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High-GLA safflower oil
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Biodiesel industry faces economic, policy challenges

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AOCS Mission Statement

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

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Calendar

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

July

July 2, 2010. 5th Jornada Lípidos, Nutrición y Salud (Conference on Lipids, Nutrition, and Health), Buenos Aires, Argentina. Information: email: gabrielapage@asaga.org.ar or asaga@asaga.org.ar.

July 5–9, 2010. 44th APCC (Asian and Pacific Coconut Community) COCOTECH Meeting and Coconut Festival, The Imperial Boat House Resort and Spa Hotel, Samui Island, Thailand. Information: www.apccsec.org/cocotech.html.

July 6–8, 2010. China Soybean Expo 2010, Harbin International Conference Exhibition and Sports Center, Heilongjiang Province, China. Information: www.chinasoybeanexpo.com/en.

July 8–9, 2010. AgriGenomics World Conference, Conrad Brussels Hotel, Brussels, Belgium. Information: www.selectbiosciences.com/conferences/AGWC2010.



July 11–16, 2010. 19th International Symposium on Plant Lipids, Cairns Convention Centre, Cairns, Australia. Information: www.ispl2010.org.

July 17–21, 2010. Institute of Food Technologists' Annual Meeting and Expo, McCormick Place, Chicago, Illinois, USA. Information: www.ift.org.

July 18–20, 2010. Food Processing Suppliers Association Process Expo, McCormick Place, Chicago, Illinois, USA. Information: <http://fpsa.org/processexpo/processexpo>.

July 25–30, 2010. Lipid Droplets: Metabolic Consequences of the Storage of Neutral Lipids, FASEB Summer Research Conference, Steamboat Springs, Colorado, USA. Information: www.faseb.org/Default.aspx?alias=www.faseb.org/src.

August

August 1–6, 2010. 19th World Congress of Soil Science, Brisbane, Australia. Information: www.19WCSS.org.au.

August 2–6, 2010. Curso Avanzado sobre Crushing de Semillas Oleaginosas (Advanced Course on Oil Seed Crushing), Rosario, Argentina. Information: email: gabrielapage@asaga.org.ar or asaga@asaga.org.ar.

August 21–24, 2010. Lipids, Inflammation, and Stress Reactions in Atherosclerosis: Mechanisms, Imaging, and Therapy, Kern Aspen Lipid Conference, Aspen, Colorado, USA. Information: www.kernconference.org.

CORRECTION

The top photo on page 209 of the April issue should have run with the preceding article on Page 207. The photo is of the members of the International Organization for Standardization Technical Committee 34/Subcommittee 16 on Horizontal Methods for Molecular Biomarker Analysis who attended a meeting in February in Tokyo. In addition, the photo at the bottom of page 209 should have been identified as being of attendees of a workshop on Sampling and Detection Methods held Friday, February 12, 2010, in Tokyo, Japan.

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AOCS Meeting Watch



July 11–16, 2010. 19th International Symposium on Plant Lipids, Cairns Convention Centre, Cairns, Australia. Information: www.ispl2010.org.



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



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

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

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

August 22–26, 2010. 240th American Chemical Society Autumn Meeting, Boston, Massachusetts, USA. Information: www.acs.org.

August 22–26, 2010. 15th World Congress of Food Science and Technology, Cape Town International Convention Centre, Cape Town, South Africa. Information: www.iufost2010.org.za.

August 26–27, 2010. Soy Innovation Africa, The Westin Grand, Cape Town, South Africa. Information: www.iufost2010.org.za/SoyInnovationAfrica.asp; <http://events.soyatech.com/conferences/SIA2010.htm>.

August 31–September 2, 2010. Farm Progress Show, Boone, Iowa, USA. Information: www.FarmProgressShow.com.

September

September 1–3, 2010. JAIMA/JSIA [Japan Analytical Instruments Manufacturers' Association/Japan Federation of Scientific Instrument Associations] Expo: 2010, Makuhari Messe, Japan. Information: www.jaimasis.jp.

September 7–11, 2010. 51st International Conference on the Bioscience of Lipids,

Bilbao, Spain. Information: www.icbl.unibe.ch.

September 8–11, 2010. 8th Encuentro de Gerentes de la Industria de Grasas y Aceites Alimentarios (Meeting for Managers of the Edible Fats and Oils Industry), Mendoza, Argentina. Information: email: gabrielapage@asaga.org.ar or asaga@asaga.org.ar.

September 13–14, 2010. FAME Summit and Exhibition, InterContinental Hotel, Berlin, Germany. Information: <http://greenworld-conferences.com>.

September 21–23, 2010. Analytica China 2010, Shanghai New International Expo Centre, Shanghai, People's Republic of China. Information: www.analyticachina.com.

September 26–29, 2010. 124th AOAC Annual Meeting & Exposition, Loews Royal Pacific at Universal Orlando, Orlando, Florida, USA. Information: www.aocs.org/meetings/124th_annual_mtg/main_2.htm.

September 28–29, 2010. Bioenergy International CANADA Expo & Conference, The Coast Plaza and Conference Centre, Calgary, Canada.

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inform

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AOCS 2.0 debuts



The new AOCS website features advanced functionality recommended by top web designers. Included are mega drop-down menus that allow site visitors to find links quickly.

Catherine Watkins

A drum roll, please: The new AOCS web experience, otherwise known as AOCS 2.0, debuted in early May. The unveiling followed more than a year of extraordinary efforts by all members of the AOCS staff, led by AOCS Web Strategy Manager Amy Lopez.

Lopez, who is a dissertation short of a Ph.D. in animal nutrition from the University of Illinois at Urbana-Champaign, is also in charge of developing AOCS' eLearning programs. As a scientist working for a scientific association, she naturally took a scientific approach to the redesign. She not only pored over reams of research on website usability and design, she also analyzed traffic patterns on the previous AOCS site to better understand what visitors to www.aocs.org need and want.

Like many nonprofit organizations, AOCS developed its first websites as time and staffing permitted, bit by bit (byte by byte?). The *ad hoc* approach led to a site with more than 3,000 separate pages, including some that had never been accessed. As Lopez began managing the herculean effort of redoing the old site, she used three organizing principles: usability, readability, and simplicity.

RESEARCH LEADS THE WAY

Lopez began by researching usability, or how to design a site from a user-centered standpoint, rather than from an organizational standpoint.

What she found was that AOCS—like most companies and organizations—had designed its previous sites based on nonweb

experience. “The web is a new medium and requires a new approach,” writes the chief usability researcher, Jakob Nielsen. Nielsen is a principal of the Nielsen Norman Group in Fremont, California, USA, which he co-founded with Donald A. Norman, a former vice president of research at Apple Computer. Rather than structuring a site to mirror the way an organization is structured, Nielsen says, a site should be structured to mirror users' tasks.

The key to taking the frustration out of finding information on any website is navigation designed for the tasks users

INFORM OFFERS DIGITAL EDITION

AOCS' member magazine, *inform*, now has both a print and a digital edition.

The new digital edition appears in a page-flipping format that replicates the experience of reading a print magazine. Each digital issue is fully searchable and all hyperlinks are live. PDFs of articles can be downloaded for easy viewing offline. Best of all, the digital version should be available seven to 10 days ahead of the previous online posting schedule.

In addition, the *inform* web news service on the AOCS home page has been enhanced so that stories will be organized by date instead of by topic area. Web news will be archived by month (a project that is not yet completed), so with the enhanced search functionality of the new site, pulling up a past story or stories on a given topic will be simple and fast.

Log in to www.aocs.org today and experience the new digital *inform* and web news.



The New York Times has called Jakob Nielsen (above) “the guru of webpage usability.” The new AOCS website design was based on his research.

want to accomplish. The new AOCS site exhibits Nielsen’s well-researched recommendation for navigation: mega drop-down menus (see photo, page 330).

Mega drop-downs, or big, two-dimensional panels divided into groups of navigation options, allow for one-click navigation for most users. All options are visible at once without scrolling. Navigation choices are structured through layout and typography.

Mega drop-downs will not help users, however, if the terms used do not reflect the tasks that visitors want to accomplish. For example, the old AOCS site had a tab for Technical Services. AOCS staff knew that the AOCS Technical Services department oversees method development, but users did not. Therefore, finding AOCS methods on the old site was difficult. Which is precisely why the new site has a tab for methods, and not Technical Services.

THE PROCESS OF REDESIGN

Next came the huge task of examining all 3,000+ pages on the old site and rewriting those that needed to remain. This part of

Highlights of the new www.aocs.org

HOMEPAGE

- “Find it fast” listing of the most-performed tasks
- Dynamically populated view of the site’s most-popular features and pages
- Increased space for *inform* web news headlines, making scanning easier

AOCS DIRECTORY

- Open access now to all listings (associations, industry, vendors, and technical resources) except the membership roster (which remains available only to members)

LISTSERVS

- 19 listservs: one each for AOCS divisions and sections
Technically, a listserv is an automatic mailing list server developed by Eric Thomas for BITNET in 1986. Practically speaking, when email is addressed to a listserv mailing list, it is automatically broadcast to everyone on the list. The result is similar to a newsgroup or forum, except that the messages are transmitted as email and are therefore available only to individuals on the list.

AOCS STORE

- Ability to read and write reviews of AOCS products
- Easy checkout and immediate download of PDF products such as methods and eChapters
- Personalized content delivery, including recommendations

MISCELLANEOUS

- Expanded free informational resources, including The AOCS Lipid Library
- New site for the AOCS Foundation (www.aocsfoundation.org) highlighting current funding projects and different donation options



the redesign involved the entire AOCS staff and was also based on research. (The new site has about 1,500 pages.)

As Janice Redish notes in *Letting Go of the Words: Writing Web Content that Works*, people come to websites for content. They want information that:

- Answers a question or helps them complete a task,
- Is easy to find and easy to understand, and
- Is accurate, up to date, and credible.

Research shows that web users want information, but actually do not read much—“especially before they get to the page that has the information they want,” Redish says. Further, even on informational pages, “they skim and scan before they start to read.” In fact, the order in which they read is affected by design more than by traditional left-to-right, top-to-bottom sequence (for those languages that are read from left to right).

Jakob Nielsen found that 79% of his test users “always scanned any new page they came across; only 16% read word-by-word.” Another study found that users read email newsletters even more abruptly than they read websites.

Now when visitors arrive at www.aocs.org, they will find content that can be skimmed and that uses about one-half the text that formerly appeared. In addition, the use of subheads, bulleted lists, and short paragraphs has greatly increased readability.

One reason web users skim content is that reading from computer monitors is tiring. Users also exhibit two distinct eye-tracking patterns, research shows. (Eye tracking is the process of measuring either the point of gaze or the motion of an eye relative to the head.) About 40% skim the page in an F pattern (two

horizontal stripes followed by a vertical stripe.); 60% skim in a Z pattern. These patterns can be modified through clever design: Studies show that images with faces or face-like shapes alter eye-tracking patterns.

WHAT IS NEXT?

The AOCS web team reports dreaming about the new website during the process of its redesign, including having nightmares about malformed URLs (Uniform Resource Locators, or web addresses).

Would Lopez go through a complete website overhaul again? Absolutely.

“It is a wonderful, fun job where we get to truly help people every day,” she says. “We all love what we do.”

If you have not already tested out the results of the 15-month project, head over to www.aocs.org now. See if you agree that the redesign has gone a long way toward fulfilling the AOCS Governing Board’s No. 1 objective on its current strategic plan: “The AOCS website should provide information ranging from late-breaking to archival, making AOCS the primary authoritative source of emerging issues and late-breaking news of importance to AOCS members and constituents.”

And if you do not agree, Amy Lopez looks forward to hearing from you at amylo@aocs.org.

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

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information

Here are four must-have books on web redesign and writing, recommended by the AOCS web redesign team:

■ **Designing Web Usability** by Jakob Nielsen (ISBN 1-56205-810-X)

Author Jakob Nielsen has made a living speaking and writing about web usability, page design, and content design. Named by *BusinessWeek* magazine as one of the world's most influential designers, he holds a Ph.D. in human-computer interaction from the Technical University of Denmark in Copenhagen. Nielsen's website—www.useit.com—is filled with resources on usability.

■ **Don't Make Me Think!** by Steve Krug (ISBN 0-321-34475-8)

Subtitled "A Common Sense Approach to Web Usability," the second edition of this reference aims "to completely change the way you think about web design."

■ **Killer Web Content** by Gerry McGovern (ISBN 0-7136-7704-X)

This book covers a great deal of ground, ranging from how to get a website into the first page of search results to understanding the benefits of blogs, RSS (Really Simple Syndication), and email newsletters.

■ **Letting Go of the Words: Writing Web Content that Works** by Janice Redish (ISBN 978-0-12-369486-7)

If only the authors of all 12 billion or so pages that exist on the web had read this book. If they had, all of us would have many fewer words to wade through while surfing.

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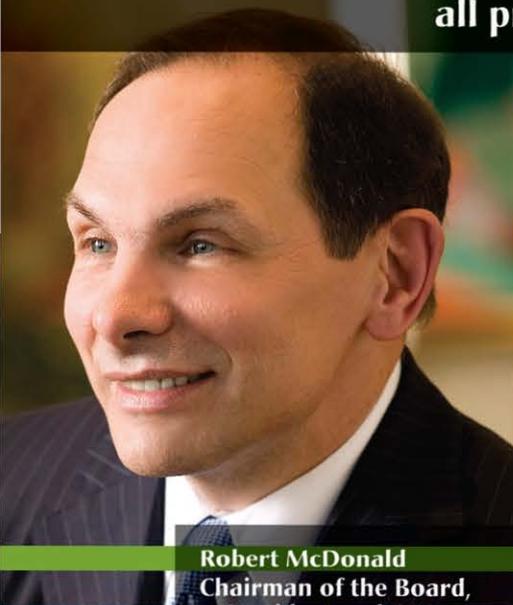
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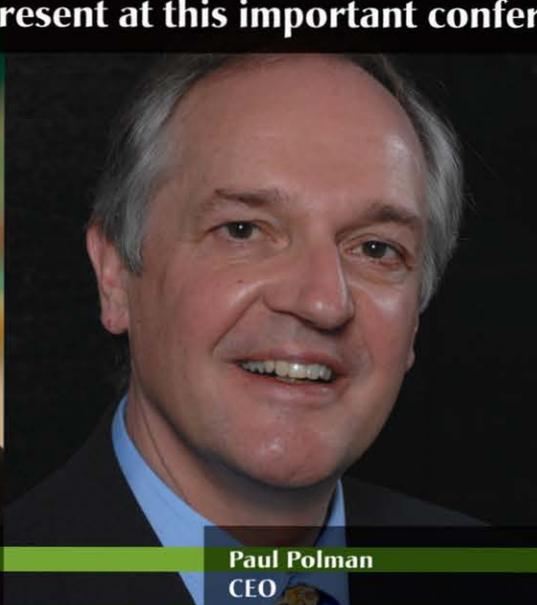
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President and CEO
The Procter & Gamble
Company
Presenting Tuesday
morning, 5 October



Paul Polman
CEO
Unilever
Presenting Tuesday
afternoon, 5 October



Kasper Rorsted
CEO
Henkel AG Co. KGaA
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www.aocs.org/meetings/Montreux

Biodiesel industry faces economic, policy challenges

NBB, AOCS leaders share insights into global conditions

Rebecca Richardson

Never in the short, stormy history of the biodiesel industry have more factors been pivotal in determining an industry's existence. Whereas policy decisions and a nervous economy continue to create hurdles, success with B20 (20% biodiesel + 80% petrodiesel) in new diesel engine technology and the promising future of biodiesel to reduce carbon emissions in new markets such as home heating oil keep industry supporters energized.

Two recent meetings provided further insights on the biodiesel industry. The Second International Congress on Biodiesel: The Science and The Technologies was held November 14–17, 2009, in Munich, Germany. The meeting was co-sponsored and organized by the American Oil Chemists' Society (AOCS) and Euro Fed Lipid. In the United States, the National Biodiesel Conference was held February 7–10, 2010, in Dallas, Texas, and was organized by the National Biodiesel Board (NBB). Although the agendas and intended audiences were somewhat different, several themes surfaced at both events.

Rebecca Richardson, regulatory and education specialist from MARC-IV Consulting, interviewed key leaders from AOCS and the NBB regarding the two annual conferences, capturing their comments related to the success of the events, impacts on the industry, and what the future holds for biodiesel worldwide:



Q *You have a longstanding record of attending and speaking at the National Biodiesel Conference and have served as the general chair for the International Congress on Biodiesel. How would you characterize the difference between the two meetings?*

A (*Haas*): They are different sorts of meetings—the National Biodiesel Conference unites producers, blenders, dealers, users, researchers, regulators, entrepreneurs, and people from a host of other areas. The International Congresses on Biodiesel are attended only by researchers. The scope of meeting topics reflects, or perhaps dictates, the audiences. The focus of the Congress is problem solving via research and new developments coming

out of labs and test bays, and even expanded in the Munich meeting to include a session on new nonbiodiesel fuels. By comparison, the National Biodiesel Conference includes a rainbow of topics dedicated to biodiesel, with research contributing one of the conference's many colors.

Q *When comparing the two meetings, do the same major issues surface, and do the discussions differ?*

A (*Haas*): The International Congress on Biodiesel does not provide detailed treatment of what might be termed local issues, such as US federal tax policy and RIN (renewable identification number) tracking (EPA's system for tracking volume requirements in Renewable Fuel Standard-2

THE INTERVIEWEES:



Michael Haas, of the US Department of Agriculture, Agricultural Research Service, Eastern Regional Research Center (Wyndmoor, Pennsylvania), served as the general chair for the 2nd International Congress on Biodiesel: The Science and The Technologies, in Munich, Germany. Haas is a research biochemist with the Agricultural Research Service and has conducted research on biodiesel for more than a decade. He is a past president of AOCS.



Steve Howell is president and founder of MARC-IV (Kearney, Missouri, USA), a consulting firm dedicated to the development of industrial products from agriculture. He also serves as the technical director for the National Biodiesel Board and is responsible for coordinating all technical sessions for the National Biodiesel Conference.



Joe Jobe has been the chief executive officer of the National Biodiesel Board (NBB) since 1999. Prior to his work with the NBB, Jobe was a fraud investigator for the Missouri Attorney General's Office. Jobe holds the professional credentials of certified public accountant and certified association executive. He is responsible for overseeing all national and international operations, including the NBB headquarters in Jefferson City, Missouri, as well as a policy office in Washington, DC.

[RFS-2]). These two issues are examples of session topics found at the annual National Biodiesel Conference. On the other hand, because it draws an international crowd, the Congress is a tremendous format for learning about issues one may rarely hear of at home—how problems were solved, what situations pertain, and the like in other countries or regions of the world. Since biodiesel feedstocks and the finished product are traded globally, a world view of challenges and solutions, and the great diversity of approaches and solutions that comes from diverse research labs, is a valuable asset.

Q *How would you characterize this year's National Biodiesel Conference compared with past years?*

A **(Jobe):** The 2008 conference in Orlando had almost 4,000 attendees, but that included a lot of “tire kickers” who were searching for ways to get into renewable energy as a sector. This year's conference had a lot fewer attendees, but they were the serious business people who have serious business models and technologies, and who have stuck it out through this period of unfavorable economic conditions.

Q *How have the program and the makeup of the Conference changed from the first year?*

A **(Jobe):** Every year we have worked hard to make sure the content of the conference is substantive, valuable, and current. The content has emphasized the priority topics of the day. For example, the first conference in 2004 emphasized passage of the biodiesel tax credit, which was signed into law later that year. The 2006 conference emphasized fuel quality (in the midst of the Minnesota requirement waiver). The 2009 conference emphasized sustainability issues such as flawed arguments of food vs. fuel and indirect land use change, and how those issues were being inaccurately and inappropriately leveled against biodiesel. The 2010 conference heavily emphasized the implementation of the RFS-2, with the final rule passing just days before the conference.

Q *With the US Environmental Protection Agency's final rule published for the updated RFS-2, is biodiesel included as part of that standard?*

A **(Jobe):** One thing that is important for people to understand is that EPA's final rule confirms that biodiesel, from a variety of feedstocks, qualifies as an “advanced biofuel” under the EPA's criteria and under federal law. This is very



The 2010 National Biodiesel Conference theme “Today's Impact, Tomorrow's Challenge” offered general and breakout sessions on issues including feedstock sourcing, new engine technology, use of biodiesel in heating oil, and advances in fuel quality.

significant because it means that biodiesel is the first advanced biofuel to reach successful commercialization in the United States. This is in spite of the fact that the EPA used unfavorable assumptions against biodiesel in its analysis of lifecycle greenhouse gas (GHG) emissions. The EPA attempted to “measure” GHG emissions from second, third, and fourth iterations of indirect emissions for biodiesel 20 years into the future. It assumed that petroleum diesel had no indirect emissions, compared with biodiesel's direct and indirect emissions. This violates the most fundamental elements of the scientific method: That comparative analysis must include the same comparative criteria and the same boundary conditions. Yet despite these worst-case-scenario assumptions for biodiesel, the EPA concluded that biodiesel meets the criteria as an advanced biofuel and has the best GHG reduction of any liquid fuel that has actually made it to nationwide commercialization.

Q *How will the EPA keep track of whether we are meeting the requirement?*

A **(Jobe):** The EPA has set up an electronic tracking system to track RINs that are generated when renewable fuels are produced. Obligated parties, which are basically petroleum refiners, must fulfill 1.1% of their gasoline and diesel output with “biomass-based diesel.” They can do this by either purchasing biodiesel or renewable

diesel gallons, or by purchasing RINs on the open market. There is a civil penalty of \$37,500 per day for noncompliance.

Q *Some say the science of renewable fuels has not kept up with the policy. Do you agree?*

A **(Jobe):** I agree with the statement but would state it a different way. Tortured attempts to assign speculative variables for one product, giving all other products a pass on the same variables, is in the realm of pseudo-science and not science. The current, flawed application of attempting to assess indirect impacts for biofuels, and no other fuels, is blatantly irrational and counterproductive. Science calls for the study of data to form a conclusion. Pseudo-science forms a conclusion and collects supporting data. Lifecycle analysis should estimate indirect impacts for all fuels or for none. At this moment there is an exploded oil derrick that is continuing to spew tens of thousands of barrels of oil per day into the Gulf of Mexico. These first-iteration, real-time indirect impacts are ignored, as are the emissions from entire forests that are being burned down in Alberta to conduct open pit mining of the oil shale that biodiesel is poised to replace. Yet biofuels must be accountable for third and fourth iterations of speculative, hypothetical, and unmeasurable decisions of millions of individuals on other continents decades into the future. AOCS is a highly respected science and research-

based organization. I hope its members will look into this area further, lend their credibility to science-based research on indirect land use change, and speak out against the pseudo-science currently being considered.

Q Steve, you've served as a technical expert in the biodiesel industry for many years, correct? During the Conference, what technical issues were people most interested in hearing about?

A (Howell): Yes, I've been the chair of the ASTM Biodiesel Standards Task Force since 1994 and have been active in the AOCS Biodiesel Expert Panel and the new AOCS Industrial Oil Products Division since their inception. This year, attendees seemed most interested in how biodiesel performs with the latest diesel engine after-treatment technology, progress on getting biodiesel blends on pipelines, and Bioheat™ (i.e., use of biodiesel as a home heating oil fuel). The interest in Bioheat was especially intense, since the oxygen in biodiesel reduces NO_x (nitrogen oxide) production in open flame applications and the oil heat industry just announced they want to transition to 100% biodiesel by 2050 to reduce their carbon footprint by 80%.

Q Where do you see the greatest challenges in the next five years for the biodiesel industry?

A (Howell): I think our biggest challenge will be to maintain the momentum we have built so far and implement the one billion gallon-per-year requirement in the RFS-2, while at the same time putting into place long-term efforts to get to significantly higher biodiesel volumes with a more "optimized biodiesel" than is possible with the excess fats and oils available as raw materials today.

Q You mention the new 2010 diesel engine technology. What are the original equipment manufacturers (OEMs) saying about biodiesel's performance with this new technology?

A (Howell): With significant funding from the soybean checkoff program, the NBB has worked cooperatively with the OEMs to test B20 in new diesel technology. Blends up to and including B20 work well in this new technology, as evidenced by Ford and GM announcing full acceptance of B20 in their 2011 diesel pickup truck models that have both NO_x and PM (particulate matter) after-treatments to meet EPA's air emissions standards. Today, more than 50% of OEMs

support B20 in their engines; virtually all OEMs support B5 (5% biodiesel).

Q With the RFS-2, there are a lot of other new fuels being considered. How do you see biodiesel stacking up against the renewable fuel competition?

A (Howell): We use a lot of fuel in this country and there is plenty of room for all of us. That being said, biodiesel is a low-capital, low-cost, high-yield way to turn fats and oils into a usable diesel fuel. Other processes have higher capital costs, require more processing steps and operating costs, or don't recapture the glycerine or oxygen in oils and fats. So we believe, moving forward, that biodiesel is positioned extremely well. Plus, as the industry grows and starts producing oils/fats optimized for biodiesel, it is possible to grow an oil/fat that will produce a *bona fide* biodiesel that freezes below -20°F (-29°C) and has superior long-term stability compared with today's ultra-low-sulfur diesel. This will make it possible and practical to use higher blends of biodiesel in cold weather—even B100 in home heating fuel.

Q Mike, getting back to the International Congress on Biodiesel and comparing it to the National Biodiesel Conference held in Dallas this year, has the science of biodiesel changed considerably in Europe or North America? If so, is the science coming closer together or diverging?

A (Haas): I don't see that the science, or in many cases even the affiliated matters, are that different between Europe and North America. In both sectors people are trying to make good product in the face of incredibly difficult economic times, and sometimes being faced with aggressive criticism from entrenched parties favoring the status quo. We have had trouble in the United States with tax credit systems, and the German government recently withdrew them from its biodiesel industry. In the United States we have tended to run low-percentage blends of biodiesel in petroleum while Germany had a history of running neat, or pure, biofuel. Today, Germany and the European Union have reached a consensus on a lower blend rate. People in both regions want quality biodiesel, made affordably by industries that are economically viable, and used in national fuel systems. What is incredible to see and to learn are the various approaches taken to

CONTINUED ON PAGE 370

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First high-GLA safflower oil on market

Catherine Watkins

The first high-GLA safflower oil has reached the market at commercial scale after six years of research and development work by Arcadia Biosciences, Inc. (Davis, California, USA).

With 44% minimum GLA, SONOVA™ 400 delivers 400 milligrams (mg) of γ -linolenic acid (GLA) per gram (g) of oil. Other sources of GLA deliver considerably less, including borage oil (20%), evening primrose oil (10%), black currant oil (15–20%), and hempseed oil (up to 5%).

“We have significant commercial volumes currently available,” said Frank Flider, Arcadia’s vice president of business development. “In a short time, we will be able to supply a very substantial portion of the world’s current GLA demand. Additionally, we are ramping up to supply new demand that is expected to develop with the availability of this more concentrated and cost-effective source of GLA.”

The market for GLA has suffered in past years from “very inelastic availability,” Flider noted, adding that sudden increases in demand caused wild price swings and made it difficult for formulators of finished products to secure adequate supplies at stable prices.

“As a result,” he said, “new product development and research have suffered and very few new products featuring GLA have been introduced over the past several years.”

METABOLIC PATHWAY AND APPLICATIONS

GLA is an omega-6 fatty acid (18:3n-6), synthesized in the body by the action of the Δ -6 desaturase (D6D) enzyme on linoleic acid (LA; 18:2n-6). Because the activity of D6D diminishes as a result of aging, stress, pollution, diet, smoking, drinking, and other activities of daily living, our bodies may produce suboptimal levels of GLA.

Once synthesized or ingested, GLA quickly is elongated to dihomo- γ -linolenic acid (DGLA; 20:3n-6). DGLA is a precursor to two important anti-inflammatory metabolites: prostaglandin PGE₁ and 15-OH-DGLA. Many of the favorable effects of GLA are attributed to increased tissue levels of PGE₁, which is known to suppress chronic inflammation. The anti-inflammatory benefits of GLA are recognized in medical foods such as Abbott Nutrition’s Oxepa®, which is used to modulate inflammation in sepsis, ARDS (acute respiratory distress syndrome), and ALI (acute lung injury). Although the body of literature concerning the effects of dietary GLA is sparse compared with the burgeoning body of research on

Table 1: Representative fatty acid composition^a for SONOVA™ 400

Fatty acid	Percentage	Fatty acid	Percentage
14:0	0.3	18:2	14.4
16:0	6.6	18:3 (GLA)	45.0
18:0	2.0	20:1	0.1
18:1	29.8	22:0	0.2

^aGLA: γ -linolenic acid.

Source: Arcadia Biosciences, Inc.

omega-3 fatty acids, there is some indication that GLA combined with omega-3 fatty acids may exhibit synergistic effects.

Animal and human studies suggest that dietary GLA may provide relief from rheumatoid arthritis and other inflammatory disorders. GLA has also been found to be helpful in alleviating the effects of atopic eczema, hyperactivity disorders, cyclical mastalgia (premenstrual breast pain), diabetic neuropathy (pain and loss of peripheral nerve function), and high blood pressure.

Dietary GLA has been shown to reduce low-density lipoprotein cholesterol, plasma triacylglycerols, and smooth muscle proliferation. It may also be helpful in treating dry eye conditions. *In vitro* studies have characterized GLA’s selective cytotoxic effects on more than 30 types of cancer cells. Others have shown evidence of the suppression of breast cancer genes, tumor growth, and metastasis. A study by Marie A. Schirmer and Stephen D. Phinney of the University of California, Davis, USA, showed that GLA helped maintain weight loss for people who had lost weight (*Journal of Nutrition* 137:1430–1435, 2007).

Recent studies on evening primrose oil have shown that dietary GLA has a measurable effect on skin softness, moisturization, and wrinkle reduction. This has not gone unnoticed by the personal care and cosmeceutical industries and may represent a significant new market for GLA.

In fact, there is a long, documented history of medicinal use of GLA-containing plants such as evening primrose. The Algonquin Indians chewed the seeds and rubbed the seed oil onto flesh wounds, according to *Herbal Medicine in Endocrinology and Metabolic Disease* (Food Products Press, Binghamton, New York, USA, 2005). The oil was known in Europe as the “King’s Cure All” because of its beneficial properties.

Although GLA does not have a DRI (Dietary Reference Intake), estimations of the amount that constitutes a therapeutic dose range from 500 to 2,000 mg daily. Given that standard 500-mg capsules of

evening primrose oil contain only 50 mg of GLA, the attractions of an oil that contains 44% GLA become immediately apparent.

DEVELOPMENT OF HIGH-GLA SAFFLOWER

The high-GLA safflower plant was developed through a combination of plant breeding and biotechnology.

As Flider previously noted (*inform 16:279–282, 2005*), Calgene LLC developed transgenic canola oil varieties containing as much as 43% GLA. (Calgene was a biotech research and development company in Davis, California, USA, that Monsanto Co. acquired in 1996.)

“This was accomplished by introducing Δ -6 and Δ -12 desaturase genes from the fungus *Mortierella alpina* into canola cells,” Flider writes. “. . . Despite the fact that Calgene conducted several generations of field trials on high-GLA canola varieties, for reasons not made public, the product was never commercially produced.”

Why safflower for the next attempt? Most safflower already is produced in defined growing regions throughout North America by contract farmers, making identity preservation easier to achieve. Because safflower is self-pollinating, pollen drift is minimal and identity preservation is improved relative to canola.

A further disadvantage of canola as a platform is the presence of significant quantities of α -linolenic acid (ALA; 18:3n-3). Production of stearidonic acid (18:4n-3) at the expense of GLA is possible in canola because ALA competes with LA for Δ -6 desaturase activity.

COST AND MARKET

SONOVA 400 is being marketed and distributed by Bioriginal Food & Science Corp., Saskatoon, Saskatchewan, Canada, in partnership with Arcadia.

In support of its commercialization program, Arcadia successfully completed the US Food and Drug Administration (FDA) regulatory process for GLA safflower in December 2009. Following established procedures for New Dietary Ingredients in Dietary Supplements, the FDA reviewed and acknowledged extensive data supporting the safety of GLA safflower, allowing it to be marketed and sold as an ingredient in dietary supplements.

“We have petitioned Canada but have not yet started on other geographies,” said Flider. “We are exploring regulatory requirements for Europe and Japan as well as other Asian and South American countries, but at this point have taken no formal action. We hope to be able to offer SONOVA 400 worldwide within a few years.”

“Typically, the cost involved with doubling the concentration of an active component will result in a per-unit price very significantly higher than two times,” Flider said. “Because it isn’t necessary to fractionate or concentrate the GLA through physico-chemical means, the per-unit GLA price for SONOVA 400 will be reasonably competitive with borage oil GLA.”

“SONOVA 400 is the first in what we hope to be a line of nutritional and functional oils developed by Arcadia,” he continued. “As we have lines of GLA safflower producing oil in excess of 65% GLA, more concentrated versions of SONOVA GLA oils can be expected in the foreseeable future.”

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

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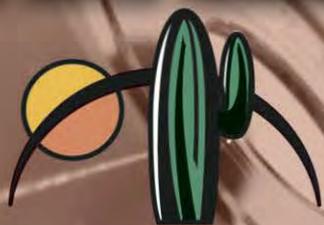


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News & Noteworthy

A new 15-minute method for determining melamine in milk has been developed by researchers at the University of Miami (Coral Gables, Florida, USA), led by Na Li, an assistant professor in the College of Engineering. Melamine is an industrial chemical used as an adulterant to add economic value to human and pet food. The combination of melamine and cyanuric acid can cause death in infants and pets as well as severe health problems in adults. The new method was described in *Applied Physics Letters* (96:133702–133705, 2010).

In related news, the tolerable daily intake (TDI) for melamine has been reduced by 60% by the European Food Safety Authority. The new TDI is 0.2 mg/kg bodyweight, which is the same as the level set by the World Health Organization in 2008.



A report from the US Government Accountability Office recommends that the Food and Drug Administration (FDA) clarify its goals in planning and management, as well as set better performance standards to boost oversight of drugs, medical devices, and food. FDA agreed with many criticisms and suggestions in the report, which also recommends enhancement for the agency's information systems and other scientific technology as well as improvement in employee recruitment. The report is available at <http://tinyurl.com/29eya3p>.



Unilever, Nestlé, and Danone occupy the top three spots of a new ranking of major food and beverage companies based on their corporate social responsibility. The Tomorrow's Value Rating by London-based consultancy Two Tomorrows ranked Unilever No. 1 because of the initiatives it has co-founded, such as the Marine Stewardship Council and the Roundtable on Sustainable Palm Oil. Unilever was also an early supporter of fair trade and an earlier adopter of nutritional labeling on products; the company also improved on important variables such as carbon emissions and water usage over recent years. The summary report is available at www.tomorrowsvaluering.com. ■



US finally delivers final olive oil standards

After five-and-a-half years of work, the United States Standards for Grades of Olive Oil are finally final.

The standards (<http://tinyurl.com/29cv8mc>) were published in the April 28, 2010, *Federal Register* by the Agricultural Marketing Service (AMS) of the Department of Agriculture. The revision replaces the first edition of the US grade standards, which were effective in March 1948 and used terms that are not consistent with current terminology.

Even though the Codex Alimentarius Commission has yet to set a limit on α -linolenic acid in olive oil, the new US standards do set limits on both α -linolenic acid and campesterol that are "consistent with commercial practices in the domestic industry." (Sterol analysis is used to detect the presence of seed oil adulterants in olive oil.)

AMS characterized its new limits for α -linolenic acid and campesterol as "slightly more liberal than the International Olive Council (IOC) standard," adding that a broader range of olive oils (including US production and oils from countries such

as Australia, Argentina, Israel, and New Zealand) will fall within the parameters of the new US standards.

Under the revised standards, oils with α -linolenic acid values between 1.0 and 1.5% and campesterol values between 4.0 and 4.5% would be subject to further testing when the product is officially certified by AMS. (The IOC limits are 1.0% for α -linolenic acid and 4.0% for campesterol.)

Thirty sets of comments were made in response to the notice of proposed rule-making in November 2004. Those comments are available online at <http://tinyurl.com/2444wuk>.

Oil Crops outlook

The US Department of Agriculture (USDA) produces monthly Oil Crops Outlook reports. The April 2010 report was written by Mark Ash, Erik Dohlman, and Kelsey Wittenberger and is excerpted below.

USDA's March 31 Prospective Plantings report indicated that US farmers intended to sow 78.1 million acres of soybeans in 2010. If realized, this would be a 1% increase over 2009's record of 77.5 million acres, or about 31.4 million hectares.

CONTINUED ON PAGE 343

Acquisitions/ mergers

In April 2010, **Monsanto Co.** (St. Louis, Missouri, USA) completed the purchase of the Chesterfield Village Research Center located in Chesterfield, Missouri, USA. Monsanto had previously announced an agreement to acquire the property from Pfizer Inc. The 1.5 million-square-foot (almost 140,000-square-meter) research center includes 250 laboratories, 108 plant growth chambers, and 2 acres of greenhouses.



Alfa Laval Group (Lund, Sweden) has acquired 65% of the shares in **Si Fang Stainless Steel Products Co. Ltd.** in China. Si Fang targets the food and beverage market in China with its sanitary product portfolio, including pumps, valves, and fittings. The acquisition closed on April 1, 2010.

Commodities

CACAO/CHOCOLATE

Cacao production is expected to be below 2009 levels, according to AP-FoodTechnology.com. The site reported that the **International Cocoa Organization** predicted in March 2010 that global cacao supplies could fall short of demand this year by around 18,000 metric tons (MT). However, it anticipated a surplus next year of as much as 90,000 MT because of the recent high prices filtering down to the growers in both Ghana and the Ivory Coast.

CANOLA/RAPESEED OIL

Viterra Inc. (Regina, Saskatchewan, Canada) has formed a joint venture with **Guangxi Beibu Gulf International Port Group Co. Ltd.** to build a canola crushing facility in the province of Guangxi, South China, at the port of Fangchenggang. The plant is expected to crush 2,000 MT of canola per day, or approximately 680,000 MT annually. Viterra will hold a 49% interest in the enterprise, the maximum allowable investment in the market; its partner will hold a 51% share. The joint venture will be known as **Fangchenggang Maple**

Grain & Oil Industrial Co. Ltd. Construction was to begin in May 2010 and is expected to be complete in approximately 18 months.

COCONUT OIL

SC Global Coco Products, Inc., based in Baybay City, the Philippines, plans to expand new markets in Asia. Emmanuel S. Licup, SC Global's managing director, told the *Business World* newspaper that the firm plans to export coconut oil and related products to South Korea, Japan, and China. These three countries are "very promising markets" for coconut-based products, he added. The company produces organic crude coconut oil; virgin coconut oil; coconut fatty acid distillate; organic flour; refined, bleached, and deodorized coconut oil; cochin; copra cake and mill; as well as coconut biofuel and lubricants.

COTTONSEED OIL

Seed giant **Monsanto Co.** has purchased a new facility in Casa Grande, Arizona. "The region represents an important agricultural environment for our cotton business," Ty Vaughn, cotton technology lead for Monsanto, said in a statement. "Having an even greater presence will allow us to develop and test our products right where they will be used by our farmer customers."

FISH OIL

Fish oil supplier **EPAX AS** (headquartered in Aalesund, Norway) has introduced a new website detailing its efforts in the areas of sustainability, traceability, and accountability. The site is at www.epax.com/EcoVision.

PALM OIL

Malaysia has no plan yet to make "sugar palms," or palm trees that produce sugar, a new commodity. Deputy Minister Hamzah Zainudin told the Bernama news agency in April 2010 that the Malaysian government was giving priority to strengthening the development of existing commodities, including oil palm, rubber, pepper, cacao, and timber.

SOYBEAN OIL

Hong Kong's **Noble Group** has opened its first South American oilseed process-

ing facility adjacent to the Timbúes Port Grain Terminal in Argentina. The new oilseed processing complex currently has an annual crush capacity of approximately 3 million metric tons (MMT) of soybeans, which are processed into high-protein soybean meal, pellets, and soybean oil for export.

SUNFLOWER OIL

Kernel Holding, one of the largest producers of sunflower oil on the Ukrainian vegetable oil market, has been allowed by Ukraine's Antimonopoly Committee to gain control over Kernel Holding's Ukrainian competitor **Allseeds Group**, according to the *Ukraine Business Daily* newspaper. Allseeds owned two processing plants in Ukraine with a total capacity of 565,000 MT/year, the report noted.



Ukrainian sunflower oil output will amount to about 3 MT during the 2009/2010 marketing year, according to oilseed association **UkrOliyaProm**. The group also reported that Ukraine obtained a permit in April 2010 to renew sunflower oil exports to the European Union (EU) countries. According to Director General Stepan Kapshuk, Ukrainian sunflower oil exported to the EU must be accompanied by a sanitary certificate issued by the territorial body of the state sanitary service, the sampling data, and the protocol of tests for mineral oil content. (Roughly 400,000 MT of Ukrainian sunflower oil headed for the EU were deliberately contaminated with mineral oil in 2008.)



Advanta Semillas of Argentina confirms that Nutrisun production in the United States has begun in 2010 in Texas and North Dakota. Production began in Spain in 2009 and in Argentina in 2006. "Planted area has been steadily growing, with an expected area of around 50,000 acres [about 20,234 hectares] for the current season," wrote Lucas Pan of Advanta in an email.

New ventures

China has a new cooking oil: **COFCO's** Fortune Natural Grains Blended Cooking Oil with life'sDHA. DHA, of course, is docosahexaenoic acid, and life'sDHA is

made from microalgae by **Martek Biosciences Corp.** David Abramson, Martek president, told NutraIngredients-USA.com: "This product [introduction] is a significant milestone as we seek to expand our presence in international markets like China, and as we continue to diversify our product applications, including the large and growing cooking oil category."



DuPont has introduced a new supplement for vegetarians: **New Harvest™ EPA** (eicosapentaenoic acid). The supplement contains 600 mg of EPA in every 1,200 mg soft gel capsule. It is produced via yeast fermentation.



Ag Processing Inc. (AGP) announced in April 2010 that it is expanding its export facility at the Port of Grays Harbor in the US state of Washington. The 13.5-acre expansion is expected to begin in the third quarter of 2010, with completion scheduled for early 2012. AGP calls itself "the largest farmer-owned soybean processor in the world" and is based in Omaha, Nebraska, USA.



A verification plan for sustainable and ethical trade of oil from the African Allanblackia tree is under development, Rik Kutsch Lojenga, executive director of the Ethical Biotrade, told FoodNavigator.com. The oil consists almost entirely of stearic and oleic fatty acids and is used in both food and personal care products. ■

Producers also intend to plant more area in 2010 to canola, cotton, flax, peanuts, and sunflowerseed than they did last year. Intended canola plantings in 2010 are up 49% from last year to 1.228 million acres. Though below the record acres planted eight to 10 years ago, attractive cash bids this spring are likely responsible for the sharp increase.

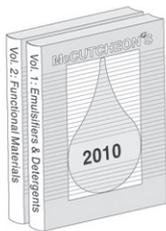
Sunflowerseed planting is expected to increase 7% in 2010 to 2.181 million acres—virtually all owing to an increase in nonoil-type (confectionery) area. Plantings of nonoil-type sunflowers may increase by 41% this year to 467,000 acres. Sunflowerseed growers will favor sowing more of the nonoil varieties this year because of a larger-than-usual price premium relative to the oil-type varieties.

US flaxseed acreage may increase for the first time since 2005. Despite a recent uptick in flaxseed imports from Canada, domestic prices have held steady. Planting intentions for flax in 2010 are at 410,000 acres, a 32% increase from last year but well below levels seen four years ago. Producers in North Dakota will account for nearly all of the increase in flax acreage.

With peanut stocks expected to decline against last year's carryover, growers intend to plant 8% more peanut acres in 2010. US planted area may rise to 1.201 million acres, compared to 1.116 million acres in 2009. The recent record high yields in peanuts have helped to offset the decline in peanut acreage, which would be the second-lowest since 1915.

Over the past year, cotton prices have strengthened considerably with a sharp reduction in stocks. Thus, US cotton plantings this year are expected to increase 15% to 10.5 million acres and help reverse a

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long-term decline in cottonseed production. Provided that yields rebound as well, 2010 cottonseed output could improve significantly from the 4.2 million short tons (3.8 million metric tons) produced in 2009—a 33-year low.

For the fourth consecutive month, domestic soybean crushing broke a previous monthly record. The February crush totaled 153.8 million bushels and pushed the crush for the first half of 2009/10 up to a record high 939.6 million bushels. However, slowing demand in the second half is expected to hold the season total well short of its peak for a full season (1.808 billion bushels in 2006/07). The forecast 2009/10 crush was unchanged in April at 1.73 billion bushels.

INTERNATIONAL OUTLOOK

Domestic crushing of soybeans in Brazil will be pressured by a sharp turnaround in crop production and processing in Argentina. Brazil's 2009/10 soybean crush was forecast down in April to 31.5 million metric tons (compared to 32.5 million metric tons in 2008/09). The reduction is associated with the exports of soybean meal from Brazil, which are expected at an eight-year low of 12 million metric tons (MMT). Similarly, Brazilian soybean oil exports are forecast at a 12-year low of 1.375 MMT. The large crop, however, will support soybean exports in 2009/10, which were forecast up 700,000 MT in April to 26.3 MMT.

Unlike a year ago, the Argentine soybean crop has not been stressed by a lack of rainfall. Yields look excellent throughout the country's main production region. USDA raised its soybean crop estimate for Argentina in April by 1 MMT to 54 MMT. About 27% of the crop was harvested as of the beginning of April 2010.

The abundant supply will provide additional support for Argentine processors, who are forecast to raise the soybean crush by 16% this year to 36.4 MMT. Exports of soybean meal and soybean oil should rebound strongly, although demand for soybean oil in biodiesel production is also likely to expand.

Soybean imports by China in 2009/10 were forecast 1 MMT higher in April to 43.5 MMT. To appreciate how important China is to world trade in soybeans, the United States—the world's top exporter—is seen exporting 39.3 MMT. Of course, US soybeans are shipped all across the world, but China alone represents 60% of the US

export market. China is the top destination for soybeans from Brazil and Argentina, too. A record 46 MMT of soybeans are expected to be crushed in China for 2009/10.

Growth in processing of imported soybeans has turned China into the world's second-largest producer of soybean oil—trailing only the United States by a modest sum. This year, continued growth in China's domestic output of soybean oil is expected to diminish its import requirements. Soybean oil imports by China are seen declining in 2009/10 to 2.3 MMT compared with 2.5 MMT in 2008/09. Large existing stocks of vegetable oil have pressured oilseed crush margins.

There soon could be a new constraint on soybean oil trade. Chinese officials have recently warned importers of soybean oil—all of whom must obtain licenses from the central Government—to avoid shipments from Argentina. Starting April 1, the country's quarantine agency tightened the maximum level of solvent residue that is permitted in soybean oil to 100 parts per million (ppm) from 200–300 ppm previously. Based on last year's data, most of the soybean oil imports from Argentina (the source for about three-fourths of China's imports) would not meet the new standard. Depending on how long the limits remain in place, they may help to temporarily reduce China's stocks of soybeans and soybean oil. A longer-term disruption in Argentine imports, however, would likely encourage an expansion of palm oil imports and soybean oil imports from other countries.

In India, domestic harvests of rapeseed, sunflowerseed, and peanuts this year are smaller than previously expected. Based on lower yields and a reduction in rapeseed harvested area to 6.45 million hectares, the 2009/10 production estimate was lowered to 6.4 MMT from 6.6 MMT in March. And, owing to cropland switching with winter grains and pulses, a reduction in sunflowerseed area lowered its crop estimate from 1 MMT to 820,000 MT. The peanut crop was reduced from 5 MMT to 4.9 MMT owing to a below-average yield.

Likely reductions in the vegetable oil produced from these crops will further enhance the demand for imports this year. And any imports of soybean oil that are diverted from China could end up in India. The cost of soybean oil in India is now approaching parity with palm oil. Indian imports of soybean oil for 2009/10 are forecast 200,000 MT higher in April to 1.4

MMT. India's total imports of vegetable oil in 2009/10 (at 9.5 MMT) could begin to rival world leader China's imports (9.9 MMT).

Indonesia wants to double palm oil production

The Government of Indonesia (GOI) has targeted palm oil production levels to reach 40 MMT by 2020, according to GAIN (Global Agricultural Information Network) Report No. ID1008. GAIN reports are produced by the Foreign Agricultural Service of the US Department of Agriculture.

This 40 MMT target is double current levels of palm oil production and would increase areas of production from current levels of approximately eight million hectares to approximately 15 million hectares. Also of note: There has been no significant impact from the reported El Niño on Indonesian palm oil production, according to the report.

The GOI also plans to shift the Indonesian palm oil industry to more sustainable, differentiated palm oil production, focused on food-based and energy-based products. To achieve these goals, the government has announced its Framework for Palm Oil Development 2010 and Beyond.

The FAS [Foreign Agricultural Service] Office of Agricultural Affairs in Jakarta forecasts that approximate planting areas in 2010/11 will be 8.2 million hectares. This number is slightly higher than the government's forecast of 7.8 million hectares. Some press and government reports have indicated the expansion of oil palm plantations in 2010 at between 2 and 3 million hectares. The FAS attaché believes this figure is unlikely, considering the limited levels of land available and suitable for growing oil palm. The most realistic estimate for 2010/11 oil palm production area growth is approximately one million additional hectares over production area in 2009/10. More specifically, production areas will increase from 7.2 million hectares in 2009/10 to 8.2 million hectares in 2010/11.

In related news, Reuters news service reported in April 2010 that Indonesia plans to introduce "green certificates" for palm oil producers who meet sustainable standards.

The government expects to issue Indonesian Sustainable Palm Oil (ISPO) certification to cover production from field to

factory, Achmad Manggabarani, director general of plantation crops at the agriculture ministry, told Reuters.

The action came after Unilever, Nestlé, and Cargill all dropped Indonesia's largest palm oil producer, Sinar Mas, as a supplier after Greenpeace alleged in a report that the company is engaging in illegal deforestation and peatland clearance in Indonesia.

In other palm oil news, IOI-Loders Crocklaan and New Britain both announced that they had opened dedicated palm oil refineries, making sales of segregated sustainable palm oil possible in the very near future. The announcements came shortly after Groupe Casino (a French supermarket group) said it will remove palm oil from its house brand food products "for environmental and health reasons," according to FoodNavigator.com.

Industrial use of water

How much water does it take to produce \$1 worth of sugar, dog and cat food, or milk? The answers appear in the first comprehensive study in 30 years documenting US industry's thirst for this precious resource. The study, which could lead to better ways to conserve water, is in *Environmental Science & Technology* (44:2126–2130, 2010).

Chris Hendrickson and colleagues, of Carnegie Mellon University (Pittsburgh, Pennsylvania, USA), note in the study that industry (including agriculture) long has been recognized as the biggest consumer of water in the United States. However, estimates of water consumption on an industry-by-industry basis are incomplete and outdated, with the last figures from the US Census Bureau dating to 1982.

The research team estimated water use among more than 400 industry sectors—from finished products to services—using a special computer model. The new data show that most water use by industry occurs indirectly as a result of processing, such as packaging and shipping food crops to the supermarket, rather than from direct use, such as watering crops. Among the findings for consumer products: It takes almost 270 gallons (or about 1,020 liters) of water to produce \$1 worth of sugar; 200 gallons of water to make \$1 worth of dog and cat food; and 140 gallons of water to make \$1 worth of milk.

"The study gives a way to look at how we might use water more efficiently and allows us to hone in on the sectors that use the most water so we can start generating ideas and technologies for better management," the scientists note.

Animal feed, not cars, related to smog

A new study identifies cattle feed as a possible culprit in the long-standing mystery of why California's San Joaquin Valley—a moderately populated agricultural region in the United States—has higher levels of ozone (one of the main ingredients in smog) than many densely populated cities. The report, which explains how fermented cattle feed works with automotive exhausts in forming ozone, is in *Environmental Science & Technology* (44:2309–2314, 2010).

Michael Kleeman and colleagues, of the University of California–Davis (USA), note that high ozone levels in the San Joaquin Valley, where 10% of all the food produced in the United States is grown, have puzzled scientists for years. Motor vehicles are the major source of smog elsewhere, but the Valley has fewer motor vehicles compared to big urban areas with similar levels of ozone.

Suspicion thus fell on farming activities, and the new study investigated the role of fermented livestock feed.

The paper documents emissions from seven different animal feeds of organic gases, which combine with combustion emissions in the presence of sunlight to form smog. It shows how fermented feed such as silage appears to be the largest manufactured source of these organic gases that is contributing to ozone formation in the Valley even more than automobiles.

New soy JV formed in Brazil

Cooperativa dos Agricultores da Região de Orlândia (CAROL) of Brazil and Sodrugestvo Group of Russia announced in April 2010 that they have formed a joint venture, named Carol Sodru. Sodrugestvo Group will own 51% of Carol Sodru and CAROL will own 49%.

CAROL will transfer to the joint venture (JV) its assets related to the origination and processing of soybeans in the states of São Paulo, Goiás, Minas Gerais, Mato Grosso do Sul, and Tocantins; the distribution of fertilizers and other inputs; and the production and distribution of soy seeds.

Sodrugestvo will contribute cash. The objective of the JV is to produce 3 MMT of soybeans, segregating genetically modified and nongenetically modified beans; to become a significant importer and distributor of fertilizers and other inputs in Brazil; and to develop crushing capacity in new regions, the companies said in a statement. ■



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Briefs

As a result of new fuel economy standards for US cars and light trucks (*inform* 21:284, 2010), the US government predicts gasoline consumption should fall and imports of crude oil and petroleum products should decline. The Obama administration calculates that the higher fuel efficiency standards should generate a savings of approximately 1.8 billion barrels of oil over the 20-year lifespan of cars and trucks that meet the higher economy standards. The US Department of Energy expects the country's oil consumption in 2010 to fall to 6.9 billion barrels, continuing a downward trend since gasoline consumption peaked in 2007.



On April 16, the third year of the Renewable Fuel Transport Obligation began in the United Kingdom. This requires the inclusion of 3.5% biofuel in all road fuel supplies, whether ordinary diesel or petrol, and represents an increase of 0.25% over the previous 12 months.



Indonesia-based PT New World Energy (NWE), a jatropa and castor oil plantation company, and appliance manufacturer Bosch and Siemens Home (BSH) Appliance Group of Germany are conducting a pilot project to introduce the Protos, a stove powered by crude plant oil instead of kerosene, in Indonesia. BSH claims that Protos' technology is 50% more efficient than traditional kerosene stoves. NWE supplied the jatropa oil for the initial six-month trial; participants included NWE employees. The goal of BSH is to have 1,000–2,000 stoves in use in 2010 (requiring 120,000 L/yr of jatropa oil).



Aviation Daily magazine reported on April 15 that the airline JetBlue has postponed its scheduled biofuel demonstration flight with an IAE V2500-powered Airbus A320 because insufficient second-generation bio-based jet fuel is available. Instead, JetBlue is now hoping

CONTINUED ON NEXT PAGE

Biofuels News



GENERAL

US Navy plane tests camelina oil on Earth Day

A Green Hornet, a Boeing-built unmodified F/A-19 Super Hornet fighter plane, flew from the US Naval Air Station at Patuxent River, Maryland, on a 50:50 mixture of biofuel made from camelina oil on April 22 (Earth Day). This was the first flight fueled by a biofuels blend of a supersonic jet with afterburners.

Ray Mabus, US Secretary of the Navy, was present at the take-off. He commented, "We think that this is one of America's big strategic imperatives, to reduce our reliance on foreign sources of fossil fuel . . . and to get us better down the road of energy independence."

The Defense Energy Support Center, which oversees procurement of biofuel for the Navy, recently awarded a \$2.7 million contract to Sustainable Oils (Seattle, Washington; Bozeman, Montana) for 40,000

gallons (150,000 liters) of camelina-based fuel. The Navy's ultimate goal is to develop protocols to certify alternative fuels for use in its aircraft and ships.

The Navy quoted the pilot of the test flight, Lt. Cmdr. Tom Weaver of Billerica, Massachusetts, who said, "The aircraft flew exactly as we expected—no surprises. The fuel works so well, all I needed to do was just fly the plane."

According to McClatchy-Tribune Business News (April 21), the Navy has a goal to make 50% of its entire fuel consumption from renewable sources by 2020.

UOP LLC (Des Plaines, Illinois), a Honeywell company, processed the camelina oil into jet fuel using a hydroprocessing technology. The result is an aviation biofuel that can be used as a drop-in fuel with petroleum-based fuel. UOP is set to produce up to 190,000 gallons of fuel for the Navy and 400,000 gallons for the US Air Force from sustainable, nonfood feedstocks, including animal fats and algae as well as camelina. The Air Force also is conducting tests of biofuels.

Sustainable Oils already has a contract for 6,000 acres of camelina in north central and northeast Montana. Mike

agreements signed by a group of 15 airlines in 2009 with two producers will lead to a supply of alternative fuels by 2012.



Bioalgene (Seattle, Washington, USA) was named by Frost & Sullivan at its 2010 Excellence in Industrial Technologies Awards Banquet in late April as a “Hot Investment Opportunity.” In the award citation, Bioalgene’s approach to large-scale algae cultivation was recognized for accomplishing environmental remediation as well as for producing multiple product streams from algae biomass. Bioalgene has developed proprietary methods to accelerate the growth of algae that are fed flue gas from a coal-fired power plant. ■

Waring, a regional sales manager for Sustainable Oils based in Great Falls, Montana, told McClatchey-Tribune Business News, “[Camelina] . . . has a half-a-million acres potential. . . . This thing could create crushing facilities in Montana, it could create a whole lot of different things.”

Fuel economy of medium- and heavy-duty vehicles

Now that mandates for fuel economy in passenger cars and light trucks are in place (*inform* 21:284, 2010), the National Research Council (NRC) has turned its eye to various methods and technologies that could improve the fuel economy of medium- and heavy-duty vehicles, such as tractor-trailers, transit buses, and work trucks. At present there are no fuel consumption standards for these vehicles, which account for about 26% of the transportation fuel consumed in the United States.

A NRC committee has written a report estimating the improvements that various technologies could achieve over the next decade in seven vehicle types. For example, using advanced diesel engines in tractor-trailers could lower their fuel consumption by up to 20% by 2020, and improved aerodynamics could yield an 11% reduction. Hybrid powertrains could lower the

fuel consumption of vehicles that stop frequently, such as garbage trucks and transit buses, by as much as 35% in the same time frame. Although vehicle purchasers would pay for these improvements, many of these technologies would pay for themselves even at today’s energy prices.

In setting fuel consumption standards, the NRC said regulators should use a measure of fuel consumption that accounts for the amount of freight or passengers carried by these vehicles. The miles-per-gallon measure used to regulate the fuel economy of passenger cars is not appropriate for medium- and heavy-duty vehicles, which are designed above all to carry loads efficiently. For example, a partially loaded tractor-trailer could travel more miles per gallon than a fully loaded one, but this would not be an accurate measure of the fuel efficiency of moving goods.

A load-specific fuel consumption metric would reflect efficiency more accurately, for example, gallons per ton-mile.

Regulating medium- and heavy-duty vehicles will be more complicated than it is for passenger cars, because of the variety of vehicles and their differing tasks and terrains. The NRC report points out, however, that Japan already regulates the fuel economy of these vehicles, and both the European Union and the state of California are developing such standards.

Imposing a fuel tax could avoid the complexity of regulating different types of vehicles. Doing so would force companies to optimize the fuel efficiency of their operations. The NRC report urged Congress to consider this approach. Other approaches are also discussed in the report, available for free download at www.nap.edu/catalog.php?record_id=12845.

Defections from Roundtable on Sustainable Biofuels

BiofuelsDigest.com reported on April 27 that both the European Bioethanol Fuel Association (eBio) and the European Biodiesel Board (EBB) had resigned from the Switzerland-based Roundtable on Sustainable Biofuels (RSB).

eBio was quoted as saying, “Some provisions in Version One of RSB’s international standard for better biofuel production and processing are not only impossible to implement but even contradict the EU directives.”

The letter of resignation from the EBB—written by Secretary General Raffaelo Garofalo, dated April 20, and available through <http://tinyurl.com/28xgylg>—said, in part, “The reason for this [resignation] is that although the initial project that you developed would have been interesting, in reality the work that the RSB is performing is becoming excessively complex and theoretical.” He added, “It does not keep enough into consideration the pragmatic implementation of what you intend to develop.”

Garofalo also wrote, “The decision-making reform that was adopted very recently did not solve the important point . . . that the respectable RSB objective to build an international and democratic initiative on biofuels needs to be based only on reliable and recognized interlocutors.”

In response, Alwin Kopse, executive secretary of the RSB, told BiofuelsDigest.com on April 30, “EBB’s letter points to the importance of developing a workable and pragmatic certification system for sustainable biofuels. I think . . . we all share this view. This is the reason why the RSB is conducting pilot tests of our standard. We want to make sure that the system we developed together works in the field and the supply chains.”

Further, Kopse challenged EBB to identify “obscure consultants” and “ambiguous organizations” that Garofalo claimed are working in the RSB. Kopse promised, “The RSB Secretariat will certainly do its utmost to keep the standards of collaboration and transparency high,” and invited EBB and eBio to rejoin the RSB when the priorities of the three organizations once again coincided.

BIODIESEL

Italian customs authorities seize biodiesel

In mid-March, Italian customs authorities seized 10,000 metric tons of biodiesel

imported in the ports of Venice and Trieste. The load was declared as Canadian in origin, but the European Biodiesel Board (EBB) said there was strong evidence that it originated in the United States, where its production was subsidized by the US government.

The European Commission approved antidumping and antisubsidy duties on imports of biodiesel from the United States in mid-March 2009 (*inform* 20:219). Since then, the EBB has repeatedly contended that these duties are being circumvented, either via triangular trade through various countries (including Canada), or via blends, such as B19 (19% biodiesel + 81% petrodiesel) or lower, which are imported into Europe. These practices are of an illegal or fraudulent nature.

Part of the evidence that this cargo involved trans-shipment, said the EBB, was that the product was offered with a \$150–\$180 per ton discount compared with European Union biodiesel of comparable quality, and at a lower price than the most common biodiesel raw materials (soybean oil and rapeseed oil).

India struggles to implement biodiesel

The issues of government pricing of biofuels and the availability of feedstocks are combining to restrict the commercialization of biodiesel in India.

The government of India has identified 40 million hectares of land for cultivation of *jatropha*, an oilseed-bearing tree that grows on suboptimal soils and has a relatively low water requirement. High-yielding varieties of *jatropha* are not expected for another two or three years, and at the moment costs of production of biodiesel from *jatropha* make the fuel unsustainable.

The focus on feedstock production in India has been on nonedible oilseeds such as *jatropha* and on importation of free fatty acid-based palm oil (e.g., *inform* 21:264–266, 2010). The latter has been stopped, but nonedible oils have not taken up the slack.

The government has set the price of biodiesel to be affordable, but tax structures on the fuel vary across the states in India. India's *Business Standard* newspaper quoted a biodiesel manufacturer from



western India who had had to close his business over two years ago as saying, “We are unable to recover our costs at the price fixed by the government.”

RENEWABLE DIESEL

EPA recognizes LS9's UltraClean diesel

In April the US Environmental Protection Agency (EPA) officially registered UltraClean Diesel™, which LS9 Inc. of South San Francisco, California produces in a one-step fermentation process based on renewable raw materials. LS9 genetically engineers microorganisms to produce fuels with improved properties such as cetane number, volatility, oxidative stability, and cold-flow.

The chemical composition of LS9's UltraClean diesel is compatible with the existing infrastructure (a “drop-in” fuel) and has a more desirable environmental footprint than conventional diesel. Production of this fuel provides an 85% reduction in greenhouse gas emissions compared with conventional petrodiesel; it contains no benzene, which is a carcinogen, and only trace amounts of sulfur.

Neste Oil road-tests renewable diesel

Neste Oil (Espoo, Finland) has begun trials of Neste Green 100 diesel, which is

produced from 100% renewable raw materials and is free of any fossil oil components, in cars in Finland. Executive Vice President, Oil Retail, Sakari Tiivola said, “This is the first time anywhere that a premium renewable diesel will be tested across a range of different cars.”

The trial includes private individuals and Neste Oil employees. Test drivers from outside the company began their work in mid-May and will continue until the middle of the third quarter. Test drivers recruited from within the company began in late April and will continue until the end of third quarter. Drivers will fill up at selected Neste Oil service stations in Greater Helsinki.

Tiivola added, “The majority of Neste oil stations in Finland already offer Neste Green diesel” that comprises 10% renewable diesel plus 90% conventional diesel. “We plan to make Neste Green 100 diesel . . . available to motorists as soon as possible,” he concluded.

Neste Green 100 diesel contains NExBTL renewable diesel and an additive package designed for Finnish conditions to keep engines clean, protect them from corrosion, prevent foaming, and promote lubrication. NExBTL renewable diesel is produced from vegetable oil and waste animal fat using proprietary hydrogenization technology.

ETHANOL

DDGS exports to Southeast Asia rise

The US Grains Council (USGC; Washington, DC) announced on April 22 that imports of distillers' dried grains with solubles (DDGS), a by-product of ethanol production from corn, to Southeast Asia rose 73% in January–February 2010 compared with the same period in 2009. The 2010 imports were 890,000 metric tons (MT) of DDGS, or 16% of total US DDGS exports for those two months. Exports in January–February 2009 were 590,000 MT.

USGC attributed the increase in exports to Southeast Asia to Vietnam's rising demand for DDGS, particularly for use in the aquaculture industry, where it complements soybean meal products in high-protein aqua diets. GrainNet.com quoted Adel Yusupov, USGC regional director in

Southeast Asia, as saying, “From livestock to aquaculture, producers in southeast Asia have come to realize DDGS keeps feed costs low without affecting feed quality and animal performance.”

As a first-ever event, 858 MT of DDGS were shipped to Cambodia in February 2010, for use in Thai- and Vietnamese-operated feed mills located there, said the USGC.

JATROPHA

Brookhaven, SG Biofuels agree to partner

Brookhaven National Laboratory (BNL; Upton, New York, USA) and SG Biofuels (Encinitas, California, USA) agreed in April to establish a partnership to accelerate the analysis and testing of oil produced on SG’s Latin American jatropha plantations. BNL is expanding its research and focus on jatropha as a sustainable, low-cost source of biofuel feedstock.

Jatropha oil will be blended with residual oil combusted in a commercial boiler that has been used by BNL to test other biofuel blends over the past few years. Measurements of gases and particulates in the stack will be made to evaluate the differences made by the blending. Physical and chemical properties are also being evaluated.

In a company statement, Kirk Haney, president and chief executive officer of SG Biofuels, said, “As we continue our scientific and genetic efforts to enhance jatropha across a number of traits . . . it’s important that we continue to benchmark oil quality and performance.” He added, “This partnership will provide valuable third-party research and analysis.”

BEI International improves jatropha harvesting equipment

BEI International, LLC (South Haven, Michigan, USA) announced in 2009 it had converted the blueberry-picking machinery it manufactures to collecting jatropha seeds

(*inform* 20:295, 2009). An eight-month trial of the BEI mechanical system for harvesting jatropha has since been conducted on the Agroipsa Farm in Coluteca, Honduras. The study area is a 550-hectare plantation of three-year-old jatropha. Max Lint, BEI International president, told BiofuelsDigest.com, “We are currently working on a jatropha harvester sale in Hawaii and another in Brazil.”

BEI market materials claim their sway picking mechanism has the ability either to harvest all fruit at one time or to harvest selectively. If selective harvest is chosen, only ripe fruit will be collected, leaving the balance for a future harvest. Up to 3 acres (1.2 hectares) per hour can be harvested with their equipment, equaling a fuel savings of up to 66%.

The company calculates that harvest of 1 acre of jatropha in 1 hour would require 3,125 people, or one BEI sway harvester. Expressed another way, 500 person-hours are needed to pick 1 ton (0.9 metric ton) of jatropha seed.

A pruning mechanism also can be mounted on the harvester, allowing the driver a choice of pruning while finishing the harvest or at any later time.

ALGAE

Tsubuka University researches algae, invites Toyota to join

Makato Watanabe, an environmental science professor with Tsubuka University (Japan) has been studying the fuel produced by *Botryococcus* algae. He reports that he has met a production target of 1,000 metric tons per hectare per year—in a laboratory experiment. Watanabe indicates he will attempt to produce fuel in a \$16 million open-air pilot project later in 2010 on the university campus.

Looking ahead, Watanabe and co-workers are urging the growth of algae in Japan’s rice fields. As of 2005, the agriculture ministry said almost 10% of the country’s cropland had been abandoned, according to Bloomberg.com (April 21, 2010). An aging population and migration to cities for better

jobs has led to the decline in farming. Thus, fallow land is available for growing algae.

Tsubuka University has invited Toyota Motor Corp. and refiner Idemitsu Kosan Co. to join the study, but neither company has yet reached a decision. General Motors Corp. is already working in a five-year partnership with the US Department of Energy to develop jatropha oil as a feedstock for biodiesel in India

In March the Japanese Cabinet called for expanding renewable energy to supply 10% of the country’s energy needs by 2020.

Hydrothermal processing for algae

Researchers at the University of Michigan (U of M; Ann Arbor, USA) are investigating a hydrothermal process for converting microalgae to fuel. The conventional technique involves cultivating special oily types of algae, drying the algae, and then extracting their oil.

The hydrothermal process being investigated at the U of M allows researchers to start with less-oily types of algae and eliminates the need to dry the cells, thus overcoming two major barriers to large-scale conversion of microalgae to liquid fuels.

According to Phillip Savage, principal investigator on the \$2-million National Science Foundation grant that supports this project, “We heat [an algae soup] to about 300°F (~150°C) and keep the water at high enough pressure to keep it liquid as opposed to steam. We cook it for 30 minutes to an hour and we get a crude bio-oil.”

The high temperature and pressure allow the algae to react with the water and break down. Not only is the native oil released, but proteins and carbohydrates also decompose and add to the fuel yield.

Savage and his co-workers are investigating ways to use catalysts to increase the energy density of the resulting bio-oil, thin it into a flowing material, and reduce its sulfur and nitrogen content. They also are considering ways to recycle waste products into future fuel batches. For example, the waste products might be used to grow the bacterium *Escherichia coli*, which also potentially could be processed into fuel. ■

Briefs

Trans fats should be banned from all UK foods, says an editorial in the *British Medical Journal* (doi: 10.1136/bmj.c1826). Ironically, the editorial was written by two Harvard Medical School researchers from across the pond—Dariush Mozaffarian and Meir J. Stampfer. The editorial (<http://tinyurl.com/24ypezw>) estimates that a 1% drop in consumption could prevent 7,000 deaths a year in England alone.



Eggs from chickens that consumed extremely high levels of melamine in their feed did not contain levels of the potentially toxic contaminant that exceeded US Food and Drug Administration limits. That was the conclusion of the first study to examine the effects of melamine-contaminated feed in laying hens. It appeared in the *Journal of Agricultural and Food Chemistry* (58:3512–3516, 2010). Melamine is an industrial chemical that has been used as an adulterant in foods to add economic value.



Can the 2008 tainted milk scandal in China be traced back to the country's reward system for science-based innovation?

That is one hypothesis put forward by commentary on SciDev.net. Author Li Jiao points out that Sanlu Group—one of the companies implicated in the adulteration of milk by the industrial chemical melamine—won second prize in January 2008 in the prestigious National Science and Technology Progress Awards for its best-selling infant milk formula.

Sanlu Group's formula and several others were later blamed for the deaths of six infants and the illnesses of more than 300,000 babies. A recent study by scientists from Peking University's Institute of Reproductive and Child Health found that 12% of the affected children still suffer from urinary tract abnormalities. ■

Health & Nutrition



Fish oil no boost to brainpower?

The largest-ever trial of fish oil supplements found no evidence that they offer benefits for cognitive function in older people.

The OPAL (Older People And omega-3 Long-chain polyunsaturated fatty acids) study investigated the effects of taking omega-3 long-chain polyunsaturated fatty acid supplements over a two-year period on the cognitive function of participants aged 70–80 years.

The number of persons with cognitive impairment is rising and it is estimated that by 2040, more than 81 million people globally will have dementia. Some studies have suggested that high intakes of omega-3 fatty acids, most commonly found in oily cold-water fish, are important for the maintenance of good cognitive health in later life.

The OPAL study, which appeared in the *American Journal of Clinical Nutrition* (doi: 10.3945/ajcn.2009.29121), was a randomized, controlled trial led by Alan Dangour, senior lecturer at the London School of Hygiene & Tropical Medicine, and colleagues. The study enrolled 867

participants aged 70–80 years from general practice clinics in England and Wales.

Trial participants, who all had good cognitive health at the start of the study, were randomly assigned into two groups, one of which received fish oil capsules while the other group received a placebo (olive oil) for two years. (Those receiving fish oil took 200 mg eicosapentaenoic acid and 500 mg docosahexaenoic acid daily.) Trained research nurses assessed cognitive function at the start and end of the study by using a series of paper and pencil tests of memory and concentration.

After two years, those participants receiving fish oil capsules had significantly higher blood levels of omega-3 fatty acids than those participants receiving placebo capsules. However, cognitive function did not change over the course of the study in either group of participants, and there was no evidence that the consumption of omega-3 fatty acids had a benefit for cognitive function in older people.

Dangour urges caution in interpreting these results: “From the data we have collected in the OPAL study there is no evidence of an important benefit for memory or concentration of increased omega-3 fatty

acid consumption over a two-year period among older people with good cognitive health. However, it is important to keep in mind that poor cognitive function can take many years to develop and although this is the longest trial of its kind ever conducted, it may be that it was not long enough for any true beneficial effects to be detected among this healthy cohort of older people.”

It is also possible that the omega-3 group received an insufficient dose for them to exhibit any benefits. Further, the olive oil placebo may itself have conferred benefits.

Shortly after the OPAL study results were released, a panel of experts convened by the US National Institutes of Health released its findings on cognitive decline at a conference titled “Preventing Alzheimer’s Disease and Cognitive Decline” held in late April.

“The state of the science is: We don’t have instruments or information that allows us to prevent the development of [cognitive decline],” said Evelyn C. Granieri, chief of the division of geriatric medicine and aging at Columbia University. Granieri, a panel member, noted that some popular anti-dementia strategies such as nutritional supplements, cognitive games, and exercise may eventually be proven helpful.

To date, however, none is backed by rigorous scientific evidence of effectiveness.

Is fat the sixth sense?

Is fat the sixth taste (after sweet, sour, salty, bitter, and protein-rich or umami)? That is what researchers at Deakin University and the University of Adelaide in Australia believe after conducting a study in humans.

The scientists tested the ability of 30 subjects to taste three different fatty acids (oleic, linoleic, and lauric) in otherwise plain solutions. All were able to differentiate fatty acids, although some persons required higher concentrations than others did. In the second part of the study, the researchers created a screening procedure to test subjects’ sensitivity to the tastes.

Of 50 people tested, the ability to taste fat was linked to their weights. Those who were sensitive to fat—who could taste very low concentrations—consumed less dietary fat than the subjects who were less sensi-

tive. They also had lower BMIs (body mass indexes).

The findings, which appeared in the *British Journal of Nutrition* (doi: 10.1017/S0007114510000267), stop short of definitively classifying fat as a taste, but co-author Russell Keast of Deakin University believes the evidence is “strong and mounting.” The next step will be to prove the existence of taste receptor cells for fat, he says.

“We have what . . . we will call possible candidate receptors for fat on taste receptor cells,” he told *COSMOS* magazine.

Phenolic compounds in olive oil

Francisco Perez-Jimenez of the University of Cordoba, Spain, led a team of researchers who studied the effects of eating a breakfast rich in phenolic compounds on gene expression in 20 patients with metabolic syndrome, a common condition associated with increased risk of cardiovascular disease and type 2 diabetes.

The study participants ate controlled breakfasts, and for six weeks before the study they had to avoid all drugs, vitamin tablets, and other supplements.

Perez-Jimenez said: “We identified 98 differentially expressed genes when comparing the intake of phenol-rich olive oil with low-phenol olive oil. Several of the repressed genes are known to be involved in proinflammatory processes, suggesting that the diet can switch the activity of immune system cells to a less deleterious inflammatory profile, as seen in metabolic syndrome.”

Phenols are micronutrients of olive oil; the extra-virgin varieties have a particularly large phenol fraction.

According to Perez-Jimenez, “These findings strengthen the relationship between inflammation, obesity, and diet and provide evidence at the most basic level of healthy effects derived from virgin olive oil consumption in humans. It will be interesting to evaluate whether particular phenolic compounds carry these effects, or if they are the consequence of a synergistic effect of the total phenolic fraction.”

The findings appeared in *BMC Genomics* (doi:10.1186/1471-2164-11-253).

In related news, a new study found that persons whose diet was rich in oleic acid were 90% less likely to develop ulcerative colitis.

The study included more than 25,000 participants, aged 40–65, in Norfolk, UK, who were recruited between 1993 and 1997. None of the participants had ulcerative colitis at the start of the study. By 2002, 22 participants had developed ulcerative colitis.

“Oleic acid seems to help prevent the development of ulcerative colitis by blocking chemicals in the bowel that aggravate the inflammation found in the illness,” said study leader Andrew Hart of the University of East Anglia’s School of Medicine in a news release.

“We estimate that around half the cases of ulcerative colitis could be prevented if larger amounts of oleic acid were consumed. Two to three tablespoons of olive oil per day would have a protective effect,” he said.

The study was presented on May 1 at the Digestive Disease Week conference in New Orleans, Louisiana, USA.

EFSA sets DRVs for fat

The European Food Safety Authority (EFSA) Panel on Dietetic Products, Nutrition, and Allergies has established dietary reference values (DRVs) for the intake of carbohydrates, dietary fiber, fats, and water. DRVs constitute the amount of an individual nutrient that a person needs for good health, depending on age and gender. Opinions on DRVs for vitamins and minerals will follow.

The Panel concluded that:

- Daily intake of total carbohydrates—including carbohydrates from starchy foods such as potatoes and pasta, and from simple carbohydrates such as sugars—should range between 45% and 60% of the total energy intake for both adults and children.
- A daily intake of 25 grams of dietary fiber is adequate for normal bowel function in adults. In addition, evidence in adults shows there are health benefits associated with higher intakes of dietary fiber (e.g., reduced risk of heart disease, type 2 diabetes, and weight maintenance).

- Evidence is still inconclusive on the role of the glycemic index and glyce-mic load in maintaining weight and preventing diet-related diseases.
- Intake of fats should range between 20% and 35% of the total energy intake, with different values given for infants and young children.
- Replacement of saturated and *trans* fats by mono- and polyunsaturated fatty acids should be considered by policy makers when making nutrient recommendations and developing food-based dietary guidelines at the national level.
- A daily intake of 250 mg of long-chain omega-3 fatty acids for adults may reduce the risk of heart disease.
- A daily intake of 2.0 liters of water for women and 2.5 liters for men is considered adequate.

The Panel also published two further opinions, one laying down the general principles for establishing DRVs, and another providing advice to policy makers on how to translate nutritional recommendations into

messages about foods, called food-based dietary guidelines.

Fermented soyfoods and diabetes

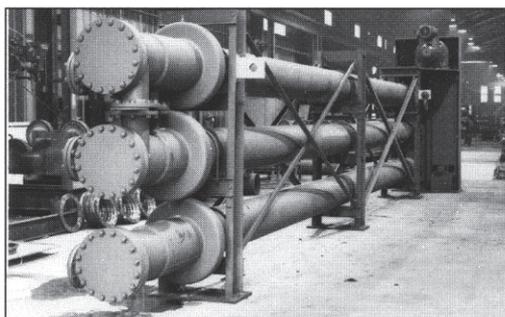
Earlier work suggests that ingestion of fermented soy foods such as tempeh by Asian cultures may explain their lower incidence of type 2 diabetes.

“Some have hypothesized that dietary phytoestrogens and soy peptides in fermented soybean foods consumed in traditional Asian diets may help prevent and slow the progression of type 2 diabetes,” write Korean researchers led by Dae Young Kwon of the Korean Food Research Institutes in Sungnam. Kwon and his colleagues evaluated existing evidence from animal studies and clinical and epidemiologic investigations on fermented soybeans in the prevention and treatment of type 2 diabetes.

“Nutritional studies performed in animals and intervention studies with humans suggest that the ingestion of soy protein with isoflavones improves glucose control and reduces insulin resistance,” they note. “Korean fermented soybean products such as doenjang, kochujang, and chungkookjang contain alterations in the structures and content of isoflavonoids and small bioactive peptides, which are produced during fermentation. Several studies revealed improvements in insulin resistance and insulin secretion with the consumption of these fermented products. Therefore, fermented soybean products may help prevent or attenuate the progression of type 2 diabetes,” the researchers suggest.

“Although the lack of human intervention trials does not permit definitive conclusions, the evidence does suggest that fermented soy products may be better for preventing or delaying the progression of type 2 diabetes compared with nonfermented soybeans,” they conclude.

The review appeared in *Nutrition Research* (30:1–13, 2010). ■



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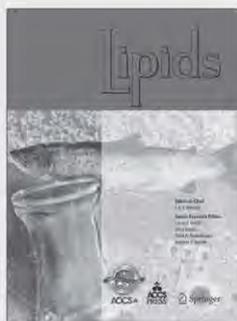


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A team led by Ray Marriott of the University of York, UK, is using supercritical CO₂ to extract paraffins for lipstick wax from waste wheat straw, according to the *New Scientist* magazine. Marriott was quoted as saying that the cosmetics business has been slow to embrace green chemistry: "They have primarily been concerned with making products that consumers want, with less regard to where the ingredients come from." One hopeful sign, writes author Sarah Everts, "was the convening in November 2009 in Frankfurt, Germany, of the first of a series of 'sustainable cosmetics summits.'" See www.sustainablecosmeticssummit.com/ for information about the 2010 meeting.



Arizona Chemical (Jacksonville, Florida, USA) announced in mid-April 2010 that it plans an Initial Public Offering (IPO) for up to \$125 million of its common stock. The company manufactures oleochemicals and specialty resins from crude tall oil, a by-product of wood pulping. International Paper sold Arizona Chemical to private equity firm Rhone Capital in 2007.



Air Products announced in April 2010 that it is building a new hydrogen production facility in West Port, Selangor, Malaysia, to support increasing demand in the region. The hydrogen will be used by a variety of industries including oleochemical manufacturers who produce fatty alcohols, and fatty acid and methyl esters.



Tide laundry detergent became the first detergent to be awarded the new Green Good Housekeeping Seal from the Good Housekeeping Research Institute (GHRI; New York, New York, USA). GHRI was founded in 1900 "to improve the lives of consumers and their families through education and product evaluation." According to GHRI, Tide Coldwater did "particularly well" in meeting the Green Good Housekeeping Seal criteria for ingredient and product safety, water reduction, and reduced production of waste during manufacturing. ■

Surfactants, Detergents, & Personal Care News



First vegetable-based ethylene oxide debuts

The first surfactant manufactured with sugar-derived ethylene oxide and lauryl alcohol sourced from palm oil has been introduced by Rhodia (Paris, France).

Rhodapex ESB-70 NAT can replace petrochemical-derived sodium laureth sulfate in shampoos, liquid soaps, and body washes that require foaming and cleansing characteristics, the company said.

Rhodia also claims that its manufacturing process for the surfactant reduces greenhouse gas emissions by 30% when compared to the conventional ingredient. The reductions result from a savings in emissions related to crude oil extraction and conversion into ethylene oxide. In addition, sugarcane waste products are used to generate heat and electricity during the upstream production steps.

The product allows for additional energy savings because it is shipped at a 70% concentration (instead of the traditional 30%). The higher concentration allows for-

mulators to use smaller volumes, which decreases transport amounts.

Rhodia has also introduced Mackine[®] 301, a nonquaternized amidoamine surfactant for hair conditioners. "A vegetable-based product, Mackine 301 offers an . . . alternative to conventional CTAC (cetrimonium chloride)," the company said in a statement.

Household cleaning agents and NDMA

Are certain ingredients in shampoo, detergents, and other household cleaning agents a source of precursor materials for the formation of a suspected cancer-causing contaminant in water supplies that receive water from sewage treatment plants?

A study from Yale University sheds new light on possible environmental sources of this poorly understood water contaminant, called NDMA (*N*-nitrosodimethylamine), which is of continuing concern to health officials.

William Mitch and colleagues note that scientists have known that NDMA

CONTINUED ON NEXT PAGE

and other nitrosamines can form in small amounts during the disinfection of wastewater and water with chloramine. Although nitrosamines are found in a wide variety of sources—including processed meats and tobacco smoke—scientists know little about their precursors in water. Past studies with cosmetics have found that quaternary amines, which are also ingredients in household cleaning agents, may play a role in the formation of nitrosamines.

The team's laboratory research showed that when mixed with chloramine, some household cleaning products—including shampoo, dishwashing detergent, and laundry detergent—formed NDMA. The report notes that sewage treatment plants may remove some of the quaternary amines that form NDMA. However, quaternary amines are used in such large quantities that some still may persist and have a potentially harmful effect in the effluents from sewage treatment plants.

"Our technical team and our members are reviewing this research," said Brian Sansoni, vice president of communication and research for the American Cleaning Institute (ACI). "We think it is very important not to draw overly broad conclusions from a single piece of research." ACI is a trade group based in Washington, DC, USA.

Antimicrobials in the news

The antimicrobial triclosan is in the news on both sides of the Atlantic. This ubiquitous chlorinated aromatic compound is found in everything from personal care products to food contact materials to toys.

In the United States, the Food and Drug Administration (FDA) and the Environmental Protection Agency (EPA) are taking another look at triclosan after recent studies suggest it may serve to disrupt the endocrine system in humans and may also help create bacteria resistant to antibiotics. The review came after Rep. Edward J. Markey (Democrat-Massachusetts) wrote letters to the FDA and EPA urging a new review.

FDA said it plans to release a report on triclosan by the second quarter of 2011.

In the meantime, the American Cleaning Institute "expressed concern" over FDA's assessment. The Personal Care Products Council said it "has worked for many years to provide voluminous scientific research

and information to FDA on both the safety and the efficacy of triclosan as an important ingredient in a range of personal care products. We will continue to support the agency's review of triclosan and have confidence that the final result will be a thorough, science-based evaluation of the ingredient."

In Europe, the European Commission (EC) has evaluated the safety of triclosan and permits its use as a preservative in cosmetics and personal care products at a maximum concentration of 0.3%. However, triclosan has formally been withdrawn from a European list of compounds for potential use as food contact materials, but plastic containing the substance can be marketed until late 2011.

The EC announced that triclosan has been removed from its provisional list at the request of Ciba, the Swiss-based company that manufactures the chemical. The notification, listed in the *Official Journal of the European Union*, said Ciba had made the decision to withdraw its application as it "does not consider the use of the substance in plastics intended to come into contact with food appropriate anymore." According to Ciba, which is owned by BASF, "This is a strategic business decision made to focus Ciba's resources in the areas of greatest customer value, and in markets where the proven safety and efficacy of triclosan is most clearly valued by our customers and supported by market demand."

The *Official Journal of the European Union* states that because triclosan may already have been used in the production of food contact plastics; a transition period will be introduced to allow a staggered phase-out.

US consumers change cleaning habits

More US households are laundering in cold water and switching to multipurpose and refillable cleaning products, according to the latest National Cleaning Survey from the American Cleaning Institute (ACI; formerly The Soap and Detergent Association). ACI is a trade association based in Washington, DC, USA.

Consumers were asked what changes, if any, they have made to their cleaning or laundry routines in the past year (respondents could choose more than one option):

- Wash laundry in cold water more frequently (58%)
- Switch to multipurpose cleaning products (41%)
- Use refillable cleaning products (38%)
- Buy high-efficiency or energy-efficient washer or dryer (36%)
- Do laundry less frequently (29%)
- Make their own cleaning products (12%)

Consumers also seem to be reading their detergent label directions more than in the past. The 2010 ACI survey shows 62% of respondents say they have read the directions on a package of laundry detergent, versus 38% who said they never have. When ACI last asked that question in 2003, 49% said they had not read the detergent package directions.

The 2010 National Cleaning Survey was completed for ACI by Echo Research, Inc. Echo questioned 1,008 American adults (500 men and 508 women) via telephone on February 25–28, 2010. The survey has a margin of error of plus or minus 3.1%. A summary of the survey results is available at www.cleaning101.com/newsroom.

SD&PC Patents

CLEANING COMPOSITION CONTAINING SUBSTITUTED STARCH

Oh, H., *et al.*, The Procter & Gamble Co. (P&G), WO2010/033897, March 25, 2010

A cleaning composition comprising from 0.05% to 30% by weight of surfactant and from 0.01% to 10% by weight of substituted starch, wherein the substituted starch has: a total degree of substitution in the range of from 0.001 to 0.6, a degree of substitution of anionic substituent in the range of from 0.001 to 0.04 and/or a degree of substitution [sic] of nonionic substituent in the range of from 0.01 to 0.5, a degree of substitution of cationic substituent in the range of from 0 to 0.004, an average per weight molecular weight in the range of from 10,000 to 100,000,000 Daltons.

LIQUID DETERGENT COMPOSITION

Ogura, H., and H. Shindo, Lion Corp., WO2010/029749, March 18, 2010

A liquid detergent composition [that] has good cleaning power and a bleaching

effect, while exhibiting excellent storage stability. The liquid detergent composition contains 50–70% by mass of a nonionic surfactant (A) represented by formula (I) or formula (I'), 1–10% by mass of an anionic surfactant (B), and 0.05–1% by mass of 4,4'-bis(2-sulfostyryl)biphenyl disodium salt serving as a fluorescent bleaching agent (C). (In formula (I), R¹ represents a linear or branched chain alkyl or alkenyl group having 5–21 carbon atoms; R² represents an alkylene group having 2–4 carbon atoms; R³ represents an alkyl group having 1–4 carbon atoms; and n represents a number of 5–30 which is the average mole number of added –OR²–. In formula (I'), R₄ represents a hydrocarbon group derived from a secondary alcohol having 8–30 carbon atoms; R² represents an alkylene group having 2–4 carbon atoms; and m represents a number of 5–20 which is the average mole number of added –OR²–.) R¹CO–(OR²)_n–OR³ (I) R⁴–O(OR²)_mH (I')

PARTICLES COMPRISING A HUEING DYE

Prabhat, M., and G.B. Swan, P&G, WO2010/030540, March 18, 2010

A particle for use in a composition comprising: a first coating layer comprising a coating material selected from surfactant, surfactant precursor, builder, film-forming polymer and mixtures thereof, and a core, at least a portion of said core being coated by said coating; wherein the particle additionally comprises a hueing dye.

SPECIFIC POLYBRANCHED ALDEHYDES, ALCOHOLS SURFACTANTS AND CONSUMER PRODUCTS BASED THEREON

Scheibel, J.J., and R.E. Shumate, P&G, WO2010/033976, March 25, 2010

A process for preparing a detergent alcohol mixture comprising the steps of providing one or more polybranched polyolefins, wherein the polybranched polyolefins must contain one nonbranched terminal olefin and one or more additional branched olefins in the molecule; hydroformylating said polybranched polyolefins to produce a polybranched olefin containing aldehyde product with one or more olefins or mixture thereof; reducing the aldehyde product of

step (b) in the presence of hydrogen and a hydrogenation catalyst to form a polybranched detergent alcohol mixture; and removing said polybranched alcohol mixture from said catalyst and branched aldehydes, alcohols, and surfactants produced from the products of this process.

SPECIFIC POLYBRANCHED POLYALDEHYDES, POLYALCOHOLS, AND SURFACTANTS AND CONSUMER PRODUCTS BASED THEREON

Scheibel, J.J., and R.E. Shumate, P&G, WO2010/033979, March 25, 2010

Acyclic polyaldehydes and polyalcohols having 11, 16, or 21 carbon atoms and

comprising at least two aldehyde or hydroxyl alcohol groups, at least three branches, and three or less carbon-carbon double bonds.

COMPOSITIONS AND METHODS FOR PROVIDING A BENEFIT

Corona III, A., *et al.*, P&G, WO2010/025097, March 4, 2010

Compositions and methods useful for providing one or more benefits, including a color rejuvenation and/or color maintenance benefit to a fabric are disclosed. The disclosed compositions contain at least one cationic polymer. The methods include providing the disclosed compositions in combination with a source of anionic surfactant. Unit dose and multi-compartment systems are also disclosed. ■

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Book Review

Biobased Surfactants and Detergents: Synthesis, Properties, and Applications

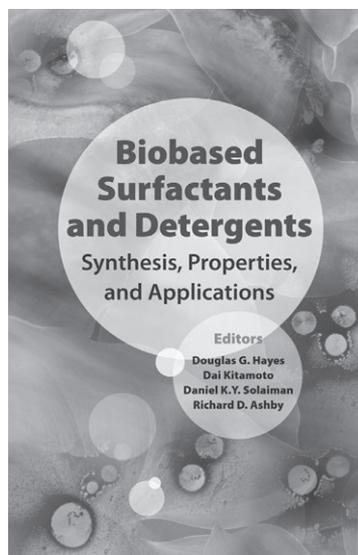
Douglas G. Hayes, Dai Kitamoto, Daniel K.Y. Solaiman, and Richard D. Ashby (eds.)
AOCS Press/CRC Press, 2009
515 pages, \$225 (nonmember) or \$180 (member)
ISBN: 978-1-893997-67-7

Krister Holmberg

Biobased Surfactants and Detergents: Synthesis, Properties, and Applications is broad in scope with three parts, each consisting of several chapters. The first part deals with glycolipid-based surfactants, with a focus on rhamnolipids and sophorolipids. The second part is about phospholipids and their synthetic counterparts. The third part deals with sugar-, polyol-, and amino acid-based lipid-based surfactants. All sixteen chapters are written by leading experts in their respective fields and constitute an impressive wealth of up-to-date information.

The use of renewable raw materials for the surfactant hydrophobic tail is not new. Vegetable oils, such as coconut, palm, and palm kernel, have been important raw materials for surfactants for a long time, and triglycerides of animal origin, such as tallow and lard, have also been used. The surfactant hydrophobic tail can also be made from petrochemical raw materials, and the products that come from the two routes can be very similar. A typical example is linear fatty alcohols of C₁₀–C₁₄ length, which may be produced from coconut oil via the fatty acid methyl ester and or made from ethylene by the Ziegler-Natta polymerization reaction.

The focus of the book is not the surfactant hydrophobic group, however, but rather the surfactant hydrophilic group, i.e., the polar head group. Sugars and other types of polyols, as well as amino acids, constitute examples of polar head groups of natural origin. The book contains numerous examples of surfactants that utilize



these materials. Sugars and other polyols, such as polyglycerol and bioderived polypropanediol, can be expected to replace oligomers of ethylene oxide as the polar head group of nonionic surfactants in the future.

All aspects of surfactants are covered in the book. Several chapters focus on surfactant synthesis. The synthesis methods range from organic synthesis, via bioorganic synthesis using isolated enzymes, to true biotechnological methods, i.e., use of microorganisms in a fermentation process.

Lipases are the most important class of enzymes for surfactant synthesis, and lipase-catalyzed esterification to produce surface active saccharide esters is examined in some detail. The fermentation route may be said to lead to “true biosurfactants,” although the term “biosurfactant” is used in a generic sense both in this book and in the general literature. Some chapter authors express some concern about surfactants obtained by fermentation.

Other chapters focus on the physical-chemical behavior of the new surfactants. The glycolipid surfactants rhamnolipids and sophorolipids, as well as sugar-based surfactants, such as sucrose fatty acid esters and alkyl glycosides, receive in-depth treatments. A particularly fundamental chapter is devoted to the latter class, including maltosides and glucosides with varying degree of branching of the alkyl chain.

There are also several chapters devoted to applications for the new surfactants. The applications range from metal-working fluids to food. A special topic, discussed by two sets of authors, is pulmonary surfactants, or lung surfactants. Pulmonary surfactants are present at the air–alveolar fluid interface in the lungs of mammals. They reduce the surface tension to very low values, thus minimizing the work required for breathing. Pulmonary surfactants are typically 90% phospholipids and 10% proteins. Dipalmitoylphosphatidylcholine is the predominant phospholipid. This saturated zwitterionic lipid forms tightly packed monolayers at the air–water interface that provide the high surface pressure needed for good lung function. A deficiency in the action of the pulmonary surfactant is a well-known cause of respiratory problems for newborn babies, and it is particularly common for premature infants. The physical-chemical aspects of this problem are discussed in detail.

The introduction is particularly helpful. Not only does it give an overview of the subject area, it also provides several compilations of useful facts. One table lists commercial biobased products, and this list ranges from alkylpolyglucosides (which are in fact not all that biobased) to pulmonary surfactants obtained from processed and supplemented bovine lung tissue. Another table lists applications in food, cosmetics, and pharmaceuticals for various biobased surfactants, while a third table presents the enzymes used for preparation of biobased surfactants via enzyme-catalyzed processes. The

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Patents

Published Patents

Method of drilling using invert emulsion drilling fluids

Kirsner, J., *et al.*, Halliburton Energy Services Inc., US7645723, January 12, 2010

A method for drilling, running casing in, and/or cementing a borehole in a subterranean formation without significant loss of drilling fluid is disclosed as well as compositions for use in such method. The method employs a drilling fluid comprising a fragile gel or having fragile gel behavior and providing superior oil mud rheology and overall performance. The fluid is especially advantageous for use in deep water wells because the fluid exhibits minimal difference between downhole equivalent circulating density and surface density notwithstanding differences in drilling or penetration rates. When an ester and isomerized olefin blend is used for the base of the fluid, the fluid makes an environmentally acceptable and regulatory compliant invert emulsion drilling fluid. The fluid preferably contains no organophilic clays.

Compositions and use of mono- and polyenoic acids for breaking VES-gelled fluids

Crews, J.B., Baker Hughes Inc., US7645724, January 12, 2010

Fluids viscosified with viscoelastic surfactants (VES) may have their viscosities reduced (gels broken) by the direct or indirect action of a composition that contains at least one unsaturated fatty acid such as a monoenoic acid and/or polyenoic acid. The unsaturated fatty acid may be contained in an oil-soluble internal phase of the fluid. The breaking composition is believed to act possibly by rearranging, disaggregating, or otherwise attacking the micellar structure of the VES-gelled fluid. In a specific non-limiting instance a brine fluid gelled with an amine oxide surfactant can have its viscosity broken with an oil such as flax (linseed) oil, soybean oil, and/or fish oils containing relatively high amounts of unsaturated fatty acids. The unsaturated fatty acids are thought to auto-oxidize into products such as aldehydes, ketones, and saturated fatty acids that break the VES gel.

Production of biodiesel and a side stream of crude glycerol which is converted to methanol

Goetsch, D., *et al.*, G.D.O. Inc., US7645807, January 12, 2010

Production of biodiesel from vegetable and animal oils with conversion of a by-product crude glycerol stream to methanol. The crude glycerol stream is combined with superheated steam and oxygen to produce a synthesis gas that is then passed to a methanol synthesis reaction zone to produce methanol.

Material compositions for reinforcing ionic polymer composites

Jong, L., The United States of America as Represented by the Secretary of Agriculture, US7645818, January 12, 2010

The invention is related to the preparation of an ionic polymer composite material comprising a protein and carbohydrate-containing vegetable material component that serves as a reinforcement agent for the composite. In preferred embodiments of the invention the vegetable seed component is selected from the group of soy spent flakes, defatted soy flour, or soy protein concentrate with ionic polymers and the ionic polymer is carboxylated poly(styrene-butadiene). The composites have a significantly higher elastic modulus when compared with base polymer.

Food for skin moisture retention

Ishikawa, K., *et al.*, Kao Corp., US7648714, January 19, 2010

This invention relates to a food containing a glycosylated ceramide and diacylglycerol. This food is capable of improving and enhancing the barrier function of skin and increasing water-holding capacity of the skin.

Intermolecular compounds of fatty acid triglycerides

Arimoto, S., *et al.*, Nisshin OilliO Group Ltd., US7648724, January 19, 2010

There are provided an intermolecular compound of (i) di-saturated medium-chain fatty acids mono-saturated long-chain fatty acid triglyceride and (ii) 1 3-di-saturated long chain fatty acids 2-mono-unsaturated long chain fatty acid triglyceride of which a long spacing value by X-ray diffraction is 65 Å or more, and foods containing the intermolecular compound. The intermolecular compound can be used as a part of fats and oils that constitute foods. Due to formation of the intermolecular compound the fats and oils containing large amounts of symmetric triglycerides such as cocoa butter and those containing medium-chain fatty acids do not form separate crystals and therefore can keep smooth texture and prevent blooming.

Toner, developer, and image forming apparatus

Umehara, K., Ricoh Co. Ltd., US7648812, January 19, 2010

A toner is provided including a binder resin; a release agent; a colorant; and a fatty acid amide compound wherein the binder resin includes: an amorphous polyester (A) having a softening point of from 70 to 140°C; an amorphous polyester (B) having a softening point of from 120 to 190°C; and a crystalline polyester (C) and wherein the following relationship is satisfied: T_mC less than $T_m(Asp)$ wherein T_mC represents a softening point of the crystalline polyester (C) and $T_m(Asp)$ represents a softening point of the fatty acid amide compound; and a developer and an image forming apparatus using the toner.

CONTINUED ON NEXT PAGE

System and method for fueling diesel engines with vegetable oil

Kleinberger, O.L., US7650878, January 26, 2010

A heated fuel delivery system for vegetable oil or other fuels of temperature-dependent viscosity, which may be used as fuel for a diesel engine. The system includes one or more heated fuel lines and/or a heated fuel tank to heat the fuel and reduce its viscosity for more efficient use. Recovered engine heat from the engine coolant system is transferred to heat the fuel.

Vegetable oil based dielectric fluid and methods of using same

Corkran, J.L., *et al.*, Cooper Industries, Inc., US7651641, January 26, 2010

In one aspect the present invention provides a dielectric fluid for use in electrical equipment comprising a vegetable oil or vegetable oil blend. In another aspect the invention provides devices for generating and distributing electrical energy that incorporate a dielectric fluid comprising a vegetable oil or vegetable oil blend. Methods of retrofilling electrical equipment with vegetable oil-based dielectric fluids also are provided.

Milk chocolate containing water

Beckett, S.T., *et al.*, Nestec SA, US7651721, January 26, 2010

A process for manufacturing milk chocolate products containing a higher than normal water content by preparing a dark chocolate containing up to 30% by weight of water, adding a milk powder suspension optionally together with seed crystals of cocoa butter or cocoa butter equivalent, and mixing under low shear. The invention also relates to high water content milk chocolate products, methods of preparing a chocolate-coated ice cream article with such products, and to the resulting chocolate-coated ice cream articles.

Herbicidal compositions

Kazen, J.L., *et al.*, Valent U.S.A. Corp. and Akzo Nobel Surface Chemistry LLC, US7651977, January 26, 2010

The present invention provides an improved herbicidal composition including (i) an effective amount of an herbicidal cyclohexanedione oxime compound or agriculturally acceptable salt thereof; (ii) one or more esters of a fatty acid; (iii) a salt of dodecylbenzenesulfonic acid; (iv) at least one nonionic surfactant selected from the group consisting of polyoxyethylene plant oils and polyoxyethylene sorbitan esters; and (v) optionally an aromatic hydrocarbon solvent. The present invention also provides a method for controlling the growth of vegetation by applying to the vegetation the composition of the present invention.

Omega 3 fatty acid formulations

Feuerstein, S., *et al.*, Cenestra LLC, US7652068, January 26, 2010

The present invention provides highly purified omega-3 fatty acid formulations. Certain formulations provided herein contain

greater than 85% omega-3 fatty acids by weight. Certain other formulations provided herein contain EPA [eicosapentaenoic acid] and DHA [docosahexaenoic acid] in a ratio of from about 4.01:1 to about 5:1. The invention also provides methods of using the dosage forms to treat a variety of cardiovascular, autoimmune, inflammatory, and central nervous system disorders by administering a formulation of the invention to a patient in need thereof.

Refined method for manufacturing ethyl esters from fatty substances of natural origin

Hillion, G., and B. Delfort, Institut Français du Pétrole, US7652156, January 26, 2010

A method allowing, from natural fat or oils, vegetable or animal, or from other glyceride mixtures to obtain in a quasi-quantitative way fatty acid ethyl esters that can be used as gas oil substitutes, comprises the succession of stages as follows: a stage (i) wherein the oil, the fat, or the glyceride mixture is transesterified by ethanol using a soluble catalyst or a catalyst that becomes soluble during the reaction, a stage (ii) wherein the glycerin formed is decanted and removed without requiring an excess ethanol evaporation operation, a stage (iii) wherein a second transesterification reaction is carried out so as to obtain a product whose ester content is at least 97% by mass, a stage (iv) wherein controlled neutralization of the catalyst is carried out, a stage (v) wherein the excess ethanol is removed by distillation, a stage (vi) wherein the ester undergoes purification by means of water wash sequences, and a stage (vii) wherein the ester mixture is dried under reduced pressure.

Homogeneous low hardness polyurethane

Killeen, K.A., Lexmark International Inc., US7655311, February 2, 2010

This invention employs a polyol derivative of a fatty acid that is reacted into a polyurethane formed also with a urethane prepolymer, a polydiene, and optionally, a curative for cross-linking. The fatty acid moiety becomes a relatively short side chain of the polyurethane formed. In embodiments the polyol is an ester of the fatty acid. This achieves reduction in hardness of the polyurethane with a homogeneity that provides consistent surface characteristics over an extended period desirable for use for electrophotographic development and the like when the material is used as a developer roller.

Recombinant *Candida rugosa* lipases

Shaw, J.-f., *et al.*, Academia Sinica, US7655453, February 2, 2010

The present invention features an isolated nucleic acid that includes a mutant DNA encoding a *Candida rugosa* lipase wherein the mutant DNA is 80% identical to a wild-type DNA encoding the *Candida rugosa* lipase and includes at least 12 (e.g., 13, 15, 17, or all) universal serine codons corresponding to CTG codons in the wild-type DNA. Each of the universal serine codons, independently, is TCT, TCC, TCA, TCG, AGT, or AGC. The *Candida rugosa* lipase can be *Candida rugosa* lipase 1, 2, 3, 4, 5, or 8.

Method and apparatus for assessing purity of vegetable oils by means of terahertz time-domain spectroscopy

Zhao, Z., *et al.*, Nuctech Company; Tsinghua University, US7652769, January 26, 2010

The present invention relates to a method for assessing the purity of vegetable oils by means of terahertz (THz) time-domain spectroscopy, comprising the steps of: measuring the THz time-domain spectra of standard vegetable oils to establish a spectral database; measuring the THz time-domain spectrum of vegetable oil to be detected; analyzing the purity of the detected vegetable oil based on the pre-built database. The present invention also relates to an apparatus for assessing purity of vegetable oil by means of THz time-domain spectroscopy, comprising: spectrum measuring device for measuring time-domain waveforms of THz pulses before and after transmitting the vegetable oil held in a container by transmission approach, or directly measuring time-domain waveforms of THz pulses before and after reflecting from the vegetable oil by reflection approach; and data processing device for extracting physical parameters of the vegetable oil in THz region according to the time-domain waveforms. Compared with the prior art, the method according to the present invention is easy rapid and quantitative.

Clean-up additive for viscoelastic surfactant based fluids

Crews, J.B., Baker Hughes Inc., US7655603, February 2, 2010

Clean-up additive compositions may be used to enhance the clean-up of VES (viscoelastic surfactant)-gelled aqueous fluids in a wide range of applications and VES fluid compositions including use of an internal breaker system. The compositions are microemulsions that may include, but not necessarily be limited to, at least one viscosity-reducing agent, at least one solubilizing agent, at least one desorption agent, and at least one water-wetting agent. One non-limiting embodiment of a specific microemulsion includes an unsaturated fatty acid oil, a glycol, a sorbitan ester/ethoxylated sorbitan ester mixture, and an alkyl sulfonate. Microemulsions may perform one or more of the following functions: keeping the reservoir water wet; keeping surface tension reduction low; demulsifying reservoir crude oils and aqueous VES fluids; dispersing and solubilizing the by-products generated when breaking the VES gel; and/or limiting the amount of VES residue on reservoir minerals.

ADS genes for reducing saturated fatty acid levels in seed oils

Heilmann, I.H., and J. Shanklin, Brookhaven Science Associates LLC, US7655833, February 2, 2010

The present invention relates to enzymes involved in lipid metabolism. In particular the present invention provides coding sequences for *Arabidopsis* desaturases (ADS), the encoded ADS polypeptides, and methods for using the sequences and encoded polypeptides, where such methods include decreasing and increasing saturated fatty acid content in plant seed oils.

Process for printing an aqueous ink composition

Bujard, P., *et al.*, Ciba Specialty Chemicals Corp., US7658488, February 9, 2010

A process for printing flat substrates in which the said substrate is printed with an ink composition including (a) a basic dye together with (b) an aliphatic carboxylic acid having at least four carbon atoms, (d) a binder resin, and water yields water-resistant prints having a high depth of shade and high chroma.

Cosmetic or dermatological impregnated cloths

Von Der Fecht, S., and J. Kuether, Goldschmidt GmbH, US7658936, February 9, 2010

The invention is a cosmetic or dermatological cloth, comprising a water-insoluble nonwoven material which is moistened with a cosmetic or dermatological impregnating solution comprising an oil-in-water emulsions having a viscosity of less than 2000 mPa·s and comprising one or more partially neutralized glyceride esters selected from the group consisting of monoglyceride and diglyceride esters of saturated fatty acids with citric acid and one or more fatty alcohols selected from the group consisting of branched and unbranched alkyl alcohols with 12 to 40 carbon atoms. ■

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



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Extracts & Distillates

Medium-chain fatty acids: Functional lipids for the prevention and treatment of the metabolic syndrome

Nagao, K., and T. Yanagita, *Pharmacol. Res.* 61:208–212, 2010.

Metabolic syndrome is a cluster of metabolic disorders, such as abdominal obesity, dyslipidemia, hypertension, and impaired fasting glucose, that contribute to increased cardiovascular morbidity and mortality. Although the pathogenesis of metabolic syndrome is complicated and the precise mechanisms have not been elucidated, dietary lipids have been recognized as contributory factors in the development and the prevention of cardiovascular risk clustering. This review explores the physiological functions and molecular actions of medium-chain fatty acids (MCFA) and medium-chain triglycerides (MCT) in the development of metabolic syndrome. Experimental studies demonstrate that dietary MCFA/MCT suppress fat deposition in animal and human subjects through enhanced thermogenesis and fat oxidation. Additionally, several reports suggest that MCFA/MCT offer the therapeutic advantage of preserving insulin sensitivity in animal models and patients with type 2 diabetes.

Single embryo and oocyte lipid fingerprinting by mass spectrometry

Ferreira, C.R., *et al.*, *J. Lipid Res.* 51:1218–1227, 2010.

Methods used for lipid analysis in embryos and oocytes usually involve selective lipid extraction from a pool of many samples followed by chemical manipulation, separation, and characterization of individual components by chromatographic techniques. Herein we report direct analysis by matrix-assisted laser desorption ionization–mass spectrometry (MALDI–MS) of single and intact embryos or oocytes from various species. Biological samples were

simply moisturized with the matrix solution and characteristic lipid (represented by phosphatidylcholines, sphingomyelins, and triacylglycerols) profiles were obtained via MALDI–MS. As representative examples, human, bovine, sheep, and fish oocytes, as well as bovine and insect embryos were analyzed. MALDI–MS is shown to be capable of providing characteristic lipid profiles of gametes and embryos and also to respond to modifications due to developmental stages and *in vitro* culture conditions of bovine embryos. Investigation in developmental biology of the biological roles of structural and reserve lipids in embryos and oocytes should therefore benefit from these rapid MALDI–MS profiles from single and intact species.

Tocochromanol functions in plants: antioxidation and beyond

Falk, J., and S. Munne-Bosch, *J. Exp. Bot.* 61:1549–1566, 2010.

Tocopherols and tocotrienols, collectively known as tocochromanols, are lipid-soluble molecules that belong to the group of vitamin E compounds and are essential in the human diet. Not surprisingly, most of what is known about the biological functions of tocochromanols comes from studies of mammalian systems, yet they have been shown to be synthesized only by photosynthetic organisms. The last decade has seen a radical change in the appreciation of the biological role of tocochromanols in plants thanks to a detailed characterization of mutant and transgenic plants, including several *Arabidopsis thaliana* mutants, the sucrose export defective1 (*sxd1*) maize mutant, and some transgenic potato and tobacco lines altered in tocochromanol biosynthesis. Recent findings indicate that tocopherols may play important roles in plants beyond their antioxidant function in photosynthetic membranes. Plants deficient in tocopherols show alterations in germination and export of photoassimilates and in growth, leaf senescence, and plant responses to abiotic stresses, thus suggesting that tocopherols may influence a number of physiological processes in plants. Thus, in this review not only the antioxidant function of tocochromanols in plants but also these new emerging possible roles will be considered. Particular attention will be paid to specific roles attributed to different tocopherol

homologs (particularly α - and γ -tocopherol) and the possible functions of tocotrienols, which in contrast to tocopherols are only present in a range of unrelated plant groups and are almost exclusively found in seeds and fruits.

Separation of *cis/trans* geometrical fatty acid isomers by silver-exchanged zeolite Y

Lykakis, I.N., *et al.*, *Tetrahedron* 66:2203–2209, 2010.

The separation of *cis* and *trans* isomers is relevant for biological and nutritional applications; silver-exchanged zeolite Y was prepared and applied for the treatment of mixtures of *cis* and *trans* geometrical isomers of mono- and polyunsaturated fatty acid methyl esters (FAME). *cis* FAME were adsorbed into zeolite with a high degree of selectivity (*cis/trans* ratio in the range of 19–32). The effectiveness was due to the synergism of the π -complexation between the silver ion and the double bonds and the different FAME structures trapped into the zeolite cages. Some indication of the complex stabilities came from theoretical studies using unsaturated lipids. A prototype cartridge was also designed for application in the fractionation of *cis/trans* FAME mixtures.

Instantaneous characterization of vegetable oils via TAG and FFA profiles by easy ambient sonic-spray ionization mass spectrometry

Simas, R.C., *et al.*, *Analyst* 135:738–744, 2010.

A fast and reliable method is presented for the analysis of vegetable oils. Easy ambient sonic-spray ionization mass spectrometry (EASI-MS) is shown to efficiently desorb and ionize the main oil constituents from an inert surface under ambient conditions and to provide comprehensive triacylglyceride (TAG) and free fatty acid (FFA) profiles, detected mainly as either $[\text{TAG} + \text{Na}]^+$ or $[\text{FFA} - \text{H}]^-$ ions. EASI (+/–)-MS analysis is simple, easily implemented, requires just a tiny droplet of the oil, and is performed without any pre-separation or chemical manipulation. It also causes no fragmentation of TAG ions, hence diacylglyceride and monoacylglyceride profiles and

contents can also be measured. The EASI (+/-)-MS profiles of TAG and FFA permit authentication and quality control and can be used, for instance, to access levels of adulteration, acidity, oxidation, or hydrolysis of vegetable oils in general.

Calibration of an evaporative light-scattering detector for the universal quantitative analyses in liquid chromatography—application to the determination of triacylglycerols in cucurbitaceous oils

Heron, S., *et al.*, *Food Anal. Methods* 3:67–74, 2010.

The goal of this work is to validate a quantitative method to analyze 15 triacylglycerols (TAG) that are present in cucurbitaceous oils using a new liquid chromatography–evaporative light-scattering detector (LC–ELSD) methodology. For the majority of the TAG, the absence of chromophoric groups absorbing in a spectral zone different from those of the high-performance liquid chromatography mobile phases limits the use of ultraviolet detectors. The most convenient detectors for this type of analyses are the “universal” aerosol-based detectors, and the most frequently used one among these detectors is the ELSD. TAG responses using ELSD can vary according to their structure, and the analyst may not possess all the 15 different TAG standards. Therefore, the determination of these analytes in unknown samples cannot be accurate and depends on the nature of the available standards. We propose here a new quantification methodology by LC–ELSD using the standard response model $A = a \times m(b)$, where a and b are numerical coefficients that are specific for each solute and both correlated. The method uses a sample dilution procedure that provides for each compound to quantify an accurate b value, and by calculation, the corresponding a value. The quantification of both coefficients a and b easily gives the direct mass determination of each TAG. Such LC–ELSD results are validated by the comparison with the fatty acid methyl ester (FAME) analysis using the conventional capillary gas chromatography–flame ionization detector that transforms nonvolatile TAG in FAME after a transesterification step. To perform this validation, we

compared the experimental FAME composition to the theoretical one calculated from the TAG results obtained by LC–ELSD. For each TAG, theoretical and experimental values were statistically similar, which proves and validates the relevance of the new quantification methodology proposed in this work. The concordance between the two different methods also highlights the great advantage of the direct LC–ELSD method which additionally provides more information on TAG structures.

The effect of dietary phytosphingosine on cholesterol levels and insulin sensitivity in subjects with the metabolic syndrome

Snel, M., *et al.*, *Eur. J. Clin. Nutr.* 64:419–423, 2010.

Sphingolipids, such as phytosphingosine (PS), are part of cellular membranes of yeasts, vegetables and fruits. Addition of PS to the diet decreases serum cholesterol and free fatty acid (FFA) levels in rodents and improves insulin sensitivity. To study the effect of dietary supplementation with PS on cholesterol and glucose metabolism in humans, twelve men with the metabolic syndrome (MetS) [according to the International Diabetes Federation (IDF) criteria; age 51 ± 2 years (mean \pm s.e.m.); body mass index (BMI) 32 ± 1 kg/m²] were randomly assigned to 4 weeks of PS (500 mg twice daily) and 4 weeks of placebo (P) in a double-blind cross-over study, with a 4-week washout period between both interventions. At the end of each intervention anthropometric measures and serum lipids were measured and an intravenous glucose tolerance test (IVGTT) was performed. PS did not affect body weight and fat mass compared with P. PS decreased serum total cholesterol [5.1 ± 0.3 (PS) vs. 5.4 ± 0.3 (P) mmol/L; $P < 0.05$] and low-density lipoprotein-cholesterol levels [3.1 ± 0.3 (PS) vs. 3.4 ± 0.3 (P) mmol/L; $P < 0.05$], whereas it did not alter serum triglyceride and high-density lipoprotein-cholesterol levels. In addition, PS lowered fasting plasma glucose levels [6.2 ± 0.3 (PS) vs. 6.5 ± 0.3 (P) mmol/L; $P < 0.05$]. PS increased the glucose disappearance rate (K-value) by 9.9% during the IVGTT [0.91 ± 0.06 (PS) vs. 0.82 ± 0.05 (P) %/min; $P < 0.05$] at similar insulin levels, compared with P, thus implying enhanced

insulin sensitivity. PS induced only minor gastrointestinal side effects. Dietary supplementation of PS decreases plasma cholesterol levels and enhances insulin sensitivity in men with the MetS.

Encapsulation of plant oils in porous starch microspheres

Glenn, G.M., *et al.*, *J. Agric. Food Chem.* 58:4180–4184, 2010.

Natural plant products such as essential oils have gained interest for use in pest control in place of synthetic pesticides because of their low environmental impact. Essential oils can be effective in controlling parasitic mites that infest honeybee colonies, but effective encapsulants are needed to provide a sustained and targeted delivery that minimizes the amount of active ingredient used. The present study reports the encapsulation of essential oils in porous microspheres that are within the size range of pollen grains and can be easily dispersed. The microspheres were made by pumping an 8% aqueous high-amylose starch gelatinous melt through an atomizing nozzle. The atomized starch droplets were air-classified into two fractions and collected in ethanol. The size range for each fraction was measured using a particle size analyzer. The mean particle size for the largest fraction was approximately 100 μ m with a range from 5 μ m to over 300 μ m. Part of the reason for the large particle size was attributed to the merging of smaller particles that impinged upon each other before they solidified. The smaller fraction of spheres had a mean particle size of approximately 5 μ m. The starch-based porous microspheres were loaded with 16.7% (w/w) essential oils including thymol (5-methyl-2-isopropylphenol), clove, origanum, and camphor white oil. The essential oils appeared to be largely sequestered within the pore structure, since the spheres remained a free-flowing powder and exhibited little if any agglomeration in spite of the high loading rate. Furthermore, scanning electron microscopy micrographs verified that the pore structure was stable, as evidenced by the persistence of pores in spheres that had first been loaded with essential oils and then had the oil removed by solvent extraction. Thermal gravimetric analyses were consistent with a loading rate at predicted levels.

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Ricinoleic acid as a marker for ergot impurities in rye and rye products

Franzmann, C., *J. Agric. Food Chem.* 58:4223–4229, 2010.

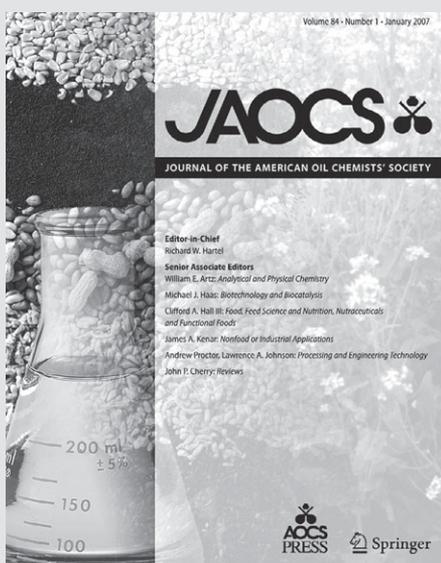
Ergot alkaloid and ricinoleic acid contents of 63 ergot sclerotia samples from rye throughout Germany of the harvest years 2006–2009 were determined. Alkaloid contents were analyzed by means of high-performance liquid chromatography with fluorescence detection (HPLC-FLD) and ricinoleic acid contents by means of gas chromatography with flame ionization detection (GC-FID). Ergot alkaloid amounts ranged from 0.01 to 0.2 g/100 g of sclerotia with an average amount of 0.08 g/100 g. Ergotamine and ergocristine were identified as lead alkaloids representing 57% (w/w) of the total alkaloid content. The average ricinoleic acid amount in the ergot sclerotia was 10.3 g/100 g. Because of the low variation of ricinoleic acid content in the ergot sclerotia, a new method for the determination of ricinoleic acid in rye products as a marker for ergot contaminations was developed. This method allows the determination of ergot impurities as low as 0.01% (w/w). Furthermore, 29 rye products (flours, bread mix, bread) were investigated for their ricinoleic acid and ergot alkaloid contents.

Effects of lipase, lipoxygenase, peroxidase, and free fatty acids on volatile compound found in boiled buckwheat noodles

Suzuki, T., *et al.*, *J. Sci. Food Agric.* 90:1232–1237, 2010.

Relationships between buckwheat (*Fagopyrum esculentum* Moench) flour lipase, lipoxygenase, and peroxidase activity, along with levels of individual free fatty acids (FFA) and levels of headspace volatile compounds of boiled buckwheat noodles, were investigated for 12 different buckwheat varieties. Enzyme activities and FFA levels in flour were correlated with their respective varietal arrays of boiled noodle headspace volatile compounds, measured by gas chromatography–mass spectrometry. The volatiles hexanal, tentative butanal, tentative 3-methylbutanal, and tentative 2-methylbutanal showed significant positive correlation with one another, indicating that they may be generated through similar

AOCS Journals



Journal of the American Oil Chemists' Society (May)

- The antioxidant functions of tocopherol and tocotrienol homologues in oils, fats, and food systems, Seppanen, C.M., Q. Song, and A.S. Csallany
- Evaluation of the oxidative stability of diacylglycerol-enriched soybean oil and palm olein under Rancimat-accelerated oxidation conditions, Wang, Y., M. Zhao, S. Tang, K. Song, X. Han, and S. Ou
- Improving plasticity of milk fat for use in baking by fractionation, Reddy, S.Y.
- Effect of irrigation regimes on oil content and composition of safflower (*Carthamus tinctorius* L.) cultivars, Ashrafi, E., and K. Razmjoo
- Characterization of soybean proteins–fatty acid systems, Quiroga, A., M.C. Añón, and M.C. Puppo
- Determination of deep frying soybean oil disposal point by a sensory method, Ravelli, D., C.R. Matsuoka, R.C. Della Modesta, T.M.F. de Souza Vieira, and M.A.B. Regitano-d'Arce

- The Plackett–Burman design for evaluating the production of polyunsaturated fatty acids by *Physcomitrella patens*, Chodok, P., A. Kanjana-Opas, and S. Kaewsuwan

- Enzymatic production of monoacylglycerols with camellia oil by the glycerolysis reaction, Zeng, F.-k., B. Yang, Y.-h. Wang, W.-f. Wang, Z.-x. Ning, and L. Li

- Physicochemical properties of garden cress (*Lepidium sativum* L.) seed oil, Diwakar, B.T., P.K. Dutta, B.R. Lokesh, and K.A. Naidu

- Potential relationships between fatty acid compositions and phytochemicals of selected low linolenic soybeans grown in Maryland, Whent, M., M. Slavin, W. Kenworthy, and L. Yu

- Antioxidant activity of tannin fractions isolated from buckwheat seeds and groats, Karamać, M.

- Effect of metal contaminants and antioxidants on the oxidation stability of the methyl ester of pongamia, Sarin, A., R. Arora, N.P. Singh, R. Sarin, M. Sharma, and R.K. Malhotra

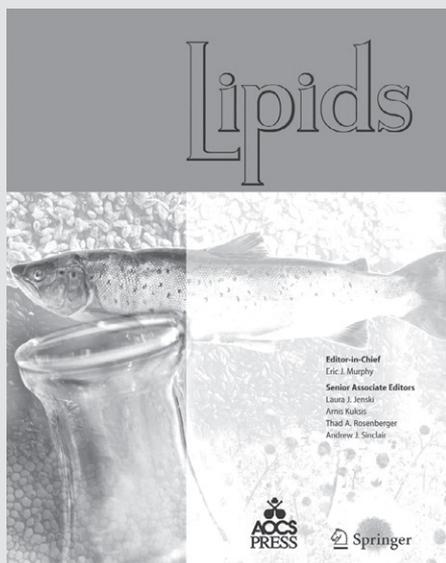
- Effect of storage conditions on the oil quality of Chinese tallow tree seeds, Terigar, B.G., S. Balasubramanian, and D. Boldor

- Sodium bisulfite-induced changes in the physicochemical, surface and adhesive properties of soy β -conglycinin, Zhang, L., and X.S. Sun

- Liquid-liquid equilibrium constant for acetic acid in an epoxidized soybean oil–acetic acid–water system, Janković, M., S. Sinadinović-Fišer, and M. Lamshoef

Lipids (May)

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mechanisms. These important volatile components of buckwheat flavor were also positively correlated with lipase and/or peroxidase activity, indicating that enzymatic reactions are important in flavor generation in boiled buckwheat noodles. On the other hand, pentanal, which showed no significant correlation with any enzyme activity, showed a significant positive correlation to the levels of C18:2 and C18:3 FFA, suggesting the existence of a "nonenzymatic" and/or "uncertain enzymatic" pathway for flavor generation in boiled buckwheat noodles. Lipase and peroxidase in buckwheat flour are important for flavor generation of boiled buckwheat noodles. This information is important for increasing desirable flavor of buckwheat products as well as for selecting varieties with improved flavor.

Major lipid classes separation of buttermilk, and cows, goats and ewes milk by high performance liquid chromatography with an evaporative light scattering detector focused on the phospholipid fraction

Rodríguez-Alcalá, L.M., and J. Fontecha, *J. Chromatog. A* 1217:3063–3066, 2010.

An improved high-performance liquid chromatography–evaporative light-scattering detector (HPLC–ELSD) method has been developed for the analysis of the lipid classes of buttermilk and milk from different species, focused on the phospholipids fraction without a prior fractionation step and in a single run. The total lipid profile analysis showed the major and minor lipid compounds as cholesterol esters, triacylglycerides, cholesterol, diacylglycerides, free fatty acids, monoacylglycerides, and also the polar compounds glucosylceramide, lactosylceramide, phosphatidylethanolamine, phosphatidylinositol, phosphatidylserine, phosphatidylcholine, sphingomyelin, and lysophosphatidylcholine. The identification and quantification of the different compounds, using calibration curves made with individual standards and the low coefficients of variation obtained in the inter- and intra-assays showed the suitability of the developed method. In this study, we optimized and validated a quantitative HPLC–ELSD method at a concentration level suitable for

routine analysis of the major lipid classes in milk and dairy products.

The gut microbiota modulates host energy and lipid metabolism in mice

Velagapudi, V.R., *et al.*, *J. Lipid Res.* 51:1101–1112, 2010.

The gut microbiota has recently been identified as an environmental factor that may promote metabolic diseases. To investigate the effect of gut microbiota on host energy and lipid metabolism, we compared the serum metabolome and the lipidomes of serum, adipose tissue, and liver of conventionally raised (CONV-R) and germ-free mice. The serum metabolome of CONV-R mice was characterized by increased levels of energy metabolites, for example, pyruvic acid, citric acid, fumaric acid, and malic acid, while levels of cholesterol and fatty acids were reduced. We also showed that the microbiota modified a number of lipid species in the serum, adipose tissue, and liver, with its greatest effect on triglyceride and phosphatidylcholine species. Triglyceride levels were lower in serum but higher in adipose tissue and liver of CONV-R mice, consistent with increased lipid clearance. Our findings show that the gut microbiota affects both host energy and lipid metabolism and highlight its role in the development of metabolic diseases.

Effect of conjugated linoleic acid on body fat accretion in overweight or obese children

Racine, N.M., *et al.*, *Am. J. Clin. Nutr.* 91:1157–1164, 2010.

Conjugated linoleic acid (CLA) is a supplemental dietary fatty acid that decreases fat mass accretion in young animals. The aim of this study was to determine CLA's efficacy with regard to change in fat and body mass index (BMI; in kg/m²) in children. We conducted a 7 ± 0.5-month randomized, double-blind, placebo-controlled trial of CLA in 62 prepubertal children aged 6–10 years who were overweight or obese but otherwise healthy. The subjects were randomly assigned to receive 3 grams/day of 80% CLA (50:50 *cis*-9,*trans*-11 and *trans*-10,*cis*-12 isomers) or placebo in chocolate milk. Fifty-three subjects completed

the trial ($n = 28$ in the CLA group, $n = 25$ in the placebo group). CLA attenuated the increase in BMI (0.5 ± 0.8) compared with placebo (1.1 ± 1.1) ($P = 0.05$). The percentage change in body fat measured by dual-energy X-ray absorptiometry was smaller ($P = 0.001$) in the CLA group ($-0.5 \pm 2.1\%$) than in the placebo group ($1.3 \pm 1.8\%$). The change in abdominal body fat as a percentage of total body weight was smaller ($P = 0.02$) in the CLA group ($-0.09 \pm 0.9\%$) than in the placebo group ($0.43 \pm 0.6\%$). There were no significant changes in plasma glucose, insulin, or low density lipoprotein-cholesterol between groups. Plasma high density lipoprotein (HDL)-cholesterol decreased significantly more ($P = 0.05$) in the CLA group (-5.1 ± 7.3 mg/dL) than in the placebo group (-0.7 ± 8 mg/dL). Bone mineral accretion was lower ($P = 0.04$) in the CLA group (0.05 ± 0.03 kg) than in the placebo group (0.07 ± 0.03 kg). Reported gastrointestinal symptoms did not differ significantly between groups. CLA supplementation for 7 ± 0.5 months decreased body fatness in 6–10-year-old children who were overweight or obese but did not improve plasma lipids or glucose and decreased HDL more than in the placebo group. Long-term investigation of the safety and efficacy of CLA supplementation in children is recommended.

Oil quality characteristics of irradiated sunflower and maize seed

Yaqoob, N., *et al.*, *Eur. J. Lipid Sci. Technol.* 112:488–495, 2010.

The characteristics of oils extracted from gamma-irradiated sunflower (*Helianthus annuus*) and maize (*Zea mays*) seeds at absorbed doses of 2, 4, 6, 8, and 10 kGy were investigated. Gamma irradiation did not affect the lipid, protein, fiber, and ash contents of either sunflower or maize seeds significantly ($p > 0.05$). No significant changes were observed for the values of refractive index and density between the control and irradiated sunflower and maize oils. Peroxide value, acid value, *para*-anisidine value, and conjugated dienes and trienes contents increased, while iodine values decreased in the irradiated oils as compared to those of control oils ($p < 0.05$). A small decrease in the contents of α -, γ -, and δ -tocopherols of both sunflower and maize oils was noted by

radiation treatment up to 6 kGy, however, the decline was more pronounced at higher dosages. The effects of irradiation on the fatty acid composition of sunflower oil showed a significant ($p < 0.05$) change in the amounts of stearic, oleic, and linoleic acids, while the concentration of palmitic acid was unaffected even at 10 kGy. Similar trends in the fatty acid profile were found for both the sunflower and maize oil.

Protection of biodiesel against oxidation

Ingendoh, A., *Lipid Technol.* 22:83–86, 2010.

The importance of using synthetic antioxidants to improve oxidation stability and shelf life of biodiesel is today generally accepted. In our investigations, which started early with the development of biodiesel, we have looked at the course of stability, aging of biodiesel, and the use of synthetic antioxidants. We have shown for the first time that oxidative stability of biodiesel is lower than that of the rapeseed oil from which it was produced. The natural stability of biodiesel relates mainly to the content of tocopherols that survive the transesterification process. Biodiesel freed from tocopherols has no stability and will be destroyed immediately in air. Synthetic antioxidants such as butylated hydroxytoluene (BHT) and the newly developed stronger “Bis-BHT” dramatically improve oxidative stability and prolong shelf life. Biodiesel rich in polyunsaturated fatty acid methyl ester needs strong antioxidants to be sufficiently protected. The class of hindered phenolic antioxidants from which the BHT and Bis-BHT derive are well suited as industrial biodiesel stabilizer because of their ready availability, sufficient effectiveness, and proven safety in diesel fuel. Surprisingly, none of the approved international biodiesel and biodiesel blend specifications refer to shelf life as a quality parameter. There is no definition of shelf life available, although it is well understood that biodiesel ages and loses its oxidative stability over time. We propose to consider the time span from production until the biodiesel reaches zero oxidative stability and becomes rancid and detrimental for the engine as the “shelf life” of biodiesel. From the perspective of customers running their cars on biodiesel blends, shelf life should become a more important issue.

Effects of tocopherols and tocotrienols on the inhibition of autoxidation of conjugated linoleic acid

Ko, S.-N., *et al.*, *Eur. J. Lipid Sci. Technol.* 112:496–501, 2010.

The effect of eight vitamin E homologs, that is, α -, β -, γ -, and δ -tocopherol and α -, β -, γ -, and δ -tocotrienol, on the inhibition of autoxidation of conjugated linoleic acid (CLA) were investigated. The oxidation was carried out in the dark for 21 days at 50°C and monitored by peroxide values (PV) and thiobarbituric acid (TBA) values. The levels of the individual vitamin E homologs in CLA during storage were determined by HPLC. γ -Tocopherol exhibited the highest antioxidant activity among the homologs tested in this study when the antioxidant activities of the individual homologs in CLA were compared by PV. The order of antioxidant activity of eight homologs was γ -tocopherol > δ -tocopherol = δ -tocotrienol \geq γ -tocotrienol > β -tocopherol = β -tocotrienol > α -tocopherol = α -tocotrienol. The degradation rates of α -tocopherol and α -tocotrienol were

faster than those of the other homologs, whereas δ -tocopherol had the highest stability in CLA during storage. All homologs exhibited an antioxidant activity by inhibiting the formation of secondary oxidation products. It appears that α -tocotrienol and β -tocotrienol have significantly higher antioxidant activities for secondary oxidation in CLA than α -tocopherol and β -tocopherol. Meanwhile, the other homologs, namely γ -tocopherol, γ -tocotrienol, δ -tocopherol, and δ -tocotrienol, exhibited similar antioxidant activity for secondary oxidation in CLA.

Lipid oxidation in algae oil-in-water emulsions stabilized by bovine and caprine caseins

Mora-Gutierrez, A., *et al.*, *J. Agric. Food Chem.* 58:5131–5139, 2010.

Caseins (α_{s1} -, α_{s2} -, and β -casein) are phosphoproteins that are capable of binding transition metals and scavenging free radicals; this property makes them good candidates to be used as natural antioxidants in oil-in-water emulsions. Caprine casein

exhibits variability in α_{s1} -casein content generated by genetic polymorphism. This variability in composition could lead to altered antioxidant properties. Thus, the ability of two caprine caseins differing in α_{s1} -casein content to inhibit lipid oxidation in algae oil-in-water emulsions at 5% oil was investigated and compared to bovine caseinate. All caseins inhibited the formation of lipid oxidation at pH 7.0 as determined by lipid hydroperoxides and thiobarbituric acid reactive substances. However, caprine caseins were in general more effective inhibitors of lipid oxidation than the bovine caseins, which may be attributed to their altered casein amino acid content and/or metal-binding capabilities. The combination of the carotenoids with bovine and caprine caseins was highly effective at repressing oxidation leading to the speculation that the caseins may inhibit the loss of the carotenoids and/or react with and enhance the carotenoid activity; again some differences between bovine and caprine caseins were observed with caprine caseins being slightly more effective in the presence of carotenoids. ■

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BOOK REVIEW

(CONTINUED FROM PAGE 358)

enzymes listed include lipases, phospholipases, glucosidases, and the protease papain.

Biobased Surfactants and Detergents originates from a symposium, "Biobased Surfactants and Oleochemicals," organized by AOCS in Québec City, Canada, in May 2007. This book is an excellent collaboration of four participants from that meeting, who have brought together this group of leading experts to write the book.

Krister Holmberg is professor of surface chemistry at Chalmers University of Technology in Gothenburg, Sweden. His research relates to novel surfactants, nanomaterials prepared via self-assembled surfactants, and organic and bioorganic reactions in organized solutions. He can be reached at kh@chalmers.se.

BIODIESEL INDUSTRY

(CONTINUED FROM PAGE 337)

solving common problems. For example, if you focused only on North America you would hear what was being done to assess the sustainability of biodiesel here in the United States. When you include Europe and beyond in the picture, you learn of a multiplicity of new approaches being taken by groups that are doing good work but have little visibility in North America. I believe that you ignore the international situation at your own risk.

Q *Joe, looking ahead to next year's National Conference, have you decided on a theme, and what changes are you anticipating for the conference and for the industry?*

A (*Joe*): We have not yet decided on a theme. Changes for the industry will be determined by critical federal and state government policy developments that are currently in a state of flux. As of this writing, the biodiesel tax credit has lapsed, and the RFS-2 is yet to be fully implemented, placing extraordinary and unnecessary distress on the US biodiesel industry. Once those two pieces of important energy policy are in place, biodiesel will be poised to become a major contributor to our domestic energy supply.

CALENDAR (CONTINUED FROM PAGE 329)

Information: www.biofuelsinternationalexpo.com/canada.

September 28–30, 2010. 2010 Algal Biomass Summit, JW Marriott Desert Ridge Resort, Phoenix, Arizona, USA. Information: www.algalbiomass.org/events.

October

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

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

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



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

October 13–14, 2010. American Fats & Oils Association Annual Meeting. Information: www.foaonline.org/events.html.



October 16–19, 2010. 9th International Symposium on the Role of Soy in Health Promotion and Chronic Disease Prevention and

Treatment, Capital Hilton, Washington, DC, USA. Information: www.SoySymposium.org.

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

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

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

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

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

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

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

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Algae oil: Biofuels and beyond

Lynn Crandall

Working in the lab in his senior year of undergraduate studies, Yusuf Chisti experienced an “Aha!” moment. His research project required purification of hydrocarbon oils from extracts of the alga *Botryococcus braunii*. The algal oil ignited possibilities in his mind.

“I held a match to a drop of the algal oil,” Chisti said. “It caught fire and burnt for quite a while. I thought, this might replace petroleum some day.”

That was 1979. Since that time, Chisti, a professor of biochemical engineering at Massey University, Palmerston North, New Zealand, has made considerable contribution to the field of microalgae research and its possible market applications. Although hopes of creating renewable fuel oils from algal oil have driven interest in recent years and made algae research “hot,” Chisti and other scientists who have amassed appreciable history in the field contend that there is more to algal oil potential than its use in biofuel. In fact, it is its potential for diverse applications that holds the most promise for making algal oil products commercially viable.

“Oil productivity of some algae exceeds the productivity of crops such as oil palm, one of the most productive oil crops,” said Chisti. His current research is focusing on producing algal oils for renewable biofuels and specialty oils, and attempting to improve

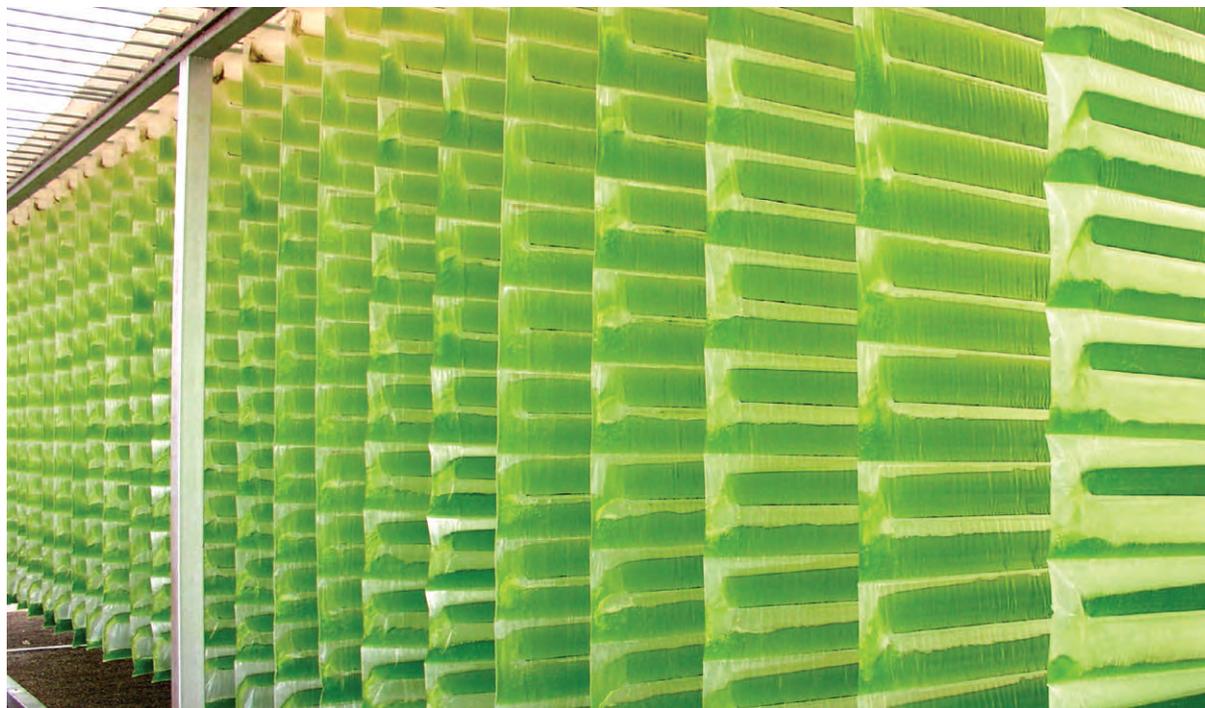
productivity of the desired oils. “Algae therefore have the potential to become a significant new source of oils for use in cosmetics, soaps, and other applications. Algae can provide certain essential fatty acids that are not easily obtained from oil crops. Algae can provide certain oils for pharmacological use.”

SOMETHING OLD

Algae are primitive plants that thrive on sunlight and carbon dioxide, as do all plants. Some algae are large, called macroalgae, and have been used as a food source throughout history. Kelps are an example of macroalgae used as food.

Current interest, however, is focused on microalgae—microscopic, unicellular plants that are the earliest evolutionary precursor to all higher plants. All of the biochemistry for oil production that is inside a canola plant or soybean plant or palm tree first arose in unicellular algae. Also known as phytoplankton, microalgae in high concentrations can make oceans, lakes, and slow-moving rivers appear green.

There are two basic options for growing microalgae on a large scale—open raceway ponds or closed system photobioreactors—but almost all commercial algal production occurs in open ponds, said John Benemann, a consultant based in Walnut Creek, California, United States, who has been involved in microalgae research at all levels for almost 40 years. Although open ponds face challenges, including invasion of other organisms and the effects of temperature fluctuations, they are cheaper to build and maintain than photobioreactor systems, Benemann said, and thus help reduce overall



Patented Vertigo system for growing microalgae. This tubular photobioreactor system, oriented vertically to maximize capture of sunlight, is a joint venture of Valcent and Global Green Solutions.

cost of production. Oil production in algae is species-dependent and is influenced by its feedstock and by the manner in which they are grown. According to Chisti, laboratory and field studies suggest that at least 60,000 liters per hectare of algal oil could be produced per year, which is nearly 10-fold higher than oil palm.

Still, Benemann suggests that current production costs tend to prohibit commercialization of algal oil and more advancement in research and development is needed. Although he foresees possibilities for biofuels, he predicts the greatest near-term potential in microalgae technology is going to be in other applications.

“It’s a question of money. Right now the research and development is not giving us commodity prices. The challenge is how to produce algal oils cheaply,” Benemann said. “Currently, 99% of production comes from open pond cultivation systems. Scale-up and rationalization of the open pond systems—from tens to hundreds of hectares—will allow some economies of scale and process efficiencies, but costs would need to be reduced further, by almost one order of magnitude.”

Chisti agrees that costs are prohibitive but potential is great for addressing global problems, such as land use, deforestation, and the need for renewable oils, through development of a variety of uses for algae oils. Specialty oils tend to have a much higher market value than fuel oils and therefore relatively expensive methods can be used to produce them, he said, pointing to uses in surfactants, foods, and pharmaceuticals.

“Production of algae is currently expensive,” Chisti said. “Methods need to be developed to reduce the cost of production. Also, low-cost technologies are required for extracting oils from

algae. But I believe algae can potentially displace oil crops as a source for oil for making detergents and soaps. Algae oils could be produced without competing with traditional food oils and could actually free up land for growing food. Large quantities of algae oils could be produced without encroaching on forests.”

SOMETHING NEW

The lure of creating renewable biofuels from microalgae is what fueled the genesis of an algal oil company founded in a garage in 2003 by Harrison Dillon and Jonathan Wolfson. Today the company, Solazyme, Inc., is headquartered in South San Francisco, California, United States, and employs about 80 people all working essentially to revolutionize the field of renewable oils. But its development didn’t come without some hard-won realizations, said Dillon, who is president and chief technology officer for the company. One realization was that photosynthetic algae as a source for renewable fuel oil seemed like a good idea but the costs were astronomical.

“We were the first algae fuel company to come into existence so we have more experience at this than anyone [else]. We thought we were going to grow algae in big open ponds to make diesel fuel. That was the original idea,” Dillon said. “After two years of growing algae in outdoor ponds and photobioreactors, we realized it costs over a thousand dollars a gallon to make oil from algae when you grow it on sunlight as a direct energy source. At over a thousand dollars a gallon, you’re not going to sell anything. We realized our company was going to fail if we didn’t find another way to make oil from algae.”

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In the process that Solazyme subsequently developed, microalgae are grown and fed carbohydrates—sugarcane, cornstarch, cellulose, for example—under controlled conditions in large fermentation tanks. The algae convert the carbohydrate into oil at large scale. The oil is then extracted from the algae using a standard agricultural oil extraction process. One of the company's key competitive advantages is that it fits into the existing infrastructure at every step of the process.

The next step in the company's development came from a second realization: The company needed to think of itself not as a diesel fuel company but a renewable oil production company that could address a range of oil-based products and markets with its unique technology platform. As a result, the company's scientists have engineered the oil production pathway in the algae to be able to tailor oils.

"Suddenly we went from diesel fuel to plastics and surfactants, soaps, edible oils, and half the stuff that's made in your house," Dillon said. "We can make the oil look like canola; we can make it look like palm oil; we can make it look like oils that have never existed or been available before. We can for the first time tailor natural oils to whatever is optimal for a particular product, so instead of having to fractionate and use only a portion of it for the product, we can make 100% of the oil targeted for that particular product."

Dillon sees achieving commodity prices in the "relatively near future," but counts among Solazyme's achievements the ability to make oil that is 100% targeted for the intended product; eliminating geographic limitations (Solazyme's algae can grow anywhere in the world); and the ability to utilize as feedstock the carbohydrates that

are grown on 87% of the Earth's arable land.

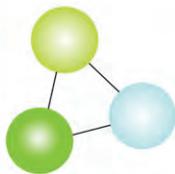
Solazyme currently is exploring partnerships with companies that can participate in the iterative process to further develop applications. One such partnership with Unilever was announced in March, and described plans for use of Solazyme's algal oil in its soaps and personal care products formulations. Solazyme's oil is already on the shelf in nutritional supplements in Whole Foods stores across the United States.

So while the thrust of algal oil research will continue to focus on development of renewable biofuels as a means to reduce dependence on petroleum products, other applications for the oils may eventually exert a more substantial influence on the plant oil industry and its impact on the planet.

"What we're doing at Solazyme is really big," Dillon said. "Our platform is so versatile, what we're doing is to really help the sustainability of natural oils. So instead of having to rip out rainforests to plant palm plantations, we can make oils that are not only equivalent to palm, but better than palm. With replacing tallow, which comes from beef and is a huge contributor to environmental destruction, we can make stuff that is equivalent and better than tallow and reduce its impact on the environment. Companies can't pay three times more per gallon just to be able to say their product is sustainable. But they're willing to work with us to develop economically viable sustainable solutions. We're going to really expand the impact of biobased fluids to things that traditionally were only able to be made by petroleum."

Lynn Crandall is a freelance writer based in Ludlow, Illinois.

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

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- Design of Vegetable Oil Metalworking Fluid Microemulsions Using Biobased Surfactants
- Polyol and Amino Acid-based Biosurfactants, Builders, and Hydrogels
- Interfacial Properties of Sugar-based Surfactants

His bags are packed, he's ready to go: A processing consultant's adventures around the globe

Jack Wolowiec

When Larry Paukert got his start in the processing industry more than three decades ago, little did he imagine that one day he'd find himself in Africa helping local farmers operate a Chinese-made oilseed press.

But that's exactly what the former president of IOMSA (International Oil Mill Superintendents Association) found himself doing last year, as a volunteer consultant sharing his expertise in Malawi, a country sandwiched between Zambia and Mozambique in south-east Africa.

Paukert's long road to Malawi began when he was working as a sales consultant for Prattville, Alabama-based Continental Eagle/IMPCO. His first trip, in 2001, was to Syria, where he helped in the startup of plants in Hama and Aleppo, Syria. Later assignments took Paukert to Brazil and Turkey, where he consulted on a biodiesel startup in 2004–2005.

A new chapter in Paukert's career began in August 2008 when he founded his own company, 3T Veg Oil Consulting, LLC. Through longstanding contacts at Texas A&M University, Paukert got in touch with the university's Norman Borlaug Institute for International Agriculture (College Station, Texas, USA). This, in turn, led to his most challenging—and rewarding—assignment: six months in war-torn Iraq, from November 2008 to May 2009, working to get a cottonseed and sunflower processing plant back online.

As part of a 10-person team assembled to help restore the nation's shattered agricultural infrastructure, Paukert was quickly able to identify the principal challenges confronting Iraq's oilseed

processing industry: a lack of qualified personnel to run the plants, an uncertain flow of raw materials, and unreliable electric power. Compounding all this was Iraq's intense four-year-long drought, which crippled all aspects of the agriculture industry. One particular frustration Paukert had to contend with was the various layers of military and civilian bureaucracy, which he said made "everything seem to take forever." But, on the positive side, he noted that the processing plants themselves were "pretty much intact." As a substitute for domestically sourced cottonseed and sunflower oil, the war had forced Iraq to import palm oil, putting additional strain on the country's economy.

Concerns over security severely limited the team's ability to travel about the countryside. "Basically," Paukert said, "we traveled

from the military base where we stayed to the various facilities we visited, which were secured before our arrival. There weren't many opportunities for sightseeing. We were also lucky to have good translators, who were locals hired by the US military." Paukert did, however, have time to see an olive grove on a farm once owned by one of Saddam Hussein's cousins, the notorious "Chemical Ali," who was executed in January 2010.

Paukert's most recent trip was a

three-week stint in Malawi. The assignment was part of a Farmer-to-Farmer project conducted by CNFA, a Washington, DC-based nonprofit organization dedicated to empowering people and enterprises in the developing world.

In Malawi, Paukert worked with the local operators of two vegetable oil extraction plants, helping train local farmers on peanut storage, shelling, grinding, roasting, refining, and oil extraction techniques. He also conducted training sessions on roasting and extracting machinery, focusing on important maintenance and safety measures.



Group picture at a farm visit with part of Paukert's team and the owners of the farm.

CONTINUED ON NEXT PAGE



An irrigated wheat field.

information

The Norman Borlaug Institute for International Agriculture, named after the 1970 Nobel Peace Prize laureate and father of the green revolution, is part of Texas A&M University, where Borlaug served as a distinguished professor of international agriculture from 1984 until his death in September 2009. The institute continues his mission of improving agriculture in poor and developing nations. Its faculty, scientists, and students are involved in over 100 countries around the world to better international agriculture. For more information, visit the Institute's web page, <http://borlaug.tamu.edu/>.

Founded in 1985, CNFA is a Washington, DC-based, non-partisan, not-for-profit organization dedicated to stimulating economic growth around the world by nurturing entrepreneurship, private enterprise, and market linkages. Originally the Citizens Network for Foreign Affairs, CNFA empowers people and enterprises in the former Soviet Union, the Caucasus, Central Asia, Africa, the Caribbean, and the Near and Middle East. As part of its Farmer-to-Farmer Initiative, CNFA assesses the weak links in the flow of crops all the way from production, through processing, marketing, and distribution. Projects include training associated service providers and agribusinesses in financial management, marketing, cooperative development, agricultural production, post-harvest and processing technologies, international quality standards, and rural finance. To learn more about CNFA's Farmer-to-Farmer Initiative, go to <http://www.cnfa.org/farmertofarmer>.

The extraction plants were operated by two local farmer-owned cooperatives, which earned most of their profits through the processing of their crops; this is where Paukert put his expertise to work.

"They were using a Chinese-made diesel-powered cold press that they weren't operating very efficiently. You see a lot of this kind of equipment in [developing] countries because it's cheap to buy. The problem is that the manufacturer doesn't provide any training after they make the sale. In this case, the local operators had no real plant training at all."

Paukert found those he worked with to be "friendly, receptive, and open to suggestions. They do really well with what they have to work with because they face many obstacles to getting their product to market." They also appreciated that Paukert took into account their limited financial resources. "I did not tell them to scrap all their equipment and buy new ones. This seemed to make them more willing to do the things I did recommend," he said.

Paukert said his most satisfying experience was a month-long assignment in India, where he found people willing and eager to learn. "Many of the big US firms are there, but are working with local partners. The technology is almost as good as here, but in many respects, India is still very much a developing country."

While Paukert enjoys the challenges and rewarding experiences that come with his international consulting work, there are some drawbacks. "I do miss my family. In Iraq, we had email and Skype, so that helped a lot. But in the more underdeveloped countries you can be pretty much cut off from the outside world."



The mechanical screw press used to extract oil from groundnuts (peanuts), sunflowerseed, and soybeans at the Mitundu Agro Processors plant.

And where is Paukert off to next? A 3T consulting assignment has taken him to Brazil, where he assisted with the startup of a 600 metric ton per day cottonseed oil mill plant. His next assignment will be back to India to continue his work with processors there.

Jack Wolowiec is area manager for the AOCs Publications Department. He can be reached at jackw@aocs.org. This article originally appeared in the May 2010 issue of Oil Mill Gazetteer, a publication of the International Oil Mill Superintendents Association, and is reprinted with permission.



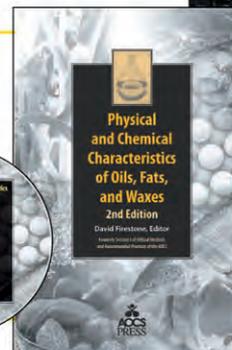
A field of maize (white corn), the primary food source for the people of Malawi. Notice the large ant hill in the field.



Processing consultant Larry Paukert, at left, with (left to right) his interpreter, a plant manager, and a volunteer from Japan.

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The role of soy



Catherine Watkins

A number of renowned scientists are preparing to gather for the 9th International Symposium on the Role of Soy in Health Promotion and Chronic Disease Prevention and Treatment, October 16–19, 2010, at the Capital Hilton in Washington, DC, USA.

The Soy Symposium has established itself as the place to be to hear about new and emerging science on the subject. Participants learn about clinical trials and epidemiological study results prior to publication as they debate some of the more controversial research

topics involving the health effects of soyfoods, isolated soy protein, and supplements such as isoflavones derived from soybeans.

“The 9th International Symposium is designed to highlight important unpublished clinical research and to address some of the misinformation and misunderstanding that exists about the health effects of soyfoods,” says Co-Chairperson Mark Messina. Messina is an adjunct associate professor at Loma Linda University (California, USA) and president of Nutrition Matters, Inc. in Port Townsend, Washington, USA. “There will be several panel discussions so the more contentious issues in the field can be thoroughly evaluated and debated. For those health professionals and researchers wanting to hear the latest findings about soy, this is a can’t-miss meeting.”

Topics tentatively scheduled to be covered include:

- Soy and skin health;



At a glance

9th International Soy Symposium
October 16–19, 2010
Capital Hilton, Washington, DC,
USA
www.soysymposium.org

- The use of genistein for the treatment of mucopolysaccharidoses (a genetic disorder);
- The impact of soy on diseases such as osteoporosis, breast cancer, and fatty liver and on symptoms such as hot flashes; and
- The effect of soy on the health of various organs, such as the thyroid.

Panel discussions will include an examination of whether, based on several recent studies, oncologists can now assure their breast cancer patients that eating soyfoods is safe. Other topics that may be dealt with in panel discussions include the health effects of equol; an exploration of the health, safety, and nutrition of whole soy; and a debate about genetically modified foods.

Also serving as co-chairpersons of the meeting are Thomas M. Badger and Aedin Cassidy. Badger is a professor at the University of Arkansas for Medical Science and director and senior investigator at the Arkansas Children's Nutrition Center, both of which are in Little Rock, USA. Cassidy is a professor and head of the Diet and Health Group at the School of Medicine at the University of East Anglia in Norwich, UK.

Among the speakers already confirmed for the meeting are James W. Anderson and Grzegorz Węgrzyn. Anderson is professor emeritus of internal medicine and director of the Metabolic Research Group of the Division of Endocrinology and Molecular Medicine at the University of Kentucky in Lexington (USA). His research focuses on nutritional approaches to dyslipidemia and intensive management of obesity with diet and pharmacotherapy. Węgrzyn is head of the Department of Molecular Biology at the University of Gdansk (Poland) and has considered the isoflavone genistein in the treatment of genetic diseases.

Symposium organizers are currently accepting abstract submissions for oral and poster presentations. Abstracts submitted by July 1, 2010, will receive highest priority;

submissions made after this date will be considered as time and space permit. There is no deadline for poster submissions. However, to be included in the printed program book, poster abstracts must be submitted for review by August 31, 2010.

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

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Pittcon 2010



Marguerite Torrey

The 61st annual Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, known as Pittcon, was held February 28 through March 4, 2010, at the Orange County Convention Center in Orlando, Florida, USA. Total attendance was 16,987, continuing a decline since the high of 22,213 in Chicago in 2007. Nine hundred sixty companies exhibited their wares in separation sciences, mass spectrometry, spectroscopy, nanotechnology, laboratory automation, and informatics. Almost 20% of the exhibiting companies came from outside the United States.

Besides the instrumentation exhibit, there were 2,348 technical presentations, 100 short courses in 60 topic areas; and 39 formal opportunities for conferee networking.

GENERAL

In September 2009 Dionex Corporation (Sunnyvale, California, USA; www.esainc.com; www.dionex.com) acquired ESA Biosciences' subsidiary Magellan Biosciences Inc., which had introduced an ultra-high-performance version of its Corona *ultra* Charged Aerosol Detector (CAD) at Pittcon 2009 (*inform* 20:398–400, 2009). This technology allows one to detect nonvolatile analytes, even those without a chromophore. Dionex is making available a considerable number of application notes for the analysis of lipids that depend on a CAD, for example, Lipid Analysis by Reversed-Phase HPLC and Corona CAD: Natural Oils; Biodiesel Analysis by Normal Phase HPLC and Corona CAD; Cholesterol; Simultaneous Analysis of Glycerides (mono, di, and triglycerides) and Free Fatty Acids in Palm Oil; and Non-Ionic Surfactants: Polysorbate 20, Polysorbate 80 and Triton® X 100.

Dionex also promoted its Accelerated Solvent Extraction (ASE®) 150 and 350 systems for sample preparation and the Ultimate® 3000 HPLC and the ICS-5000 Reagent-Free™ Ion Chromatography (RFIC) systems for lipid and carbohydrate profiling.

In a poster presentation, Dionex scientist Xiadong Liu and co-workers introduced a stationary phase especially designed for liquid chromatographic separation of cationic surfactants. The surface chemistry of this new product effectively deactivates the ionic interaction between negatively charged silanol groups and positively charged cationic surfactants, resulting in excellent selectivity and peak shapes. Acetonitrile, ethanol, isopropanol, and acetone were evaluated as eluents.

Agilent Technologies (Santa Clara, California, USA; www.agilent.com) presented a system to identify fish species in food. The method can be used for routine verification of seafood labeling and detecting species substitutions. The system uses an Agilent DNA Fish Species ID Ensemble with an Agilent 2100 Bioanalyzer lab-on-a-chip system, and specialized RFLP (restriction fragment length polymorphism) Decoder Software. The DNA analysis method is based on polymerase chain reaction–RFLP. The method is more accurate than existing protein-based tests and lowers analysis time from days to hours. The system can be used with fresh, frozen, dried, salted, or minced fish, as well as fish fins. The Decoder Software comes with experimentally derived patterns from more than 50 species, and the user can add more.

CDS Analytical, Inc. (Oxford, Pennsylvania, USA; www.cdsanalytical.com) markets thermal sample preparation instrumentation for analytical laboratories, including front-end GC equipment for pyrolysis, purge and trap, headspace, and thermal desorption. Thomas Wampler and co-workers from CDS presented a poster at the meeting on several alternative sampling techniques, using control of temperature instead of solvents, to remove the oils from algae and transfer them to a gas chromatograph. All samples were placed in a quartz tube, which was then inserted into the coil of a CDS Pyroprobe and heated to the desired temperature. Experiments were done by (i) heating the algae to volatilize the oils to a GC injector, (ii) adding tetramethyl ammonium hydroxide to the sample before heating, thus generating fatty acid methyl esters, and (iii) pyrolyzing the algae at relatively high temperatures, releasing the fatty acids. The presentation concluded that chromatograms from the whole algae bore a good resemblance to those produced from isolated oil.

LIQUID CHROMATOGRAPHY (LC)

Agilent presented an application for the high-resolution analysis of intact triglycerides by reversed-phase high-pressure liquid



On the Expo Floor of the 61st annual Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy

chromatography (HPLC) on their Agilent 1290 Infinity LC system. Separations were carried out on C18 columns (i.d. 3.0 and 2.1 mm) of various lengths, with 1.8- μm packing materials. Analytes were detected with ultraviolet/visible diode array detectors (DAD). Pressures can be taken up to 1,200 bar and flow rates up to 5 mL/min for maximal chromatographic performance, compatibility, and flexibility. Agilent also has applications with this system for fast analysis of fat-soluble vitamins and for synthetic antioxidants in vegetable oils (<http://www.chem.agilent.com/Library/applications/5990-4694EN.pdf>).

Waters (Milford, Massachusetts, USA; www.waters.com) displayed its new Acquity UPLC (ultra performance liquid chromatography) H-Class System at Pittcon. The company says this system has the advantages of UHPLC with the operational simplicity of traditional HPLC technology. As an example of how this instrumentation could be useful to oil chemists, Waters has available a file showing the transfer of a US Pharmacopeia HPLC method for soy isoflavones in powdered extracts to a UPLC method. Another application with this instrument is the UPLC separation of aflatoxins M1, G2, G1, B2, and B1, without derivatization, in under 5 minutes per sample.

UHPLC (ultra-high pressure liquid chromatography) builds on the older HPLC methodology, which is found in a great many analytical and biological laboratories. Many labs have a great deal of money invested in HPLC equipment, and thus have compelling financial reasons for staying with HPLC equipment. The enhanced speed, resolution, and flexibility of UHPLC have much to recommend them, however. Laboratory supply houses are recognizing

this need by providing columns having particle sizes more nearly like the standard HPLC materials while providing the resolution of the very small particles (<2 μm) used in UHPLC. Agilent is marketing Poroshell columns, which it describes as particles made with a layer of porous silica on a solid core of silica. Phenomenex (Torrance, California, USA; www.phenomenex.com) is providing Kinetex columns, based on a similar principle. The company says these columns provide roughly twice the efficiency of fully porous 3- μm columns and three times the efficiency of fully porous-5 μm columns without generating excessive backpressure.

The very high pressures used in UHPLC require great attention to column protection so as to extend column life. Phenomenex introduced KrudKatcher Ultra filters at Pittcon. Designed to remove microparticulates from the LC flow stream, KrudKatcher produces lower dead volumes than other protection devices and comes with a universal fit that can be used with columns 1.0–4.6 mm in diameter.

PORTABLE INSTRUMENTS

C&EN magazine hosted a forum at Pittcon highlighting industry trends. One emerging trend is the use of high-end analytical instruments by regulatory agencies involved with food safety and environmental issues. According to Gregory Herrema, senior vice president and president, Analytical Instruments, Thermo Fisher Scientific (Waltham, Massachusetts, USA; www.thermo.com), “Enforced compliance is now a global initiative.” Field-testing has also grown, Herrera added. Hand-held portable testing devices have seen high



FIG. 1. A: Torion Technologies' Guardian[®]-7 GC-TMS (gas chromatograph-toroidal ion trap mass spectrometer). B: Torion's CUSTODION[®] solid phase microextraction (SPME) fiber syringe.

growth, with the need to move data from the field site to the lab for instant results.

A number of manufacturers promoted portable instruments at Pittcon. For example, Wilks Enterprise Inc. (East Norwalk, Connecticut, USA; www.wilksir.com) presented three portable instruments of use to fats and oils chemists. (i) The InfraSpec VFA-IR Spectrometer is a small, variable filter array (VFA) mid-infrared spectrometer that allows samples to be analyzed at remote locations without having to transport them to a centralized laboratory, thus eliminating the delay to off-load the raw material. The company claims biodiesel in diesel fuel can be accurately measured down to 0.05% in under a minute; this characteristic is particularly important for nuclear power plants and pipeline operators who need to be sure little or no biodiesel is in their system. (ii) InfraCal Biodiesel and Ethanol Blend Analyzers are preset for one analysis, either biodiesel or ethanol blend, and can be operated by personnel with no scientific background. (iii) InfraCal TOG/TPH Analyzers can be used to measure fats, oils, and greases (FOG) in water, for example to determine discharge levels of FOG from water treatment plants.

A₂ Technologies (Danbury, Connecticut, USA; www.a2technologies.net) was showing its iPal and PAL Analyzers, which are Fourier-transform infrared spectrometers designed to measure biodiesel concentrations in diesel fuel. The iPAL is portable, for field use, and weighs 15 lb (7 kg); the PAL is a benchtop system for on-site use and weighs only 8 lb. A₂ has applications for these instruments for both low-level detection of biodiesel in diesel fuel and determination of 1–100% biodiesel; methods are available that comply with ASTM and EN procedures.

One of the main instruments being promoted at the Torion Technologies Inc. (American Fork, Utah, USA; www.torion.com) booth was its Guardian[®]-7 GC-TMS (gas chromatograph-toroidal ion trap mass spectrometer). The instrument, which weighs less than 28 lb, has a mass range of 50–500 Daltons. Samples are injected using a CUSTODION[®] solid phase microextraction (SPME) fiber syringe (see Fig. 1A and 1B). The Guardian-7 GC-TMS is ideal for rapid screening of chemicals including environmental volatiles and semi-volatiles. In a presentation in a technical session, C.R. Bowerbank and co-workers of Torion Technologies pointed out a possible field

use of this instrument: monitoring cacao beans from the time they are picked to when they arrive for processing. It would be possible to check beans for quality in the field, where storage conditions may be much less than ideal. Further, the beans can be monitored during shipment—since their quality is often adversely affected by hot, humid conditions—and at the receiving point. Bowerbank and colleagues pointed out that at present 40% of cacao bean shipments are rejected by processors owing to smell or taste. Other field uses for the Guardian-7 GC-TMS could include monitoring for melamine adulteration, detecting mold contamination, and evaluating mycotoxin contamination of feed.

OF INTEREST

Entering “Fat” in the agenda builder for Pittcon brought up a presentation entitled “Food Additives as Tracers of Wastewater Using Advanced Mass Spectrometry Techniques: The ‘Low Fat’ Diet Impact.” The report by Imma Ferrer and Michael Thurman (Center for Environmental Mass Spectroscopy, University of Colorado, Boulder, USA) did not focus on fat *per se*, however, but on compounds included in processed foods to make them less calorie-dense. Their research developed a method to analyze aqueous samples for sucralose (C₁₂H₁₉Cl₃O₈), an artificial sugar that is present in well over half of the diet drinks and foods in the United States. The method, based on liquid chromatography coupled with time-of-flight mass spectrometry, detected sucralose in wastewater samples that received a direct impact of human sources, thus demonstrating that sucralose is a good tracer for wastewater inputs in the environment. Other reports have identified sucralose in both surface and groundwater in the US states of Colorado, Ohio, Alabama, and Minnesota.

Asking Pittcon exhibitors “What do you do that a chemist interested in fats and oils would like to know about?” could produce a surprising answer. H-B Instrument Company (Collegetown, Pennsylvania, USA; www.hbinstrument.com), a manufacturer of time, temperature, density, and weather-related instruments, sells products intended to support sustainable green initiatives. In response to this question, Darlyn Nash, vice president of sales, replied, “The sensing liquid in our Enviro-Safe[®] thermometers is orange peel oil, not mercury or alcohol.” Should this be added to a list of Novel Uses of Fats and Oils?

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

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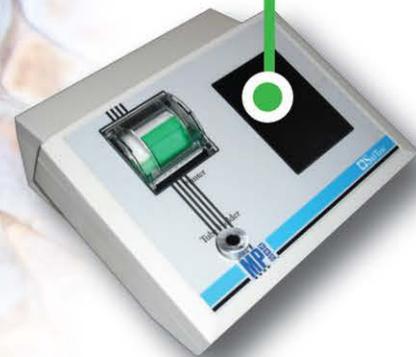
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