Emergent Detergents
Commercial laundry trends and sustainability gains

ALSO INSIDE
Could a pill shrink the effects of obesity?
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Option # 2
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**inform — International News on Fats, Oils, and Related Materials**

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**Letter from the president**

Outgoing AOCS President J. Keith Grime reviews progress made in 2010 and looks forward to the organization’s increased efforts to meet the needs of its diverse membership during 2011.

**President’s profile: Erich E. Dumelin**

Incoming AOCS President Erich E. Dumelin discusses his career, his personal life, and his goals for AOCS.

**Reconstructing formulas**

A three-year study of commercial laundry liquids in Western Europe and the United States traces the evolution of surfactant systems.

**Shrinking the effects of the obesity epidemic**

A Harvard School of Public Health researcher’s hunt for the complex and elusive biological links between obesity and insulin resistance has uncovered new molecular pathways and identified control points that may prove to be valuable targets for short-circuiting the connection.

**AOCS corporate member profile**

Peerless Foods is Australia’s largest privately owned manufacturer and marketer of edible oils and fats.

**Minutes of the 2010 AOCS Annual Business Meeting**

Learn how an industry-driven sustainability initiative is reducing the footprint of the detergents and maintenance products industry in Europe.

**Estimating the effect of fermentation yeast on distillers grains protein**

Four methods for estimating yeast’s contribution to distillers grains products are explained and compared.

**AOCS 2011 award recipients announced**

AOCS Foundation Development Manager Amy Lydic and AOCS Executive Vice President Jean Wills Hinton discuss how giving to the AOCS Foundation is not only easy and convenient. It’s also a great value.
**Calendar**

### April

April 5–6, 2011. Global Algae Biodiesel World India 2011, Jaipur, India. Information: +91 9413343550 or +91 9829423333; info@biodieselacademy.com or jatrophatraining@gmail.com; http://biodieselacademy.com/course-details.php?id=24.


April 12–13, 2011. OFI Middle East 2011, Inter-Continental Citystars, Cairo, Egypt. Information: email: oilsandfats@quartzltd.co.uk; www.oilsandfatsinternational.com.


April 30–May 1, 2011. Functionality of Lipids in Foods—AOCs Short Course, Hyatt Regency Hotel, Cincinnati, Ohio, USA. Information: email: meetings@aocs.org; phone: +1 217-693-4821; fax: +1 217-693-4865; http://annualmeeting.aocs.org.

### May

May 1, 2011. New Technologies in Oilseed Extraction and Edible Oil Refining—AOCs Short Course, Hyatt Regency Hotel, Cincinnati, Ohio, USA. Information: email: meetings@aocs.org; phone:
AOCS Meeting Watch


April 30–May 1, 2011. Functionality of Lipids in Foods—AOCS Short Course, Hyatt Regency Hotel, Cincinnati, Ohio, USA. Information: email: meetings@aocs.org; phone: +1 217-693-4821; fax: +1 217-693-4865; http://annualmeeting.aocs.org.


September 16–18, 2011. 10th Phospholipid Congress of The International Lecithin and Phospholipid Society (ILPS): Phospholipids—Sources, Processing and Application, Congress Centre "De Doelen," Rotterdam, the Netherlands. Information: e-mail: ilps@lecipro.nl; www.ilps.nl/10th%20Congress.htm.


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


May 1–4, 2011. 102nd AOCS Annual Meeting & Expo, Duke Energy Convention Center, Cincinnati, Ohio, USA. Information: email: meetings@aocs.org; phone: +1 217-693-4821; fax: +1 217-693-4821; email: meetings@aocs.org; http://annualmeeting.aocs.org.


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Remarkably, a year has passed since I addressed the annual conference in Phoenix, and it’s time to review progress during the year as I hand over the presidency to the very capable hands of Erich Dumelin. In my opening address at last year’s annual conference, I made some observations on the change and economic uncertainty that are occurring all around us and the reality that AOCS must adapt to respond to those changes in order to meet the needs of its diverse membership around the world and in the multiple disciplines in which it operates.

Well, there’s no need to tell you that this environment of global economic and political uncertainty has continued; we have all become accustomed to the fact that it’s an environment in which we must not only survive but also figure out how to succeed. To quote the much overused phrase, “It is what it is”—and while there are certainly positive indicators, it’s likely to stay that way for the foreseeable future. The successful, in any endeavor, will be those who are agile and flexible and transition their capabilities and operating models to formats that flourish in the new environment. The Governing Board and staff had already begun to make such moves, and I’m pleased to report that we have had a very successful year on just about all fronts, in spite of the uncertain environment.

We’ve been working in five areas: (i) financial health and responsible fiscal management; (ii) increasing communication, knowledge management, and networking tools across our membership; (iii) a more streamlined and focused governance and operating structure for the Board; (iv) increasing our global reach to match the global nature of business and technology development that is now mainstream in our world; and (v) continuous improvement in two of our core competencies, major scientific meetings and technical services.

We continue to have financial stability, and, in fact, we are showing some growth. AOCS has met or exceeded the forecast for the last five years. Additionally, the resulting reserves have been well invested on the guidance of our financial advisors to the extent that they are now contributing nicely to our income. One of the reasons that we missed our forecast in the positive direction this year is that we overlooked including income from this source. In an economic world of too many negative economic surprises, that was a pleasantly positive one. Worthy of note is our decision in 2006 to outsource publishing of our journals to Springer Verlag. This continues to be a major success, providing us with much wider distribution than we could have possibly achieved independently. It’s a classic example of where it makes sense to outsource. In this case, when we asked, “What business are we in?” the correct answer was clearly knowledge transfer and networks, NOT publishing. It causes us to consider where that model of focusing on our core competencies can be reapplied for efficiency and focus. In similar vein, the sales function has also been recently been outsourced to enhance the identification of global opportunities for our products. We cannot be in all the places needed to do that whereas a professional sales organization can. We provide the input (products), our strength—someone else uses their strength, network, and market reach, to expand our markets.

On the practical side, our fiscal strength has allowed us to pay down the mortgage on our headquarters building such that it will be paid off in the next 18 months.

In the communication area, 2010 saw considerable progress, funded by the Foundation, with the complete redesign of our web site to be more member friendly. With an upgraded platform now in place, we are working on our ultimate goals of building member networking and open innovation capability, hosting education programs developed through universities around the world, using page-flipping software for our magazines, and launching a blog. In addition, the Foundation funded the hardware to upgrade email and server infrastructure. Virtual communication is a major part of our future and as such is an excellent area for the direction of Foundation funds.

We continue to streamline the structure and operation of the Board. Our goals are to reduce its size, balance representation to reflect membership, and focus the Board more on strategic issues and planning the future, less on routine operational matters. This is the true role of any Board, whether profit or non-profit. In this regard, we are in the first year of a new election and nominations process specifically designed to result in a more deliberate set of competencies and representation. Additionally, the number of at-large Board members will be decreased by natural attrition as terms expire. In parallel, we
It has been a year of progress, growth, and transition as we move forward with our eyes firmly focused on the future and our place in it, to serve our ever-diversifying membership.

are taking guidance from governance consultants on possible operational structure options. We have a draft in hand and aim to complete this by the end of the year.

- Several initiatives have focused on extending our global reach. In partnership with the Indian Home and Personal Care Industry Association (IHPCIA), AOCS will begin publishing C³ Science, a quarterly features magazine for professionals working in the Indian personal care, cleaning, and cosmetics industries. The complimentary inaugural issue will be distributed to nearly 15,000 recipients. The cost is covered by advertising.

- It was a successful year for our big meetings. Following an excellent annual meeting in Phoenix, the 2010 Montreux meeting was a major success in every respect. Attendance, including exhibitors, was close to 900, and there’s no doubt that attracting the three chief executive officers of Procter & Gamble, Henkel, and Unilever as speakers was very well received and drew attendance and interest from around the globe. As usual for this convention site, which provides excellent exhibit access, feedback from exhibitors was excellent.

Taking into account the ongoing success of this meeting and its format, feedback from the attendees over the last few years, the rapid development of the Asian business for the soaps and detergents industry and its suppliers, and our goal to extend our reach in Asia, we have decided to assess the possibility of a Singapore-based event of similar stature to Montreux in 2012. A strong Executive Committee has been formed, and we will have a “go/no go” decision by the annual meeting.

An AOCS core competence that shows continual growth and contribution to our financials is our Technical Services department, and we are looking for ways to extend that part of our services. In this vein, we are following up on contacts with the publishers of Standard Methods for the Examination of Water and Waste Water, who have contacted us with interest in the determination of surfactants and oils in waste water. We will be canvassing membership in these businesses for engagement in this Expert Panel. This a classic example where our core competence can be an outsourcing option for others.

Summing up, it has been a year of progress, growth, and transition as we move forward with our eyes firmly focused on the future and our place in it, to serve our ever-diversifying membership. With a growing financial base and a strategy to focus on what we do well and partner to extend our capabilities outside our own core competencies, extend our reach into rapidly developing regions of the world, and create state-of-the-art communication networks between our members, I believe that we are strongly placed to grow and flourish for the benefit of the membership.

I’d like to add one last personal note of encouragement. The concept of sustainability has clearly (and appropriately) gained momentum in virtually every direction of business endeavor. The time for exhortation and public relations exercises has passed, and it’s time for actions that will make sustainable technology a reality. This is not about kitchen chemistry; it’s about serious science, and it’s time for serious scientists to step up, step forward, and make it happen. AOCS is an organization full of such scientists, many of whom work in the disciplines required to make this happen. We cover the chemical and biochemical disciplines from natural to synthetic sources, and we can create the forums to build the bridge between these two areas and make a difference. Let’s not discuss this subject in silos. I encourage you to create some discussion and meeting focus across the disciplines so that we can create the collaborations between industry, academe, and government to drive the science forward to viable solutions. When you consider the scientific talent and diversity within AOCS you can only ask, “If not us, then who? If not now, then when?”

Let me end by saying that it’s been a pleasure and honor to serve as your president and in particular, to work with an enthusiastic board and the dedicated set of professional staff in Champaign. I hand off in May with a sense of optimism that AOCS will continue its growth.

J. Keith Grime
AOCS President 2010−2011

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Dear Editor:
I read with interest the articles by Hill, Hoke, Taylor, and Stiffe regarding the nutrient variation of common feed ingredients in the September and October 2010 issues of inform. While the data are interesting, however, with the crude fat data for full-fat canola and flaxseed. The values given for flaxseed (35.2% average ether extract) and canola full fat (36.44% oil) are much lower than would be expected based on many years of crop surveys, both in Canada and in the United States. Both of these crops have been found to have oil contents in excess of 40% or more in all but the worst possible years; and over the last five years, canola has had an oil content averaging in excess of 44% on an 8.5% moisture basis. Similarly, flaxseed has had an average oil content of about 45% (dry basis) over the last five years. The discrepancies shown would suggest that feed compilations would have significant errors in caloric content (about 20% low) for the full-fat feed component.

In trying to come to terms with the large discrepancy in the data from harvest surveys and the data shown in inform, I have concluded that the methodology in the inform paper was in error. The September paper quotes fat content as being determined by AOAC 920.39, a method commonly used for feed analysis. Unfortunately, this method relies on a single extraction of the sample, and we have shown that multiple extractions are necessary to completely remove the oil from soft oilseeds (Barthet, V.J., T. Chornick, and J.K. Daun, Comparison of methods to measure the oil contents in soft oilseeds such as canola and flaxseed, J. Oleo Sci. 51:589–597, 2002). Indeed the results given by Hill et al. are exactly what would be expected from a single extraction. This type of error has also been reported for foods (Daun, J.K., and R. Thomas, Fat content of oilseeds used as foods is dependent on the method, J. Am. Oil Chem. Soc. 82:762–769, 2005), in this case the erroneous fat determinations being carried out by AOAC Official Method 933.05 Fat in Cheese.

In conclusion, I would like to remind all analysts to be sure to know the applicability of the methodology to all of the analytes you are testing.

James Daun
AgriAnalytical Consulting
Winnipeg, Canada

Dear Editor:
The concern expressed by James Daun is very valid. The fat extraction method cited (AOAC 920.39) was used for samples reported in Part 1 in the September issue. Part 2 of this article (October issue) reported near-infrared (NIR) data from Perten Instruments and was heavily reliant on results reported by customers using NIR for everyday quality assurance plant decisions. While generally reported as the wet chemistry reference method (AOAC 920.39), the customer lab variance from this method is unknown. This may well explain the lower than expected average values and the relatively large variation that accompanies the full-fat canola and flaxseed values reported. All values in the Perten database were reported, and outliers were not excluded. This further illustrates that NIR data are only as good as the reference chemistry allows.

We fully agree with Mr. Daun’s statement that all nutritionists and analysts need to be aware of the methods used and applicability for the product being tested. Thank you for the correction.

Dale Hill
ADM Alliance Nutrition, Inc.
Quincy, Illinois, USA
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-growing up on a farm in the northeast corner of Switzerland, I was destined to become a farmer. So I began to study agriculture at the Swiss Federal Institute of Technology in Zurich but realized that I was more interested in the processing of agricultural products than their production and therefore received my degree in food science and technology. To deepen my expertise, I continued in a Ph.D. program and left with a degree in technical sciences.

The challenge in my thesis work was to identify the pathways involved in the formation of taste-enhancing components in potatoes because industrial processing of potatoes resulted in products with good structure but poor taste. Although it is a rather complex process, it was possible to map out the biochemical processes and to identify a few key parameters that could be influenced during processing.

To widen my personal and professional experience and with a grant from the Swiss National Science Foundation, I left for the United States, where I accepted a post-doctoral position at the University of California Davis, in Al Tappel's laboratory. There, I was exposed to real lipid science for the first time.

My post-doctoral work was on lipid peroxidation in vivo. After the hype surrounding vitamin C supplementation started to fade in the 1970s, the vitamin industry was keen to find a replacement. The hope was for an anti-smog pill in the guise of vitamin E working as an antioxidant protecting our bodies/lungs from air pollution. Although the hype over vitamin E never reached the same level as vitamin C, I still enjoy getting my daily vitamin E through my consumption of vegetable oil.

I have been married for more than 35 years to my wife, Ruth, who has followed me ever since our first trip to California in 1975. Her history in the travel and airline business helped me a great deal during all the transfers and new settlings over the years. We both love skiing in winter as well as hiking and playing golf for the rest of the year. We have two grown children: Our daughter is a veterinarian in Zurich, while our son and daughter-in-law are both post-docs in biochemistry at Harvard University.

On returning to Switzerland in 1977, I joined Unilever's oils and fats business in product development but soon found the manufacturing world even more appealing and accepted an opportunity to switch to production. What followed turned out to be a management development pathway, as was typical during those days in larger companies— as long as both parties were happy with each other!

In 1979, I had another international experience and career warm-up in Germany as assistant refinery manager of Union Deutsche Lebensmittelwerke, a Unilever subsidiary in Kleve. Next came my first real challenge, the start-up of a new factory in Canada, followed by a restructuring task in England. Based on these, I was considered ready for the technical director's role (comprising product development and manufacturing) of Unilever's food business in Switzerland. Eventually, I transferred to the Global Research Center in the Netherlands, first as director of the Technical Unit for Unilever's global oils and fats business and finally as vice president, Supply Chain Strategy and Technology of the foods business. I returned to Switzerland after my retirement in 2007. Although I stayed with the same company for my whole career, I very much enjoyed the diverse and extremely interesting challenges and times.

What I realized only very slowly during these last years was the huge impact my responsibility for parts of the company's sustainability program had on me personally. Coming to grips with what sustainability means was challenge enough, but the insight into the raw material growers' lives in the very different regions of this world also closed a loop for me with my agricultural background. This interest in
The oils and fats industries have a number of challenges ahead of them. The issue of sustainability was well addressed by presentations by the CEOs of the three global companies (Procter & Gamble, Henkel, and Unilever) at the recent AOCS Montreux Conference in Switzerland. Other topics of a global nature are the availability of raw materials, quality, contaminants, and the like.

The globalization and consolidation of our industry is of major importance. We are dealing increasingly with a very few commodity-oriented players and a larger group of highly innovative specialty companies. New innovations are more often outsourced or done in cooperation with specialized research centers, start-up companies, or universities.

This is where AOCS can play a vital role in this changing world. It is in an ideal position to offer a platform for the different interest groups to meet and exchange information on a precompetitive level globally. There is no other organization with the international reach, the network, or the strength of AOCS.

However, membership in a professional society such as AOCS might not be considered to be of the same value as in the past. There is an increasing trend for industry professionals to “graze” instead of making a firm commitment by joining an association. To maintain the attraction of membership for our members and other stakeholders (i.e., senior technical management), we must be up-front with our offers and always think of new types of services.

One of my more personal key objectives will be to work on the global platform of AOCS and to link the international oils and fats world closer together. There are many themes that would benefit from a more mutual and global approach. We are all sitting in the same boat, and if any news arises anywhere, we all feel the outcome given today’s communication technologies. So the improvement and extension of our AOCS network, via either our geographical sections, affiliates, or other existing local organizations, will be very close to my heart.

I am really looking forward to the challenge of this next year. And I know that I have an excellent team behind me at AOCS headquarters and great colleagues on the Governing Board. I remain very grateful for the opportunity to serve the oils and fats community in my new role.

Erich E. Dumelin
AOCS President 2011–2012
IT’S OKAY TO PLAY WITH YOUR FRUIT

…because the end of fruit stains is here.

For the really stubborn pectin-based stains, there is a new detergent enzyme category.
In laundry detergents the single most consequential change in marketing form has been the introduction of compact powders. The revolution started in Japan, where compact powder products were introduced in 1987. They were such a success that, within two years, the Japanese powder market had converted to compacts. Compact powders spawned concentrated liquids, which first appeared in Europe in 1991 and in the United States in early 1993. The growth in sales of liquid concentrates in Western Europe was accelerated by the introduction of encapsulated liquid detergent doses in 2000, while in 2006 the shift of the market balance toward liquids in the United States became even more pronounced (72% liquids vs. 28% powders in terms of volume); the encapsulated liquid detergent doses were available through mass merchandisers, presented either by multinational brands or private labels.

The development of more environmentally friendly products led to the introduction in 2006 of super-concentrated liquids. These are an example of the cleaning industry’s efforts to enforce its commitment to deliver valuable products to consumers while reducing both consumption of resources and waste from packaging excess. Such super-concentrated liquids provide advantages for consumers—in that they can be used more easily and in smaller amounts—and manufacturers and distributors—by lowering transportation and warehousing costs. The growing success of super-concentrated laundry liquids in North America and Western Europe prompted a three-year study by Battelle’s analytical lab that compared the surfactant systems of a number of commercial products sold in the United States and Europe during 2006, 2007, and 2008.

**Study methods**

Western European (WE) and US markets were selected for study, as they can be considered mature and similar in many respects, such as domination by the same manufacturers and similarity with respect to their retail structures and consumer bases. For this study, 30 to 40 commercial liquid laundry detergents were selected for each of three years (2006, 2007, and 2008). Germany, France, Spain, UK, and Italy were selected; their total combined market represents about 80% of the WE market. Detergent producers selected included multinational companies such as Procter & Gamble, Unilever, Henkel, and Reckitt Benckiser for both geographical areas; private labels or national companies such as McBride, Persan, Bolton Manitoba, Realchimica, and Ital silica, for Western Europe and Henkel, Church & Dwight, Hush, Method, Seventh Generation, and Phoenix for the United States; and finally retailers or generics manufacturers such as Tesco, Carrefour, Auchan, Sainsbury’s, Lidl, and Dalli for Western Europe and Walmart for the United States.

Several state-of-the-art analytical techniques were combined to perform reverse engineering of formulations in order to determine quantitatively and qualitatively the different surfactants (i.e., hydrocarbon chain length, oxo- or oleo alcohol-based surfactants), builders, solvents, hydrotropes, complexing agents, enzymes, and foaming agents present in each formulation with the aim of reconstructing their complete formulas.
FIG. 1. Total surfactant content of laundry liquids in (a) Western Europe (UK, Germany, Spain, France, Italy) and (b) USA introduced by different producers in 2006 (green), 2007 (red), and 2008 (black). Blue bars represent formulations existing before 2006 but analyzed during the study period. The market was covered in a comprehensive manner (i.e., 30 to 40 products were acquired in Western European and US markets each year). Products are grouped according to their dosage and by descending order of total surfactant content. Each bar represents the average of the surfactant content in formulations of the same brand analyzed in one, two or three consecutive years. Up to eight products were summarized for brands that have important market share.
Total surfactant content

During 2006–2008 the level of surfactants in European laundry liquids varied from 15% to 55% (Fig. 1a) vs. 6% to 45% in North America (Fig. 1b). In 2006, super-concentrated versions were first introduced by Brand Producer 2 and a Private Label (3× conc. ~45% surfactants) in North America (shown in green bars) followed by Brand Producer 1 (2× conc. ~45% surfactants) and Private Labels (2× conc. ~12–25%) in 2007 (shown in red bars). During the same year, Brand Producer 2 expanded its “3× or 2x” concentrated versions (~55% surfactants) into Europe (France, UK, Spain). All products introduced in 2008 are shown in black.

Before 2006 (formulations shown in blue bars) in Europe, the dosage varied from 125 mL (regular conventional liquids) to 75 mL (concentrated conventional liquids) while the newly introduced super-concentrated liquids have doses about two times smaller than concentrated liquids and only ~1.5-fold increase in surfactants. On the other hand in the United States, Brand Producer 1 and Brand Producer 2 decreased the dose and increased the surfactant level by factors of ~2 and ~3, respectively, achieving at the end the same surfactant concentration (45%).

Surfactant blends

Typical surfactant mixtures for both geographical areas are shown in Figure 2. In Europe, formulations vary widely from country to country. For example, Brand Producers 1, 2, and 3 sometimes manufacture different formulations not only for different countries but also for different brands and brand extensions for the same country. Brand Producer 1 generally uses a mixture of LAS (linear alkyl benzene sulfonates), AEO (alcohol ethoxylates), AO (aminoxides); FAM(D)A, fatty acid mono(di)ethanol amines; MES, methyl ester sulfonates; APG, alkyl polyglucosides.

Evolution of formulations

As product innovation continues to drive the laundry detergent business, detergent manufacturers and ingredient suppliers are keen to follow the balance between the market share of individual brands, physical presentation changes, and the composition of detergents as they are the prime factors for determining the market for chemical ingredients incorporated in detergents.

A few examples on the evolution of laundry liquid formulations covering the period between 2005 and 2008 are shown in Figure
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FIG. 3. Representation of the evolution of some formulations manufactured during 2005–2008 by (a) Brand Producer 1 in France; (b) Brand Producer 3 in Italy; (c) Private Label 9 in the United States; and (d) an unknown Producer but distributed by Retailer 6 in the United States. Producer names on the x axis and values on the y axis are not shown for reasons of confidentiality. APE, alkyl phenol ethoxylates; for other abbreviations see Figure 2.
3. For the Western European market in 2008, Brand Producer 1 withdrew AO from its brand in the French market (Fig. 3a), while Brand Producer 3 replaced LAS with AEOS in its Italian brand (Fig. 3b). The search for more ecologically acceptable ingredients, while keeping functionality and performance of the detergent, led to the withdrawal of APE (alkyl phenol ethoxylates) from the formulation of Private Label 9 in the US market during 2007. Lastly, in 2007 Retailer 6 changed the surfactant mixture in its formulation by replacing AEO with FADA and decreasing the levels of AEOS.

Worldwide, there are substantial differences in detergents formulation from region to region. Western European laundry liquids often have more surfactants than those in North America. This is due in part to the extremely hard water found in most of Europe that requires higher level of surfactants, but also to their different wash philosophy and technology. Whereas the cleaning process in an American top-loading washer relies on strongly agitating the clothes for a few minutes in 50 gallons of water and on using pre-treatment chemicals (e.g., chlorine bleach), a European wash system (front-loader) relies instead on extended wash cycles at optimal temperatures and gentle agitation, thus using less water (e.g., 15 gallons) and less energy. Recently, due to growing awareness of environmental concerns, energy crunches, water shortages, and new rules, front-loading, high-efficiency washers are becoming more common in North American homes. Consequently, detergent producers are adapting the detergent formulations.

The author acknowledges Battelle Memorial Institute for logistic support of this work and all the multinational clients for founding the Battelle World Detergent Technical Program during the 2006 – 2008 period, whose partial data were used for this study (website: www.battelle.org/bwdp).

Heliana Kola is a freelance consultant in chemistry providing technical and business development support related to multiclient analytical programs on detergent formulations and their trends worldwide. During 2009 she assisted in the transfer of the Geneva-based Battelle Research Institute analytical program to the United States and then consolidated the technical and business model of the new organization. From 2005 to 2009, she was program manager of the Battelle World Detergent Program on detergent composition and technical leader in the Analytical Chemistry Laboratory at Battelle-Geneva (Switzerland). She can be reached at Kola@battelle.org.

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Shrinking the effects of the obesity epidemic

Worldwide, there are more than 1 billion overweight adults. An estimated 22 million children under five are overweight. If we can’t stop people from getting heavier, can we at least develop drugs that prevent them from getting sick with obesity-related diseases?

Richard Saltus

The research career of Göğhan Hota- misligil, chair of the Harvard School of Public Health (HSPH) Department of Genetics and Complex Diseases, has circled around that question for more than two decades. Today, with findings from his lab poised to be translated into new drugs, the goal of averting long-term medical complications in an increasingly overweight population may be closer than ever.

Since arriving at the School in 1995, Hotamisligil has pursued with Captain Ahab-like intensity one of the most important biomedical problems of our time: the spiraling epidemic of metabolic diseases, such as type 2 diabetes and heart disease, associated with the relentless rise of obesity in America and, increasingly, around the world.

In October 2010, his 2006 article in Nature, “Inflammation and metabolic disorders,” was named the most-cited paper in clinical medicine research. Hotamisligil has “catalyzed a paradigm shift in our understanding of the nature of metabolic disease,” said the International Association for the Study of Obesity, which named him the 2010 winner of its prestigious Wertheimer Award, given every four years for outstanding basic science contributions to the field.

Racing against a surging epidemic

When Hotamisligil launched his research here 15 years ago, the US rate of overweight and obesity was already 56%; in lock step, the prevalence of diabetes was surging. Today, the overweight rate is 66%, and the paired epidemics are rising so rapidly that, if current trends continue, by 2015, a shocking three of every four Americans will be overweight (and 41% obese). By 2015, 75% of Americans will be overweight, and 41% obese.

Worldwide, there are more than 1 billion overweight adults. An estimated 22 million children under five are overweight. If we can’t stop people from getting heavier, can we at least develop drugs that prevent them from getting sick with obesity-related diseases?

When Göğhan Hotamisligil began his career at HSPH 15 years ago, the overweight and obesity rate in the U.S. was 56%, and type 2 diabetes was surging. Today, the overweight rate is 66%. By 2015, 75% of Americans will be overweight, and 41% obese.
Obesity: A Global Snapshot

- Worldwide, there are more than 1 billion overweight adults. An estimated 22 million children under five are overweight.
- Current obesity levels range from below 5% in China, Japan, and certain African nations to more than 75% in urban Samoa.
- Americans walk just 5,117 steps per day. By contrast, adults in western Australia average 9,695 steps; the Swiss average 9,650 steps; and the Japanese average 7,168 steps.
- A severely obese person is likely to die 8–10 years earlier than a person of normal weight.
- In 1997, the World Health Organization formally recognized obesity as a global epidemic.

Sources: World Health Organization; Medicine & Science in Sports & Exercise, October 2010; Organization for Economic Cooperation and Development

and identified control points that may prove to be valuable targets for short-circuiting the connection between obesity and poor health.

A new picture of the body

Over the years, Hotamisligil has expanded his investigations of the mechanisms behind inflammation—the body’s complex biological response to injury, infection, and to the cellular stress caused by obesity. He has also delved into the role of lipid-binding proteins. Most recently, Hotamisligil has woven these discoveries into a cohesive new picture of how the body normally maintains a healthy energy balance—and how so many bad things happen when the metabolic machinery becomes overwhelmed by excess nutrients and fat and starts to break down.

In his view, the metabolic balance of fuel and energy in the body is regulated by two systems that have been intertwined through evolution. One is made up of networks of proteins that sense levels of nutrients and adjust their processing into energy; the other is the immune system cells that detect microbes and fight them off. This integration of the two systems, according to Hotamisligil, accounts for the inflammatory response to overweight obesity, although this particular form of inflammation—he calls it “metaflammation”—is not the result of infection and does not resemble the classic features of inflammation at all.

The path from obesity to disease

In a recent interview, Hotamisligil reflected on the trajectory and implications of his prolific research. His spacious office is artistically decorated and obsessively neat, with piles of manuscripts and journals squared up perfectly at attention. A native of Turkey, he is, not surprisingly, a lover of strong coffee, and although it’s late in the afternoon, he produces cups of espresso for himself and a visitor. “From the beginning,” he explains, “the big question for me was why, in the presence of even a few extra pounds of accumulated fat, do you become prone to so many different diseases, including insulin resistance, diabetes, hypertension, asthma, neurodegenerative diseases, and cancer?” He likens this condition to an accelerated form of aging of the body.

The general idea is that when individuals gain and retain excess pounds, dietary fats are no longer safely stored in cells called adipocytes. As a result, lipids—blood-borne fats—spill into the circulation and deposit themselves in skeletal muscles, the liver, the heart, and blood vessels. There, through biochemical actions, the lipids throw a wrench into the normal uptake of glucose into muscle and other body cells by making the cells’ receptors “deaf” to insulin signals. Insulin resistance creates a pre-diabetic state of rising blood sugar levels, triggering a cascade of tissue-damaging events.

Hotamisligil and other scientists had discovered that adipocytes are not simply passive fat-storing cells; they also emit metabolic and hormonal signals, some of which help regulate the immune system. During his earliest work at the School, he attracted attention with a finding that when he knocked out one of these immune-activating signals in obese mice, they were less prone to the ill effects of excess weight, providing solid evidence that erroneous immune response is triggered by excess nutrients and energy.

He later showed that mice lacking a particular fatty acid-binding protein (FABP) didn’t develop insulin resistance even when eating a high-fat diet. These escort proteins or “lipid chaperones” latch onto fat molecules and transport them within cells and dictate their biological effects. Hotamisligil reported that when these FABP-deficient mice were fed on high-fat diets, they were protected from diabetes, fatty liver, and heart disease.

Convincing the skeptics

These and other early discoveries began to implicate immune system overreaction and inflammation as triggers of metabolic disease. But the upstart ideas ruffled some feathers in the mainstream obesity community. “Many people were not convinced,” he says, referring to the early 1990s.

Thus, Hotamisligil was gratified when he won the 2007 Outstanding Scientific Accomplishment Award of the American Diabetes Association for discovering the inflammatory basis of obesity and type 2 diabetes. The award recognizes “independence of thought, originality, significance of discovery, and impact on his/her area of research.”

Many more findings on this theme were to follow, and not just in mice. In 2006, Hotamisligil and HSPH associate professor Eric Rimm reported that obese individuals who had inherited another variation of a FABP gene were much less prone to type 2 diabetes, heart disease, and elevated triglycerides. In 2008, it was reported that blocking an inflammatory cytokine in humans treats insulin resistance and type 2 diabetes.

And in 2010, scientists at Harvard-affiliated Joslin Diabetes Center reported that an aspirin-like drug improved insulin function and other complications in diabetic patients, raising the prospect of treating diabetes with off-the-shelf anti-inflammatory drugs.

Next: drug treatments

Although there is still much more to be unraveled, Hotamisligil’s discoveries have already produced a number of targets within the obesity-triggered networks that drug-makers have in their sights. Some potential drugs would hinder the action of FABP; others would inhibit molecular signals that rev up inflammation in response to cellular stress caused by overburdened fat cells. This type of stress affects the “minifactories,” called endoplasmic reticulum, within cells where proteins are made. In his most recent work, Hotamisligil is developing strategies to beef up the minifactories’ ability to absorb the extra demands of
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Swiss specialty chemicals group Clariant International Ltd. (Muttenz) announced on February 16, 2011, an agreement with the major shareholders of Süd-Chemie AG (Munich, Germany) to take over more than 95% of Süd-Chemie’s shares. The transaction is subject to several conditions, including clearance under cartel law and execution of a capital increase to be decided by a general meeting of Clariant shareholders.

Premium Nutrients Bhd’s wholly-owned Malim Sawit Sdn Bhd (MBSB) agreed in February 2011 to sell a palm oil refinery complex in Kluang, Johor, Malaysia, to ST Refinery Sdn Bhd for RM15.5 million (about $5.1 million). “The company faces increasing competition from large integrated regional and global players, who are involved from plantations to milling, refining and manufacturing and where economies of scale and substantial injection of capital are critical,” according to the New Straits Times (Malaysia).

MPT Mustard Products & Technologies Inc. (Saskatoon, Saskatchewan, Canada) has received a $300,000 financing package from Ag-West Bio’s Commercialization Fund. MPT is developing biodegradable products from locally grown mustard seed, including a high-value biopesticide formulation. Ag-West, which is also based in Saskatoon, has been working with MPT since 2009 on business planning, feasibility assessment, and capitalization.

India’s Avesthagen Ltd. (Bangalore) announced in February 2011 that it has completed its development of microalgae-derived DHA (docosahexaenoic acid).

The company told AP-FoodTechnology.com that its patented technology allows commercial production of high-quality, 100% vegetarian AvestaDHA. The ingredient is produced via fermentation using a novel Schizochytrium linacuum strain SC-1. DHA is a long-chain omega-3 essential fatty acid linked to eye, brain, and heart health.

Estimated global soybean output for 2010/11 was estimated higher at 256.1 million metric tons (MMT) in the February 2011 Oil Crops Outlook report issued by the US Department of Agriculture (USDA) as compared with the previous month’s report. The higher estimate was due to crop increases for Brazil and Paraguay, which more than offset a reduction for Argentina. USDA also estimated global exports of soybeans for 2010/11 as slightly higher, increasing to 98.6 MMT from 92.8 MMT in 2009/10.

Soybean production for Brazil in 2010/11 was forecast 1 MMT higher in the February report, to 68.5 MMT, based on a small increase in the expected yield. Brazil’s growing season started late as rainfall did not really pick up until mid-October 2010. Since then, frequent rains have aided yield prospects dramatically. Soybean harvesting was underway in Mato Grosso in February 2011 but at that point accounted for no more than 1% of this year’s total area, compared with 5% a year ago. Near-record soybean prices in Brazil have already encouraged farmers to make sales commitments for close to half the crop. The higher expected supply is seen raising 2010/11 soybean exports from Brazil by 900,000 metric tons (MT) to a record 32.3 MMT.

Similarly, favorable growing conditions are present in Paraguay. Higher expected soybean yields boosted USDA’s crop estimate for Paraguay to a record 7.5 MMT from 7 MMT last month. Paraguay’s soybean exports in 2010/11 are seen increasing to 5.6 MMT—beating last year’s high of 5.35 MMT.

In Argentina, abundant rains in the second half of January and early February eased a dry spell that had gripped the country since September 2010. The timely moisture encouraged farmers to continue planting into early February, ensuring that Argentine soybean area would match last year’s record high. Despite the stabilizing weather conditions, the prior dryness likely stunted yield potential for the earliest sown soybeans. Thus, USDA lowered its soybean yield estimate for Argentina in the February outlook report, which decreased the crop forecast by 1 MMT to 49.5 MMT.

With a likely smaller crop, Argentine soybean exports in 2010/11 are expected to slip to 11.6 MMT from 13.1 MMT last year. Ending stocks of soybeans are also likely to tighten further as domestic crushing stays strong.

CONTINUED ON NEXT PAGE
In Canada, export shipments of canola seed were proceeding at a record pace. The 2010/11 export forecast was raised 400,000 MT to 6.8 MMT. A decline to date for canola exports to China has been offset by increases to Pakistan, the United Arab Emirates, and Bangladesh, USDA said. The gains in international trade were expected to reduce season-ending canola stocks to 1.3 MMT. This carryout would be down from 2.1 MMT in 2009/10 and would be Canada’s lowest since 2003/04. “The reduction is impressive since it follows two of the top three canola crops ever produced in Canada,” the report noted.

GLOBAL PALM OIL OUTLOOK

Global stocks of palm oil were expected to fall to an eight-year low in 2010/11 of 3.1 MMT. Steady demand from India, China, and other importing countries was expected to raise consumption by 8% to 48.9 MMT in 2010/11. Exports of other vegetable oils were anticipated to increase quite modestly due to higher domestic use in the major exporting countries. Palm oil therefore has to bear more of the responsibility of international trade in vegetable oil. So, like soybean oil, prices for Malaysian palm oil are up 56% from a year ago and approaching their all-time peak of early 2008.

In Malaysia, palm oil output for October–December 2010 was down 15% from a year earlier. The production deficit may even widen, USDA suggested, because recent torrential rains have flooded oil palm plantations and disrupted their deliveries of fruit to oil mills. The current deficit is likely to be made up by a seasonal upswing after March, but it reduces the 2010/11 forecast of Malaysian palm oil output in the February report by 600,000 MT to 18 MMT. The modest production gains against last season’s total of 17.8 MMT may not occur until late in the October–September marketing year.

At the same time, Malaysian palm oil exports are up 1% from a year earlier. They could strengthen in the months ahead unless further price increases ration demand by importing countries. However, some importers may already believe that higher prices are inevitable and are preparing to build stocks for security. If so, it means that Malaysian season-ending stocks of palm oil could tumble below 1 MMT for the first time in eight years. The country’s oil stocks at the end of December still totaled 1.6 MMT.

In contrast, Indonesia may account for more than three-fourths of this year’s expected global increase in palm oil production, which is expected to be up 5% to 48 MMT. Annual production increases have been largely due to a rapid expansion of oil palm area over the past decade. Indonesian output for 2010/11 is forecast to expand to 23.6 MMT (up 600,000 MT from the January 2011 report), compared with 22 MMT in 2009/10.

However, much of this gain in palm oil production may be absorbed by the domestic market, the report suggested. In February, the rise in prices automatically triggered a hike in the Government of Indonesia’s export tax on crude palm oil to 25% from 20% in January and 15% in December. Food security is a top concern right now for Indonesian officials, as it is in many countries. The food sector uses about 75% of the palm oil produced in Indonesia, although development of the country’s oleochemical industry has been emphasized in recent years.

As edible and industrial use of palm oil within Indonesia grows, it constrains the capacity to export. Therefore, USDA trimmed the forecast of Indonesian exports for 2010/11 by 150,000 MT to 17.85 MMT. “Still, the gain from last year’s total of 16.6 MMT would represent two-thirds of the annual global increase in palm oil exports,” the report noted.

Although Thailand has historically been a self-sufficient producer and minor exporter of palm oil, this year its government is expected to allow imports of up to 150,000 MT. Implementation of a compulsory 5% biodiesel blend for Thailand is fueling robust growth in its biodiesel industry (expected to rise 23% in 2010/11 to 1 MMT). As a result, local shortages of cooking oil have driven up consumer costs.

The imports of palm oil will help Thailand to preserve adequate domestic supplies for the food sector, USDA said, but will convert the country into a net importer.

First US aquaculture guidelines released

In February 2011, the National Oceanic and Atmospheric Administration (NOAA; Silver

Sustainability watch

Lawmakers in India announced plans in February 2011 to require larger or profitable companies to contribute a minimum of 2% of their average annual profits for the past three years to corporate social responsibility (CSR) programs. The recommendations do not detail what constitutes spending on CSR, notes Satvik Varma in *The Economic Times* (India).

Almost all companies are beginning to develop green-business practices strategies, according to a report from the MIT Sloan Management Review and the Boston Consulting Group. Based on data collected from more than 3,100 global corporate leaders, the study “found that a two-speed landscape is emerging, with a gap between sustainability ‘embracers’—those who place sustainability high on their agenda—and nonembracers or ‘cautious adopters,’ who have yet to focus on more than energy cost savings, material efficiency, and risk mitigation,” the two groups said in a joint news release. The study is titled “Sustainability: The ‘Embracers’ Seize Advantage.” It is available at http://tinyurl.com/Sloan-Sustainability.

Archer Daniels Midland Co. (ADM; Decatur, Illinois, USA) announced in February 2011 that it plans to invest in sustainable palm production in Brazil. Spanning five years,
Spring, Maryland, USA) released a draft national aquaculture policy—the first for the United States—in response to increased demand for sustainably produced seafood.

Farmed seafood presently accounts for about 5% of seafood consumed in the United States, according to NOAA. Eighty-four percent of seafood consumed in the United States is imported and about half of that comes from aquaculture, the agency said, adding that global demand is increasing rapidly.

The draft policy document focuses on how US aquaculture can be carried out sustainably. It also outlines general standards that aquaculture fisheries will have to meet in an effort to ensure minimal impact on wild fish stocks and marine ecosystems. “These include recommending more research into alternative feeds for farmed fish so they are not fed smaller wild varieties, which contributes to the decline in wild fish populations, and a proposed ban on stocking fish farms with non-native fish, pending more research into potential outcomes if they should escape,” noted FoodNavigator.com.

**EFSA on tallow and TSE**

Following a request from the European Commission (EC), the European Food Safety Authority (EFSA) Scientific Panel on Biological Hazards (BIOHAZ) provided scientific advice on the capacity of specific oleochemical processes to minimize possible risks linked to TSE (transmissible spongiform encephalopathy) infectivity in tallow, including Category 1 materials.

The current Regulation (EC) No. 1774/2002 on animal by-products foresees that rendered fats obtained from Category 2 and Category 3 materials may be used for the manufacture of oleochemical products. (Category 1 material includes animals suspected of being infected by TSE as well as specified risk material [SRM]. SRM is the general term for tissues of ruminant animals that cannot be inspected and passed for human food because scientists have determined that bovine spongiform encephalopathy-causing prions concentrate there. These can include brains, eyes, spinal cords, and other organs. Category 2 material includes animals that die [other than cattle and sheep containing SRM], animals killed to eradicate an epizootic disease, and manure and digestive tract content. Category 3 materials include parts of slaughtered animals that are fit for human consumption but are not intended for human consumption for commercial reasons or because of consumer choice.)

Under the new Animal By-Product Regulation (Reg. EC No. 1069/2009), the use of Category 1 material in the production of oleochemical products may be also authorized, if the manufacturing processes that are applied by the oleochemical industry are capable of sufficiently inactivating any potential risks linked to TSE. This would allow the use of such products in various applications, such as in soaps, cosmetic products, and plastics, regardless of the category of animal by-products that is used as starting materials.

The European Oleochemicals and Allied Products Group (APAG), a sector group of the European Chemical Industry Council (CEFIC), has submitted scientific evidence to the EC regarding the capacity of oleochemical processes to inactivate possible risks linked to TSE in animal by-products not intended for human consumption.

The oleochemical processes considered consist mainly of hydrolytic fat splitting of tallow to obtain fatty acids and glycerol under conditions of 200°C at 16 bar of pressure for 20 minutes. The processes can be carried out in a unit tower or multitower plant. If saturated fatty acids or hydrogenated tallow is to be obtained, hydrogenation under conditions of 160°C at 12 bar of hydrogen pressure for 20 minutes is applied in batch or continuous reactors. Eight different processes consisting of a combination of different steps may be used according to the different end products desired and type of reactors used.

The parameters considered are mainly temperature, time, and pressure. In EFSA’s opinion, the reduction effects of the different steps that characterize the processes are assessed and, when possible, quantified. The two steps with experimental evidence that contribute to the TSE risk reduction are hydrolytic fat splitting and hydrogenation.

EFSA has concluded that if the critical limits of the specific method considered are met, the reduction of TSE infectivity of certain processes is significant. However, considering the uncertainties in the TSE infectivity reduction in oleochemical products derived from Category 1 material, these products cannot be reliably regarded to be free of infectivity and therefore could pose a risk if they entered the food and feed chain.

As for efficacy of the hydrogenation step, only batch processes can be compared to validated experiments; continuous processes could not be considered effective due to the lack of critical data (i.e., minimum retention time). As for the splitting step carried out in continuous reactors, the processing time represents a sufficient safety margin compared to the minimum requirement, and therefore it is considered effective, EFSA noted.

**Castorseed crop survey**

India’s production of castorseed is expected to increase by 22% to 11.90 lakh tons (about 1.1 million metric tons) in 2010/11, according to the Solvent Extractors’ Association of India. Production in 2009/10 reached 9.78 lakh tons (approximately 890,000 metric tons).

The survey, which was conducted by Nielsen India, said that yield is also expected to increase by 7% to 1,385 kilogram (kg)/hectare (ha) as compared with 1,297 kg/ha in the 2009/10 marketing year. The greatest increase in production is expected to occur in the state of Andhra Pradesh, followed by Rajasthan and Gujarat.
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Indian Railways is ready to build up to four biodiesel plants costing about Rs 120 crore ($26.3 million). Two esterification plants will be commissioned at Raipur and Chennai during the next two years, according to a senior railway ministry official. Plans for the other two will be made firm at a later date. Each plant will produce about 30 metric tons of biodiesel per day from waste oil, fatty acid, and non-edible vegetable oils. The biodiesel will then be blended with HSD (high-speed diesel) oil for running the locomotives.

After Finnair announced in December 2010 that it would start using biofuel in some of its commercial flights in 2011 (inform 22:81, 2011), the airline went back on its decision. Kati Ihamäki, environmental director of Finnair, was quoted in the newspaper Helsingin Sanomat on February 3 saying, “We would have wanted to start commercial flights with biofuel now, but products that are currently available have not met our sustainability criteria.” The fuel was to have been supplied by Neste Oil. Price was another consideration. Ihamäki added, “The problem is that products . . . at a suitable price are not currently available.”

Lufthansa Airlines also ran into a snag with its plan to power commercial flights with biofuels. Estimates in late February were that Lufthansa’s six-month trial of biofuels, which had been scheduled to start in April, will now be postponed to the end of May. The delay was necessitated by the failure of an ASTM International subcommittee to give an anticipated green light to the airline for the 50:50 blend of biofuel (derived from vegetable oil) and traditional kerosene it had planned to use. According to Richard Altman, executive director of the Commercial Aviation Alternative Fuels Initiative, “ASTM is simply wrapping up the remaining technical details . . . It has simply taken longer than we would have expected” (www.soyatech.com/news_story.php? Credit: U.S. Air Force photo/Staff Sgt. Brian Ferguson

RENEWABLE DIESEL

US Air Force certifies C-17 for hydrotreated renewable jet fuel

The US Air Force certified its C-17 Globemaster III for unlimited usage of hydroprocessed blended biofuels, also known as hydrotreated renewable jet (HRJ) fuels. According to Kevin Geiss, deputy assistant secretary for energy of the Air Force, “This certification marks the Air Force’s first platform to be fully certified using an HRJ blend.” Geiss added that this certification represents the Air Force’s commitment to ensure the supply, no matter the source, meets the service’s required standards, and demonstrates the commitment of the Air Force to reduce its dependence on foreign sources of oil.

According to Jeff Braun, alternative fuel certification office chief for the Air Force, the certification clears the C-17 to fly on a volumetric blend of up to 50% HRJ fuel with 50% JP-8, as well as a blend of 25% HRJ/25% synthetic paraffinic kerosene fuel/50% JP-8.

Braun said, “We expect to conclude HRJ flight testing with the next 12 months, supporting fleetwide HRJ certification within the next 22 months.”

Preem announces diesel made from forestry residue

In February, Swedish oil and energy firm Preem AB, headquartered in Stockholm, announced it had completed the development of what it calls the “world’s first” green diesel made using tall oil (see inform 11:580–588, 2000), a waste product from making paper. The diesel product is scheduled to be released in two forms: Preem Evolution, or B15 (15% biodiesel and 85% petrodiesel), and B5. The company says Preem Evolution diesel will provide 16% lower CO₂ emissions.

Tall oil is a by-product of the kraft (sulfate) processing of pinewood for pulp and paper. Preem jointly runs the SunPine factory in Piteå along with Sveaskog Southern and Kiram (inform 19:545, 2008). The tall oil is first processed there, then refined to diesel specifications at Preem’s refinery in Gothenburg. According to Green Car Congress
Neste renewable diesel reduces emissions

A three-year biofuel trial organized by Neste Oil (Espoo, Finland), Helsinki Regional Transport (HSL; Finland), and Proventia (Oulunsalo, Finland), an international environmental technology group that is working for clean air, was recently completed.

Data collected by VTT Technical Research Centre (Finland) showed that (i) particulate emissions in buses fueled with Neste’s NExBTL renewable diesel were reduced by 30% and (ii) emissions of NOx were reduced by 10%.

The trial was the world’s largest renewable fuel field trial to date. About 300 vehicles, or over 20% of HSL’s buses, took part in the trial. During the trial, the buses were driven more than 50 million kilometers in total.

In the initial phase of the trial, buses ran on a blend of 30% NExBTL renewable diesel and 70% standard diesel. From 2008 onward, some of the buses used solely NExBTL. The greatest reductions in emissions occurred in buses using 100% NExBTL.

At present, Neste uses vegetable oil, such as palm oil and rapeseed oil, as well as waste fat from food manufacturers for the company’s renewable diesel. According to Sakari Toivola, Neste Oil’s executive vice president, oil retail, “The fuel . . . works very well in older buses and performs excellently even in challenging winter conditions.”

Neste expects loss

The Business Times Singapore reported on February 8 that Neste Oil is expecting its renewable fuel division to wind up with a loss this year. The prediction is based on weak margins for renewable diesel—as prices of feedstocks for renewable diesel rose in the second half of 2010—and the slow pace of adoption of biofuel legislation in the European Union and the United States.

The company stance is that it still anticipates a future in renewable fuels and that it does not regret the resources it has spent in constructing either its renewable diesel plant in Singapore, which came onstream in 2010, or the plant that presently is being finished in Rotterdam, the Netherlands.

ALGAE

Algae production potential modeled

A group of researchers from Joule Unlimited (Cambridge, Massachusetts, USA), Flagship Venture Labs (Cambridge), and Harvard University (Boston, Massachusetts) have published a model of the production of oil by genetically engineered cyanobacteria. According to their calculations, direct product synthesis and continuous product secretion of 15,000 gallons (57,000 liters) of alkane per acre per year are feasible, compared with 3,000 gallons of biodiesel per acre per year produced indirectly from algae.

The solar-to-product conversion efficiency of Joule’s direct continuous process for producing diesel, ethanol, and chemicals is 5–50 times greater than any biomass-dependent process and gains additional efficiencies by avoiding downstream refining.

The researchers calculated that the direct process—using the genetically engineered cyanobacteria—could achieve a photosynthetic conversion efficiency of more than 7% relative to available yearly solar energy striking the ground, a value considerably higher than earlier industry assumptions.


Solazyme, Qantas to collaborate

In mid-February, Solazyme, Inc., an industrial biotechnology company producing renewable oils and bioproducts using microalgae, and Australia’s Qantas Airlines announced their agreement to collaborate in establishing the potential to produce Solazyme’s microbially

Biofuels will be used in the United States to make money—literally. Crane & Co., which has been producing paper used for US currency for over 130 years, will use technology provided by Envergent Technologies LLC (Des Plaines, Illinois, USA), a Honeywell company, to convert biomass feedstock into a renewable oil to heat and power its Crane, Massachusetts, facility. Envergent’s technology will convert local forest residues into liquid biofuel by rapidly heating biomass at ambient pressure to generate liquid biofuel. This can be used as a direct replacement for petroleum-based fuel in Crane’s burners and generators.
derived aviation fuel, Solajet, on a commercial basis in Australia.

The two companies issued a joint statement in which Qantas Chief Executive Officer Alan Joyce said, “Over the next year, we look forward to working with Solazyme—and with other important government and private sector stakeholders—to build the case for clean jet fuel production in Australia.” He added, “We believe this is important not just for Qantas but for the Australian economy as a whole, given the global emergence of green technologies and their potential to drive growth and create jobs.”

Technology developed by Solazyme (headquartered in South San Francisco, California, USA) allows algae to produce oil and biomaterials in standard fermentation facilities quickly, efficiently, and at a large scale. These oils can be tailored not only for biofuel production but also as replacements for fossil petroleum and plant oils in a diverse range of products.

According to BiofuelsDigest.com (http://tinyurl.com/SolazymeQantas), Qantas’ General Manager of Environment and Fuel Conservation Peter Broschofsky, who is coordinating the collaboration with Solazyme, said that Qantas has not ruled out taking an investment stake in a biofuels enterprise. Any decision, though, will be made after the feasibility work is completed.

Algae to be grown in Kentucky for biofuel

Alltech, a company active in the field of natural animal nutrition, opened its $200 million Alltech Algae plant in Winchester, Kentucky, USA, on February 23. Alltech Algae is a state-of-the-art algae fermentation facility that was acquired in 2010 from Martek Bioscience Corporation (Columbia, Maryland, USA) for approximately $14 million and has been renovated in the past few months to begin in April as one of the largest algae production sites in the world.

At the plant opening, Pearse Lyons, founder and president of Alltech, said, “For Alltech, algae fermentation presents the latest technological frontier from which we expect incredible opportunities in the areas of food, feed, and fuel to arise.”

A company statement said that the algae will be used for value-added feed products, algae-derived bio-fuel, and the production of ethanol.

Biodiesel in conflict with cooking oil in Thailand

Bangkok’s The Nation newspaper reported in February that supermarkets in the country had been having difficulties since January in procuring enough bottled cooking oil (palm oil) to keep their shelves stocked.

One reason is that November-December floods in 2010 hampered shipments of crude palm oil (CPO) from farms to processors.

Another, according to the paper, was that biodiesel companies were hoarding palm oil in anticipation of rising palm oil prices. Biodiesel companies have been using palm oil as a feedstock for B3 (3% biodiesel + 97% petroleum diesel) and B5, following the Thai government’s policy promoting the use of biofuels to reduce dependence on petroleum-based fuels.

In late February the Thai Energy Ministry decided to redirect 5,000 metric tons (MT) of CPO, originally intended for biofuel production, into the nation’s food chain for refinement into cooking oil. Another 10,000
MT, held by the private sector, was also scheduled for conversion to household cooking oil.

Additionally, the National Palm Oil Policy Committee, chaired by Thailand’s Deputy Prime Minister Suthep Thaugsuban, decided on February 22 to import 30,000 MT of CPO before mid-March to help meet the domestic demand for cooking oil. According to Thaugsuban, the 30,000 MT of CPO could produce 22 million liters of cooking oil. The total of 45,000 MT could thus be converted to 33 million liters of cooking oil.

Cooking oil prices rose from 36 Baht ($1.19) per liter before the shortage to 47 Baht ($1.55) per liter in late February.

**JATROPHA**

**No consensus on jatropha in Africa**

Questions continue to arise regarding the suitability of jatropha as a cash crop in places such as Africa.

**Speaking against jatropha:** Three non-governmental organizations—the African Biodiversity Network, the Ethiopian Society for Consumer Protection, and The Gaia Foundation—released a report in December 2010 entitled “Biofuels—A Failure for Africa.” The groups decry the idea that biofuels are a great alternative to solving these problems in Africa, because the plant does not produce sufficient seeds for farmers to make a profit under conditions of inadequate water.

According to the report, jatropha is failing on these counts:

1. Jatropha performs poorly in areas with low rainfall or low-nutrient soil, to the extent that it is no longer being grown in areas originally developed for plantations.
2. Due to unproductive yields on jatropha plantations, companies have recruited small farmers as out-growers to grow castor oil. Yet castor’s yields are still just a fraction of those expected by companies and farmers alike.
3. Biofuel companies are paying farmers lower prices per unit than they would earn from growing traditional food crops, or failing to pay farmers at all.
4. Biofuel feedstock produced in Ethiopia is being exported for processing and sale in European and Asian markets. Thus, it is not in any way addressing the government’s stated need for energy security.
5. Challenges at policy level mean that the government is also failing to undertake the monitoring and regulation required to prevent negative socio-economic and environmental impacts.

**Speaking for jatropha:** Karl Hilding Thunes, a scientist with the Norwegian Forest and Landscape Institute, has been investigating the characteristics of jatropha by performing controlled experiments on irrigation and fertilization. He is conducting these experiments with the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), under the auspices of the Consultative Group on International Agricultural Research.

According to Thunes, “Jatropha has undoubtedly been over-hyped somewhat in recent years. Expectations have become more realistic now, but there is no question that jatropha has major potential.”

Thunes has conducted studies and field trials of pest risks with jatropha in Ghana and Niger. He reports, “A number of species consume jatropha, such as grasshoppers, beetles, mites, butterflies, and thrips” (http://tinyurl.com/jatropha-Thunes). However, he contends these pests do not pose serious threats, and they can be thwarted by establishing blooming hedges to help with pollination or planting natural barriers of mango or avocado trees between fields of jatropha.

Furthermore, jatropha can be fertilized with its own nutrient-rich press cake, a residue of the oil extraction process, and utilizes much less water than sugarcane and corn.

**Crop insurance proposed for biofuels producers**

US Department of Agriculture (USDA) Secretary Tom Vilsack announced on February 25 that the USDA would in the near future seek proposals to study the feasibility of providing crop insurance to producers of biofuel feedstocks, including corn stover, straw, and woody biomass. These feasibility studies, funded by the Risk Management Agency (RMA), will join research efforts already under way for energy cane, switchgrass, and camelina.

“Providing additional risk management tools for American farmers to produce advanced biofuels crops is an important step toward developing a thriving biofuels industry and reducing our dependence on foreign oil,” said Vilsack.

Two contracts will be funded by USDA. Those interested in applying should refer to the solicitations that will be available on FedBizOpps at https://www.fbo.gov/ or on RMA’s website at http://www.rma.usda.gov/aboutrma/opportunities/.
Phytosterols show benefit as part of Western diet

A daily four-gram dose of plant sterols in an enriched yogurt was associated with a 20% drop in LDL (low-density lipoprotein) cholesterol, a 16% decrease in total cholesterol, and a 19% decline in triglyceride levels, despite the subjects maintaining their habitual Western diet, according to results of a randomized placebo-controlled study published in *Nutrition, Metabolism & Cardiovascular Diseases* (doi: 10.1016/j.numecd.2010.12.004).

Researchers at the Agricultural University of Athens led by T.E. Sialvera recruited 108 persons with metabolic syndrome who were between 30 and 65 years of age and with an average BMI (body mass index) of 29 kg/m². Participants were randomly assigned to receive yogurt mini-drinks with or without added sterols (ELAIS-Unilever Hellas SA) for two months. The daily sterol dose was four grams, and participants continued to eat their normal diets.

Results showed a significant reduction in total cholesterol, LDL cholesterol, triglycerides, as well as small and dense LDL (sdLDL) levels in the phytosterol group, compared with the control group. “To the best of our knowledge, this is the first study [that] observed a decrease in sdLDL following phytosterol supplementation,” according to the researchers.

The researchers also found that subjects in the sterol group experienced a significant reduction of 7% in levels of apolipoprotein B (apo B), compared with no change in the controls. ApoB is the primary apolipoprotein of LDL cholesterol and is responsible for the transport of cholesterol to tissues. There were no changes in levels of HDL (high-density lipoprotein) cholesterol, apoA1, C-reactive protein, or in the subjects’ blood pressures.

How omega-3s prevent retinopathy

Omega-3 fatty acids have been shown to prevent retinopathy, a major form of blindness, in a mouse model of the disease. A follow-up study from the same research team at Children’s Hospital Boston (Massachusetts, USA) reveals exactly how omega-3s provide protection, and provides reassurance that widely used COX-inhibiting drugs such as aspirin and other NSAIDs do not negate their benefit. (COX, or cyclooxygenase, refers to either of two related enzymes that control the production of prostaglandins, which cause inflammation.) The findings, published in *Science Translational Medicine* (doi: 10.1126/scitranslmed.3001571), also suggest that omega-3s may be beneficial in diabetes.

Retinopathy is caused by the proliferation of tortuous, leaky blood vessels in the retina and is a leading cause of blindness for millions of persons around the world. Millions more have age-related macular degeneration (AMD). The most common “wet” form of AMD is also caused by abnormal blood vessel growth.

The ability to prevent these neovascular eye diseases with omega-3 fatty acids could provide tremendous cost savings, says Children’s ophthalmologist Lois Smith, senior investigator on the study. “The cost of omega-3 supplementation is about $10 a month, versus up to $4,000 a month for
Researchers led by Jonathan Purnell at Oregon Health & Science University (Portland, USA) say they have demonstrated that the brain—which serves as a master control for body weight—reacts differently to fructose compared with another common sweetener, glucose. The research appeared in Diabetes, Obesity and Metabolism (13:229–234, 2011).

To conduct the research, nine normal-weight human study subjects underwent magnetic resonance imaging as they received an infusion of fructose, glucose, or a saline solution. When the scientists compared the brain scans from these three groups, they observed distinct differences. Brain activity in the hypothalamus, one brain area involved in regulating food intake, was not affected by either fructose or glucose.

However, activity in the cortical brain control areas showed the opposite response during infusions of the sugars. Activity in these areas was inhibited when fructose was given but activated during glucose infusion. This is an important finding, the authors say, because these control brain areas included sites that are thought to be important in determining how humans respond to food taste, smells, and pictures.

anti-vascular endothelial growth factor therapy,” she says, referring to drugs such as Macugen and Lucentis used in AMD and diabetic retinopathy. “Our new findings give us new information on how omega-3s work that makes them an even more promising option.”

Omega-3 fatty acids, highly concentrated in the retina, are often lacking in Western diets, which tend to be higher in omega-6 fatty acids. In Smith’s previous study, mice fed diets rich in omega-3 fatty acids had nearly 50% less pathologic vessel growth in the retina than mice fed omega-6-rich diets. Smith and colleagues further showed that the omega-3 diet decreased inflammatory messaging in the eye.

In the new study, they document another protective mechanism: a direct effect on blood vessel growth (angiogenesis) that selectively promotes the growth of healthy blood vessels and inhibits the growth of abnormal vessels.

In addition, Smith and colleagues isolated the specific compound from omega-3 fatty acids that has these beneficial effects in mice (a metabolite of the omega-3 fatty acid DHA, known as 4-hydroxy-docosahexaenoic acid), and the enzyme that produces it (5-lipooxygenase, or 5-LOX). They showed that COX enzymes are not involved in omega-3 breakdown, suggesting that aspirin and NSAIDs (nonsteroidal anti-inflammatory drugs) will not interfere with omega-3 benefits.

“This is important for people with diabetes, who often take aspirin to prevent heart disease, and also for elderly people with AMD who have a propensity for heart disease,” says Smith. (One drug used for asthma, zileuton, does interfere with 5-LOX, however.)

Finally, the study demonstrated that 5-LOX acts by activating the peroxisome proliferator-activated receptor-γ, the same receptor targeted by “glitazone” drugs taken by patients with type 2 diabetes to increase their sensitivity to insulin. Since these drugs also increase the risk for heart disease, boosting omega-3 intake through diet or supplements might be a safer way to improve insulin sensitivity in patients with diabetes or prediabetes. “There needs to be a good clinical study in diabetes,” Smith says.

Smith works closely with principal investigators at the National Eye Institute who are conducting an ongoing multicenter trial of omega-3 supplements in patients with AMD, known as AREDS2. The trial will continue until 2013. An earlier retrospective study, AREDS1, found higher self-reported intake of fish to be associated with a lower likelihood of AMD.

In addition, Smith is collaborating with a group in Sweden that is conducting a clinical trial of omega-3 fatty acids in premature infants, who are often deficient in omega-3. That study will measure infants’ blood levels of omega-3 products and follow the infants to see if they develop retinopathy. If results are promising, Smith will seek FDA approval to conduct a clinical trial in premature infants at Children’s.

Meanwhile, in her lab work, Smith plans to continue seeking beneficial lipid pathways, while looking for the most harmful omega-6 metabolites. “We found the good guys, now we’ll look for the bad ones,” says Smith. “If we find the pathways, maybe we can selectively block the bad metabolites. We would hope to start with drugs that are already available.”

US eggs now lower in cholesterol

According to new nutrition data from the US Department of Agriculture’s Agricultural Research Service (USDA-ARS), eggs are lower in cholesterol than previously believed. The USDA-ARS recently reviewed the nutrient composition of standard large eggs, and results show the average amount of cholesterol in one large egg is 185 mg, which is 14% lower than previously recorded. The analysis also revealed that large eggs now contain 41 IU of vitamin D, an increase of 64%.

“We collected a random sample of regular large shell eggs from 12 locations across the country to analyze the nutrient content of eggs,” says Jacob Exler, nutritionist with the Agricultural Research Service’s Nutrient Data Laboratory. “This testing
procedure was last completed with eggs in 2002, and while most nutrients remained similar to those values, cholesterol decreased by 14%, and vitamin D increased by 64% from 2002 values.”

The collected eggs were sent to a laboratory at Virginia Tech University (Blacksburg, USA) to be prepared for nutrient analysis at certified nutrient analysis laboratories. The samples were randomly paired for the testing procedure, and the analysis laboratories tested samples to determine composition of a variety of nutrients including protein, fat, vitamins, and minerals. Accuracy and precision were monitored using quality control samples.

According to Exler, this procedure is standard for the National Food and Nutrient Analysis Program (NFPNAP), the program responsible for analyzing the nutrient composition of a wide variety of foods and making nutrition information publicly available. This information is available on the nutrient data lab website at www.ars.usda.gov/nutrientdata. The new nutrient information will also be updated on nutrition labels to reflect these changes wherever eggs are sold, from egg cartons in supermarkets to school and restaurant menus.

The link between omega-3 deficit and depression

The link between deficits of omega-3 polyunsaturated fatty acids and the onset of depressive disorders is not new in the medical field. However, the brain mechanism by which diet can condition mental health to a certain extent has been difficult to establish. Now research undertaken by scientists in Bordeaux (France) and at the Faculty of Medicine and Odontology of the University of the Basque Country (UPV/EHU) and published in Nature Neuroscience (doi:10.1038/nn.2736) provides new clues to understanding this phenomenon.

According to Susana Mato, a researcher at the UPV/EHU, “We have observed that, in mice subjected to a diet low in omega-3 polyunsaturated fatty acids, they have lower brain levels of omega-3s, and this fact is associated with an alteration in the functioning of the endocannabinoid system.” More concretely, Mato points to the confirmation of “the existence of a deficit in the signaling of the CB1 cannabinoid receptor in the prefrontal cortex of the brain. This protein—the CB1 cannabinoid receptor—has been linked, over the last decade and in various studies, to depressive disorders.”

Rafael Rodríguez-Puertas, a co-author who is also a researcher at the UPV/EHU, points out that “[c]ertain forms of synaptic plasticity—a change in the efficiency of neuronal communication—measured by the brain’s endocannabinoid system, disappear specifically from certain zones of the brains of mice with [a deficit of omega-3 fatty acids].”

Despite several examples in the scientific literature referring to the existence of a link between a dietary deficit of omega-3 fatty acids and depressive disorders, Mato recognizes that “little more is known about how modern Western diets, poor in [omega-3 fatty acids], affect brain function and what might be the reason for a greater rate of depression associated with a deficit of these fatty acids.”

Mato added that the research “reinforces the idea that manipulating the endocannabinoid system can be useful for the treatment of depressive disorders, although the data we have up to now is very green for us to say what would be the ideal way to do so.”
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Soap Manufacturing Technology
Luis Spitz, Editor
Product code 238
List: $198 • AOCS Member: $165

Soap Manufacturing Technology, dedicated exclusively to bar soaps, contains updated content from selected out of print books, including Soap Technology for the 1990’s and Soaps and Detergents (1996). This informative new book also contains unpublished material from the 2006 and 2008 SODEOPEC Conferences, as well as other new subjects.

Soap Manufacturing Technology’s 16 comprehensive chapters will be a useful reference guide for those already in the soap industry and for newcomers as well.

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Amyris (Emeryville, California, USA) has announced the first sale of its renewable squalane. Squalane is a moisturizing ingredient used in a wide range of cosmetics, currently sourced from refined olive oil or shark liver oil. “Both parties involved in the collaboration believe squalane may be used for expanded consumer applications which today rely on nonsustainable materials,” said CosmeticsDesign.com. The renewable squalane is produced through the manufacture of Amyris’s renewable farnesene, which is then converted to squalane.

Ecolab (St. Paul, Minnesota, USA) announced in February that it has received an environmental stewardship award from the Austrian state of Oberösterreich in recognition of the company’s efforts to reduce the carbon footprint of a local hospital laundry.

The Austrian Textile Care team was recognized for implementing a low-temperature washing process known as “Performance Smart” at a Braunau hospital laundry earlier in 2011. Performance Smart is a complete laundry program for conventional washers that combines chemistry with advanced wash formulas to create a process that reduces a facility’s water, energy, and time requirements per load of soiled laundry. The result is a more sustainable, efficient wash program, Ecolab says.

In the case of the Braunau facility, the program reportedly saved the hospital 1 million liters of water per year and, simultaneously, reduced its energy consumption by 13,000 kilowatt-hours per year.

Azelis (Antwerp, Belgium) announced in February 2011 that it had signed a definitive agreement to acquire raw material and ingredient supplier S&D Group (Leicestershire, UK). The European specialty chemicals distributor will acquire S&D to strengthen its Life Science business serving the personal care, pharmaceutical, and food industries, according to CosmeticsDesignEurope.com.

First report on fate of underwater dispersants

Researchers are reporting that key chemical components of the 770,000 gallons (roughly 2.9 million liters) of oil dispersants applied below the ocean surface in the Deepwater Horizon spill did mix with oil and gas spewing out of the damaged wellhead and remained in the deep ocean for two months or more without degrading. However, it was not possible to determine if the first deep ocean use of oil dispersants worked as planned in breaking up and dissipating the oil. Their study, the first peer-reviewed research published on the fate of oil dispersants added to underwater ocean environments, appears in Environmental Science & Technology (45:1298–1306, 2011).

Elizabeth Kujawinski of the Woods Hole Oceanographic Institution (Massachusetts, USA) and colleagues note ongoing concern about the environmental fate of the 1.4 million gallons of dispersant applied to the ocean surface and the 770,000 gallons of dispersant pumped to the mile-deep well head during the oil spill in the Gulf of Mexico. Many studies show that dispersants added to surface oil spills prevent them from coating and harming sensitive coastal environments, but no large-scale applications of dispersants in deep water had been conducted until the Deepwater Horizon oil spill. Thus, no data exist on the environmental fate of dispersants in deep water, the scientists say.

The scientists collected and analyzed seawater samples from the Gulf of Mexico for the presence of a key dispersant ingredient, called DOSS (dioctyl sodium sulfosuccinate—an anionic surfactant), during the active oil flow and again after the flow had ceased. They found DOSS became concentrated in the
Here is a bit of history from the October 2010 AOCS World Conference on Detergents in Montreux, Switzerland: Luigi Perani (left), founder and director of IIT SRL (Busto Arsizio, Italy), and Burton Brooks, founder and chairman of The Chemithon Corp. (Seattle, Washington, USA), talk over their contributions as founders of the modern sulfonation industry. Brooks developed the continuous sulfonation process (oleum type for linear alkylbenzene) in 1954 while pursuing his master’s degree at the University of Washington (Seattle, USA). Thereafter, he was largely responsible for the development of continuous air/SO₃ sulfonation and annular falling film and other specialized reactor technologies. Chemithon alliance partner Luigi Perani developed the first multi-tube-type sulfonation reactor and helped pioneer the development of European sulfonation.

Deepwater plumes of suspended oil and gas at depths of up to three-quarters of a mile (1.2 km) and did not mix with the surface applications of dispersant. They also detected the dispersant ingredient at distances of nearly 200 miles (320 km) from the well two months after deepwater dispersant applications ceased, indicating it was not rapidly biodegraded.

Their data are not sufficient to resolve whether the dispersant was effective in dispersing the oil coming out of the wellhead. However, the scientists argue that the persistence of the dispersant over long distances and time periods justifies further study of the effects of chemical dispersant and oil mixture exposure on marine life.

Hair dyeing poised for transformation

Technological progress may be fast-paced in many fields, but one mundane area has been left in the doldrums for the last 150 years: the basic technology for permanently coloring hair. That is the conclusion of a review of almost 500 articles and patents on the chemistry of permanent hair dyeing. The authors, Robert Christie and Olivier Morel, foresee much more innovation in the years ahead, including longer-lasting, more natural-looking dyes and genetic manipulation to reverse gray hair. They note that hair dye already is a multibillion dollar international industry, poised for even greater expansion in the future due to the graying of a global population yearning to cling to appearances of youth.

Most permanent hair coloring technology, however, is based on a 150-year-old approach that uses p-phenylenediamine (PPD), a chemical that produces darker, browner shades when exposed to air. Concern over the safety of PPD and other hair dye ingredients, as well as demand for more convenient hair dyeing methods, has fostered an upswing in research on new dyes and alternative hair coloring technologies.

The scientists describe progress toward those goals. Future hair coloring techniques are likely to include nano-sized colorants, for instance. Composed of pigments 1/5,000th the width of a human hair, they will penetrate the hair and remain trapped inside for longer-lasting hair coloration. Scientists are also developing substances that stimulate the genes to produce the melanin pigment that colors hair. These substances promise to produce a wider range of more natural-looking colors, from blond to dark brown and black, with less likelihood of raising concerns about toxicity and better prospects for more natural results. Other new technologies may stop graying of the hair or prevent its formation altogether, the scientists say.

The research appears in Chemical Reviews (doi: 10.1021/cr1000145).

ACI: New York proposal “unnecessary”

Plans by the US state of New York to implement a 35-year-old law on cleaning product ingredient disclosure is “unnecessary, unworkable, and would further strain scarce taxpayer resources,” according to the American Cleaning Institute (ACI; Washington, DC, USA).

ACI—which represents the US cleaning products industry—says that an existing industry initiative has led to ways to expand ingredient information available to consumers.

Requirements laid out by the State Department of Environmental Conservation (DEC) would duplicate and in some cases contradict federal labeling requirements for household and industrial and institutional cleaning products, according to ACI. The Institute questions why the State wants to invest scarce taxpayer dollars in implementing a program that industry is already putting into place.

ACI and other industry representatives met with DEC staff in February 2011 to share details about the industry’s efforts to provide ingredient information to consumers through the voluntary Consumer Product Ingredient Communication Initiative and other industry programs. ACI emphasized that these voluntary programs are addressing the intent of the 1976 law, and that the current proposal from DEC is unworkable and would not provide consumers with useful information.

“ACI believes that the industry’s Consumer Product Ingredient Communication Initiative correlates highly with the DEC program intent and effectively fulfills the criteria noted. Equally important is the fact that the voluntary nature of the initiative allows the program to evolve and improve significantly in response to consumer needs.”

“The initiative provides for more disclosure than required under any law for any industry. We have seen very strong participation in the initiative, with 99% of the cleaning products represented by ACI...”
in compliance, at no burden to the State of New York,” the trade association said in a statement.

**Clorox discloses ingredients**

The Clorox Co. (Oakland, California, USA) announced in February 2011 that it is now disclosing the following additional information about its products through its Ingredients Inside program:

- The specific identity of preservatives and dyes in all US and Canadian cleaning, disinfecting, and laundry products. This information expands on the listing of active ingredients, which have been provided to consumers over the last two years.
- The palette of fragrance ingredients—listed in numerical and alphabetical order—used in all US and Canadian cleaning, disinfecting, and laundry products. Clorox is also including a link to a PDF file that includes each fragrance ingredient’s CAS registry number, the unique numerical identifier assigned by the Chemical Abstracts Service to every chemical available in open scientific literature, as well as the fragrance chemical names, provided by the International Union of Pure and Applied Chemistry.


Additionally, Clorox said it has begun the continuing process of adding a notice on all product labels that states: “A list of this product’s ingredients is available at www.CloroxCSR.com.”

“We applaud Clorox’s continued efforts to become even more transparent with respect to the ingredients in their products,” said Carl Pope, chairman of the environmental organization, Sierra Club. “This is another example of the company responding to the immediate needs and interests of consumers.”

**P&G unveils compact powders**

The first of Procter & Gamble’s (P&G) new compacted powder laundry detergents were available in the United States at the end of February 2011. “The new detergents are compacted by one-third, while offering the same number of loads in a smaller box,” according to the *Cincinnati* (Ohio) *Enquirer* newspaper.

Company officials told the newspaper that the first brands available in the new format were Tide and Gain and that P&G also will introduce compacted powder formulas for Cheer, Dreft, and Ivory Snow. According to the company, use of the compacted detergents could help save up to 22 million pounds (almost 10 million kg) of total packaging in the US and Canada each year. “In addition, because the new products are smaller and lighter, fewer truckloads will be needed to ship deliveries, cutting costs and pollution,” the *Enquirer* noted.

“This launch represents P&G’s commitment to innovate and improve consumers’ lives, while also demonstrating our commitment to sustainable innovation,” Kevin Crociata, P&G marketing director for North America fabric care, said in a news release. “These new compacted detergents give consumers the same number of loads as our noncompacted powder detergent in a more convenient product that is easier to handle and store.”

The new formulas were developed at P&G’s Ivydale (Cincinnati area) research center and at a research center in Europe, the newspaper said.

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Dumelin, Myers elected to lead AOCS

Erich E. Dumelin, retired vice president, supply chain strategy and technology foods, Unilever, Zurich, Switzerland, was elected AOCS president for 2011–2012. Deland J. Myers, professor and director of School of Food Systems, Great Plains Institute of Food Safety at North Dakota State University, Fargo, North Dakota, USA, was elected vice president. Under AOCS by-laws, the vice president is also president-elect and runs unopposed for president the following year.

Timothy J. Kemper, president and chief executive officer, Desmet Ballestra North America, Inc., Marietta, Georgia, USA, was elected to a two-year term as treasurer.

The new officers will be installed May 3, 2011, during the 102nd AOCS Annual Meeting & Expo in Cincinnati, Ohio, USA.

Elected as AOCS Governing Board members-at-large were: Douglas M. Bibus, community faculty, Center for Spirituality and Healing, University of Minnesota, president, Lipid Technologies, LLC, and director, Holman Center for Lipid Research, Austin, Minnesota, USA; Michael A. Snow, industrial director, Bunge North America, St. Louis, Missouri, USA; Manfred Trautmann, vice president and head of Detergents & Intermediates Business Unit, Clariant International, Muttenz, Switzerland; and Neil R. Widlak, director, Product Services and Development, ADM Cocoa, Milwaukee, Wisconsin, USA.

Continuing in their current terms are Sevim Z. Erhan, center director, Eastern Regional Research Center (ERRC), US Department of Agriculture, Agricultural Research Service (USDA-ARS), Wyndmoor, Pennsylvania; Richard H. Barton, owner and president, N. Hunt Moore and Associates, Inc., Memphis and Collierville, Tennessee, USA; David R. Duncan, president, DRD Consulting, Surrey, England; Mila P. Hojjilla-Evangelista, research chemist, plant polymer research unit, National Center for Agricultural Utilization Research, USDA-ARS, Peoria, Illinois, USA; Alejandro G. Marangoni, professor and Canada Research Chair, food and soft materials science, University of Guelph, Guelph, Ontario, Canada.

Robert Moreau, research chemist at USDA-ARS, ERRC, Wyndmoor, Pennsylvania, USA, continues as Publications Steering Committee chairperson; and Len Sidisky, manager, Gas Separations Business Unit, Supelco (Division of Sigma-Aldrich), Bellefonte, Pennsylvania, USA, continues as Technical Steering Committee chairperson.

Ballots were emailed or mailed to eligible members in December 2010. Ballots received prior to the deadline were counted at AOCS Headquarters on February 16, 2011. AOCS member George Willhite was on hand to oversee the counting and verify the results.

IFFO appoints Mallison

Andrew Mallison has been appointed to succeed Jonathan Shepherd as director general of the International Fishmeal and Fish Oil Organisation (IFFO), headquartered in St. Albans, UK. Mallison joins IFFO from the Marine Stewardship Council (MSC) where he has been Director of Standards & Licensing since 2009.

Before that he spent 13 years with food retailer Marks & Spencer plc (M&S) as technical manager with responsibility for procurement and sustainability strategy for all seafood sourced globally.

CONTINUED ON NEXT PAGE
In Memoriam

GEORGE U. LIEPA

AOCS Fellow and Award of Merit recipient George Uldis Liepa of Saline, Michigan, USA, passed away on January 26, 2011. He was 64 years old. Liepa, whose parents were natives of Latvia, was born in 1946 in Oldenburg, Germany. He and his family immigrated to the United States in 1949.

Liepa is survived by his wife, Candice, and his daughters, Arianne and Marisa.

Liepa earned his bachelor’s and master’s degrees from Drake University, Des Moines, Iowa, USA, and his doctorate from Iowa State University, Ames. He was professor of nutrition at Eastern Michigan University and former department head. He served on the National Guard Association Medical Task Force, and was an accomplished researcher, educator, administrator, and speaker. He retired from the US Army Reserves as Lieutenant Colonel in 1993, after 22 years of service.

Liepa’s affiliation with AOCS was a long and active one, spanning more than 30 years. He served on the AOCS Governing Board for 14 years in various capacities. His intelligence, sincerity, and commitment to doing the right thing were always held in high regard by the AOCS membership. He served as member at large (1992–1993), secretary of the Society (1998), and division council representative (2000–2006).

He served the Society in other ways as well. He chaired the Protein and Co-Products Section, which then became the Protein and Co-Products Division. He also served as an associate editor for the Journal of the American Oil Chemists’ Society, as a reviewer for Lipids, and as a book reviewer.

Liepa was honored for his service to the Society in 2008 when he was named a Fellow, a designation which recognizes those whose achievements in science entitle them to exceptionally important recognition or those who have rendered unusually important service to the Society or to the profession. Liepa qualified on both counts.

He was honored again with the Award of Merit in 2009, recognizing productive service to AOCS including leadership in committee activities; service that has advanced the Society’s prestige, standing, and interests; and service not otherwise specifically recognized. Again, George qualified on all counts.

In fact, in the words of his colleagues:

“Dr. Liepa has had a profound impact on the AOCS throughout his professional career.” Dr. Pam White, Iowa State University, AOCS Past President

“His involvement raised the caliber of deliberations.” Dr. Michael Haas, US Department of Agriculture Agricultural Research Service, Eastern Regional Research Center, Wyndmoor, Pennsylvania, AOCS Past President

“When I think of George Liepa in relationship to AOCS, I think of unbridled enthusiasm and a positive attitude.” Dr. Margaret C. Craig-Schmidt, Auburn University, Auburn, Alabama

“Certainly for the duration of his active participation, the depth of his commitment to AOCS programs, and his ability to work with staff, membership groups, and other governing board members on a wide variety of topics over a long period of time, I cannot think of any other members that are not past presidents who are as deserving of (the Award of Merit) as is George Liepa.” Dr. Howard R. Knapp, Billings, Montana, AOCS Past President

Liepa’s daughters accompanied him to the AOCS Annual Meeting in 2009, where he received the Award of Merit. After knowing George for so many years, those of us who worked with him on the Board felt that we knew Candy and the girls as well. He always spoke proudly of them to all who knew him.

Thank you, George. You gave us so much. We will miss your positive attitude and your never-ending stream of really good ideas!

Jean Wills Hinton
AOCS Executive Vice President
Champaign, Illinois (jeanwh@aocs.org)

Butler becomes Solix CEO

In late January Joel Butler assumed the position of chief executive officer (CEO) of Solix Biofuels, located in Fort Collins, Colorado, USA. He had formerly been chief technology officer for the company. His appointment was based in part on his considerable experience in manufacturing and product commercialization.

In a company statement, Butler said, “I look forward to driving the launch of our proprietary algae production systems.” He added, “I believe that Solix’s AGS technology provides the best opportunity to enable the industry to deliver a range of products derived from algae in the coming years.”

According to the company statement (www.solixbiofuels.com/content/news/butler-new-ceo), Solix achieved peak growth rates of over 3,000 gallons of algae per acre (28,000 liters per hectare) per year, thereby crossing the threshold that has been deemed as commercially viable.

Doug Henston, previously Solix’s CEO, and David Maytubby, chief financial officer, have resigned from Solix to pursue other opportunities.

ACI recognizes AkzoNobel’s Sherman

The American Cleaning Institute (ACI; formerly, the Soap and Detergent Association) presented its Elva Walker Spillane Distinguished Service Award to Frank Sherman, chairman of AkzoNobel Inc. and member of the ACI Board of Directors. The presentation was made during the 2011 ACI Annual Meeting & Industry Convention held in Orlando, Florida, USA, in January, 2011. The award honors an individual for extensive or exceptional service to ACI who has promoted the growth and interests of the association and the industries it represents; and who exercised outstanding leadership within ACI.

Based in Chicago, Sherman currently serves as president and general manager of AkzoNobel’s Global Surface Chemistry...
Business Unit, as well as chairman of AkzoNobel Inc., overseeing the shared service organization for all AkzoNobel business units located in North America. He has been with AkzoNobel since 1987 when Akzo acquired Stauffer Chemical’s specialty chemical business.

POS names president/CEO

As of March 1, 2011, Dale Kelly became president and chief executive officer (CEO) of POS Bio-Sciences, Saskatoon, Canada. He came to the position from the Saskatchewan Research Council, where he was vice president of agriculture, biotechnology, and food.

POS Bio-Sciences is a confidential contract research, toll processing, and analytical services organization that specializes in extraction, fractionation, purification, and modification of bio-based materials.

In Memoriam

Richard D. O’Brien

Richard D. O’Brien passed away on December 2, 2010, at the age of 76. He had been an AOCS member since 1973.

He was born in Bloomington, Illinois, and attended the University of Texas at Arlington (USA) for two years, before completing his bachelor of science degree in baking science and management at Florida State University (Tallahassee, USA) in 1957. He was also an Army veteran.

O’Brien worked for Anderson Clayton Foods (which was subsequently purchased by Kraft Inc.) for many years in the areas of product development and quality control, and he later worked as a consultant to the fats and oils industry.

O’Brien’s works on fats and oils processing and safety are cited internationally. With Walter Farr and Peter Wan, he was editor of the AOCS Press book *Introduction to Fats and Oils Technology*, to which he contributed six chapters. He also wrote the text *Fats and Oils: Formulating and Processing for Applications*. Originally published in 2000, the third edition of this book appeared in 2008.


O’Brien is survived by his wife of 51 years, Earlene, and his sister Nancy.

AOCS Corporate Member profile

This profile has been provided by the following Bronze Level AOCS Corporate Member:

Peerless Holdings Pty Ltd.
21 Evans Street, Braybrook
Victoria 3019 Australia
Web: www.peerlessfoods.com.au
Phone: +61 (03) 9214-7777
Fax: +61 (03) 9318-2396

Peerless Foods is Australia’s largest privately owned manufacturer and marketer of edible oils and fats. The company provides a range of oil-based products for the industrial, food service, bakery, retail, and export markets. These include high-performance deep frying oils such as Frytol and Formula 40, plus Sunbeam vegetable shortenings for frying and cooking purposes.

For all-around culinary cooking purposes, the range of Pura premium oils including canola, Tuscan, and olive blends can be supplied. These oils are all perfect for both shallow frying and cold purposes such as dressings and mayonnaise.

The EOI brand of bakery fats includes cake and pastry margarines, shortenings, and dry mixes for the bakery industry. These products also come in a VTF (virtually trans-free) range for bakeries to cater to the health-conscious consumer.

Peerless Foods also supplies a range of margarine spreads. These include 99% trans-free products that are all natural and are halal and kosher approved.

For international markets, Peerless Foods manufactures a range of specialized fats. These include butter oil substitutes, performance margarines, and Australian buttery spreads and butter replacers for the bakery, confectionary, ice cream, and coffee-roasting markets.

For more information, please contact Peerless Foods at +61 (03) 9214-7777 or visit www.peerlessfoods.com.au.

As a benefit of corporate membership, companies are entitled to provide a 250-word profile for inclusion on a space-available basis in inform magazine. For more information, contact Nicole Philyaw at nicolep@aocs.org.
Minutes of the 2010 AOCS Annual Business Meeting

The 101st AOCS Annual Business Meeting was called to order by AOCS President, Ian Purtle at 7:20 a.m., Tuesday, May 18, 2010, at the Phoenix Convention Center in Phoenix, Arizona, USA.

President Purtle welcomed the participants and presented a short video highlighting AOCS. For the first time, Purtle explained, the meeting was streaming on a live webcast. Purtle thanked the breakfast sponsor, Oil-Dri, and the Annual Meeting Committee chaired by Doug Bibus.

Purtle gave his retiring president’s address, noting that AOCS has made substantial progress in strengthening the financial status of the organization while improving on the quality, timeliness, and speed of access to the services. AOCS journals, books, meetings, and Methods continue to provide highly respected scientific information to meet the needs of our constituents. Purtle reported AOCS had been working more closely with our geographical Sections in an effort to increase relevancy to our global audience. Purtle stressed the importance of preparing our student members, as they will be the next generation of AOCS.

President Purtle called AOCS Secretary Steve Hill to the podium to present the minutes from the 2009 business meeting—unless someone were to make a motion to approve the minutes as published in the August 2009 issue of inform. The motion to approve the minutes as published was made, seconded, and approved by a voice vote.

AOCS Foundation Chairperson Mike Boyer took the podium to announce the Foundation’s new fundraising initiative, the Influencing Innovation Campaign. The purpose of the campaign is to provide a steady source of funding for research on and development of new products and services that will continue to build the AOCS global network.

Purtle passed the AOCS gavel to incoming President Keith Grime, and Purtle was presented with the Past President’s key.

AOCS Award winners were recognized.

Following the presentation of Awards, Keith Grime addressed the participants. Grime’s remarks included an emphasis on pursuing the vision for the future of AOCS. Grime said, “The core competency of AOCS, our business if you will, is the transfer of knowledge. Our vision therefore is logical...to offer the best global connection network available for our members within our areas of expertise, namely the science and technology of oils, fats, surfactants, and detergents.” Grime said the focus during his presidency will be on maximizing AOCS’ capability as a connection forum that can bring together experts for information building, problem solving, and networking.

With no further business, President Grime adjourned the meeting at 8:00 a.m. Annual Meeting Chairperson Doug Bibus took the podium to introduce the keynote speaker, Richard Theiler, senior vice president of The Dial Corporation.
In *Analytical Methods*, Anthony O’Lenick has successfully compiled 20 analytical methods for analyzing surfactants into a cookbook-style format. This eBook is appropriate for those new to the surfactant and formulation business and for those unfamiliar with the details of specifications. More importantly, the book is a great first reference for someone purchasing surfactants. In addition, *Analytical Methods* illustrates several real-life examples for why appropriate specifications are needed for surfactants.

The cookbook style also allows for the book to be used in the laboratory as a method guide with step-by-step instructions for the user. Although the methods are not as detailed as the official peer-reviewed methods, in reality, these are what in-house methods look like. Just as a cookbook assumes the user is familiar with cooking, this book assumes an analogous level of competency of the reader in the laboratory. Each method includes a succinct scope, summary, equipment requirements, reagents, clear procedure, calculations, precision, and safety guidelines. Where appropriate, the methods reference “official” peer-reviewed methods. However, the greatest value comes from the remarks that provide key insights into the methods from O’Lenick’s years of experience. It would have been helpful to include the time it takes to conduct the test from beginning to end, assuming all the equipment and standards outlined in the method had been used.

The introduction emphasizes the need to have the appropriate salient specifications. This is critical to a supplier–formulator relationship so that a consistent product is delivered. As stated in the text, care must be taken to choose the most appropriate specifications because each analysis adds to the product overhead.

Although the eBook delivered exactly what was implied—a black-and-white text in an electronic format—it did not fulfill my expectations of what an eBook could be. As I type this review on my iPad while sitting on a cramped regional jet, I ponder what my expectations were. It would have been much better to have included embedded images of all the glassware, diagrams, and/or pictures of the laboratory set-ups; links to Wikipedia for background information on the chemicals; links to official references online; and even video illustrating color changes for the titrations. These are common inclusions in modern PowerPoint presentations or smart phone applications.

Charles Hammond is a research associate with Sasol North America Inc. in Westlake, Louisiana, and has been an AOCS member since 1991. He can be reached at Charles.Hammond@us.sasol.com.

AOCS members can receive 15% off on any of the Allured books at www.Alluredbooks.com. Simply enter coupon code aocs15 (not case sensitive) and the discount will be applied at check-out. Questions? Contact Books@allured.com.

AOCS’ strategic vision is to build an interactive global network of professionals and professional societies in the interest areas we serve for the purpose of collaborating and building an information base that will foster innovation in oils, fats, home care, health, energy, and related fields.

Are you interested in leading AOCS towards those goals? Go to http://www.aocs.org/goto/nominations2011 and complete the AOCS Prospective Board Member Questionnaire to be considered for future Governing Board elections.

For more information, contact Amy Lydic by phone at +1 217-693-4807, or by email at amyl@aocs.org.
Patents

Published Patents

Pesticide compositions and methods for their use
Coleman, R., Summerdale Inc., US7820594, October 26, 2010
This invention relates to agricultural compositions, particularly pesticidal compositions which find particular use as a fungicide or herbicide composition. The pesticidal composition can include one or more fatty acids and one or more organic acids different from the fatty acid. The organic acid can but need not exhibit any fungicidal activity; however, when combined with a fatty acid, the organic acid functions as a potent synergist for the fatty acid as a fungicide. Additionally, the pesticidal composition can include other components such as emulsifiers, adjuvants, surfactants, and diluents. The pesticidal composition significantly reduces or prevents the fungal infection of cash crops including vegetables, fruits, berries, seeds, grains, and, at higher application rates, can also be used as a herbicide and/or harvest aid or desiccant for harvested crops such as potatoes. The addition of an emulsifier further enhances the pesticidal properties of the compositions.


Natural rubber latex natural rubber composition and tire using the same
Kondou, H., Bridgestone Corp., US7825175, November 2, 2010
The natural rubber latex of the present invention in which phospholipid contained in the latex is decomposed, particularly the natural rubber latex in which it is decomposed by enzyme treatment with lipase and/or phospholipase at a temperature of 70°C or lower is excellent in a processability, and in the natural rubber thereof and the rubber composition using the same, the physical properties such as an anti-aging characteristic, a tensile strength and an abrasion resistance are sufficiently maintained. Accordingly, the natural rubber of the present invention can be used as an excellent member for a tire.


Wax and wax-based products
The present lipid-based wax compositions commonly include a polyol fatty acid ester component (made up of partial and/or completely esterified polyols). Generally, at least a portion of the polyol fatty acid ester has been subjected to a transesterification reaction. Lipid-based wax compositions having a melting point of about 48°C to about 75°C can be particularly advantageous for use in forming candles. The wax may contain other components such as mineral wax, plant wax, insect wax, and/or other components. The polyol fatty acid ester component can include triacylglycerols such as those derived from plant oils (soybean oil, palm oil, etc.). The polyol ester component may be characterized based on one or more of its physical characteristics, such as SFI-40, SFI-10, typical crystal structure, iodine value, melting curve, and/or other properties.


Manufacturing method of bio-diesel oil
The object of this invention is to provide a method of producing a bio-diesel oil in a great amount in a relatively short time, in which oil/fat and alcohol, used as reactants are homogeneously mixed with each other to form a single liquid phase mixture which effectively react with each other. The method includes transesterifying the oil/fat and alcohol in the presence of alkyl ester. Additionally, in the method alkyl ester is added to a mixture of the oil/fat and alcohol by recycling alkyl ester as a product to the mixture. Furthermore, the method includes (i) an acidic catalyst, and (ii) transesterifying the pre-esterified oil/fat with alcohol in the presence of alkyl ester.


Products and methods for maintaining or increasing ceramide levels in skin
Disclosed are methods and products such as wet wipes and absorbents capable of providing a skin health benefit when utilized in the intended fashion. More specifically, the products described herein comprise an agent, such as a botanical extract, which is capable of increasing the activity of sphingomyelinase in a Sphingomyelinase Activity Screening Test and/or decreasing the activity of ceramidase according to a Ceramidase Activity Screening Test. By increasing the activity of sphingomyelinase and/or decreasing the activity of ceramidase, the agents in combination with the products described herein are able to maintain or increase the level of ceramides in the skin leading to improved skin health.


Fat composition
Masui, K., and H. Takahashi, Kao Corp., US7838060, November 23, 2010
The invention provides a fat and oil composition which contains diacylglycerol at a high concentration recognized to have an action of suppressing the accumulation of body fat, has a low content of trans-un satu rated fatty acid having a risk of exerting an adverse influence on diseases in circulatory organs, and is used in bakery products. The
invention relates to a fat and oil composition containing 60 to 80 wt% diacylglycerol in fats and oils, wherein 90 wt% or more of fatty acids constituting the diacylglycerol are unsaturated fatty acids, and, in triacylglycerol as the balance, tri-saturated triacylglycerol whose every constituent fatty acid is a saturated fatty acid accounts for 10 to 50 wt%, and the content of trans-unsaturated fatty acids in total fatty acids constituting the fats and oils is 5 wt% or less.


Increasing rate of enzyme catalyzed equilibrium reactions


A method of increasing the rate of conversion of reactants to reaction product of enzyme-catalyzed, reversible, i.e., equilibrium, reactions having water or methanol as by-product includes removing water and/or methanol from the reaction mass during reaction by permeation of the reaction mass through a selectively permeable perfluorinated polymer or copolymer membrane.


Liquid dye formulations in non-petroleum based solvent systems

Friswell, M.R., Sunbelt Corp., US7842102, November 30, 2010

A dye formulation is disclosed that includes a vegetable oil ester based solvents that have carbon chain lengths of C1 to C18, a solvent dye that is a true liquid dye dissolved in the vegetable oil ester for imparting color to the dye formulation, and reduced sulfur levels in commercially available dye formulations as compared to those in hydrocarbon-based solvent systems. Sulfur content is typically reduced to 2–3% of dye formulations in hydrocarbon-based solvents. The formulations are particularly useful for tagging petroleum substrates as well as writing instrument and ink jet formulations.


Method of concentrating minor ingredient contained in oily matter obtained from plant tissue

Mori, O., et al., Ajinomoto Co., Inc., US7842321, November 30, 2010

Fat-soluble trace constituents contained in plant tissues may be conveniently concentrated and/or purified by a method which involves extracting the fat-soluble trace constituent from a plant, to obtain an extract containing the fat-soluble trace constituent; adding a fatty acid ester to the extract, to obtain a mixture; and subjecting the mixture to molecular distillation. The method is particularly effective for the concentration and/or purification of fat-soluble constituents which are solids or viscous liquids at ambient temperature and ordinary pressure. The concentrated and/or purified fat-soluble trace constituent of a plant tissue prepared by the method may be combined with a food or drink to afford a food or drink product that contains the concentrated and/or purified fat-soluble trace constituent.


Phospholipases and uses thereof


The invention relates to a newly identified polynucleotide sequence comprising a gene that encodes a novel phospholipase isolated from Aspergillus niger. The invention features the full-length nucleotide sequence of the novel gene, the cDNA sequence comprising the full length coding sequence of the novel phospholipase as well as the amino acid sequence of the full-length functional protein and functional equivalents thereof. The invention also relates to methods of using these enzymes in industrial processes and methods of diagnosing fungal infections. Also included in the invention are cells transformed with a polynucleotide according to the invention and cells wherein a phospholipase according to the invention is genetically modified to enhance or reduce its activity and/or level of expression.


Method of making high solids, high protein dairy-based food

Fitzsimons, W., et al., Fonterra IP Ltd., US7842325, November 30, 2010

The present invention provides a process for producing a high solids/high protein dairy product wherein a milk protein concentrate is first mixed with molten fat to produce a mixture of protein particles coated in fat and the mixture hydrated, acidified, and heated under low shear to produce a dairy product, preferably a cheese or cheese-like product having a protein to water ratio of between 0.6 and 3.0.


Cereal and fruit oil


The present invention relates to a vegetable oil comprising a mixture of cereal oils and fruit oils. These are selected from: corn oil, rice oil, wheat germ oil, barley oil, oat oil, rye oil, sorghum oil and millet oil and walnut oil, blackcurrant oil, almond oil, hazelnut oil,
apricot oil, peach oil, avocado oil, cherry oil, watermelon oil, melon oil, blueberry oil, and orange oil.


Process for the preparation of lubricants
Darbha, S., et al., Council of Scientific and Industrial Research, US7842653, November 30, 2010

The present invention provides an improved process for the preparation of lubricants from vegetable oil or fat obtained from animal source. The present invention involves a reaction of vegetable oil or fat with an alcohol in the presence of a double metal cyanide catalyst, at a temperature in the range of 150–200°C for a period of 3–6 hr to obtain the desired bio-lubricant.


Method for treating oils and fats
Murakami, S., US7846221, December 7, 2010

A method for treatment of oils and fats having a high saturated fatty acid content whose treatment has previously been difficult, especially waste oils and fats and discharged oils and fats, characterized in that the oils and fats just prior to hydrolysis are subjected to ozone treatment and light irradiation treatment.


Method for making a vegetable oil-based candle

The present invention provides a method of making a candle from a vegetable oil-based candle wax that provides a smooth, solid vegetable oil-based candle having fully integrated color and fragrance.

Patent family members: US7846372 BA

Phospholipid gel compositions for drug delivery and methods of treating conditions using same
Murthy, Y.V.S.N., IDEXX Laboratories, US7846472, December 7, 2010

The present invention relates to pharmaceutical compositions in the form of a gel for controlled or sustained release of a pharmaceutically active agent and to methods for treating or preventing a condition in an animal by administering to an animal in need thereof the pharmaceutical compositions. One particular type of condition for which the pharmaceutical compositions are useful is a microbial infection, e.g., of the skin, ear, or eye, especially for veterinary applications.


Synthetic lipid mixtures for the preparation of a reconstituted surfactant

The invention relates to reconstituted surfactants consisting of artificial phospholipids and peptides able to lower the air-liquid surface tension, more particularly to reconstituted surfactants comprising special phospholipid mixtures and artificial peptides which are analogs of the natural surfactant protein C for the treatment of respiratory distress syndrome and other diseases relating to pulmonary surfactant dysfunctions.


Environmentally benign anti-icing or deicing fluids employing triglyceride processing by-products

Deicing compositions comprised of glycerol-containing by-products of triglyceride processing processes are disclosed.


Foodstuff supplement and method of producing same
Palamountain, J.R., et al., Vita Power Ltd., US7854953, December 21, 2010

A foodstuff supplement and method of producing the foodstuff supplement. The method includes forming a liquid phase and adding vitamins to the liquid phase at a temperature below that at which significant depletion and/or degradation of the vitamins will occur. Oil is heated in a vessel and an emulsifier is added to the heated oil. The resultant mixture is cooled and the liquid phase is added.

Barrier film


A barrier composition which is injection moldable and able to be made into a transparent film or incorporated (by co-extrusion and/or lamination) into multi-layer film products, the composition on dry basis: (i) from 45 to 90% by weight of a starch and/or a modified starch selected from starches modified by reaction with a hydroxyl alkyl group, an acetate or a dicarboxylic acid anhydride or a grafting polymer; (ii) from 4 to 12% by weight of a water-soluble polymer selected from polyvinyl alcohol, polyvinylacetate, and copolymers of ethylene and vinylalcohol which have a melting point compatible with the molten state of the starch components; (iii) from 5 to 45% by weight of a non-crystallizing mixture of sorbitol and at least one other plasticizer selected from glycerol, maltitol, xylitol, mannitol, glycerol trioleate, epoxidized linseed or soybean oil, tributyl citrate, acetyl triethyl citrate, glyceryl triacetate, 2,2,4-trimethyl-1,3-pentanediol diisobutyrate; polyethylene oxide or polyethylene glycol; (iv) from 0.3 to 2.5% by weight of a C_{12–C_{22}} fatty acid or salt; (v) from 0.25 to 3% of an emulsifier system having a hydrophilic-lipophilic balance value between 2 and 10. The barrier film may be co-injection molded with polyethylene terephthalate (PET) or polylactic acid (PLA) for blow molding into beverage bottles, with polyethylene (PE) or polypropylene (PP) or biodegradable polymers for high gas-barrier containers or closures, or may be co-extruded with PE, PP, or PLA for thin-film packaging applications or for blow-molded containers.

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Developing water-resistant adhesives.

In subunits and greater water resistance than those from adhesives made from subunits than on that of the lesser effect on adhesion strength of the try showed that subunits existed as uniformly discrete parti -

cles. Transmission electron microscopy showed that the subunits were spherical hydrophobic clusters, whereas the pH ranges of 4.1–5.4, 3.5–7.0, and 4.8–5.3, respectively. The minimum solubility for subunits from 140 g of soy flour were 1.86 g (1.3%) and 0.95 g (0.67%), respectively. Transmission electron microscopy showed that the subunits existed as uniformly discrete particles at pH 5.0. Differential scanning calorimetry showed that subunits had higher thermal stability than α′α′ subunits. The pH had a lesser effect on adhesion strength of the β subunits than on that of the α′α′ subunits. The adhesives made from β subunits also showed greater water resistance than those from α′α′ subunits and β-conglycinin. Soy protein rich in β subunits is likely a good candidate for developing water-resistant adhesives.

New hydrothermal treatment of alperujo enhances the content of bioactive minor components in crude pomace olive oil


The application of a new process based on the hydrothermal treatment of olive oil waste (alperujo) led to a final solid rich in pomace olive oil (POO) enriched in minor components with functional activities. The effects of the time (15–90 min) and the temperature (150, 160, and 170°C) of the thermal processing of alperujo on the yield, quality, and enrichment of minor components of crude POO were evaluated. The final treated solid had an increase in oil yield up to 97%, with a reduction in solids up to 35.6–47.6% by solubilization. Sterols increased up to 33%, aliphatic alcohols increased up to 92%, triterpenic alcohols increased up to 31%, squalene increased up to 43%, tocoph-erols increased up to 57%, and oleic anic acid increased up to 16% by the new treatment. The increase maintains a high concentration of functional substances probably even in the refining POO.

Biofortification of soybean meal: immunological properties of the 27 kDa γ-zein


Legumes, including soybeans (Glycine max), are deficient in sulfur-containing amino acids, which are required for the optimal growth of monogastric animals. This deficiency can be overcome by expressing heterologous proteins rich in sulfur-containing amino acids in soybean seeds. A maize 27 kDa γ-zein, a cysteine-rich protein, has been successfully expressed in several crops including soybean, barley, and alfalfa with the intent to biofortify these crops for animal feed. Previous work has shown that the maize 27 kDa zein can withstand digestion by pepsin and elicit an immunogenic response in young pigs. By use of sera from patients who tested positive by ImmunoCAP assay for elevated immunoglobulin E (IgE) to maize proteins, specific IgE binding to the 27 kDa γ-zein is demonstrated. Bioinformatic analysis using the full-length and 80 amino acid sliding window FASTA searches identified significant sequence homology of the 27 kDa γ-zein with several known allergens. Immunoblot analysis using human serum that cross-reacts with maize seed proteins also revealed specific IgE binding to the 27 kDa γ-zein in soybean seed protein extracts containing the 27 kDa zein. This study demonstrates for the first time the allergenic potential of the 27 kDa γ-zein and the potential that this protein has to limit livestock performance when used in soybeans that serve as a biofortified feed supplement.

Comparative analysis of lipid composition and thermal, polymorphic, and crystallization behaviors of granular crystals formed in beef tallow and palm oil


Six rectangular block all beef tallow (BT)-based and all palm oil (PO)-based model shortenings prepared on a laboratory scale, denoted BTMS and POMS, respectively, were stored under temperature fluctuation cycles of 5–20°C until granular crystals

Extracts & Distillates

Physicochemical properties of β and α′α′ subunits isolated from soybean β-conglycinin


Soy protein has shown great potential for use in biobased soy adhesives; β-Conglycinin is a major component of soy protein; it accounts for 30% of the total storage protein in soybean seeds. β-Conglycinin was isolated and purified, and its subunits’ (β, α′α′) physicochemical and adhesive properties were characterized. Crude β-conglycinin was isolated from soy flour and then purified by the ammonium sulfate precipitation method. The α′α′ and β subunits were isolated from the purified β-conglycinin by anion exchange chromatography. Yields of α′α′ subunits and β subunits from 140 g of soy flour were 1.86 g (1.3%) and 0.95 g (0.67%), respectively. The minimum solubility for α′α′ subunits, β subunits, and β-conglycinin occurred in pH ranges of 4.1–5.4, 3.5–7.0, and 4.8–5.3, respectively. Transmission electron microscopy showed that the β subunits existed as spherical hydrophobic clusters, whereas α′α′ subunits existed as uniformly discrete particles at pH 5.0. Differential scanning calorimetry showed that β subunits had higher thermal stability than α′α′ subunits. The pH had a lesser effect on adhesion strength of the β subunits than on that of the α′α′ subunits. The adhesives made from β subunits also showed greater water resistance than those from α′α′ subunits and β-conglycinin. Soy protein rich in β subunits is likely a good candidate for developing water-resistant adhesives.

Lipase-catalyzed esterification of ferulic acid with oleyl alcohol in ionic liquid/isoctane binary systems


Lipase-catalyzed synthesis of ferulic acid oleyl alcohol ester in an ionic liquid (IL)/iso-ctane system was investigated. Considerable biocconversion and volumetric productivity were achieved in inexpensive 1-hexyl-3-methylimidazolium hexafluorophosphate ([Hmim][PF6])- and 1-methyl-3-octylimidazolium hexafluorophosphate ([Omim][PF6])-mediated systems, and thus, the two types of ILs were selected for further optimization of variables. The results showed that, before reaching a maximum, the increase of ferulic acid concentration, temperature, or enzyme dosage led to an increase in volumetric productivity. Variations of the ratios of IL/ isoctane and concentrations of oleyl alcohol also profoundly affected the volumetric productivity. To a higher extent, [Hmim][PF6]/isoctane and [Omim][PF6]/isoctane showed similar reaction behaviors. Under the optimized reaction conditions (60°C, 150 mg of Novozym 435, and 100 mg of molecular sieves), up to 48.50 mg/mL productivity of oleyl ferulate could be achieved for the [Hmim][PF6]/isoctane (0.5 mL/1.5 mL) system with a substrate concentration of ferulic acid of 0.08 mmol/mL and oleyl alcohol of 0.32 mmol; while an optimum volumetric productivity of 26.92 mg/mL was obtained for the [Omim][PF6]/isoctane (0.5 mL/1.5 mL) system under a similar reaction condition other than the substrate concentrations of ferulic acid at 0.05 mmol/mL and oleyl alcohol at 0.20 mmol.

Lipase-catalyzed synthesis of ferulic acid oleyl alcohol ester in an ionic liquid (IL)/isoctane binary systems


The application of a new process based on the hydrothermal treatment of olive oil waste (alperujo) led to a final solid rich in oleic acid and enriched in minor components with functional activities. The effects of the time (15–90 min) and the temperature (150, 160, and 170°C) of the thermal processing of alperujo on the yield, quality, and enrichment of minor components of crude POO were evaluated. The final treated solid had an increase in oil yield up to 97%, with a reduction in solids up to 35.6–47.6% by solubilization. Sterols increased up to 33%, aliphatic alcohols increased up to 92%, triterpenic alcohols increased up to 31%, squalene increased up to 43%, tocopher-ols increased up to 57%, and oleic anic acid increased up to 16% by the new treatment. The increase maintains a high concentration of functional substances probably even in the refining POO.

Comparative analysis of lipid composition and thermal, polymorphic, and crystallization behaviors of granular crystals formed in beef tallow and palm oil


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were observed. The lipid composition and thermal, polymorphic, and isothermal crystallization behaviors of the granular crystals and their surrounding materials separated from BTMS and POMS, respectively, were evaluated. The changes of nanostructure including the aggregation of high-melting triacylglycerols and polymorphic transformation from \( \beta' \) form of double-chain-length structures to complicated crystal structures, in which the \( \beta \) and \( \beta' \) form crystals of triple- and double-chain-length structures simultaneously coexisted, had occurred in granular crystals compared with surrounding materials, whether in BTMS or in POMS. Consequently, a slower crystallization rate appeared in granular crystal parts of both model shortenings noted above, which would yield larger and fewer crystals indicated by the Avrami model analysis that would further aggregate to form large granular crystals.

**Insecticidal activity of rhamnolipid isolated from* Pseudomonas* sp. EP-3 against green peach aphid (*Myzus persicae*)**


Microorganisms capable of growth on oils are potential sources of biopesticides, as they produce complex molecules such as biosurfactants and lipopeptides. These molecules have antimicrobial activity against plant pathogens, but few data are available on their insecticidal activity. The present study describes the insecticidal activity of a rhamnolipid isolated from diesel oil-degrading *Pseudomonas* sp. EP-3 (EP-3). The treatment of cell-free supernatants of EP-3 grown on glucose–mineral medium for 96 h led to >80% mortality of aphids (*Myzus persicae*) within 24 h. Bioassay-guided chromatography coupled with matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS) and \( \text{\(^{13}\)}\text{C}\) nuclear magnetic resonance (NMR) analyses was employed to isolate and identify the EP-3 insecticidal metabolites. Dirhamnolipid, with molecular formulas of \( \text{C}_{32}\text{H}_{58}\text{O}_{13} \) and \( \text{C}_{34}\text{H}_{62}\text{O}_{13}\), was identified as a main metabolite exhibiting insecticidal activity against aphids. Dirhamnolipid showed a dose-dependent mortality against aphids, producing about 50% mortality at 40 μg/mL and 100% mortality at 100 μg/mL. Microscopy analyses of aphids treated with dirhamnolipid revealed that dirhamnolipid caused insect death by affecting cuticle membranes. This is the first report of rhamnolipid as an insecticidal metabolite against *M. persicae*. Rhamnolipid shows potential for use as a pesticide to control agricultural pests.

**Production of conjugated linoleic acid (CLA) by* Bifidobacterium breve* LMC520 and its compatibility with CLA-producing rumen bacteria**


This study was performed to characterize the ability of an active *Bifidobacterium* strain to produce conjugated linoleic acid (CLA) and to test its possible utilization as a probiotic compatible to the ruminal condition. *Bifidobacterium breve* LMC520 can actively convert linoleic acid (LA) to cis-9,trans-11-CLA, which is a major isomer derived from microbial conversion. LMC520 showed reasonable tolerance under acidic conditions (pH 2.5 with 1% pepsin) and in the presence of oxgall (0–3%). The growth and CLA production of LMC520 were tested under ruminal conditions and compared with those of *Butyrivibrio fibrisolvens* A38, which is a major CLA producer in the rumen as an intermediate in the biohydrogenation (BH) process. LMC520 converted 15% of LA to CLA under ruminal conditions, which was 2 times higher activity than that of A38, and there was no decline in CLA level during prolonged incubation of 48 h. The BH activity of LMC520 was comparable to that of A38. When LMC520 was co-cultured with A38, even with slight decrease of CLA due to high BH activity by A38, but the level of CLA was maintained by the high CLA-producing activity of LMC520. This comparative study shows the potential of this strain to be applied as a functional probiotic not only for humans but also for ruminants as well to increase CLA production.

**Nutritional and biological properties of extra virgin olive oil**


The nutritional benefits generally recognized for the consumption of extra virgin olive oil (EVOO) are based on a large number of dietary trials of several international populations and intervention studies. Unfortunately, many authors in this field used questionable analytical methods and
Influence of vegetable oils on micellization of lutein in a simulated digestion model, Nidhi, B., and V. Baskaran

Distribution of triacylglycerols and fatty acids in soybean oil with thermal oxidation and methylene blue photosensitization, Park, Y.W., M.K. Jeong, C. Park, and J. Lee

In vitro antioxidant properties of hemp seed (Cannabis sativa L.) protein hydrolysate fractions, Girgih, A.T., C.C. Udenigwe, and R.E. Aluko

Evaluating esters derived from mustard oil (Sinapis alba) as potential diesel additives, Issaryakul, T., A.K. Dalai, and P. Desai

Selectively functionalized glycerol/diacid dendrimers via click chemistry of azido fatty acids, Zerkowski, Hoshino, and M. Matsuda

Cetane number prediction of biodiesel from the composition of the fatty acid methyl esters, Tong, D., C. Hu, K. Jiang, and Y. Li

Physical and chemical processes to enhance oil recovery from condensed corn distillers solubles, Majoni, S., T. Wang, and L.A. Johnson

Changes in lipid composition during dry grind ethanol processing of corn, Moreau, R.A., K. Liu, J.K. Winkler-Moser, and V. Singh

Application of enzymatic hydrolysis on sunflower lecithin using a pancreatic PLA₂, Cabezas, D.M., R. Madero, B.W.K. Diehl, and M.C. Tomás


Lipids (March)

Lipids editorial: Are you a good citizen of science?, Murphy, E.J.

 Dietary monounsaturated fatty acids are protective against metabolic syndrome and cardiovascular disease risk factors, Gillingham, L.G., S. Harris-Janz, and P.J.H. Jones

Aerobic training in rats increases skeletal muscle sphingomyelinase and serine palmitoyltransferase activity, while decreasing ceramidase activity, Blachnio-Zabielska, A., P. Zabielski, M. Baranowski, and J. Gorski


N-Acylated bacteriohopanehexolmannosamides from the thermophilic bacterium Alicyclobacillus acidoterrestris, Rezanka, T., L. Sîrîs-tova, K. Melzoch, and K. Sigler

The absolute configurations of hydroxy fatty acids from the royal jelly of honeybees (Apis mellifera), Kodai, T., T. Nakatani, and N. Noda


In vitro intestinal bioaccessibility of alkylglycerols versus triacylglycerols as vehicles of butyric acid, Martin, D., M.I. Morán-Valero, F.J. Señorán, G. Reglero, and C.F. Torres


Improved methods for the fatty acid analysis of blood lipid classes, Ichihara, K., K. Yoneda, A. Takahashi, N. Hoshino, and M. Matsuda

Commercial kits that were not validated scientifically to evaluate the complex bioactive constituents of EVOO and lipid oxidation and decomposition products. Many questionable antiradical methods were commonly used to evaluate natural polyphenolic antioxidants, including an indirect method to determine low density lipoprotein (LDL) cholesterol. Extensive differences were observed in experimental design, diet control, populations of different ages and problems of compliance intervention, and questionable biomarkers of oxidative stress. Analyses in many nutritional studies were limited by the use of one-dimensional methods to evaluate multifunctional complex bioactive compounds and plasma lipid profiles by the common applications of commercial kits. Although EVOO contains polyphenolic compounds that exhibit significant in vitro antioxidant activity, much more research is needed to understand the absorption and in vivo activity. Many claims of in vivo human beneficial effects by the consumption of EVOO may be overstated. No distinctions were apparently made between in vivo studies based on general health effects in large populations of human subjects and smaller scale well-controlled feeding trials using either pure or mixtures of known phenolic constituents of EVOO. More reliable protocols and testing methods are needed to better validate the complex nutritional properties of EVOO.

Sequence conservation of apolipoprotein A-I affords novel insights into HDL structure–function


We performed alignment of apolipoprotein A-I (apoA-I) sequences from 31 species of animals. We found there is specific conservation of salt bridge-forming residues in the first 30 residues of apoA-I and general conservation of a variety of residue types in the central domain, helix 2/3 to helix 7/8. In the lipid-associating domain, helix 7 and helix 10 are the most and least conserved helices, respectively. Furthermore, eight residues are completely conserved: P66, R83, P121, E191, and P220, and three of seven Tyr residues in human apoA-I, Y18, Y115, and Y192, are conserved. Residue Y18 appears to be important for assembly of high density lipoprotein (HDL). E191-Y192 represents the only completely conserved pair of adjacent
residues in apoA-I; Y192 is a preferred target for site-specific oxidative modification within atheroma, and molecular dynamic simulations suggest that the conserved pair E191-Y192 is in a solvent-exposed loop-helix-loop. Molecular dynamics testing of human apoA-I showed that M112 and M148 interact with Y115, a microenvironment unique to human apoA-I. Finally, conservation of Arg residues in the α11/3 helical wheel position 7 supports several possibilities: interactions with adjacent phospholipid molecules and/or oxidized lipids and/or binding of antioxidant enzymes through cation–π orbital interactions. We conclude that sequence alignment of apoA-I provides unique insights into apoA-I structure–function relationship.

Quantitative analysis of steroidal glycosides in different organs of Easter lily (Lilium longiflorum Thunb.) by LC-MS/MS


The bulbs of the Easter lily (Lilium longiflorum Thunb.) are regularly consumed in Asia as both food and medicine, and the beautiful white flowers are appreciated worldwide as an attractive ornamental. The Easter lily is a rich source of steroidal glycosides, a group of compounds that may be responsible for some of the traditional medicinal uses of lilies. Since the appearance of recent reports on the role of steroidal glycosides in animal and human health, there is increasing interest in the concentration of these natural products in plant-derived foods. A liquid chromatography-tandem mass spectrometry (LC-MS/MS) method performed in multiple reaction monitoring mode was used for the quantitative analysis of two steroidal glycoalkaloids and three furostanol saponins in the different organs of L. longiflorum. The highest concentrations of the total five steroidal glycosides were 12.02 ± 0.36, 10.09 ± 0.23, and 9.36 ± 0.27 mg/g dry weight in flower buds, lower stems, and leaves, respectively. The highest concentrations of the two steroidal glycoalkaloids were 8.49 ± 0.3, 6.91 ± 0.22, and 5.83 ± 0.15 mg/g dry weight in flower buds, leaves, and bulbs, respectively. In contrast, the highest concentrations of the three furostanol saponins were 4.87 ± 0.13, 4.37 ± 0.07, and 3.53 ± 0.06 mg/g dry weight in lower stems, fleshy roots, and flower buds, respectively. The steroidal glycoalkaloids were detected in higher concentrations as compared to the furostanol saponins in all of the plant organs except the roots. The ratio of the steroidal glycoalkaloids to furostanol saponins was higher in the plant organs exposed to light and decreased in proportion from the aboveground organs to the underground organs. Additionally, histological staining of bulb scales revealed differential furostanol accumulation in the basal plate, bulb scale epidermal cells, and vascular bundles, with little or no staining in the mesophyll of the bulb scale. An understanding of the distribution of steroidal glycosides in the different organs of L. longiflorum is the first step in developing insight into the role these compounds play in plant biology and chemical ecology and aids in the development of extraction and purification methodologies for food, health, and industrial applications. In the present study, (22R,25R)-spiroisoprostan-5-en-3β-yl O-α-L-rhamnopyranosyl-(1→2)-β-D-glucopyranosyl-(1→4)-β-D-glucopyranoside, (22R,25R)-spiroisoprostan-5-en-3β-yl O-α-L-rhamnopyranosyl-(1→2)-6-O-acetyl-β-D-glucopyranosyl-(1→4)]-β-D-glucopyranoside, (25R)-26-O-[(β-D-glucopyranosyl) furost-5-ene-3β,22α,26-triol 3-O-α-L-rhamnopyranosyl-(1→2)-β-D-glucopyranoside, (25R)-26-O-[(β-D-glucopyranosyl)furost-5-ene-3β,22α,26-triol 3-O-α-L-rhamnopyranosyl-(1→2)-β-D-glucopyranoside, and (25R)-26-O-[(β-D-glucopyranosyl)furost-5-ene-3β,22α,26-triol 3-O-α-L-rhamnopyranosyl-(1→2)-β-D-glucopyranoside] were quantified in the different organs of L. longiflorum for the first time.

Vacuum frying as a route to produce novel snacks with desired quality attributes according to new health trends


Consumers look for products that contribute to their wellness and health, however, even health-conscious consumers are not willing to sacrifice organoleptic properties, and intense full-flavor snacks remain an important trend. The objective of this study was to examine most important quality parameters of vacuum (1.92 in Hg, or 0.065 bar) and atmospheric-fried carrot, potato, and apple slices to determine specific advantages of vacuum technology. Slices were fried using equivalent thermal driving forces, maintaining a constant difference between oil temperature and the boiling point of water at the working pressure (ΔT = 60 and 80°C). This resulted in frying temperatures of 160 and 180°C, and 98 and 118°C, for atmospheric and vacuum frying, respectively. Vacuum-fried carrot and potato chips absorbed about 50% less oil than atmospheric-fried chips, whereas vacuum-fried apple chips reduced oil absorption by 25%. Total carotenoids and ascorbic acid (AA) were greatly preserved during vacuum frying. Carrot chips vacuum fried at 98°C retained about 90% of total carotenoids, whereas potato and apple slices vacuum fried at 98°C preserved around 95% of their initial AA content. Interestingly, results showed that the antioxidant capacity of chips may be related to both the presence of natural antioxidants and brown pigments developed at elevated temperatures.

Synthesis of fatty acid methyl ester from used vegetable cooking oil by solid reusable Mg$_1$Zn$_{10}$O$_x$ catalyst


Fatty acid methyl ester was produced from used vegetable cooking oil using Mg$_{1-x}$Zn$_{10-x}$O$_x$ solid catalyst and the performance monitored in terms of ester content obtained. Used vegetable cooking oil was employed to reduce operation cost of biodiesel. The significant operating parameters that affect the overall yield of the process were studied. The highest ester content, 80%, was achieved with the catalyst during 4 h 15 min reaction at 188°C with methanol to oil ratio of 9:1 and catalyst loading of 2.55 wt%. Also, transesterification of virgin oil gave higher yield with the heterogeneous catalyst and showed high selectivity toward ester production. The used vegetable cooking oil did not require any rigorous pretreatment. Catalyst stability was examined and there was no leaching of the active components, and its performance was as good at the fourth as at the first cycle.

Krill oil significantly decreases 2-arachidonoylglycerol plasma levels in obese subjects


We have previously shown that krill oil (KO), more efficiently than fish oil, was able to downregulate the endocannabinoid system in different tissues of obese Zucker rats. We
therefore aimed at investigating whether an intake of 2 grams/day (g/d) of either KO or menhaden oil (MO), which provides 309 mg/d of eicosapentaenoic acid/docosahexaenoic acid (EPA/DHA) 2:1 and 390 mg/d of EPA/DHA 1:1, respectively, or olive oil (OO) for four weeks, is able to modify plasma endocannabinoids in overweight and obese subjects. The results confirmed data in the literature describing increased levels of endocannabinoids in overweight and obese with respect to normo-weight subjects. KO, but not MO or OO, was able to significantly decrease 2-arachidonoylglycerol (2-AG), although only in obese subjects. In addition, the decrease of 2-AG was correlated to the plasma n-6/n-3 phospholipid long-chain polyunsaturated fatty acid (LCPUFA) ratio. These data show for the first time in humans that relatively low doses of LCPUFA n-3 as KO can significantly decrease plasma 2-AG levels in obese subjects in relation to decrease of plasma phospholid n-6/n-3 LCPUFA ratio. This effect is not linked to changes of metabolic syndrome parameters but is most likely due to a decrease of 2-AG biosynthesis caused by the replacement of 2-AG ultimate precursor, arachidonic acid, with n-3 PUFAs, as previously described in obese Zucker rats.

**Ethanol production from biodiesel-derived crude glycerol by newly isolated Kluyvera cryocrescens**


The rapidly expanding market for biodiesel has increased the supply and reduced the cost of glycerol, making it an attractive sustainable feedstock for the fuel and chemical industry. Glycerol-based biorefinery is the microbial fermentation of crude glycerol to produce fuels and chemicals. A major challenge is to obtain microbes tolerant to inhibitors such as salts and organic solvents present in crude glycerol. Microbial screening was attempted to isolate novel strain capable of growing on crude glycerol as a sole carbon source. The newly isolated bacteria, identified as nonpathogenic Kluyvera cryocrescens S26, could convert biodiesel-derived crude glycerol to ethanol with high yield and productivity. The supplementation of nutrients such as yeast extract resulted in distinguished enhancement in cell growth as well as ethanol productivity under anaerobic condition. When glycerol fermentation is performed under microaerobic condition, there is also a remarkable improvement in cell growth, ethanol productivity, and yield, compared with those under strict anaerobic condition. In batch fermentation under microaerobic condition, *K. cryocrescens* S26 produced 27 g/L of ethanol from crude glycerol with high molar yield of 80% and productivity of 0.61 g/L/h.

**Identification and characterization of the propanediol utilization protein PduP of Lactobacillus reuteri for 3-hydroxypropionic acid production from glycerol**


Although the de novo biosynthetic mechanism of 3-hydroxypropionic acid (3-HP) in glycerol-fermenting microorganisms is still unclear, the propanediol utilization protein (PduP) of *Lactobacillus* species has been suggested to be a key enzyme in this regard. To verify this hypothesis, a *pduP* gene from *Lactobacillus reuteri* was cloned and expressed, and the encoded protein was characterized. Recombinant *L. reuteri* PduP exhibited broad substrate specificity including 3-hydroxypropionaldehyde and utilized both NAD⁺ and NADP⁺ as a cofactor. Among various aldehyde substrates tested, the specific activity was highest for propionaldehyde, at pH 7.8 and 37°C. The *Kₘ* and *Vₘₐₙ* values for propionaldehyde in the presence of NAD⁺ were 1.18 mM and 0.35 U mg⁻¹, respectively. When *L. reuteri pduP* was overexpressed in *Klebsiella pneumoniae*, 3-HP production remarkably increased as compared to the wild-type strain (from 0.18 g L⁻¹ to 0.72 g L⁻¹) under shake-flask culture conditions, and the highest titer (1.38 g L⁻¹ 3-HP) was produced by the recombinant strain under batch fermentation conditions in a bioreactor. This is the first report stating the enzymatic properties of *PduP* protein and the probable role in biosynthesis of 3-HP in glycerol fermentation.

**Biopolymer scaffolds for use in delivering antimicrobial sophorolipids to the acne-causing bacterium Propionibacterium acnes**


Sphorolipids (SLs) are known to possess antimicrobial properties toward many species (particularly Gram-positive, or Gram+) of bacteria. However, these properties can only be exerted if the SLs can be introduced to the bacterial cells in an acceptable manner. *Propionibacterium acnes* is the common bacterial cause of acne. It is a Gram facultative anaerobe that is susceptible to the antimicrobial effects of SLs. In this study we demonstrated that different biopolymer matrices could be used to produce SL composite films that exert various antimicrobial efficiencies against *P. acnes*. Increasing SL concentrations in poly-3-hydroxybutyrate (PHB) and PHB-co-10% 3-hydroxyhexanoate (PHB/HHx) resulted in noticeably improved (PHB/HHx was best) antimicrobial activity based on the size of the zones of inhibition using an overlay plating technique on synthetic growth medium. However, increasing concentrations of SLs in PHB and PHB/HHx films also increased film opacity, which diminishes the appeal for use especially in visible (facial) areas. Pectin and alginate improved the transparent character of SL composite films while also acting as successful carriers of SLs to *P. acnes*. The lactone form of the SLs proved to exhibit the best antimicrobial action and in concert with either pectin or alginate biopolymers provided a comparatively transparent, successful means of utilizing SLs as a renewable, environmentally benign anti-acne solution.

**Production of biodiesel from wet activated sludge**


The production of biodiesel from activated sludge obtained from Tuscaloosa, Alabama, USA, was optimized based on the yield of fatty acid methyl esters (FAMES) using an in situ transesterification process. An orthogonal central composite response surface design was considered to investigate the main and interaction effects of temperature, methanol to sludge ratio, and catalyst concentration. The biodiesel yield can be satisfactorily described by the quadratic response surface model with *R²* of 0.836 and a statistically not significant lack of fit (p = 0.254). Coded regression coefficients, main effect plots, and surface plots indicated that maximum biodiesel yield may be obtained at 75°C, 30 mL g⁻¹ (methanol/Sludge), and 10% volume (catalyst concentration). Numerical optimization showed that at this reaction condition, a biodiesel yield of 3.78% (weight) can be obtained. Experimental verification gave
a biodiesel yield of 3.93 ± 0.15% (weight) giving a model error of 7.35%. This indicates high reliability of the model. The economic analysis showed that the in situ transesterification of wet activated sludge (84.5% weight moisture) is less economical than the in situ transesterification of dried sludge (5% weight moisture). However, sensitivity analysis indicated that the process can be made more economical by reduction of water to 50% (weight). At this level of moisture, a biodiesel break-even price of around $7.00 per gallon is attainable, which is still more expensive than petroleum-based diesel (~$2.95 per gallon). For the biodiesel from activated sludge to be economically competitive, a biodiesel yield of at least 10% (weight) is necessary.

Simple and efficient method for the analysis of transesterification reaction mixtures for biodiesel production by reversed-phase high performance liquid chromatography


Isocratic reversed-phase high performance liquid chromatography (HPLC) methods have been developed for the analysis of biodiesel methyl esters and intermediate species associated with transesterification reactions. While most HPLC methods for biodiesel analysis employ gradient elution and ultraviolet (UV) detection, these methods employ isocratic elution with refractive index detection (RID). For the separation of methyl esters, monoglycerides, and free fatty acids, a mobile phase of 85% acetonitrile + 15% deionized water is used. Diglycerides can be separated using 100% methanol, and triglycerides can be quickly analyzed using a mixture of 60% 2-propanol + 40% methanol. While previous HPLC methods for methyl ester analysis have been shown to successfully separate components found in biodiesel mixtures, the use of UV detection is inadequate for the detection of species with saturated carbon chains. Many of the common feedstocks used for biodiesel synthesis contain a significant percentage of species with saturated carbon chains, for example, soybean, sunflower, palm, and palm kernel oils. The use of RID, however, allows for both saturated and unsaturated methyl esters to be detected. Additionally, the use of HPLC for the analysis of biodiesel methyl esters and the intermediate species associated with transesterification reactions, as opposed to the more commonly employed gas chromatography (GC) method, has the advantage that samples can be directly analyzed without any sort of sample derivatization, as is required when GC is used.

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The A.I.S.E. Charter for Sustainable Cleaning

How Europe is reducing the footprint of the detergents and maintenance products Industry

Valérie Séjourné, Sandra Dworak, and Sascha Nissen

A.I.S.E., the International Association for Soaps, Detergents and Maintenance Products, is the official representative body of this industry in Europe. Its membership totals 37 national associations in 42 countries, covering about 900 companies ranging from small- and medium-sized enterprises to large multinationals active both in the consumer goods market and the industrial & institutional (I&I) domains. During the last 13 years, A.I.S.E. has conducted proactive work on sustainable production and consumption for the whole of the industry sector. A.I.S.E.’s mission is detailed in its Agenda for Sustainable Cleaning (www.aise.eu/agenda) and follows the Industry Vision, which is based on the three pillars of sustainable development—economically successful, environmentally sound, and socially responsible—as identified at the UN World Summit in 2005.

Driving sustainability through voluntary action

The A.I.S.E. Charter for Sustainable Cleaning translates the concept of sustainable development outlined in the Agenda into reality and actions. It was launched in 2005 in all European Union (EU) countries plus Iceland, Norway, and Switzerland, covering all product categories of the industry, in both the household and the I&I sectors. It is open to all companies, whether they are members of A.I.S.E. or not, and whether they manufacture, distribute, or market soaps, detergents, maintenance products, or cleaning systems.

The aim is to encourage the whole of industry to undertake continual improvement in terms of sustainability and also to encourage consumers to adopt more sustainable ways of doing their washing, cleaning, and household maintenance. From the outset, the Charter has been regarded as a living scheme, evolving over time through regular upgrades. This ensures that it continues to offer the most advanced sustainability assurance scheme for promoting best practice within the industry, using life cycle analysis (LCA) and science as a basis.

The Charter is an LCA-based framework. It promotes and facilitates a common industry approach on sustainability practice and reporting. It covers a wide variety of activities and initiatives, ranging from the human and environmental safety of chemicals and products

FIG. 1. The A.I.S.E. Charter covers the whole life cycle of products.

FIG. 2. Best use tips on packs.
to eco-efficiency, occupational health and safety, resource use, and consumer information.

Success to date

As of early 2011, more than 130 companies have joined the A.I.S.E. Charter, representing more than 80% of the total production output for Europe.

The process of implementing the charter sustainability procedures (CSPs) and measuring and reporting the key performance indicators (KPIs) helps to drive continual improvement in sustainable production and consumption. Improvements occur at all stages of the product life cycle, from product specification, through manufacturing, to end use and disposal. For example, safety improvements can come from selection of properly risk-assessed raw materials, adoption of best practice in manufacturing systems, and increased use of on-pack guidance for consumers. Environmental improvements can include reducing use of resources, creating less waste, and emitting less carbon dioxide.

In the Charter’s first four full years of operation (2006–2009), verified returns from companies via the annual KPI reporting demonstrate how Charter members’ efforts continue to yield positive results across all Europe:

- Energy consumed per ton of production: –5.5%
- CO₂ emitted per ton of production: –8.9%
- Packaging per ton of production: –1.5%
- Waste per ton of production: –3.9%

How does it work?

The Charter consists of three main components, all of which are subject to independent verification.

CSPs. Based on ISO 14001 and other comparable standards, a number of CSPs have been defined for companies to implement in their management systems in order to become members of the Charter (see Table 1). These CSPs must apply to a minimum of 75% of the company’s production, independently verified on the occasion of the Charter Entrance Check. The scheme also establishes synergies between the CSPs and certain other manufacturing standards such as ISO 9001, ISO 14001/EMAS, and BS OHSAS 18001.

KPIs. The Charter also defines a set KPIs (Table 2), which are specifically linked to the CSPs. Companies that sign up to the Charter are required to report annually to A.I.S.E. on the KPIs. A.I.S.E. collects and aggregates the results and publishes them in the annual A.I.S.E. Activity & Sustainability Report, providing measurable evidence of the progress for the whole industry sector at European level. The KPI reporting is also externally verified through a process of random audits managed by an independent body for A.I.S.E.

Product dimension–Advanced Sustainability Profiles (ASPs). ASP status represents a high standard of sustainability in the product characteristics which companies can adopt. Defined per product category, the ASP criteria/thresholds are based on the main life cycle impacts. Products that meet the requirements of these ASPs may use a differentiated Charter logo on pack, which signifies not only that the manufacturer is committed to certain sustainability processes at the manufacturing level but also that the product itself meets certain advanced sustainability criteria.

Independent verification

Independent verification guarantees that all applicant companies are individually assessed on the same basis by a neutral, external body. Before a manufacturing company can join the Charter, it is visited by an accredited independent verifier who must certify that the company

---

**TABLE 1. Charter sustainability procedures for companies**

| Raw material selection and safety evaluation |
| Raw material and packaging supplier selection |
| Packaging design and selection |
| Resource use policy |
| Occupational health and safety management system |
| Environmental management system |
| Distribution risk assessment |
| Product recall |
| Consumer and user information |
| Finished product safety evaluation |
| Product performance and product review |
| Internal target setting |
has the required CSPs in place, under control, and adequately applied. This verification process is part of the Charter Entrance Check and is designed to follow a well-defined path, directing attention in turn to each of the required sustainability elements. Verifications on all CSPs continue every three years subsequently.

In addition to the CSP checks, the annual reporting on KPIs is also verified each year through a system of random audits of reporting companies, again by an independent external verifier.

Promoting sustainable use of the industry’s products

In addition to industry’s efforts, consumers and professional users have a critical role to play in ensuring that they get the best results from their products, while minimizing the impact on the environment (e.g., by reading the label and following the instructions for dosing correctly, washing with full loads, at low temperatures, recycling, etc).

The Charter builds on a number of campaigns that aim to promote the safe use and sustainable consumption of products. It also encourages companies committed to the scheme to promote such tips on packs by featuring the www.cleanright.eu industry portal.

For all details and complete documentation, please visit www.sustainable-cleaning.com.

Valérie Séjourné is Director of Communications at A.I.S.E. Email her at valerie.sejourne@aise.eu. Sandra Dworak is responsible for external communications at A.I.S.E. Email her at Sandra.dworak@aise.eu.
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Estimating the effect of fermentation yeast on distillers grains protein

Jianchun Han and Keshun Liu

Increasing demand for ethanol as a gasoline additive and a desire to decrease dependency on fossil fuels have resulted in a dramatic increase in fuel ethanol production (Fig. 1). According to the 2010 Ethanol Industry Outlook (RFA 2010), ethanol biorefineries in the United States converted 3.8 billion bushels of corn in 2009 into an estimated 10.6 billion gallons of ethanol and 30.5 million metric tons of high-value livestock feed (distillers grains, corn gluten meal, and corn gluten feed). In the 2008/2009 US Department of Agriculture marketing year, ethanol represented about 30% of gross corn use.

A common method for making ethanol from corn is dry-grind processing (Fig. 2, also see inform 18:658–660, 2007). The basic steps of the process include grinding (dry milling), slurrying, cooking, liquefaction, saccharification, fermentation, distillation, and co-product recovery. During co-product recovery, whole stillage (nonvolatile components remaining following distillation) is usually centrifuged to produce a liquid fraction (thin stillage) and a solid fraction called distillers wet grains (DWG). Thin stillage is concentrated through evaporation into condensed distillers solubles (CDS). CDS and DWG are then typically combined into distillers wet grains with solubles (DWGS) and dried to produce a marketable co-product commonly known as distillers dried grains with solubles (DDGS). Production of DDGS has increased significantly in recent years, as the number of dry grind ethanol production facilities has increased.

**FIG. 1.** Production of US fuel ethanol and distillers grains. Adapted from Renewable Fuels Association (RFA), 2010 Ethanol Industry Outlook, Washington DC. DDGS, distillers dried grains with solubles.

**FIG. 2.** Dry grind process and downstream products of key steps. DWGS, distillers wet grains with solubles. For other abbreviation see Figure 1.
The major use of DDGS is for animal feed. Factors affecting quality and market values include protein quantity (concentration) and quality (amino acid composition) (Liu 2011). During fuel ethanol production, yeast contributes insignificantly toward the cost of raw materials. Yet a well-selected yeast strain is an important ingredient for efficient fermentation. It can also potentially affect the quality of DDGS. As early as 1944, Bauernfeind and coworkers defined corn distillers dried solubles as a grain-yeast concentrate comprising water-soluble nutrients derived from the original grains and from the grain-yeast fermentation. Thus, DDGS proteins come from both corn and yeast. Yet, until recently, the effect of fermentation yeast on DDGS protein quantity and quality has not been well documented.

Four estimating methods
Following is an explanation and comparison of four methods in the literature for estimating yeast’s contribution toward distillers grains products. Since the amino acid (AA) composition of yeast is nutritionally better than that of corn, investigating yeast’s effect and accurately estimating its contribution toward DDGS will have a positive impact on feed and ethanol industries and at the same time increase our basic understanding of the processing system.

Hemacytometer counts. In 1944 Bauernfeind and colleagues suggested that yeast cell (all dead) content can be estimated by hemacytometer counts of thin stillage, condensed solubles, or dried solubles. They reported that dried solubles contained about $4 \times 10^9$ cells per gram. When this figure was compared to that of dried yeast, the approximation was reached that 20% by weight of dried solubles is dried yeast. Note that for DDGS, yeast contribution was not given.

Assumption and calculation. In 1999 Ingledew estimated the amount that yeast contribute toward DDGS by making assumptions and calculating the protein and mass in a known amount of fermentation mash. He stated that in the late 1990s the annual fuel ethanol production in North America was estimated at $7 \times 10^9$ L. If the fermentation mash contains 12% alcohol, the total mash would be $6 \times 10^{10}$ L. If then the yeast count in a fermentor at the peak of fermentation is $1.9 \times 10^{11}$ cells/L of mash, the total yeast cells in total annual mash production would be 6

### TABLE 1. Changes in amino acid composition\(^a\) (relative % to total amino acids in each sample) during the dry grind ethanol\(^b\) processing from corn at Plant 1

<table>
<thead>
<tr>
<th>Amino acid</th>
<th>Milled corn</th>
<th>Cooked slurry</th>
<th>Liquef mash</th>
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\(^a\) Ala, alanine; Arg, arginine; Asp, aspartic acid; Cys, cysteine; Glu, glutamic acid; Gly, glycine; His, histidine; Ile, isoleucine; Leu, leucine; Lys, lysine; Met, methionine; Phe, phenylalanine; Pro, proline; Ser, serine; Thr, threonine; Tyr, tyrosine; Val, valine.

\(^b\) Liquef mash, liquefied mash; Sacch mash, saccharified mash; Fmted mash, fermented mash; CDS, condensed distillers solubles; DWG, distillers wet grains; DWGS, distillers wet grains with solubles; DDGS, distillers dried grains with solubles.

TABLE 2. Multiple linear regression for amino acid composition (relative %) of products from 3 ethanol plants

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Cooked slurry</th>
<th>Liquefied mass</th>
<th>Fermented mass</th>
<th>Whole stillage</th>
<th>Thin stillage</th>
<th>Distillers solubles</th>
<th>Distillers wet grains</th>
<th>DDGS</th>
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<tr>
<td>$A$</td>
<td>0.918</td>
<td>0.926</td>
<td>0.835</td>
<td>0.802</td>
<td>0.513</td>
<td>0.488</td>
<td>0.950</td>
<td>0.889</td>
</tr>
<tr>
<td>$B$</td>
<td>0.046</td>
<td>0.060</td>
<td>0.196</td>
<td>0.238</td>
<td>0.390</td>
<td>0.407</td>
<td>0.165</td>
<td>0.195</td>
</tr>
<tr>
<td>$C$</td>
<td>0.208</td>
<td>0.080</td>
<td>$-0.180$</td>
<td>0.240</td>
<td>0.571</td>
<td>0.622</td>
<td>$-0.680$</td>
<td>$-0.511$</td>
</tr>
<tr>
<td>$r^2$</td>
<td>0.977</td>
<td>0.978</td>
<td>0.954</td>
<td>0.963</td>
<td>0.936</td>
<td>0.940</td>
<td>0.949</td>
<td>0.951</td>
</tr>
</tbody>
</table>

* $A$, a fixed-value parameter indicating the extent of contribution by corn amino acids (AA); $B$, a fixed-value parameter showing the extent of influence by yeast AA; $C$, a fixed-value parameter showing the intercept on the Y-axis. For other abbreviations see Table 1.


TABLE 3. Comparison of methods for estimating yeast contributions

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemacytometer counting</td>
<td>May not apply directly to DDGS unless solubles from DDGS are separated or a mass percentage of solubles is first estimated or assumed. Must estimate the number of cells per 1 gram dry yeast.</td>
</tr>
<tr>
<td>Assumption and calculation</td>
<td>Based on multiple assumptions and prone to errors.</td>
</tr>
<tr>
<td>Averaging ratios of AA concentration of DDGS vs. that of yeast</td>
<td>Disregards corn protein contribution. Excludes non-essential amino acids. The average ratio in amino concentrations of DDGS vs. those of yeast actually reflects the ratio of protein concentration of DDGS vs. yeast, which results in a higher estimation of yeast’s contribution to DDGS protein (up to 55%).</td>
</tr>
<tr>
<td>Multiple linear regression model</td>
<td>Links DDGS AA composition as a function of both corn and yeast AA composition. It includes all AA and is based on relative percentages rather than absolute concentrations of AA. Unlike AA concentrations, AA in relative percentage is independent of the sample’s protein content. Can be used to estimate yeast’s effect on not only DDGS but also other downstream products.</td>
</tr>
</tbody>
</table>

If the average yeast contains 38% protein, the total annual mass would contain $2.34 \times 10^6 \times 38\% = 88,920$ MT yeast protein. If 1,000 L of ethanol corresponds to the production of 860 kg DDGS, the total annual DDGS would be $(7 \times 10^9$ L)/$1,000$ L $\times 860$ kg $= 6 \times 10^6$ MT. And if the average protein content in DDGS is 28%, the total annual DDGS protein would be $6 \times 10^6 \times 28\% = 1.68 \times 10^6$ MT.

Therefore, yeast contribution by mass would be $(2.34 \times 10^6$ MT)/$(6 \times 10^6$ MT) $= 3.9\%$; and yeast contribution by protein would be $(88,920$ MT)/$(1.68 \times 10^6$ MT) $= 5.3\%$.

Averaging ratios of AA concentration of DDGS vs. that of yeast. In 2004, Beylea and coworkers calculated the ratio of each essential AA concentration (g/100 g dry sample) of DDGS vs. that of yeast. They found that most ratios ranged between 0.45 and 0.70, with an average value of 0.55. Based on this average value, they suggested that yeast protein makes up approximately half of the protein in DDGS.

Multiple linear regression model. In 2010, Han and Liu reported the results of a study using three sets of samples provided by three commercial dry grind ethanol plants in Iowa, USA. Each set consisted of ground corn, yeast, DDGS, and several intermediate stream products. They found that when the AA composition of DDGS protein was expressed as concentration based on sample mass (as most previous studies did) the change in AA concentrations followed the pattern of protein changes during the dry grind process: Prior to the fermentation step, there was a slight increase. Upon fermentation, concentrations of all AA increased 2.0- to 3.5-fold, resulting from starch depletion. However, when the AA profile was expressed as a relative percentage of total AA, its change did not follow the trend of protein change (Table 1). Upon fermentation, some AA increased, some decreased, and others remained unchanged. Furthermore, through this expression, the influence of yeast AA composition on that of a downstream product became noticeable.

For example, arginine in corn was 3.55%, in yeast 5.15%, so the trend was increasing (Table 1). Methionine in corn was 3.2%, in yeast, 2.14%, so the trend was decreasing. Although most changing trends in AA composition depended on the difference between corn and yeast AA compositions, there were some exceptions. For example, for proline, there was no clear pattern of change during the dry grind process, but yeast had a much lower value than corn (2.18% vs. 6.67%).

Accordingly, Han and Liu (2010) proposed that the AA composition of a downstream product (response variable) is a function of the AA of corn (independent variable 1) and AA of yeast (independent variable 2), based on a multiple linear regression model:

$$Y = AX_1 + BX_2 + C$$  \[1\]

where $Y$ is relative % of an amino acid in an downstream product; $X_1$, $X_2$ are the mass concentrations of corn and yeast, respectively.
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Further reading


Which method is best?

Although the estimated results vary greatly with the methods chosen, a comparison (Table 3) seems to indicate that the multiple linear regression method is by far the most accurate estimation for the effect of yeast on the AA composition of not only DDGS but also other downstream products.

The article is based on a presentation made on May 13, 2010, at the 14th Annual Distillers Grains Symposium in Indianapolis, Indiana, USA.

Jianchun Han is an associate professor at College of Food Science, Northeast Agricultural University, Heilongjiang, China. Keshun Liu is a research chemist in the National Small Grains and Potato Germplasm Research Unit, US Department of Agriculture, Agricultural Research Service, Aberdeen, Idaho. Liu may be contacted at keshun.liu@ars.usda.gov.
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- **collaborate**: to work jointly with others or together especially in an intellectual endeavor
- **innovate**: to introduce as or as if new; to make changes; do something in a new way
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AOCS 2011 award recipients announced

Outstanding accomplishments and service by individuals from around the world are recognized during the 102nd AOCS Annual Meeting & Expo held May 1–4 in Cincinnati, Ohio, USA. The following list includes awards for whom recipients had been named by the deadline for this issue of inform.

SOCIETY AWARDS

A. Richard Baldwin Award
GARY R. LIST, US Department of Agriculture—NCAUR, retired, USA

The highest Society award recognizes and honors an individual who has made profound contributions to the Society over a substantial period of time.

Award of Merit
JAMES A. KENAR, US Department of Agriculture–NCAUR, USA

The AOCS Award of Merit is presented for productive leadership service to AOCS that has advanced the prestige, standing, or interests of AOCS, and for services not otherwise specifically recognized.

AOCS Fellows
WILLIAM (BILL) W. CHRISTIE, formerly at The Scottish Crop Research Institute and consultant to Mylnefield Lipid Analysis, Scotland

JESSE E. COVEY, retired, USA
HOWARD R. KNAPP, Big Sky Medical Research, P.C., USA

KESHUN LIU, US Department of Agriculture–ARS, USA

KENKICHI OBA, emeritus member of AOCS, retired, Japan

ANDREW PROCTOR, University of Arkansas, USA

NEIL R. WIDLAK, Archer Daniels Midland Cocoa, USA

Fellows are selected for exceptional recognition for achievements in science as well as for unusually important service to AOCS or to their profession.

AOCS Corporate Achievement Award
NutraLease Ltd., Israel

The Award recognizes industry achievement for an outstanding process, product, or contribution that has made the greatest impact on its industry segment. NutraLease Ltd. is recognized for the technology Novel Nano-Sized Self-assembled Liquid (NSSL) carriers as delivery vehicles for improved solubilization and bioavailability of nutraceuticals cosmeceuticals, cosmetotextiles and pharmaceuticals.

SCIENTIFIC AWARDS

Supelco/Nicholas Pelick–AOCS Research Award
JOHN L. HARWOOD, Cardiff University, Wales

$10,000 honorarium, $1,500 travel stipend, and a plaque

The Supelco/Nicholas Pelick–AOCS Research Award is for accomplishment of outstanding original research in fats, oils, lipid chemistry, or biochemistry, the results of which have been presented through publication of technical papers. The award is funded by Supelco Inc., a subsidiary of Sigma-Aldrich, and Nicholas Pelick, an AOCS past president.
Stephen S. Chang Award

COLIN RATLEDGE, University of Hull, England
$5,000 honorarium and a jade horse
The Stephen S. Chang Award recognizes a scientist, technologist, or engineer who has made decisive accomplishments in basic research for the improvement or development of products related to lipids. The award was established by former AOCS President Stephen S. Chang and his wife, Lucy, for individuals who have made significant contributions through a single breakthrough or through an accumulation of publications.

AOCS Young Scientist Research Award

RAFFAELE MEZZENGA, ETH Zürich, Switzerland
$1,000 honorarium, $1,500 travel stipend, and a plaque
The AOCS Young Scientist Research Award recognizes a young scientist who has made a significant and substantial research contribution in one of the disciplines represented by AOCS Divisions. Vijay K.S. Shukla and the International Food Science Centre A/S of Denmark sponsor the award.

DIVISION/SECTION AWARDS

Analytical Division: Herbert J. Dutton Award

GARY R. LIST, US Department of Agriculture, retired—NCAUR, USA
$1,000 honorarium and a plaque
The award is presented for significant contribution to the analysis of fats and oils or to improvement in the understanding of the processes used in the fats and oils industries. The award is named for Dr. Dutton, a long-time research leader at the US Department of Agriculture facility in Peoria, Illinois, USA.

Biotechnology Division: Student Awards

1st place—MICHAEL S. GREER, University of Alberta, Canada
$300 honorarium and a certificate
2nd place (tie)—NANTAPRAPA NANTIYAKUL, University of Nottingham, United Kingdom
RAN YE, University of Tennessee, USA
$200 honorarium and a certificate

Edible Applications and Technology Division: Timothy L. Mounts Award

NURHAN T. DUNFORD, Oklahoma State University, USA
$500 honorarium and a plaque
The award is for either basic or applied research accomplishments relating to the science, technology, or application of edible oils in food products. It memorializes the former AOCS president, who was a distinguished research scientist with the US Department of Agriculture. The award is sponsored by Bunge.

Student Award

NAVIDEH ANARJAN KOUCHEHBAHG, Universiti Putra Malaysia, Malaysia
$500 travel stipend and a certificate

Health & Nutrition Division: Ralph Holman Lifetime Achievement

DEBORAH A. DIERSSEN-SCHADE, Mead Johnson Nutrition, USA
$500 honorarium, $1,000 travel stipend, and a signed orchard photo print
The award recognizes outstanding performance and meritorious contributions to the health and nutrition interest area. The award is named after Ralph Holman in recognition of his lifetime service to the study of essential fatty acids.

Student Award

JUSTINE M. TISHINSKY, University of Guelph, Canada
$500 honorarium and a certificate
Industrial Oil Products Division: ACI/NBB Glycerine Innovation Award
VICTOR M. ARREDONDO, MICHAEL S. GIBSON, NEIL T. FAIRWEATHER, PATRICK J. CORRIGAN, DAVID KREUZER, DEBORAH J. BACK, and ANGELLA C. DANIELS, The Procter & Gamble Company, USA
$5,000 honorarium and a plaque
The ACI/NBB Glycerine Innovation Award, sponsored by the American Cleaning Institute and the National Biodiesel Board, recognizes achievements in research relating to new applications for glycerine, particularly those with commercial viability.

USB Industrial Uses of Soybean Oil Award
MICHAEL J. HAAS, US Department of Agriculture–ERRC, USA
$3,000 honorarium and a plaque
This award is for outstanding research into new industrial applications or uses for soybean oil. The United Soybean Board’s New Uses Committee sponsors the award to encourage and recognize such research.

Student Award
EMMANUEL REVELLAME, Mississippi State University, USA
$500 travel stipend and a certificate

Lipid Oxidation and Quality Division:
Edwin Frankel Best Paper Award
Antioxidant Activity of Potato Peel Extracts in a Fish-Rapeseed Oil Mixture and in Oil-in-Water Emulsions (Journal of the American Oil Chemists’ Society 87:1319–1332)
K.H. SABEENA FARVIN, NINA SKALL NIELSEN, and CHARLOTTE JACOBSEN
Technical University of Denmark, Denmark
Plaque and certificates for all authors
The award recognizes the best paper relating to lipid oxidation or lipid quality published during the previous year by AOCS Press.

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Phospholipid Division: Best Paper Award

Anti-Obesity Effect of Phosphatidylinositol on Diet-Induced Obesity in Mice (Journal of Agricultural and Food Chemistry 58:11218–11225)

KOSUKE SHIMIZU1, TOMOKO IDA1, HARUHITO TSUTSUI1, TOMOHIRO ASAI1, KAZUMASA OTSUBO2, and NAOTO OKU1

1University of Shizuoka, Japan, and 2Asahi Kasei Pharma Corporation, Japan

Plaque, and certificates for all authors

The award recognizes an outstanding paper related to phospholipids published during the previous year. International Lecithin & Phospholipid Society sponsors the award.

Processing Division: Distinguished Service Award

ROBERT C. HASTERT, retired, USA

$1,000 travel stipend and a certificate

The award recognizes outstanding, meritorious service to the oilseed processing industry or to the Division over a substantial amount of time.

Register by 15 April 2011 and Save!

World Conference on Oilseed Processing, Fats & Oils Processing, Biofuels & Applications

21–23 June 2011  Hilton Izmir  Izmir, Turkey

Where the Global Fats and Oils Community Will Discuss Critical Scientific Issues and Technologies Affecting the Future of the Industry

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- Global Issues for Canola Products
- Global Issues for Olive Oil
- Critical Issues in Palm and Palm Kernel Oil and Its By-products
- Global Issues for Sunflower Seed, Rapeseed, and Other Oilsseeds
- Advancements in Oil and Oilseed Processing
- Industrial Applications and Utilization: Lipid-Based Liquid Fuels
- Omega-3 Oils: Applications and Processing Technologies
- Specialty Oils and Their Applications
- Food, Feed, and Plant Safety
- Lipids as Feedstocks for Polymers, Lubricants, and Other Industrial Materials
- 3-MCPD and Glycidyl Esters Analytics and Mitigation
- By-Products and Utilization
- Edible Applications: Emerging Technologies
- Biotechnology and Other Technology
- Industrial Applications and Utilization: Alternative Fuels
- Edible Applications: Antioxidants, Nutraceuticals
- Processing Technologies

Sponsoring Organizations

AOCS • Culinary Products and Margarine Industrialists Association of Turkey • Vegetable Oils and Fats Industrialists Association

Complete program details: www.aocs.org/goto/Turkey2011
Plaque, and certificates for all authors
The awards are presented annually for the outstanding paper related to protein and co-products appearing in an AOCS publication during the previous year. Archer Daniels Midland sponsors the awards.

Surfactants & Detergents Division: Samuel Rosen Memorial Award
THOMAS W. FEDERLE, The Procter & Gamble Company, USA
$2,000 honorarium and a plaque
The award recognizes a significant advance in, or application of, the principles of surfactant chemistry by a chemist working in the industry. The award is sponsored by Milton Rosen in honor of his father, Samuel, who worked as an industrial chemist on the formulation of printing inks for more than four decades.

Distinguished Service Award
TERRI GERMAIN, Oxiteno USA, USA
A plaque
The award recognizes outstanding, meritorious service to the industry or to the Division over a substantial amount of time.

American Cleaning Institute (ACI) Award
Creation of Novel Green and Sustainable Gemini-Type Cationics Containing Carbonate Linkages (Journal of Surfactants and Detergents 13:387–398)
TAISUKE BANNO¹, KAZUO KAWADA², AND SHUICHI MATSUMURA¹
¹Keio University, Japan, and ²Kitasato University, Japan
Crystal plaques for all authors
The award is presented annually to the authors of the best technical paper published during the preceding year in the Journal of Surfactants and Detergents. The award is sponsored by the American Cleaning Institute.

Student Awards
CHODCHANOK ATTAPHONG, The University of Oklahoma, USA
MAYSAM SODAGARI, The University of Akron, USA
$500 travel stipend and a certificate

Oils and Fats World Market Update 2011
20–21 June 2011 ★ Hilton Izmir ★ Izmir, Turkey

World-Class Speakers to Address Key Business Issues:
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• Worldwide Trade Issues and Regulations
• Sustainability for the Oils and Fats Business
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• Market Update and Critical Issues for Global Soybeans, Meal, and Oil
• Global Issues for Canola Products
• Global Issues for Olive Oil
• Critical Issues in Palm and Palm Kernel Oil and its By-Products
• Global Issues for Sunflower Seed, Rapeseed, and Other Oilseeds

Register by 27 May 2011 and Save!

Complete program details: www.aocs.org/goto/WorldMarket

Sponsoring Organizations: AOCS • Culinary Products and Margarine Industrialists Association of Turkey • Vegetable Oils and Fats Industrialists Association
USA Section:
Alton E. Bailey Award

JAMES K. DAUN, Agri-Analytical Consulting, Canada
$750 honorarium and a plaque
The USA Section established this award to recognize outstanding research and exceptional service in the field of lipids and associated products. The medal commemorates Alton E. Bailey's great contributions to the field of fats and oils as a researcher, as an author of several standard books in the field, and as a leader in the work of the Society.

Hans Kaunitz Award
VERMONT DIA, University of Illinois at Champaign-Urbana, USA
$1,000 honorarium, $500 travel stipend, and a certificate
The award recognizes the outstanding performance and merit of a graduate student within the geographical boundaries of the USA Section.

STUDENT RECOGNITION
AOCS Foundation Honored Student Awards
The awards recognize graduate students at any institution of higher learning who are conducting research in any area of science dealing with fats and lipids and who are interested in the areas of science and technology. Supported by contributions from members as well as companies in the industry.
Travel stipend and a certificate.

Manuchehr (Manny) Eijadi Award
The Eijadi Award recognizes outstanding merit and performance by an AOCS Honored Student. The award, established by Mr. Eijadi, is intended to help the recipient finance his or her studies.
$1,000 scholarship and a certificate

Peter and Clare Kalustian Award
The Kalustian Award recognizes outstanding merit and performance by an AOCS Honored Student. The award is supported by the Kalustian estate.
$1,000 scholarship and a certificate

Ralph H. Potts Memorial Fellowship Award
SWAPNIL R. JADHAV, CUNY, USA
$2,000 scholarship, travel stipend, and a plaque
The Ralph H. Potts Award is presented annually to a graduate student working in the chemistry of fats and oils and their derivatives. The award is sponsored by AkzoNobel to memorialize Ralph Potts, a pioneer in research on industrial uses of fatty acids.

SUMIT K. KIRAN, University of Toronto, Canada—Honored Student and Manuchehr Eijadi Honored Student
JENNA C. SULLIVAN, Dalhousie University, Canada—Honored Student
JUSTINE M. TISHINSKY, University of Guelph, Canada—Honored Student
TANUSHREE TOKLE, University of Massachusetts, USA—Honored Student
HUAIXIA YIN, Louisiana State University, USA—Honored Student

CHESLEY L. CASTRODALE, University of Arkansas, USA—Honored Student and Peter and Clare Kalustian Honored Student
GAMAGE ANOMA P. CHANDRASEKARA, Memorial University of Newfoundland, Canada—Honored Student
BINGCAN CHEN, University of Massachusetts, USA—Honored Student
MICHAEL S. GREER, University of Alberta, Canada—Honored Student

CASTRODALE

CHANDRASEKARA

CHEN

GREER

DIA

KIRAN

SULLIVAN

TISHINSKY

JADHAV

TOKLE

YIN
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This congress provides an international forum for professionals, scientists, researchers, and students involved in fats and oils industries. The congress will focus on current issues affecting the Ibero-American marketplace, including processing, refining and packaging, health and nutrition, analytical and quality control processes, industrial applications, biodiesel, environmental impacts, and new developments.

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The Organizing Committee is welcoming abstract submissions for oral and poster presentations. The technical program will feature invited presentations by leading experts as well as volunteer presentations. Online submission required.

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Dates to Remember
May 16, 2011 ● Call for Papers Deadline
May 31, 2011 ● Early Exhibit Rental Fee Deadline
September 16, 2011 ● Early Registration Deadline
September 30, 2011 ● Last Day to Register Online

Spanish or English translations will be available for all oral presentations.
OBESITY EPIDEMIC (CONTINUED FROM PAGE 202)

obesity without sounding an inflammatory alarm. A prototype medicine to fix the problem in endoplasmic reticulum and reduce its stress also works in humans, as shown by collaborative work published this year with Samuel Klein at Washington University in St. Louis (USA). Now the hunt is on for new and more powerful molecules to replicate these early findings.

None of the newly developing compounds has yet reached clinical trials, but may in the next few years, Hotamisligil says. Another strategy that may bear fruit sooner involves hormones—which he calls “lipokines”—that Hotamisligil has identified in mice that halt or even reverse insulin resistance and other complications related to obesity and type 2 diabetes. One such lipokine is a rare nutrient in nuts and other foods called palmitoleate. Because it is a natural substance without known adverse effects, he says that if funding can be obtained, a clinical trial could happen “at any moment.” In collaboration with HSPH professor Dariush Mozaffarian, work showed that people with high levels of this lipokine have marked protection against type 2 diabetes.

Obviously these efforts to combat obesity-related diseases are very early and the outlook uncertain. Yet the groundwork being laid by Hotamisligil and others in the field is promising, and the potential for reducing the insidious and extraordinarily worrying toll of obesity is enormous.

“Ten years from now, I hope that there will be drugs on the shelves emerging from this research—not necessarily from what we are doing, but related to it,” he says. “I predict that such drugs will not be toxic to the heart and have other bad side effects, which current diabetes medications do. I also hope that at least some of these drugs will be affordable and reach the mass populations with desperate needs.” Looking farther ahead, Hotamisligil, who calls himself “pathologically optimistic,” sees a future in which the food industry can tinker with thousands of individual nutrients in foods to enhance their healthful properties. “That,” he says, “is the next frontier.”

Richard Saltus has written about science, medicine, and public health for the Associated Press, the Boston Globe, the San Francisco Examiner, and The New York Times.

CALENDAR (CONTINUED FROM PAGE 185)


June


June 6–8, 2011. 8th World Surfactant Congress and Business Convention (CESIO 2011),


June 15–16, 2011. European Biodiesel 2011, Rotterdam, the Netherlands. Information: Marisa Magtultol: Tel: +44 (0)20 7981 2503; email: mmagtultol@aci.eu; www.acius.net/aci/conferences/eu-eaf4.asp.


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Did you know that as an AOCS member, you spend approximately $13 per month on your AOCS membership? Would you say you derive $13 in value through the connections you maintain through AOCS each month?

Did you realize that hundreds of your colleagues (maybe including you) volunteer their time each year to develop methods, books, meeting presentations, and conferences for AOCS? As such, they set the agenda for their fields by deciding what will be talked about, how things will be labeled, and which individuals’ work will be made available to a global audience.

The interesting thing about those people is that rather than being paid for their efforts, they pay $13 per month to be a member of AOCS. If you are wondering why, the answer can only be that they derive value from their connection with AOCS. Otherwise, why would they be so productive outside of their full-time, professional responsibilities, expecting no compensation, but rather paying money to ensure that AOCS continues to exist for them to do so?

Do you think the value is far greater than the mere business expense of $13/month for you to be a part of a group of researchers and innovators that will lead the oils and fats community into the future? If you said yes, you are not alone.

■ “The AOCS facilitated access to information and personal contacts which supported my career in industry; inform keeps me in touch with world events.” —Joseph Endres

■ “I have found few things as beneficial to my career as my AOCS membership. The interpersonal ties that I have formed as a result of my membership and participation in AOCS have been tremendously valuable to me, benefiting me as much as, or more than, the scientific information contained in the AOCS journals.” —Michael Haas

■ “After my educational degrees, my membership in AOCS has been the best investment I have made for my career.” —Lawrence Johnson

These comments speak well for this organization—this professional community that has included Wesson, Bailey, Mehlenbacher, Perkins, and Cahn in the past, and currently includes Baldwin, Mori, Applewhite, Christie, Gunstone, Johnson, Lands, Holman, and Hou.

For AOCS, many of the benefits you enjoy, such as up-to-date methods, distance learning, and the AOCS website, got their start through funding from the AOCS Foundation. Even the cultivation of the next generation is facilitated through the Smouse Fellowship and Honored Student Awards, which are made possible through the AOCS Foundation. The dollars for this type of activity came from members who valued their experience so highly that they wanted to give back. Imagine how much more AOCS could do for you and our community if you acted on the value you perceive by supporting AOCS beyond what you pay in dues.

The AOCS staff stands in awe of the individuals we have worked with through this organization. To us, knowing and interacting with people of your intellect, character, and achievements is worth far more than the $154 you pay as a member. We do not pay $154 for membership; however, because we understand the immeasurable value of AOCS, we have chosen to support AOCS through our own personal gifts to the AOCS Foundation.

It is at this point that we challenge you to join us in adding value to your membership, participation, and shared global network by making a donation to the AOCS Foundation this year. Donate now. Go to www.aocsfoundation.org/donate.cfm.

Amy Lydic is the development manager for the AOCS Foundation. Jean Wills Hinton is executive vice president of AOCS and executive director of the AOCS Foundation.
Verenium’s Purifine® PLC is a ground-breaking product that offers a way to improve yields from degumming and refining of high phosphorus seed oils. In addition to increased oil yields, plants that adopt Purifine® PLC benefit from reduced dilution of meal protein, reduced formation of unwanted side products, and reduced use of chemicals and other non-specific processing aids in the refinery. Purifine® PLC is easily integrated into most existing plant designs without requiring major changes to conventional processing conditions or equipment.

What does this mean for you? Getting just a little more oil from each of your seeds adds up to more value, less waste and better control over the quality of your products. The result is industry-leading economics and considerably improved operating margins.

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