer heat-shrinkable styrene-based film that makes it possible, even when the film is transparent, to confirm that the film is correctly applied on a drink bottle and the like as a label. The present invention provides a heat-shrinkable styrene-based film having at least one layer containing a styrene-based resin containing a copolymer b1 of 98 to 40% by weight vinyl aromatic hydrocarbon and 2 to 60% by weight aliphatic unsaturated carboxylic acid ester, and/or a block copolymer b2 of 70 to 85% by weight vinyl aromatic hydrocarbon and 15 to 30% by weight conjugated diene hydrocarbon, and a fluorescent brightening agent in an amount of 100 to 2,000 weight ppm with respect to the total weight of the styrene-based resin. The present invention also provides a heat-shrinkable film having a three-layer structure containing front and back layers and a core layer, wherein the above-mentioned copolymer b1 and/or copolymer b2 forms the core layer.

Chocolate drawing method

Kuwabara, Y., and A. Kuwabara, US8173186, May 8, 2012

A method of making a drawing on a chocolate by causing a pulsed laser to irradiate the surface of a solid chocolate under limited operation conditions, and a chocolate manufactured by said method are provided. The irradiation energy per pulse and the irradiation energy per sweeping unit line length of the pulsed laser are limited to a certain range. The trace of the laser irradiation remains circular or arc-shaped on the surface of the chocolate manufactured under the above conditions. Further, the method makes a drawing on the surface of the chocolate, using the phenomenon that chocolate changes color when being irradiated by a pulsed laser under the above operation conditions.

Method of treatment using fatty acid synthesis inhibitors

Singh, S.B., *et al.*, Merck Sharp & Dohme Corp., US8173629, May 8, 2012

The present invention relates to natural products that possess fatty acid synthesis inhibitor activity and can be used to treat and prevent diseases such as obesity, cancer, diabetes, fungal infections, *Mycobacterium tuberculosis* infections, malarial infections, and other apicomplexan protozoal diseases.

Dry analytical element for lipase measurement

Arakawa, J., *et al.*, Fujifilm Corp., US8168406, May 1, 2012

The present invention provides a method for producing a dry analytical element for measurement of pancreatic lipase contained in a body fluid which contains triglyceride of long-chain alkyl fatty acid having 12 to 22 carbon atoms, monoglyceride lipase, and a glycerine measurement reagent, and comprises a water-impermeable support and at least one spreading or reagent layer, said method comprising the step of coating an emulsion/dispersion solution of triglyceride with an average particle size of 1 μm or less.

Lubricant blend composition

Thoen, J.A., *et al.,* Dow Global Technologies LLC, US8168572, May 1, 2012

The present invention relates to a lubricant composition. The present invention more particularly relates to a fully miscible lubricant composition that comprises a polyether and a renewable raw material such as an unsaturated seed or vegetable oil.

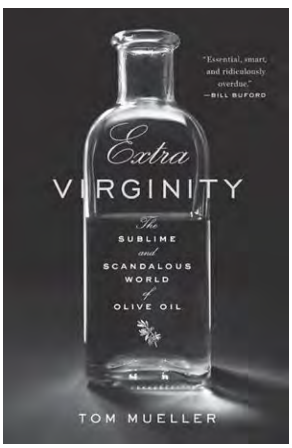
Patent information is compiled by Scott Bloomer, a registered US patent agent with Archer Daniels Midland Co., Decatur, Illinois, USA. Contact him at scott.bloomer@adm.com.

Book Review

Extra Virginity: The Sublime and Scandalous World of Olive Oil
Tom Mueller, W.W. Norton & Co., 2012,
$25.95, 256 pages, ISBN: 978-0-3930702-1-7

Catherine Watkins

To read Tom Mueller's *Extra Virginity: The Sublime and Scandalous World of Olive Oil* is to fall in love with the history, romance, and intrigue surrounding the olive and its fresh juice. Be forewarned, though; after reading the book, you are not likely ever again to settle for substandard supermarket oils and may even become an activist like Mueller, agitating for tougher standards and testing so that consumers the world over can know that what is labeled as extra virgin olive oil (EVOO) truly is EVOO.



Mueller is perhaps best known as the author of a 2007 article in *The New Yorker* magazine entitled "Slippery Business" (see tinyurl.com/SlipperyBusiness). In it, he exposed the trade in adulterated olive oil that remains a problem for the industry. Add to the list of challenges nonexistent profit margins, oversupply of poor-quality oil, mislabeling (whether conscious or not), and it is clear that reform is imperative.

"Olive oil without emotion is just a grease," says Lamberto Baccioni, who spent 30 years with Alfa Laval and presently is chief executive officer of Agrivision, an olive oil consulting firm in Swan Hill, Victoria, Australia. The truth of Baccioni's assertion is driven home with each page of Mueller's account. The world of olive oil is filled with passionate advocates, and Mueller draws deft word portraits of many key players. These are people who would make wonderful companions at a dinner party (at which EVOO would be served, naturally)—energetic, opinionated devotees of top-quality oil.

Take Thomas Jefferson, third president of the United States, who turns out to have been a whole-hearted supporter of olive oil. He first saw olive trees in the Alps in 1788, Mueller says, and called them "the richest gift of heaven" as well as "the most interesting plant in existence." It is thanks to Jefferson that the bald eagle shown on the Great Seal of the United States clutches an olive branch in its talons.

Then there is Lanfranco Conte, chair of food chemistry at the University of Udine (Italy), who organizes olive oil tastings at elementary and middle schools. He asserts that the children "sometimes describe the oils with a chemist's insights." The trade standard for EVOO, which sets the limit for free fatty acid content at 0.8%, "is still much too high to ensure excellent oil," Mueller quotes Conte as saying. (Indeed, presenters at the May 2012 AOCS short course on olive oil pointed out that current standards delineate the point at which EVOO is about to fail rather than identifying the point of maximum freshness.)

The youngest advocate of great olive oil is Cosimo, the 2-year-old grandchild of Paolo Pasquali, a former professor of philosophy and musician who created the OliveToLive business model, "which he says will allow restaurants and stores to serve the highest-quality olive oil, and to make a profit doing it." As Mueller sat talking with Pasquali, they sampled a "fierce oil: floridly fruity, brazenly bitter, lip-puckeringly pungent." Cosimo enters the room, sees the oil, and reaches to taste it. He reacts as if slapped on the face, coughing loudly and tearing up; Mueller expects the pungent oil is too much for him. Just the opposite—Cosimo "chokes out a word: '*Buono*!'"

In addition to detailing his meetings with passionate producers and canny suppliers on several continents, Mueller delivers an impressive amount of history. All of it is riveting, but nothing is as maddening as the accounts of adulteration and deception. Fraud has been a part of olive oil production for at least 5,000 years, Mueller notes: "The earliest known documents to mention olive oil, cuneiform tablets written at Ebla [Syria] in the twenty-fourth century BC, refer to teams of inspectors who checked olive growers and millers for fraudulent practices." More recently, US Health Commissioner Royal S. Copeland observed in 1922, according to Mueller, that "there is more profit in adulterating olive oil than there is in bootlegging."

Currently, fraud and mislabeling threaten the integrity of the EVOO designation, as evidenced by newspaper reports from around the world and research studies conducted by the Olive Center at the University of California, Davis. Growers, millers, and even oil chemists have received death threats for opposing the status quo. Olive oil bandits operate in Italy, siphoning oil out of storage silos.

Olive oil fraud is a very big—and profitable—business. Jack Cappozzo of the Institute for Food Safety and Health at the Illinois Institute of Technology in Summit-Argo (USA) presented his analysis of the potential economic gain of adulteration to participants at the AOCS short course on olive oil (see www.aocs.org/oliveoil). Adulteration at 10% with soybean oil equals a gain of about $0.20/kg, or approximately $200/metric ton, he said.

Mueller quotes Grazia De Carlo, matriarch of a family olive oil business founded in 1600 in the Puglia region of Italy, as she summed up the challenge facing all those who love great olive oils: "The road we've got to follow is *la cultura*: educating people about good oil is the only way out of this crisis. Because once someone tries a real extra virgin—an adult or a child, anybody with taste buds—they'll never go back to the fake kind."

Many observers think that a well-educated US market—"worth over $1.5 billion and climbing," Mueller says—is crucial to forcing change. In 2009, the United States passed Greece to become the third-largest consumer of olive oil, with a modest per capita consumption of 0.9 liters of oil per year. (Compare that with Greece's per-capita consumption of 21 liters/year.) Here's to awakening the sleeping US consumer to the joys of fresh olive juice before olive oil is just another commodity oil.

The book has several useful add-ons, including a glossary and an appendix on how to choose good oil. Take good notes, though, complete with page numbers—there is no index. For Mueller's blog as well as his thoughts about the great olive oils of the world, visit extravirginity.com.

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

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***Thomas P. Mawhinney*:** Cholesterol, *trans* Fatty Acid Content, Oilseed Meal

TABLE 1. An application and fat-reduction comparison

	Shortening		
Application	Coasun	Trancendim	Olestra
Baking	Yes	Yes	Yes
Frying	No	Yes	Yes
Sat. fat reduction	Up to 85%	Up to 60%	60% or more
Total fat reduction	Up to 40%	Not achievable	Up to 90%

Challenges for the food industry in the post-*trans* era

In the post-trans era, the big hurdle for the food industry is to make lower-calorie, lower-fat, lower-saturated-fat foods that still taste good and meet consumer demands. The following article looks at three technologies that may help with this challenge.

Peter Lin and Don Appleby

Health and wellness concerns are sweeping the globe. According to the World Health Organization's *World Health Statistics 2012* report, one in six adults is obese, one in 10 has diabetes, and one in three has elevated blood pressure, Obesity and its resulting health consequences impose an increasing economic burden on national health care systems worldwide. The global health expenditure on diabetes alone is expected to total at least $490 billion by 2030 (Zhang, P., *et al.*, Global healthcare expenditure on diabetes for 2010 and 2030, *Diabetes Res. Clin. Pract.* 87:293–301, 2010). As governments bear a greater percentage of these costs, politicians will be forced to require food companies to reformulate their products to have significantly lower caloric density, to limit serving sizes, or, at the extreme, to cease sales of certain foods.

Some national and local governments are already taking action. New York City was first to ban the sale of foods containing *trans* fats and has recently announced it will ban the sale of large-sized sugar-sweetened soda in 2013. San Francisco has banned toys in McDonald's "Happy Meals." Mexico has banned "unhealthy" products such as chips and cookies from their school system lunches. Even some corporations are getting into the act. The Disney Channel is refusing to advertise unhealthful foods on their network.

Consumers are also becoming more aware of the nutritional content of foods they buy. Recent studies show that two-thirds of consumers in the United States say they look at calories and total fat on the nutrition label when deciding what new foods to buy (International Food Information Council—*2011 Food & Health Survey*). Such nutritional awareness on the part of consumers is being accelerated by dietary fat recommendations and nutrition labeling initiatives in the United States, Canada, United Kingdom, European Union, Japan, Korea, Philippines, Australia, and other countries.

With so much market pressure, the newest hurdle for the food industry is to make lower-calorie, lower-fat, lower-saturated-fat foods that still taste good and meet consumer demands.

Consumers desire indulgent flavors in baked goods and confections. Low-calorie and low-fat products are often relegated to niche products owing to taste and texture compromises. Beverage manufacturers have successfully navigated these waters by developing great-tasting diet sodas, such as Diet Coke and Diet Pepsi. A solution in the bakery industry has been more elusive. However, there are technologies that may help address these challenges, including Coasun ™ SA, Trancendim™, and Olestra.

Coasun SA structured shortening delivers reduced fat and sat fat

Coasun SA (Guelph, Ontario, Canada) structured monoacylglyceride (MAG) gel behaves as a solid at room temperature, like conventional shortening. Coasun shortenings are reported to be substitutes for vegetable shortening, butter, lard, and bakers' margarine and are suitable for making muffins, cookies, cakes, brownies, biscuits, breads, pie crusts, and biscotti without any quality compromises.

It uses MAG to form an oil-in-water emulsion that is 1–5 micrometers (μm) in diameter. The water-swollen multilamellar globules are reported to be interconnected via hydrogen bonding where the surface charges (aided by stearic acid) are adjusted to deliver a solid

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TABLE 2. Nutritional values for chocolate chip cookies made with three shortening substitutes

Chocolate chip cookie	Control	Coasun	Trancendim	Olestra
Calories	250	230	250	185
Fat (g)	11	9	11	5
Sat. fat (g)	3.5	2	2	2
trans fat (g)	2	0	0g	0

shortening-like rheology (Marangoni *et al.,* 2007a,b). MAG gel is composed of vegetable oil (55%), water (40%), MAG (4.5%), and stearic acid (0.25%).

Structured MAG gel is similar to mayonnaise in that both are oil-in-water emulsions. Mayonnaise is emulsified by egg yolk lecithin and stabilized by mustard powder. Mayonnaise globules are typically 10–40 μm in diameter, substantially larger than the MAG gel particles. Unlike MAG gel, mayonnaise is not a good shortening substitute because it does not have the structural integrity needed to withstand the dough-making processes in baking owing to its large, easily collapsible globules. The MAG gel's inherently smaller particle size and interconnection significantly increase its rheology to withstand dough-making shear stresses to provide its shortening functionality.

Trancendim structured shortening delivers reduced sat fat

Caravan Ingredients (Dolton, Illinois, USA) developed Trancendim to deliver a zero-*trans*, reduced-saturates alternative for structuring fats and oils. Trancendim shortenings can be used to prepare cookies, donuts, icing, pastries, frying, and laminated products. These shortenings provide significant saturated fat reduction (up to 60%) while eliminating hydrogenated and palm-based fats (palm and palm kernel) from the ingredient declarations. The structured shortening can be used in both baking and frying applications.

Trancendim is composed mainly of diglyceride with minor amounts of monoglyceride and triglyceride. It replaces the hydrogenated hardstocks in shortenings and margarines and improves the crystallization properties by promoting the β′ polymorph formation. It is reported to increase shortening production efficiency and reduce production cost by increasing the rate of shortening crystallization and reducing production time.

Trancendim shortening is produced by combining Trancendim with vegetable oil and votating the blend into shortening. A range of Trancendim from 5–30% can be used, but the preferred range is 15–20% (US Patent number 7691428 B2).

Olestra: a zero-calorie, zero-saturated and zero-*trans*-fat substitute derived from sugar and oil

Procter & Gamble scientists serendipitously discovered this noncaloric fat substitute in the late 1960s while looking for a more digestible fat. After thorough review of numerous clinical study data, the US Food and Drug Administration approved the use of olestra for salted snack applications in 1996. Olestra is currently approved in the United States for all ready-to-eat and ready-to-heat baked goods and mixes (cookies, cakes, puff pastries, breads, etc.); confections (including chocolates); cheeses (pizza, cheese sauces); ice cream and whipped toppings; sauces; salted snacks and popcorn. It is approved in more than 20 countries including Mexico, China, South Korea, and others.

Olestra is a fat substitute made from sucrose and fatty acids from vegetable oils. It consists primarily of the sucrose octa-esters of fatty acids with lower amounts of hepta- and hexa-esters. Olestra contributes zero calories and zero saturated or *trans* fats to the diet because it is not absorbed by the human body. Normal fat absorption via lipase is not applicable to olestra. Lipase does not hydrolyze the esterified fatty acids of olestra because of the steric hindrance due to the large number of fatty acids surrounding the sucrose core. Olestra may be formulated to provide the full shortening functionalities to deliver baked good with full-fat texture and taste utilizing a variety of fatty acids without being absorbed by the body and producing the subsequent deleterious health effects of consuming these fats. Nor do these fatty acid constituents appear on the nutritional label (US Code of Federal Regulations 21CFR§172.867).

By combining the zero-calorie, fat-free aspects of olestra with the lipid-structuring ability of Trancendim diglycerides, it is possible to create shortenings containing significantly fewer calories, zero *trans* fat and very low saturated fatty acid content.

Olestra formulations are being evaluated in a number of applications including baked goods, confections, frozen desserts, fried foods, and cooking oils in several countries. In all cases, the olestra prototypes are indistinguishable from their full-fat controls. In some cases, the olestra prototypes are more preferred than full-fat controls in blind tests.

Benefit nd cost comparisons

These distinct shortening technologies deliver unique benefits and costs. All three technologies deliver shortening alternatives with significant saturated fat reduction of at least 60%, with options to achieve higher reductions. All options are reported to produce high-quality baked goods with no compromises (Table 1, page 527).

Table 2 shows nutritional benefits that can be achieved in chocolate chip cookie cookies by using these technologies. All three technologies significantly reduce the saturated and *trans*-fats contents. Each formulation provides differing levels of fat and caloric reduction.

Olestra delivers a much more consumer meaningful caloric and total fat reduction, in addition to the saturated and *trans* fat reductions.

The future is industry's to shape

Food industry managers may ask if they can afford these technologies. The real question ought to be, "Can the food industry afford not to use these technologies?" While these technologies are no substitute for a healthful lifestyle including exercise and a diet containing more fruits and vegetables, providing consumers with a choice of foods that satisfy the occasional emotional need for the indulgent taste they desire with no more calories or fat than is necessary just makes good business sense. It behooves industry to use all available tools to offer consumers great-tasting, satisfying foods with improved nutritional properties before regulators force their hand. It would be irresponsible to their consumers and shareholders to do otherwise.

Don Appleby (Appleby.db@pg.com) is the marketing manager for Procter & Gamble (P&G) Food Ingredients, Cincinnati, Ohio, USA. During his 35-year career at P&G, Appleby has held numerous positions in research and development, sales, and marketing for fats, oils, and oleochemicals. He has authored several articles and holds multiple patents in the field. Peter Lin, Ph.D. (lin.py.1@pg.com) is the principal scientist at P&G within the P&G Food Ingredients division. Lin has over 27 years of experience in the fats and oils business, with a focus on reformulating reduced-fat and –calorie food prototypes.

Busken "Skinny" Cookie: a small shining light

One regional bakery has successfully crossed the barrier by delivering a cookie with improved nutritional properties that also tastes good. For the past two years, Busken Bakery in Cincinnati, Ohio, USA, has seen a 37% increase in cookie sales resulting from introduction of the "Skinny" Cookie version of their signature "Really Happy Cookie" that contains less than half the fat and one-third fewer calories while delivering all the taste and satisfaction of the regular cookie. Busken has improved their profit margins by achieving premium pricing.

information

- Batte, H., A.J. Wright, S.H.J. Idziak, and A.G. Marangoni, Phase behavior, stability and mesomorphism of monostearin-oil-water gels, *Food Biophysics 2*:29–37 (2007a).
- Batte, H., A.J. Wright, S.H.J. Idziak, and A.G. Marangoni, Effect of processing conditions on the structure of monostearin–oil water gels, *Food Research International 40*:982–988 (2007b).

CALL FOR NO

A. Richard Baldwin Distinguished Service

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

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

Deadline: November 1

AOCS Award of Merit

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

Nature of the Award: A plaque.

Deadline: November 1

AOCS Fellow

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

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

Deadline: December 1

CALL FOR NOMINATIONS

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

ELECTRONIC SUBMISSIONS ONLY!

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

Supelco/Nicholas Pelick-AOCS Research

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, 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

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: A cash prize and a jade horse, provided by the Stephen and Lucy Chang endowed fund.

Deadline: October 15

AOCS Young Scientist Research

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

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

Deadline: November 1

Corporate Achievement

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

ACI/NBB Glycerine Innovation

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

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

Deadline: November 1

Samuel Rosen Memorial

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

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

Deadline: November 1

Herbert J. Dutton

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

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

Deadline: November 1

Timothy L. Mounts

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

Nature of the Award: $1,000 and a plaque provided by Bunge North America.

Deadline: November 1

Edible Applications Technology Outstanding Achievement

This award recognizes a scientist, technologist, or leader who has made significant contributions to the Division's field of interest, or made contributions to the advancement of edible oils.

Nature of the Award: $500 and a plaque.

Deadline: November 1

Ralph Holman Lifetime Achievement

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

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

Deadline: November 1

Alton E. Bailey

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: $750 and a plaque.

Deadline: November 1

AAOCS Award for Scientific Excellence in Lipid Research

This award recognizes a scientist from within the Australasian region that has made a significant research contribution towards fats and oils research, either cumulative or one major advancement.

Nature of the Award: Travel-and-expense allowance to attend the 2013 AAOCS Section meeting and a plaque.

Deadline: Varies

Thomas H. Smouse Fellowship

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

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

Deadline: February 1

Ralph H. Potts Memorial Fellowship

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

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

Deadline: October 15

Honored Student

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

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

Hans Kaunitz

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

Nature of the Award: $1,000, 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
- Lipid Oxidation and Quality Division Student Poster
- Processing Division Student Excellence Award
- Protein and Co-Products Division Student Poster
- Surfactants and Detergents Division Student Travel Award

Nature of the Award: Awards can consist of $100 to $1,000 and a certificate.

Deadline: Varies from October 15 to January 15

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

The 104th AOCS Annual Meeting & Expo will be held in Montréal, Québec, Canada from April 28–May 1, 2013.

AOCS Awards contact ➤ awards@aocs.org • **www.aocs.org/awards**

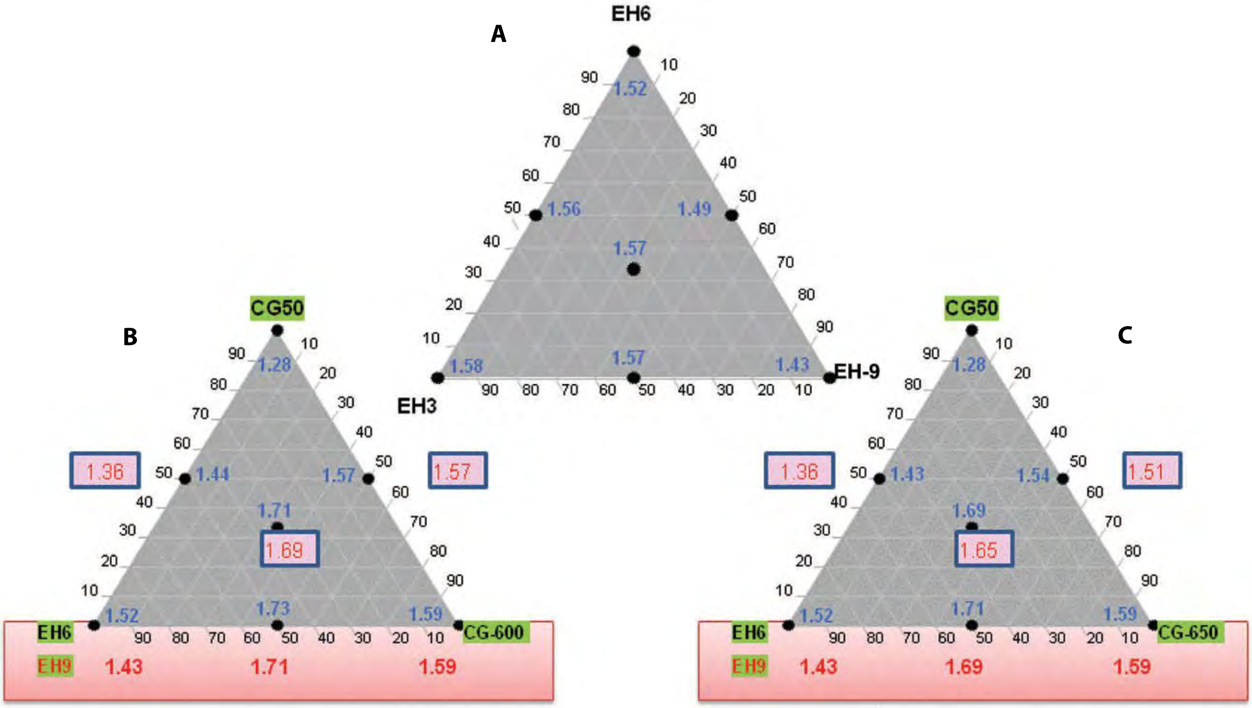

FIG. 1. *Spread index for ECOSURF surfactants and mixtures of ECOSURF surfactants and alkyl polyglucosides. Numbers shown in the diagrams are spread index values of the corresponding blends (black dot). (a) Ternary diagram of surfactant blends (EH-3/EH-6/EH-9). (b) Ternary diagrams of surfactant blends (left: EH-6/CG-50/CG-600; right: EH-6/CG-50/CG-650). (c) Ternary diagrams of surfactant blends (left: EH-9/CG-50/CG-600; right: EH-9/ CG-50/CG-650).*

Achieving effective, volatile organic compound-compliant formulations using biorenewable surfactant blends

Molly I. Busby and Sze-Sze Ng

In the cleaning industry today, cost and performance are no longer the only drivers considered when reformulating existing products or developing new ones. Cost and performance are still very important, of course, but formulations must also meet increasingly stringent volatile organic compound (VOC) rules. At the same time, government and consumers have come to expect each new generation of a product to be lower in toxicity and milder to the skin and to have a lower impact on the environment. The issue of environmental impact involves not only toxicity and biodegradability but also the conservation of natural resources.

One way that producers of cleaning products have addressed the issue of natural resources is to improve their manufacturing processes to reduce the use of energy and water and minimize the amount of waste created. A major new emphasis is now being placed on the use of biorenewable raw materials, and raw material suppliers have developed biorenewable surfactants, solvents, and other raw cleaning materials to help formulators achieve effective VOC-compliant formulations with substantial biorenewable content.

Traditional nonionic surfactants rely on hydrocarbon alcohols to provide the hydrophobic end with varying amounts of alkylene oxides to give the hydrophilic end. The properties of such surfactants can vary widely depending on the choice of the hydrocarbon alcohol as well as the nature and number of the alkylene oxide units. Alkoxylates of alkylphenols and highly branched alkyl alcohols tend to give the best wetting and reduction of surface tension, but they are also slower to biodegrade compared to primary and secondary alcohol alkoxylates.

Moderately branched alcohol alkoxylates, such as the ECOSURF™ EH surfactants (Dow Chemical, Co., Midland, Michigan, USA), which are mixed alkoxylates of 2-ethylhexanol, give a good balance of properties, with performance rivaling alkylphenol alkoxylates while maintaining good biodegradability and toxicology

DOWANOL, ECOSURF, and TRITON are trademarks of the Dow Chemical Co. (Dow):

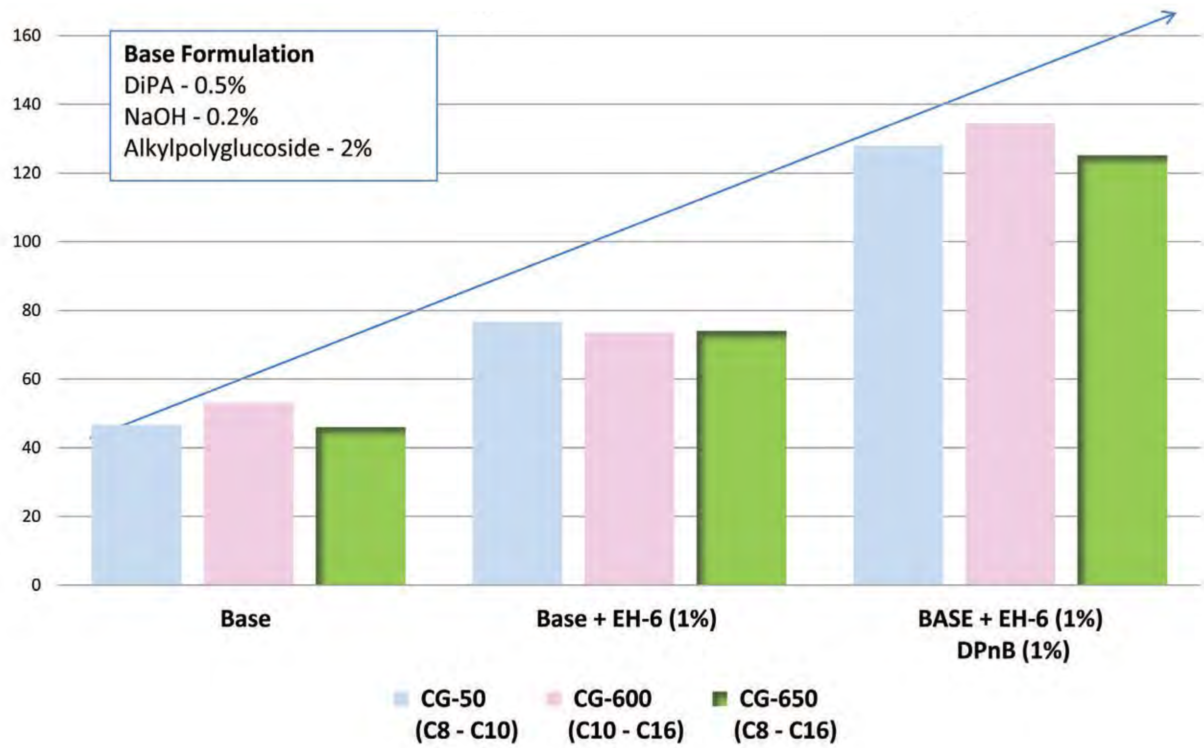

FIG. 2. *Relative cleaning efficiencies of alkyl polyglucoside/ECOSURF EH surfact blends. Abbreviations: DiPA, diisopropanolamine; Dowanol DPnB, dipropylene glycol-n-butyl ether; Edenor, C8–C10 fatty acid.*

profiles. Their very narrow gel range makes them easy to formulate and ideal for concentrates. They are competitive in the laundry area and superior to other surfactants for hard-surface cleaners.

For biorenewable surfactants, desired attributes include improved performance without a cost penalty and the ability to address multiple formulation needs through multifunctionality, mildness, and improved ecological and toxicity profiles. Alkyl polyglucosides, such as the Dow line of TRITON™ CG surfactants, are polyglucoside ethers with varying alkyl chain-length ranges. They offer good foaming, wetting, and detergency over a wide pH range. They have high filming and streaking performance and are tolerant to the presence of electrolytes. They are also mild to the skin, have low toxicity, and are readily biodegradable. These properties make them suitable for hard-surface cleaners, degreasers, and all-purpose cleaners.

Since alkyl polyglucosides are produced from sugars and fatty alcohols, they have 100% biorenewable content. The hydrophilic end of TRITON alkyl polyglucosides consists of an average of one to two cyclic glucose units, and the hydrophobic end consists of an aliphatic chain connected to the hydrophile through an ether linkage. The length of the hydrophobic chain can be varied. Increased hydrophobe length gives higher surface activity with lower water solubility, lower salt tolerance, and less stable foam.

Performance properties of surfactants have been measured in a wide variety of ways, but one of the most useful is the measurement of contact angle to describe how well a solution wets the surface to be cleaned. The measurement of contact angle requires fairly expensive equipment, however, so Dow has developed a simple method that can be used in any laboratory and requires only a micropipette. A controlled volume of test solution is deposited onto a substrate such as Parafilm® or glass tiles, the drop is allowed to spread for one minute, and the drop size is determined. Typically, three separate measurements are performed for each solution, and a spread index value is determined by dividing the average drop size of the sample by the drop size of pure water under identical conditions. Dow has developed a correlation table to relate the measured spread index to contact angle.

Using the spread index method, we explored blends of moderately branched surfactants with biorenewable surfactants. The results are shown in Figure 1a, b, and c.

In Figure 1a, the spread index numbers are shown for three ECOSURF surfactants. The black dots at the vertices of the triangle represent a single surfactant with the spread index shown in blue, the black dots on the sides of the triangle represent a 50:50 blend of the two surfactants on that side with the spread index shown in blue, and the black dot in the center represents an equal mixture of the three surfactants with the spread index shown in blue.The spread index value was largest for EH-3, which is the most hydrophobic, and smallest for EH-9, which is the most hydrophilic. Blends gave spread index values between the values of the pure components as expected.

In contrast, when the experiment was repeated with TRITON CG-50 (Fig. 1b, 1c), either CG-600 (Fig. 1b) or CG-650 (Fig. 1c), and either EH-6 or EH-9, blends gave significantly higher spread index values—1.71 and 1.69—than any of the pure components by themselves. These results indicate that blending of an alkyl polyglucoside with a moderately branched alkoxylate gives a synergistic improvement in wetting. This improved wetting translated into

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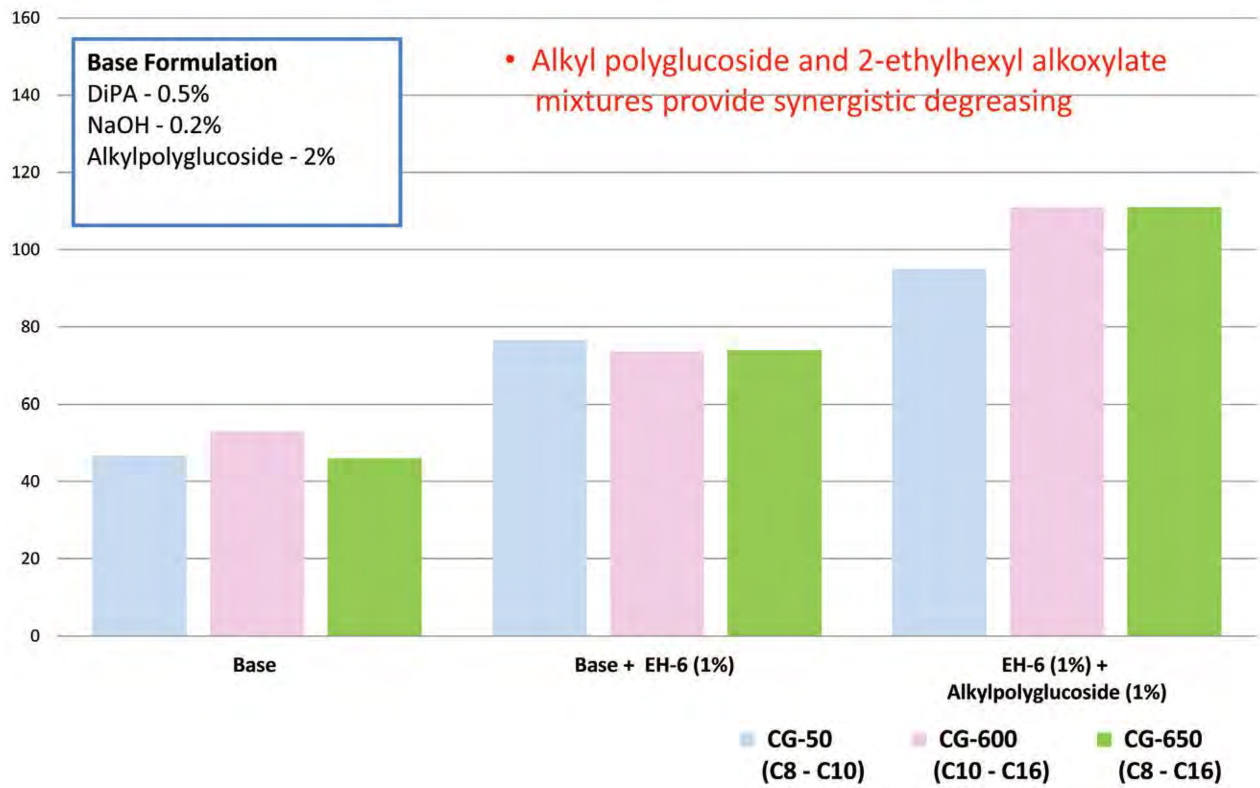

FIG. 3. *Synergistic effects of blends of alkyl polyglucosides with ECOSURF EH surfactants. For abbreviations see Figure 2.*

improved cleaning as shown in Figures 2 (page 533) and 3 (page 534).

In Figure 2 (on page 533), three base formulations containing 2% of TRITON surfactants CG-50, CG-600 and CG-650 were prepared with 0. 5% DiPA (diisopropanolamine) and 0.2% NaOH, and cleaning efficiency for greasy soils was measured. Results are shown by the first set of bars. When 1% ECOSURF EH-6 surfactant was added to these base formulations, cleaning efficiency was significantly improved as shown by the middle set of bars, and when both 1% ECOSURF EH-6 and 1% DOWANOL DPnB glycol ether solvent (dipropylene glycol n-butyl ether) were added to the base formulations, the improvement was even greater as shown by the third set of bars.

Figure 3 shows results for additional formulations containing CG surfactants and ECOSURF EH-6. The left set of bars in Figure 3 represents results for the base formulations with 2% CG surfactant, 0.5% DiPA, and 0.2% NaOH, and the middle set of bars shows results for the base formulations plus 1% ECOSURF EH-6. These are the same results shown in Figure 2. The right set of bars in Figure 3 shows cleaning results for formulations containing 1% CG surfactant, 0.5% DiPA, 0.2% NaOH, and 1% ECOSURF EH-6.

TABLE 1. Starting formulations for zero VOC general cleaners

Ingredients	Concentration, wt%		
Di-isopropanol amine (DiPA)	0.50	0.50	0.50
DOWANOL DPnB	1.00	1.00	1.00
NaOH	0.20	0.20	0.20
ECOSURF EH-6	1.00	1.00	1.00
TRITON CG-50	1.00	—	—
TRITON CG-600	—	1.00	—
TRITON CG-650	—	—	1.00
Water	Balance	Balance	Balance

[a]Abbreviations: VOC, volatile organic compounds; DOWANOL DPnB, dipropylene glycol *n*-butyl ether

TABLE 2. All-purpose cleaner formulation, 0.5% VOC[a]

Ingredient	Concentration, wt%
TRITON CG-600	0.5
DiPA	0.25
Hydroxyethylimido diacetic acid	0.25
NaOH (50%)	0.2
Water	Balance

[a]For abbreviations see Table 1.

TABLE 3. Window cleaner, 1.5% VOC[a]

Ingredient	Concentration, wt%
DOWANOL-PnB	0.5
DOWANOL-DPM	0.75
ECOSURF EH-6	0.25
TRITON CG-50	0.5
Monoisopropanol amine	0.25
Water	Balance

[a]Abbreviations: DOWANOL DPM (dipropylene glycol methyl ether); for others see Table 1.

Surprisingly, these formulations gave significantly better results compared to the same formulations with 2% CG surfactants and further illustrate the synergistic improvements possible with blends of alkyl polyglucosides with moderately branched alcohol alkoxylates.

The California Air Resources Board (CARB) proposed VOC changes that will drop VOC levels for glass cleaners, metal cleaners/polishes, and spot removers to 3% and general-purpose cleaners to 0.5% at the end of 2012. More efficient ingredients will allow ingredient levels to be lowered, reducing VOC. In addition, new low- or zero-VOC ingredients are now available, and these will be the keys for formulators to meet the new CARB rules.

Di- and tri-isopropanolamines are zero-VOC replacements for monoethanolamine and monoisopropanolamine. There is now also a good selection of zero-VOC glycol ether solvents available with a good range of properties for cleaning formulations and of new chelants with improved toxicology profiles. By using these ingredients, it is possible to formulate low- or no-VOC products with good performance and better ecological and toxicological profiles. Representative base formulations are shown in Table 1.

The starting formulations in Tables 2 and 3 have good cleaning performance for general soils. They can be modified to target specific soils, but care should be taken to maintain the hydrophilic-lipophilic balance. pH can be modified by the use of amines.

The process of improving traditional cleaning ingredients and developing new, biorenewable ingredients helps formulators

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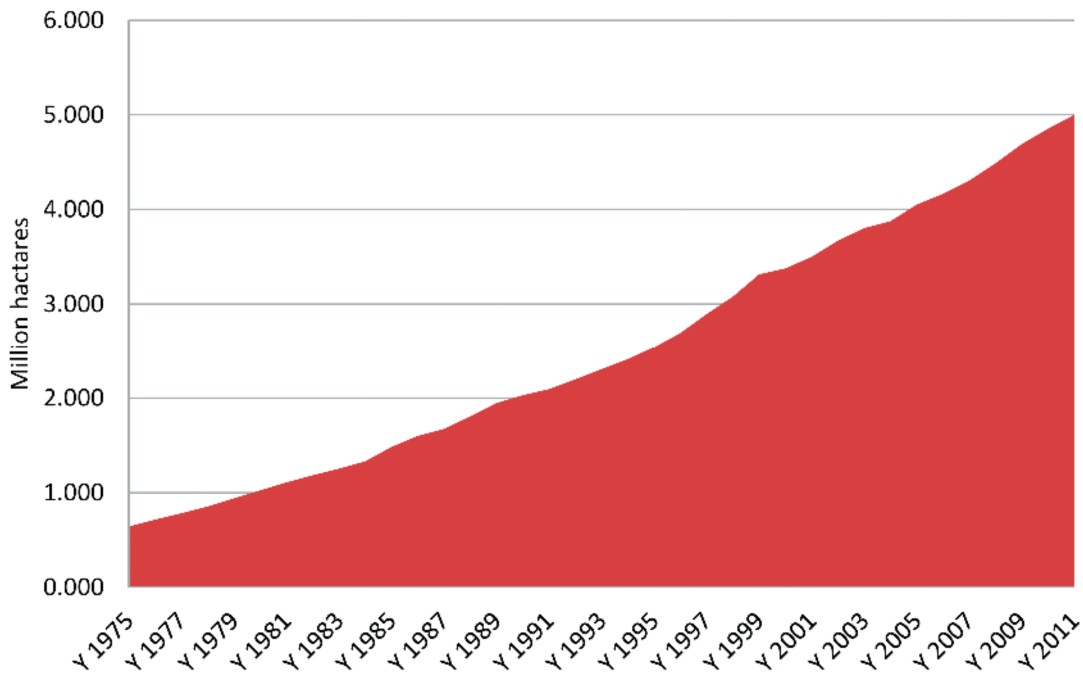

FIG. 1. *Oil palm planted area: 1975–2011 (million hectares).*

Malaysia: economic transformation advances oil palm industry

Choo Yuen May

Malaysia is currently the world's largest exporter of palm oil although it is the second-largest producer of the oil after neighboring Indonesia. With a humid tropical climate and temperature ranging from 24°C to 32°C throughout the year, coupled with ample sunshine and an evenly distributed annual rainfall of around 2000 mm, Malaysia is now home to the West African palm first introduced to Malaysia (then known as Malaya) as an ornamental plant in 1875. Commercial planting of oil palm did not take place until 1917. The rapid expansion of oil palm in the 1960s was encouraged by the Malaysian government, which recognized its potential as a complementary crop to rubber.

The main palm product exported until the 1970s was crude palm oil (CPO). At that time taxation and incentive policies were introduced to encourage the export of refined palm products. The importance of the palm oil trade to the Malaysian economy was affirmed with the founding of the Kuala Lumpur Stock Exchange (KLCE) for price setting, hedging, and disseminating market information to reduce market risk in the trading of palm oil. Currently, Bursa Malaysia Derivatives Bhd. (BMD) is the sole exchange operator for the futures and options market in Malaysia, and the CPO Futures Contract is the flagship contract of the BMD launched in 1980 by the KLCE.

The most significant change/ trend in the past year two years

Formerly, the industry was mainly concentrated on upstream activities such as cultivating palms for production of fruit bunches in plantations, processing fresh fruit bunches (FFB) in mills for CPO and palm kernel oil, producing refined palm oil (RPO) from CPO, and fractionating palm oil (both crude and refined) to obtain liquid olein and solid stearin fractions as well as oleochemical products. This traditional approach was changed when the Malaysian government introduced the Economic Transformation program (ETP) in September 2010. The ETP is a comprehensive effort that outlines a 10-year economic roadmap to energize Malaysia toward becoming a high-income nation by 2020. The implementation of the ETP gave the oil palm industry a new focus after it was identified as one of the 12 National Key Economic Areas (NKEA) to drive the nation's economy. The palm oil sector NKEA is aimed at improving upstream productivity and increasing downstream expansion, while focusing on the sustainable development of the oil palm industry. To overcome regulatory restrictions and limited land bank for development of new plantations, the government will focus on downstream activities such as processed food, biodiesel, second-generation biofuel, oleo derivatives, and phytonutrients. Further, plantation owners will be encouraged to look farther afield for upstream expansion and to enhance productivity toward the targeted CPO yield of 6 metric tons per hectare per year (MT/ha/yr).

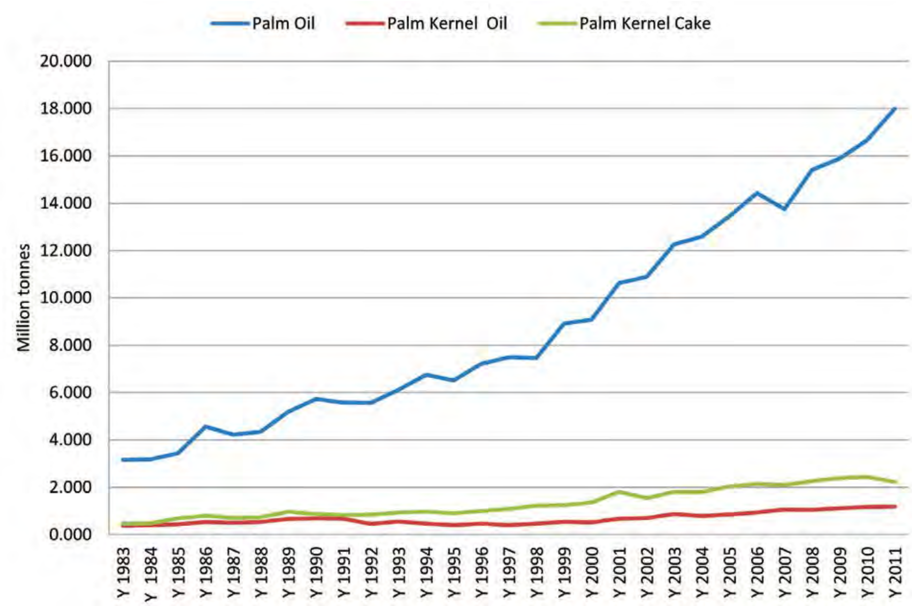

FIG. 2. *Annual export of palm oil products, 1983–2011 (million metric tons).*

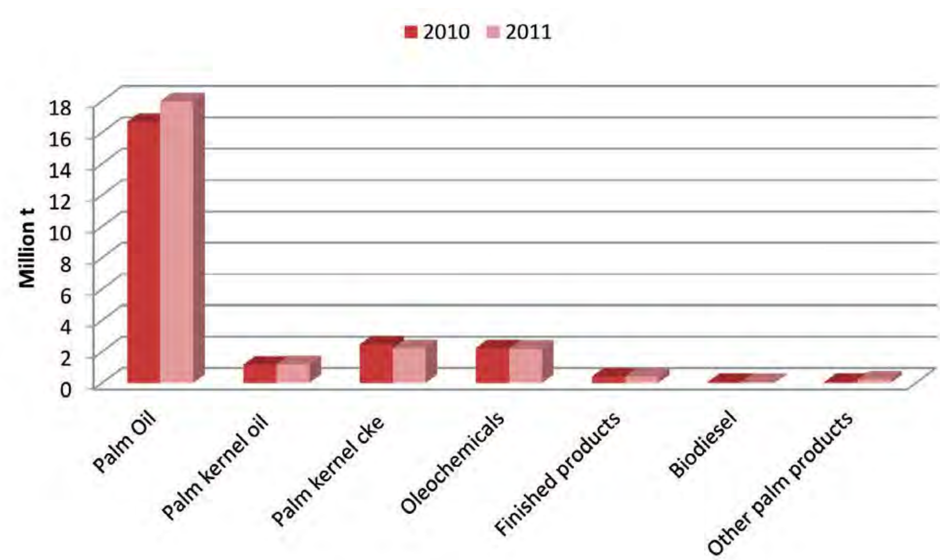

FIG. 3. *Annual export of oil palm products, 2010/2011.*

Production and exports

In 1920, Malaysia had a mere 400 ha under palm. This area increased to 0.6 million hectares in 1975 and to 5.0 million hectares in 2011 (Fig. 1).

In tandem with this increase in area of cultivated palm, Malaysia's annual export of palm oil increased steadily from 1.17 million metric tons (MMT) in 1975 to 18 MMT in 2011 (Fig. 2). The volume of 2010 and 2011 exports of various palm products is shown in Figure 3. Palm oil accounted for 74.1% of the palm products exported in 2011 (Fig. 4, page 538). Approximately 19% of the palm oil exports is CPO, and the remainder is processed palm oil.

The oil palm is the nation's most valuable agricultural crop, with annual exports of palm oil and palm-based products valued at $27 billion in 2011—up from $21 billion (34.5% increase) in 2010. The highest export earnings on record were due to higher export prices when palm oil prices traded firmer and the CPO price increased by 19.2% to $1,056 per metric ton in 2011 compared to that in 2010. The increase was largely due to market sentiments that were driven by the impact of a heavy rainfall season that disrupted harvesting, as well as a tight palm oil supply situation.

Processed palm oil export prices also rose significantly, influenced by higher crude oil prices in 2011 vis-à-vis 2010. Collectively, the sum of palm oil, palm kernel oil, and other palm oil products is the fourth-largest contributor to the country's economy, accounting for 8% of the Gross National Income (GNI) per capita. Malaysia exported 24.27 MMT of palm oil products in 2011, a 5.3% increase over the amount exported in 2010. The key importers of Malaysian palm oil are China People's Republic, the European Union, Pakistan, India, and the United States (Fig. 5, page 539).

Sustainable growth and competitiveness

World palm oil production more than tripled between 1995 and 2011, and increased demand for the oil has made significant contributions

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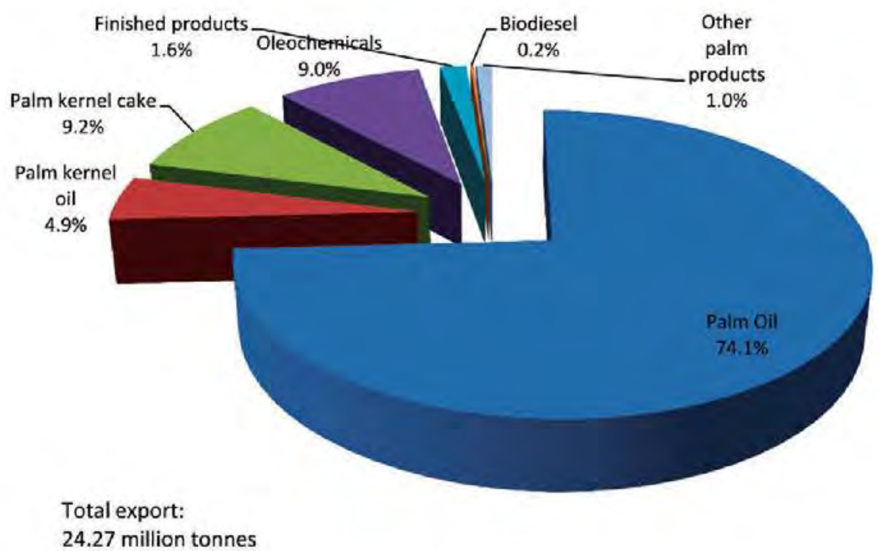

FIG. 4. *Breakdown of oil palm products exported in 2011 (Source:Malaysian Palm Oil Board: MPOB).*

contributing 28% to the world's production of oils and fats in 2011 (Fig. 6).

Malaysia has a total land mass of 329,000 square kilometers in Peninsular Malaysia and the states of Sabah and Sarawak (collectively known as East Malaysia) on the island of Borneo to the east (Fig. 7, page 540).

As Malaysia is geographically small, arable land for new oil palm plantations is scarce. Past growth of palm oil production in Malaysia was achieved by expanding onto land formerly used to cultivate other crops such as rubber, cacao, and coconut or onto degraded land or secondary forests. With a scarcity of suitable land banks, the industry can no longer rely on acreage expansion to raise production. The only way forward is to increase yields significantly. Although CPO yield has been stagnating (Fig. 8, page 540), the actual projection of yield per hectare and the theoretical yield potential of the oil palm can range from 3 MT/ha to 14 MT/ha (Fig. 9, page 541). The theoretical maximum palm oil yield is 18.2 MT/ha/yr (Corley, 1998). Malaysia continues to increase planters' productivity and competitiveness through a nationwide replacement of unproductive palms with

to the economies of Malaysia and Indonesia, which together produce an estimated 85% of the world's palm oil supply. Today, palm oil is the most important of the 17 major oils and fats traded in the global market, high-yielding hybrids, and the exercise includes replanting on lands owned by independent smallholders who contribute to 14% of the area under oil palm in Malaysia (Fig. 10, page 542).

There is also a need to close yield gaps between smallholders and plantation companies; the latter have greater financial resources to manage their estates better and attain higher yields. Under the oil palm sector NKEA, independent smallholders will be clustered around their nearest mills into cooperatives to promote, mandate, and implement best management practices so that the national CPO yield can be improved significantly by 2020 to 6 MT/ha/yr.

Besides good agricultural practices and good harvesting and processing methods, the competitiveness of the industry has also depended on planting improved materials that give better yield. The oil palm NKEA addresses this issue comprehensively. Ongoing research and development by the Malaysian Palm Oil Board (MPOB) and the industry have resulted in elite *dura* × *pisifera* material from conventional breeding with a yield exceeding 6 MT/ha/yr. Further, use of tissue culture technology has resulted in the development of clones with yields of 8–12 MT/ha/yr. These materials will go a long way toward supporting replanting efforts on old oil palm stands and ensuring increased palm oil production without land expansion.

In addition to investigations on selective breeding, the oil palm genome project undertaken in collaboration with an international consortium currently comprising 13 members has allowed MPOB to have the most comprehensive genetic blueprint of the oil palm to date. In the longer term, genomics-guided breeding will help expedite the production of improved planting material, tissue culture uniformity, high yield, and disease resistance.

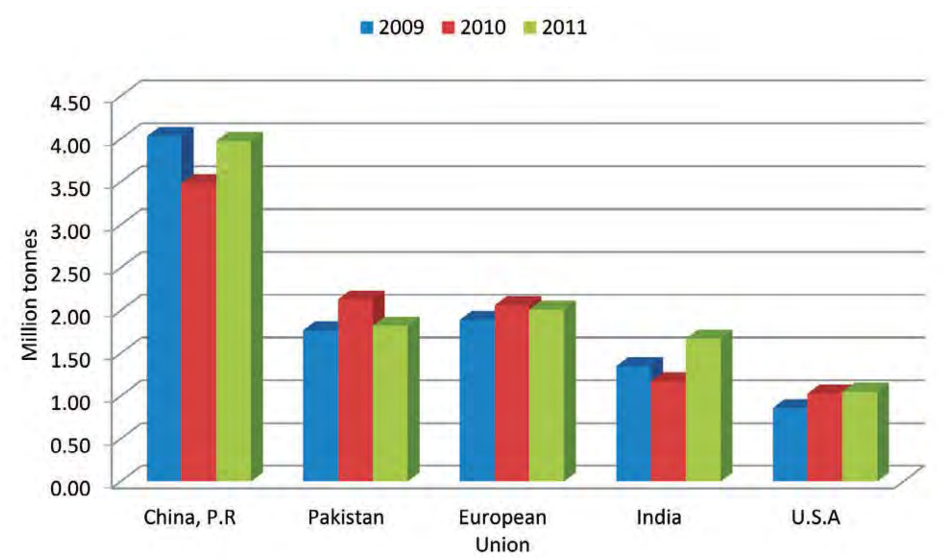

FIG. 5. *Major importers of Malaysian palm oil[a]: 2009–2011. Source: MPOB.*

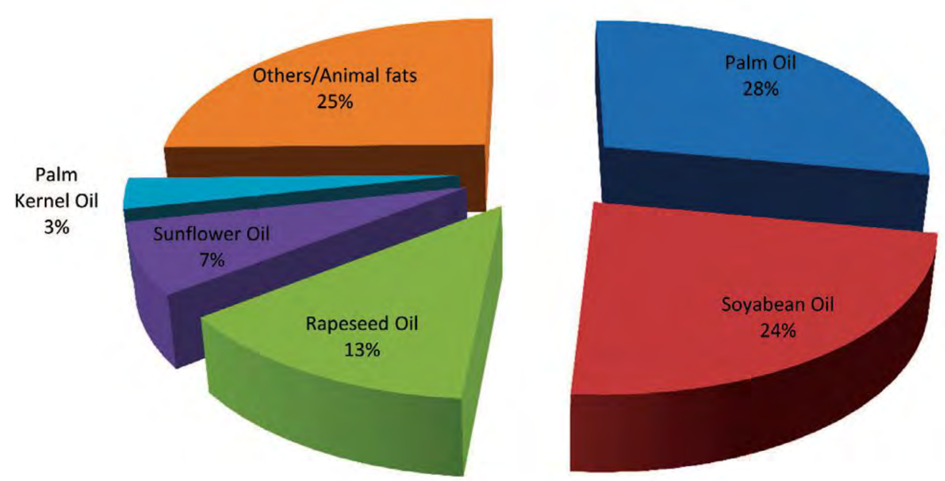

FIG. 6*. World production of palm oil vis-à-vis other vegetable oils in 2011 (Source: OIL WORLD Annual of May, 2012, ISTA Mielke GmbH, Germany.)*

The oil palm industry in Malaysia is a well-regulated industry with many laws and regulations governing environmental management, forest conservation, and sustainability. These include water management, soil conservation, biological control of pests, and reduction of waste and greenhouse gas (GHG) emissions. To address the issue of GHG emissions, which is related to global warming, one can use a life cycle approach (LCA) to develop an inventory of GHG emissions along the entire palm oil supply chain beginning with the cultivation and ending with the determination of palm products. Malaysia views mitigation using the LCA as an investment to ensure the sustainable production of palm oil as well as the sustainable competitiveness of palm oil in the global oils and fats market.

Key challenges and opportunities

One of the most challenging issues confronting the oil palm industry is proving its commitment to sustainable production of palm oil and oil palm products. Several nongovernmental organizations have related oil palm cultivation to deforestation and declining biodiversity. In response, several agri-food industries are promoting certified sustainable palm oil

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FIG. 7. *Map of Malaysia showing Peninsular and East Malaysia (states of Sabah and Sarawak).*

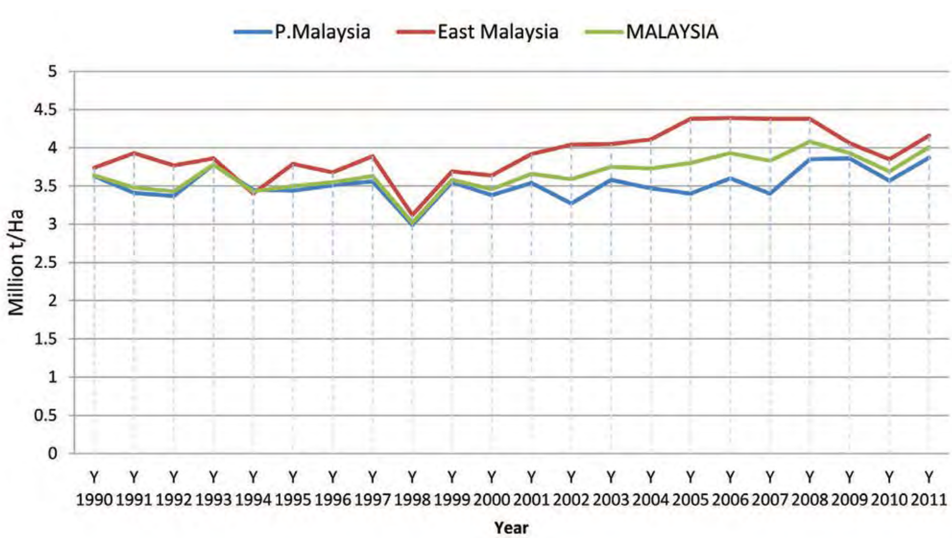

FIG. 8. *Crude palm oil yield: 1990 to 2011.*

(CSPO) to meet the increasing demand of buyers requiring proof of sustainability in the palm oil supply chain. Currently, CSPO—such as certified RSPO (Roundtable on Sustainable Palm Oil) palm oil—has grown to 11% of global CPO production, with Malaysian producers supplying 48% and Indonesia 40% of CSPO. Most producers of CSPO are big plantation companies that have the human resources and financial capacity to meet the sustainability criteria put forth by RSPO sustainable certification schemes and biofuel certification systems such as the International Sustainability and Carbon Certification and Round Table on Sustainable Biofuels.

One of the great opportunities for the palm industry will likely be related to nutrition. Palm oil is desirable as a food for its technical and nutritional attributes. It has good resistance to oxidation, which contributes to its longer shelf life. It is an ideal ingredient in frying oil blends owing to its stability under prolonged elevated temperature. Palm oil can be combined with more solid fractions, such as palm stearin, to make products of a required consistency without hydrogenation. Thus, palm oil has been used as a replacement for traditional hydrogenated seed oils as a strategy to circumvent *trans* fats. Blending palm oil with other oils to meet dietary recommendations of 1:1:1 ratio of saturated/monounsaturated/polyunsaturated fatty acids will improve the oxidative stability of soft oils such as soybean and canola oil.

Palm oil is phytonutrient rich, containing a number of minor components such as α- and β-carotene, tocotrienols, coenzyme Q10, phytosterols, and squalene. These minor components confer potent antioxidant and free-radical-scavenging activities and anti-cancer properties.

Regulatory outlook

With consumers from developed countries becoming increasingly concerned about the social and environmental aspects of production and marketing of products, sustainability requirements are being incorporated into national laws and regulations. Trade in palm oil-based biodiesel may be influenced by requirements to certify environmentally and socially sustainable production, examples being the European Union Renewable Energy Directive and the US Environmental Protection Agency Renewable Fuel Standard programs. The European Commission has already adopted a number of conditionalities and recognized seven voluntary sustainability standards (Voegele, 2011).

Notwithstanding land restrictions and environmental legislation, global demand for and output of palm oil is expected to increase steadily. Although current legislation for sustainable requirements is limited to palm oil (as well as all other vegetable oils) for production of biofuel, increasing consumer awareness on sustainability may drive the demand for sustainable palm oil regulations with respect to food. As the world's largest supplier of RSPO-certified sustainable palm oil, Malaysia is well prepared to handle environmental policies of importing countries.

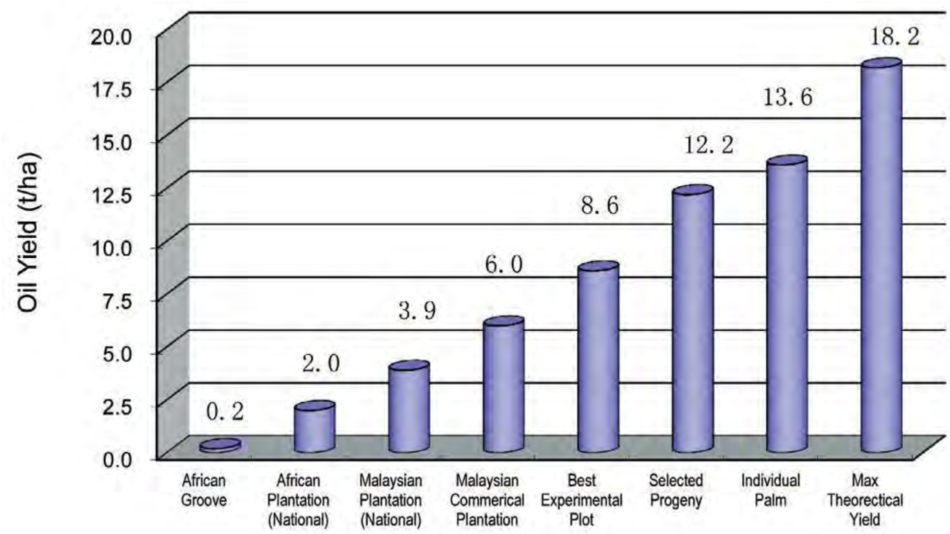

FIG. 9. *Yield potential of the oil palm.*

The continuity of palm

The oil palm is the world's most efficient oil-bearing crop in terms of land utilization and productivity. A hectare of cultivated oil palm land can supply about ten and five times more oil than a soybean or rapeseed hectare, respectively. Whether further improvements occur in the agronomic performance of the palm or the nutritional property of palm oil, the crop's future depends on innovation through research and development. With a head start of more than 100 years in the oil palm business, Malaysia has a competitive advantage and will continue to innovate with continued support and facilitation of agronomic research, technology transfer, and alliances with other centers of excellence to ensure the sustainable development of the industry.

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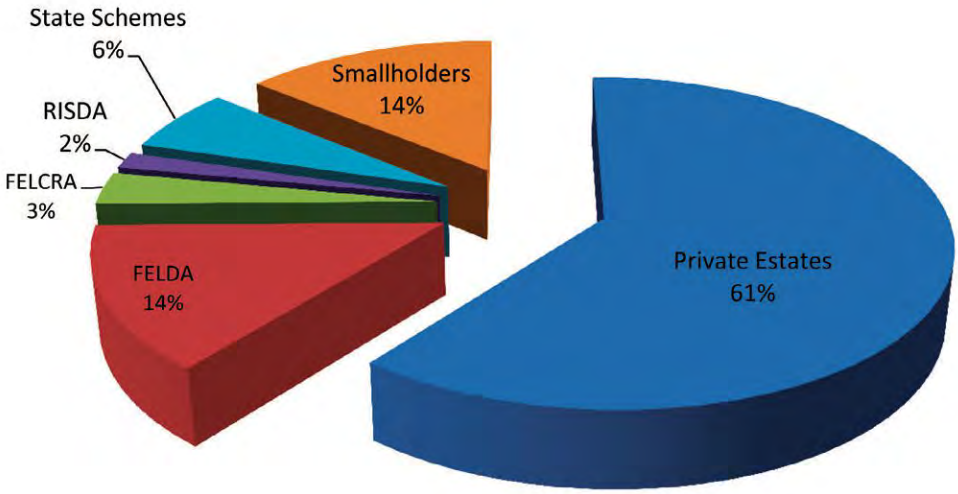

FIG. 10. *Distribution of oil palm planted area by category: 2011[Federal Land Development Authority (FELDA), Federal Land Consolidation and Rehabilitation Authority (FELCRA), Rubber Industry Smallholders' Development Authority (RISDA), and State Schemes are government schemes).*

Currently, 99% of palm oil in nonfood applications is used in basic oleochemical products such as fatty acids, fatty alcohols, methyl esters, and glycerin. The remaining 1% is in oleo derivatives that are developed from basic oleochemicals. One strategy to maximize economic opportunities of palm oil is to shift the share of nonfood applications from basic to higher-value oleo derivatives by producing agrochemicals, surfactants, biolubricants, biopolyols, and glycerol derivatives. Additionally, Malaysia is encouraging expansion of high-value food and health-based products such as functional food products and food supplements that contain palm phytonutrients.

Malaysia is expected to remain the world's second largest producer and a major exporter of oil palm products during 2012. Initiatives have already been set to ensure that the industry will progress in a responsible and sustainable manner for diversification into various food and nonfood products.

Choo Yuen May is an international award-winning scientist and inventor with 54 patents, author of innumerable articles, and a leader in the field of oil palm as a source of renewable energy. As the director general of the Malaysian Palm Oil Board, she leads and directs programs to advance the sustainable development, socially responsible expansion, and competitiveness of the Malaysian oil palm industry. She can be contacted at choo@mpob.gov.my.

information

- Corley, R.H.V., What is the upper limit to oil extraction ratio? In *Proceedings of International Conference on Oil and Kernel Production in Oil Palm—A Global Perspective*, edited by N. Rajanaidu, I.E. Henson, and B.S. Jalani, Palm Oil Research Institute of Malaysia, Bangi, Malaysia , 1998, pp. 256–269.
- *Malaysian Oil Palm Statistics 2011*, Malaysian Palm Oil Board, Ministry of Plantation Industries and Commodities, Malaysia.
- Deepening Malaysia's palm oil advantage, in *Economic Transformation Programme, A Roadmap for Malaysia*, Performance Management and Delivery Unit (PEMANDU), Prime Minister's Department, Malaysia, 2010, Chapter 9, pp. 281–314.
- Voegele, E., European Commission announces new voluntary schemes under RED, *Biodiesel Magazine*, tinyurl.com/Voegele-biodiesel, July 20, 2011.

VOC-COMPLIANT FORMULATIONS (CONTINUED FROM PAGE 535)

of cleaning products meet the increasingly stringent demands from governments and consumers. For example, we have found that blends of moderately branched alkoxylate surfactants and alkylpolyglucosides provide cleaning superior to either product alone. Blends are especially suitable for degreasing with excellent filming and streaking performance, an area where alkylpolyglucosides alone are much less effective. For amine additives, the more hydrophobic di- and triisopropanolamines are good replacements for ethanolamines, and they have the added benefit of having zero VOC. Use of these new ingredients and blends can help formulators meet the CARB proposed VOC rules without sacrificing performance.

Molly Busby received M.S. degrees in chemistry from the University of Nebraska-Lincoln (USA) and electrical engineering from West Virginia Institute of Technology (Montgomery, USA). At Dow Chemical, Molly has worked on heterogeneous catalysis, new product development and commercialization, fabric and surface care, and formulation design and development. She is active in the Consumer Specialty Products Association and AOCS. She may be contacted at Busbymi@dow.com.

Sze-Sze Ng completed her B.S. in chemistry from the University of Texas at Austin (USA) and her Ph.D. in organic chemistry from the Massachusetts Institute of Technology (Cambridge, USA). She joined Dow Chemical Co. in 2008. Since then she completed research and development projects involving rheology modifi rs and surfactants for consumer product applications and has worked with carbohydrate and amino acid surfactants. She may be contacted at SNg@dow.com.

EXTRACTS & DISTILLATES (CONTINUED FROM PAGE 519)

significant cytotoxicity against the cells. This is the first report about the isolation and characterization of OBs-G and OBs-M, and this knowledge could be used for novel applications of these raw materials.

Inhibition of gastrointestinal lipolysis by green tea, coffee, and Gomchui (*Ligularia fischeri*) tea polyphenols during simulated digestion

Cha, K.H., *et al.*, *J. Agric. Food Chem. 60*:7152–7157, 2012.

Green tea, coffee, and gomchui (*Ligularia fischeri*) tea, which are rich in polyphenols, may exhibit antiobesity effects by inhibiting pancreatic lipase. However, the bioavailability of some polyphenols is poor due to either degradation or absorption difficulties in the gastrointestinal tract, thus making their beneficial effects doubtful. This study was conducted to evaluate the inhibitory effect of three beverages on lipolysis and the contribution of their major polyphenols during simulated digestion. During simulated digestion, gomchui tea was the most potent at inhibiting gastrointestinal lipolysis, whereas green tea was the least potent. The strongest lipase inhibitor among purified major polyphenols was a green tea polyphenol, (−)-epigallocatechin gallate (EGCG; $IC_{50} = 1.8 \pm 0.57$ μM), followed by di-*O*-caffeoylquinic acid isomers (DCQA; IC_{50} from 12.7 ± 4.5 to 40.4 ± 2.3 μM), which are gomchui tea polyphenols. However, the stability of DCQA was greater than that of EGCG when subjected to simulated digestion. Taken together, gomchui tea, which has DCQA as the major polyphenol, showed stronger lipolysis inhibitory activity during simulated digestion compared to both green tea and coffee.

In vitro inhibitory effect on pancreatic lipase activity of subfractions from ethanol extracts of fermented oats (*Avena sativa* L.) and synergistic effect of three phenolic acids

Cai, S., *et al.*, *J. Agric. Food Chem. 60*:7245–725, 2012.

The purpose of the present work is to study the pancreatic lipase inhibitory effects of different subfractions (*n*-hexane, ethyl acetate (EA), *n*-butanol, and water) from ethanol extracts of nonfermented and fungi-fermented oats and to delineate the interactions of three primary phenolic acids in the EA subfractions. The EA subfraction showed the highest inhibitory effect on pancreatic lipase activity at 1.5 mg/mL compared to the other subfractions, regardless of whether the oats were fermented. Meanwhile, both of the EA subfractions of two fungi-fermented oats demonstrated more effective inhibitory activity than that of nonfermented oats. A positive correlation between the total phenolics content and inhibitory activity was found. The inhibitory ability of the EA subfraction from nonfermented or fermented oats also displayed a dose-dependent effect. The standards of caffeic, ferulic, and *p*-coumaric acids, mainly included in EA subfractions of fermented oats, also displayed a dose-dependent inhibitory effect. A synergistic effect of each binary combination of p-coumaric, ferulic, and caffeic acids was observed, especially at 150.0 μg/mL. Those results indicate that fungi-fermented oats have a more effective inhibitory ability on pancreatic lipase and polyphenols may be the most effective component and could be potentially used for dietary therapy of obesity. ■

CALENDAR (CONTINUED FROM PAGE 484)

2013

January 28–February 2, 2013. American Cleaning Institute Annual Meeting & Industry Convention, Orlando, Florida, USA. Information: www.cleaninginstitute.org

February 3–8, 2013. Feeds and Pet Food Extrusion, College Station, Texas, USA. Information: http://foodprotein.tamu.edu

February 28–March 1, 2013. HPCI (Home and Personal Care Ingredients) Exhibition & Conference, Bombay, India. Information: www.hpci-congress.com

March 10–15, 2013. Snack Food Processing: Extruded Snacks and Tortilla Chips, College Station, Texas, USA. Information: http://foodprotein.tamu.edu

March 10–12, 2013. Annual National Institute of Oilseed Products (NIOP) Convention, Scottsdale, Arizona, USA. Information: www.niop.org

March 17–22, 2013. Pittcon 2013, New Orleans, Louisiana, USA. Information: www. http://pittcon.org

April 7–11, 2013. 245th American Chemical Society National Meeting & Exposition, New Orleans, Louisiana, USA. Information: www.acs.org

April 9–10, 2013. OFI Middle East 2013, Cairo, Egypt. Information: www.ofievents.com/middle-east

April 10–12, 2013. IESD 2013 - The 14th China International Exhibition on Surfactant & Detergent, Shanghai, China. Information: http://tinyurl.com/IESD-2013

April 14–18, 2013. Membrane and Separations Technologies, College Station, Texas, USA. Information: Information: http://foodprotein.tamu.edu

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

May 29–31, 2013. 11th Yeast Lipid Conference, Halifax, Canada. Information: www.yeastlipidconference.tugraz.at/Future.htm

June 10–12, 2013. 9th World Surfactant Congress and Business Convention, Barcelona, Spain. Information: www.cesio-congress.eu

July 13–17, 2013. Institute of Food Technologists' Annual Meeting and Expo, McCormick Place, Chicago, Illinois, USA. Information: www.ift.org ■


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August 20–23, 2013 ★ Santiago, Chile
105th AOCS Annual Meeting & Expo
May 4–7, 2014 ★ San Antonio, Texas, USA
Montreux 2014
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October 6–9, 2014 ★ Montreux, Switzerland
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