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AOCS Mission Statement

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

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Calendar

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October

October 10–14, 2011. SupplySide West, The Venetian and the Sands Expo, Las Vegas, Nevada, USA. Information: www.supplysideshow.com/2011/west.

October 12–13, 2011. American Fats & Oils Association Annual Meeting, Grand Hyatt Hotel, New York. Information: www.americanfatsandoilsassociation.com/node/2183.

October 12–14, 2011. 58th SEPAWA Congress and European Detergents Conference, Esperanto Hotel, Fulda, Germany. Information: www.sepawa.com/index/sepawa-congress-en/home-con.html.

October 14–20, 2011. ASA-CSSA-SSSA (American Society of Agronomy-Crop Science Society of America-Soil Science Society of America) 2011 International Annual Meetings, San Antonio, Texas, USA. Information: www.acsmeetings.org.

October 16–19, 2011. AACC [American Association of Cereal Chemistry] Annual Meeting, Palm Springs, California, USA. Information: <http://meeting.aaccnet.org>.

October 16–19, 2011. New Horizons 2011: The Evolving Face of Cleaning in the Early 21st Century, Ponte Vedra, Florida, USA. Information: www.cspa.org/public/events/new_horizons_2011.html.

October 16–20, 2011. International Symposium on Sunflower Genetic Resources, Fan-

tasia Deluxe Hotel, Kuşadası, İzmir, Turkey. Information: www.ttae.gov.tr/symposium.

October 16–21, 2011. International Congress on Energy: Sustaining Supplies, Minneapolis Convention Center, Minneapolis, Minnesota, USA. Information: www.energycongress.org.

October 17, 2011. Basics of Edible Oil Processing and Refining—AOCS Short Course, Hilton Cartagena, Cartagena, Colombia. Information: email: meetings@aocs.org; phone: +1 217-693-4821; fax: +1 217-693-4865; www.aocs.org/LACongress.

October 17, 2011. Oilseed Processing and Solvent Extraction—AOCS Short Course, Hilton Cartagena, Cartagena, Colombia. Information: email: meetings@aocs.org; phone: +1 217-693-4821; fax: +1 217-693-4865; www.aocs.org/LACongress.

October 18, 2011. Oils and Fats Modification—AOCS Short Course, Hilton Cartagena, Cartagena, Colombia. Information: email: meetings@aocs.org; phone: +1 217-693-4821; fax: +1 217-693-4865; www.aocs.org/LACongress.

October 18, 2011. SODEOPEC: Soaps, Detergents, Oleochemicals, and Personal Care Products—AOCS Short Course, Hilton Cartagena, Cartagena, Colombia. Information: email: meetings@aocs.org; phone: +1 217-693-4821; fax: +1 217-693-4865; www.aocs.org/LACongress.

October 18, 2011. Fats and Oils for Confectionary and Chocolates: Structure and Function—AOCS Short Course, Hilton Cartagena, Cartagena, Colombia. Information: email: meetings@aocs.org; phone: +1 217-693-4821; fax: +1 217-693-4865; www.aocs.org/LACongress.

October 18–21, 2011. 78th National Renderers Association Convention, The Ritz-Carlton, Tucson, Arizona, USA. Information: <http://convention.nationalrenderers.org>.

October 19–21, 2011. 14th Latin American Congress on Fats and Oils, Hotel Cartagena, Cartagena, Colombia. Information: email:

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October 19–21, 2011. 14th Latin American Congress on Fats and Oils, Hotel Cartagena, Cartagena, Colombia. Information: email: meetings@aoacs.org; phone: +1 217-693-4821; fax: +1 217-693-4865; www.aoacs.org/LACongress.

November 9–11, 2011. AAOCS [Australian Section of the American Oil Chemists Society] Biennial Conference: Fats and Oils—Industry, Innovation and Health Perspectives, Sebel Playford Adelaide, Adelaide, SA, Australia. Information: email: matt.miller@plantandfood.co.nz.

April 29–May 2, 2012. 103rd AOCS Annual Meeting & Expo, Long Beach Convention and Entertainment Center, Long Beach, California, USA. Information: phone: +1 217-359-2344; fax: +1 217-351-8091; email: meetings@aoacs.org; <http://AnnualMeeting.aoacs.org>.

September 30–October 4, 2012. World Congress on Oleo Science & 29th ISF Conference (JOCS/AOCS/KOCS/ISF Joint Conference), Arkas Sasebo, Nagasaki Prefecture, Japan. Information: <http://www2.convention.co.jp/wcos2011/index.html>.

October 29–31, 2012. Singapore 2012: World Conference on Fabric and Home Care, Shangri-La Hotel, Singapore. Information: phone: Mindy Cain, +1 217-693-4827; email: mindyc@aoacs.org; www.singapore.aoacs.org.

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October 25–27, 2011. Algae Biomass Summit, Hyatt Regency Hotel, Minneapolis, Minnesota, USA. Information: <http://algae-biomasssummit.org/ema/DisplayPage.aspx?pagelid=About>.

October 26–28, 2011. 8th Lipidomics Meeting: Membranes and Bioactive Lipids, INSA de Lyon, Villeurbanne, France. Information: www.gerli.com/lyon2011Eng.htm.

October 31–November 2, 2011. IFSCC [International Federation of Societies of Cosmetic Chemists] Conference: Effective, Economic and Ecological Cosmetics, Centara Grand and Bangkok Convention Centre, Thailand. Information: email: Rojana@ifsc2011.com; www.ifsc2011.com.

October 31–November 3, 2011. Soy & Grain Trade Summit, Hyatt Regency St. Louis at the Arch, St. Louis, Missouri, USA. Information: www.soyasummit.com.

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November

November 1–3, 2011. 54th Biennial CHEM SHOW (The Chemical Process Industries Exposition), Jacob K. Javits Convention Center, New York City, New York, USA. Information: email: info@chemshow.com; www.chemshow.com.

November 6–10, 2011. 31st Practical Short Course on Vegetable Oil Extraction, Texas A&M University, Food Protein R&D Center, College Station, Texas, USA. Information: Rich Clough, phone: +1 979-862-2262; fax: +1 979-845-2744; email: rcclough@tamu.edu; <http://foodprotein.tamu.edu>.

November 7–8, 2011. Workshop: Production of Margarines, Dairy Blends and Spreads, CSIRO Food and Nutritional Sciences, Werribee, Victoria, Australia. Information: www.aocs.org/files/Meetings/AAOCSflyer.pdf.

November 7–9, 2011. US Canola Association Board Meeting, San Antonio, Texas, USA. Information: www.uscanola.com/site/epage/102409_956.htm.

November 7–10, 2001. 14th World Ethanol & Biofuels Conference, W Barcelona Hotel, Spain. Information: <http://web.agraevents.com>.

November 8–9, 2011. Soy & Health Summit 2011: Regulation, Marketing, Science & Health, Château du Lac, Genval, Belgium. Information: www.soyconference.com.

November 8–10, 2011. AOSDAC [Asia Oceania Soap & Detergent Association Conference] 2011, incorporating the 31st CASSDI Annual Meeting and Beijing International Cosmetics, Personal Care & Detergents Expo 2011, China National Convention Centre, Beijing. Information: email: zht586@cassdi.org or yanglin@cassdi.org; www.cassdi.org.

November 8–10, 2011. Advanced Biofuels Markets, Parc 55 Hotel, San Francisco, California, USA. Information: www2.greenpowerconferences.co.uk/EF/?sSubSystem=Prospectus&sEventCode=BN1111US&sSessionID=86fa34dd96cf3783047f51467a6f012f-3388770.

November 9–11, 2011. AAOCS [Australasian Section of the American Oil Chemists Society] Biennial Conference: Fats and Oils—Industry, Innovation and Health Perspectives, Sebel Playford Adelaide, Adelaide, SA, Australia. Information: email: matt.miller@plantandfood.co.nz.

November 9–11, 2011. Southeastern Regional Lipid Conference, High Hampton Inn, Cashiers, North Carolina, USA. Information: email: ebieberich@georgiahealth.edu; www.georgiahealth.edu/institutes/immag/serlc.

November 9–11, 2011. European Federation of Food Science and Technology (EFFoST) Annual Meeting: Process-Structure-Function Relationships, Technische Universität Berlin, Germany. Information: www.effostconference.com.

November 10–11, 2011. 1st ICIS Asian Surfactants Conference, Intercontinental Hotel, Singapore. Information: www.icisconference.com/asiansurfactants.

November 15–16, 2011. 4th Algae World Asia: Resource Potential Analysis, Experience and Facilities for Algae Production in Asia/China, Novotel Beijing Xinqiao, Beijing, China. Information: www.cmt-events.com/aboutevent.aspx?ev=111143.

November 15–17, 2011. PIPOC 2011, Kuala Lumpur Convention Center, Kuala Lumpur, Malaysia. Information: email: pipoc2011@mpob.gov.my.

November 16–17, 2011. Biofuels International Expo & Conference, Antwerp Expo, Antwerp, Belgium. Information: www.biofuelsinternationalexpo.com/bio_rott.html.

November 18–19, 2011. Oil Technologists' Association of India: International Conference on Innovations in Oils, Fats & Allied Products Towards Sustainability, Indian Institute of Chemical Technology, Hyderabad, India. Information: <http://iictindia.org/IOFATS-2011>.

November 23–25, 2011. 10th Anniversary International Conference: Fat-and-Oil

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SOY **AND** BREAST CANCER



COURTESY OF THE UNITED SOYBEAN BOARD

The safety of soy foods for breast cancer patients has been in and out of the news for several decades. In this article, inform's Associate Editor Catherine Watkins examines current thinking.

Catherine Watkins

Is it safe for postmenopausal women who have had breast cancer to eat soy foods?

On January 27, 2011, answering that question became much more than just an interesting intellectual exercise. That Thursday, at 3:47 p.m., the phone rang in my cubicle at AOCS headquarters.

"The biopsy shows breast cancer," my doctor informed me.

With those words, a journey of discovery began. Initial terror over my perceived imminent demise gave way to a period of intense research as I recuperated from my subsequent surgery. I found myself engaging in magical thinking about dietary silver bullets. Was there anything I should add to my diet, or was there a dietary supplement regimen that would drive a stake into the heart of any remaining cancer cells? As I read paper after paper, I found that most decisions about food and supplements were easy to make, either because there was a consensus about efficacy among scientists or because there were few questions about safety.

One potential dietary cancer-slayer was less clear: soy. Estrogen feeds between 60% and 75% of breast cancers, including my own. The standard oral therapy undertaken after initial treatment (known as "adjuvant therapy") for estrogen-sensitive cancers is either tamoxifen, which binds to estrogen receptors and stops cell growth signaling, or an aromatase inhibitor, which inhibits production of estrogen in the body.

Soy is a rich source of isoflavones (primarily genistein, daidzein, and glycitein), which exhibit estrogenic activity. The safety of isoflavone intake for women at high risk of breast cancer or those recovering from it may depend on whether isoflavones act as agonists by initiating cell growth signaling or as antagonists by suppressing a response.

Early research on soy and breast cancer in cell cultures and animal models pointed to possible negative effects from isoflavones. These findings remain firmly lodged in the public consciousness, despite several recent, well-designed epidemiological studies suggesting dietary soy not only is safe, but may also be protective against cancer recurrence in certain subgroups of women. The public memory is long, however; it takes a significant number of positive findings to displace memories of the negative ones.

To prove the point: When asked about the safety of soy intake, my oncologist said, "Didn't that fellow at the University of Illinois at Urbana-Champaign (UIUC; Illinois, USA) show it is bad for women who have had breast cancer? You should talk to him."

Early animal studies

"That fellow" is William Helferich, a professor of nutrition in the Department of Food Science and Human Nutrition at UIUC, just down the road from AOCS headquarters. Helferich and colleagues have demonstrated that dietary genistein and genistin (see sidebar) stimulate the growth of estrogen-sensitive breast cancers in mice (*Cancer Research* 58:3833–3838, 1998; *Carcinogenesis* 22:1667–1673, 2001).

He and his team injected MCF-7 cells under the skin of athymic ovariectomized mice and implanted estrogen pellets in them to fuel tumor growth. Tumors regressed completely in mice

ABOUT ISOFLAVONES

Isoflavones are a subclass of the flavonoids, the plant secondary metabolites named for their function as yellow (in Latin, *flavus*) pigments.

Soy foods are the only source of physiologically relevant amounts of isoflavones. Each gram of soy protein in traditional soy foods such as tofu, soy milk, and miso delivers approximately 3.5 mg of isoflavones. People in Asia typically consume about 30–50 mg of isoflavones per day (8–10 g of soy protein). For reference, a traditional soy food contains about 25 mg of isoflavones per serving. The consumption by the upper quartile (25%) of Asian populations studied is about 75–100 mg of isoflavones/day. In the United States, isoflavone intake is about 1.5 mg/day, according to Mark Messina of Nutrition Matters, Inc., in Port Townsend, Washington, USA.

Soybeans are tiny isoflavone factories, producing 12 different isoflavone isomers. The key isoflavones in soybeans are genistin and daidzin (the glucoside form) and their aglycones, genistein (4',5,7-trihydroxyisoflavone) and daidzein (4',7-dihydroxyisoflavone). (A translation for nonchemists is in order: An aglycone is the nonsugar compound remaining after replacement of a glycosyl group from a glycoside by a hydrogen atom.) A third isoflavone is present in small amounts—glycitin and its aglycone form, glycitein (4',7-dihydroxy-6-methoxyisoflavone).

"Perhaps the greatest misnomer has been the liberal classification of soy isoflavones as 'estrogens,'" writes Kenneth D.R. Setchell of the Children's Hospital Medical Center in Cincinnati, Ohio, USA (*Journal of the American Medical Association* 20:354S–362S, 2001).

He continues by pointing out that the isoflavones in soy are nonsteroidal in chemical structure. But because of their phenolic rings, they are able to bind to estrogen receptors (as does tamoxifen, the original antiestrogenic agent used as adjuvant treatment in breast cancer that continues in use for premenopausal women and some postmenopausal women with breast cancer).

Isoflavones bind preferentially to the estrogen receptor (ER)- β . Studies by X-ray crystallography have compared the binding of estrogens, the selective ER modulator raloxifene, and the soy isoflavone genistein. These studies show "distinct differences in positioning," Setchell notes, that determine whether the binding agent has an agonist (initiating a response) or antagonist (inhibiting a response) effect.

Genistein, it turns out, "sits in the ER-complex that is almost identical to that of raloxifene, and not like estradiol [the most potent estrogen in humans]," Setchell says. "So, rather than classifying soy isoflavones as 'estrogens,' they should more correctly be judged to act normally as natural selective estrogen receptor modulators As such, this suggests that soy isoflavones are likely to have the beneficial effects of estrogen without the negatives, especially in tissues such as the endometrium and breast."

CONTINUED ON NEXT PAGE

TABLE 1. Cancer incidence and mortality worldwide^a (2008)

	Male	Female	Both sexes
Population (thousands)	3,402,841	3,347,220	6,750,061
Number of new cancer cases (thousands)	6,617.8	6,044.7	12,662.6
Age-standardized rate (W)	203.8	165.1	181.6
Risk of getting cancer before age 75 (%)	21.2	16.5	18.7
Number of cancer deaths (thousands)	4,219.6	3,345.2	7,564.8
Age-standardized rate (W)	128.6	87.6	106.1
Risk of dying from cancer before age 75 (%)	13.4	9.1	11.2
Five most frequent cancers in descending order of prevalence	Lung	Breast	Lung
	Prostate	Colorectum	Breast
	Colorectum	Cervix uteri	Colorectum
	Stomach	Lung	Stomach
	Liver	Stomach	Prostate

^aGlossary:

Age-standardized rate (W): A rate is the number of new cases or deaths per 100,000 persons per year. An age-standardized rate is the rate that a population would have if it had a standard age structure. Standardization is necessary when comparing several populations that differ with respect to age because age has a powerful influence on the risk of cancer.

Risk of getting or dying from the disease before age 75 (%): The probability or risk of individuals getting/dying from cancer. It is expressed as the number of newborn children (out of 100 or 1,000) who would be expected to develop/die from a particular cancer before the age of 75 if they had the rates of cancer observed in the period in the absence of competing causes.

Source: GLOBOCAN 2008, Cancer Incidence and Mortality Worldwide: IARC CancerBase No. 10: International Agency for Research on Cancer (Lyon, France); 2010. Available from: <http://globocan.iarc.fr>.

fed a standard diet after removal of the pellet; tumors were stimulated in mice fed diets containing either isolated soy protein or isoflavone extracts.

One finding in Helferich's work that points to the potential safety of whole soy foods for breast cancer patients often is overlooked in media reports and is unknown by most oncologists: This same research demonstrated that minimally processed soy in the form of soy flour did not stimulate tumor growth (*Journal of Agricultural and Food Chemistry* 53:8542–8550, 2005).

The breast cancer patient is left trying to decide how much weight to place on research conducted in animals when making her postcancer nutrition plan. And I am here to report that the postcancer psyche is tricky. As much as I want to include all the magical anticancer foods and supplements possible, I just as passionately do not want to do anything at all that might cause recurrence. (Not everyone is aware that recurrent metastatic breast cancer is incurable, most often appearing in bone, lungs, or liver.)

Susan Love, a medical doctor and author of *Dr. Susan Love's Breast Book*—known to the community of breast cancer patients as the “breast cancer bible”—disagrees with generalizing animal data to women. (Love also heads the Dr. Susan Love Research Foundation, whose website [www.dsrlf.org] is a treasure trove of well-organized information about the disease.)

“The issue is that in mice and rats, there's no question that dietary soy or genistein can increase metastases. [Those findings] gave everybody pause and led to the proscription by all oncologists to Never Eat Soy. Soy in the human diet, however, is different from giving artificial soy to mice and rats. The big mistake that we make is conflating the data, especially for causation or recurrence; mice are just not people. You have to be really careful.”

Another reason to be careful about assigning too much importance to animal studies is that there are crucial differences in isoflavone metabolism between athymic mice and humans. “Because mice are poorly able to conjugate phenolic compounds such as isoflavones,” writes Mark Messina in an article on soy and the breast cancer patient (<http://tinyurl.com/MessinaSoy>), “circulating levels of unconjugated genistein, the biologically active form, are much higher in these mice than they are in humans.” Messina is an *inform* contributing editor and president of Nutrition Matters, Inc., in Port Townsend, Washington, USA.

“Furthermore, in mice, despite similar genistein exposure, the consumption of more concentrated or processed soy products leads to higher unconjugated genistein levels and greater tumor stimulation. This observation is generally cited as the basis for recommendations endorsing the use of soy foods but not soy supplements by breast cancer patients. However, in humans, processing does not affect genistein metabolism. Thus, at least in regard to isoflavone metabolism, there appears to be little basis for differentiating between the two types of isoflavone-containing products.”

Research published in the September issue of *Food and Chemical Toxicology* (49:2279–2284, 2011) provides a different answer to a similar question and highlights the limitations of animal research, because it shows how slight changes in the model can produce different results.

In research led by Atsuko Onoda of the Saga Nutraceuticals Research Institute in Japan, scientists looked at the effect on ovariectomized mice implanted with MCF-7 cells of diets consisting of an isoflavone mixture or genistein vs. a control diet.

Unlike the earlier work, there were no significant differences in tumor growth among the treatment groups and control

group. (In other words, the dietary genistein did not promote tumor growth as it appears to have done in previous studies.) The major difference between the earlier and later work is in the estrogenic environment of the medium in which the MCF-7 cells were cultured before implantation. Onoda *et al.* used a low-estrogen environment; Helferich and his team used a high-estrogen environment. The question is, which cells or conditions best reflect the microenvironment in postmenopausal women. Perhaps future studies will provide a definitive answer.

Helferich, in an interview, called whole soy products such as tofu, soy milk, and miso “healthful foods,” but urged breast cancer patients to eat a variety of legumes in the form of dried beans. (A study from the 1980s examined data from 41 countries and revealed that countries with the greatest consumption of beans had the lowest death rates due to breast, prostate, and colon cancer [*Cancer Research* 41:3685–3689, 1981].)

“Do not make soy your only legume,” Helferich cautioned, adding that in his opinion, taking isoflavones in the concentrated form of dietary supplements is dangerous for both women at high risk of breast cancer and women who have had breast cancer.

Epi and clinical trump animal

Recent epidemiological and clinical studies (which trump animal studies in the hierarchy of research reliability) have found soy consumption to be safe for women with breast cancer and potentially even protective.

In a well-designed prospective study led by Xiao Ou Shu of Vanderbilt University (Nashville, Tennessee, USA), more than 5,000 surgically treated breast cancer patients in Shanghai, China, were followed for four years. The women who ate the most soy—more than 15 g of soy protein and 62 mg of isoflavones/day—saw a significant 30% reduction in cancer recurrence and mortality. The study appeared in the *Journal of the American Medical Association* (302:2437–2443, 2009).

“Higher soy intake was still beneficial, but there was a suggestion that as you started to consume more than 20 g of soy protein/day, some of the benefit was lost,” notes Messina. “The trend was not significant, however.”

Another study published in 2009 followed almost 2,000 US breast cancer patients for six years. Researchers led by Neela Guha of the University of California, Berkeley (USA) found that soy consumption may reduce the risk of recurrence in women who have not been treated with tamoxifen, and “furthermore does not appear to negate the effects of tamoxifen.”

An unpublished clinical study led by Seema Khan of the Northwestern University Feinberg School of Medicine (Evanston, Illinois, USA) examined human breast cells obtained by fine needle aspiration from healthy women at high risk for breast cancer before and after exposure to isoflavone supplements. After six months of supplementation, there was no difference in markers

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indicating cell proliferation between the placebo and supplemented (150 mg/day of isoflavones) groups.

Khan, who is a surgical oncologist, noted that she and her group also measured the expression of a number of genes before and after supplementation. There was no change one way or the other in postmenopausal women, she said. But there was “a hint of cell growth” in premenopausal subjects after statistical adjustments.

“When my patients ask me about soy consumption,” she said, “I tell them that if they like soy-containing foods, they shouldn’t avoid them. I do, however, caution them about [isoflavone] supplements.”

Khan’s advice is more conservative than that of the American Cancer Society, which has since 2006 recommended that breast cancer patients can safely consume up to three servings of soy foods/day (<http://tinyurl.com/ACS-Guidelines>).

Do results in Asian women generalize?

The criticism most often leveled against the Shu epidemiological study (and several others) is that results in Asian women should not be extrapolated to Western women. The former group tends to have much greater intake of soy foods from early in life onward; the latter generally has barely any. Work by Leena Hilakivi-Clarke, a professor of oncology at Georgetown University (Washington, DC, USA) and others finds that when isoflavones are consumed before puberty and during early adolescence, they are protective against breast cancer.

WHAT IS AN MCF-7 CELL, ANYWAY?

MCF-7 is a breast cancer cell line isolated in 1970 from a 69-year-old Caucasian woman. The acronym refers to the Michigan Cancer Foundation (now the Karmanos Cancer Institute in Detroit, USA), where Herbert Soule and co-workers established the cell line in 1973. The cell line exhibits tumorigenicity in mice, but only with estrogen supplementation.

The patient, whose name—Frances Mallon—is unknown to the vast majority of cancer researchers, died in 1970. Her cells are the source of much of the current knowledge about breast cancer. At the time of sampling, she was a nun in the convent of the Immaculate Heart of Mary in Monroe, Michigan, USA, under the name of Sister Catherine Frances.

MCF-7 and two other breast cancer cell (BCC) lines, named T-47D and MDA-MB-231, account for more than two-thirds of all abstracts reporting studies on mentioned BCC lines, as concluded from a Medline-based survey published in 2004. Cell lines established prior to MCF-7 did not live longer than a few months.

Source: Wikipedia, accessed August 1, 2011

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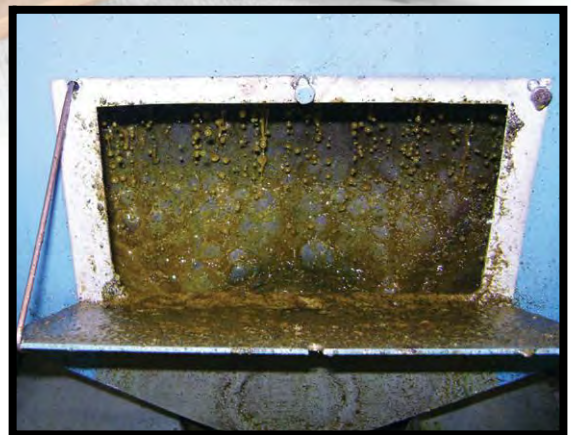
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Sugar to glucaric acid: a sweet path to renewable chemicals

Tyler N. Smith

During the last two years US consumers have seen the introduction of numerous new automatic dishwashing detergents. Almost everyone—from upstarts such as Method Home to majors like Procter & Gamble—has introduced new phosphate-free formulations. With some notable exceptions, these introductions have left consumers with spotting, filming, and frustration. In the same period, a European commission determined that cleaner dishes required the continued allowance of phosphates and declined to ban their use, as several US states have. In both Europe and North America, detergent brands are innovating to recover and gain market share, yet the market is still wide open, as no dominant phosphate replacement has emerged. Finding a suitable phosphate replacement is a complex problem in which formulators must try to balance ingredient cost, performance, and a demand for green chemicals.

One such solution is glucaric acid, a sugar acid identified in a 2004 US Department of Energy report entitled *Top Value Added Chemicals from Biomass* (available from <http://www1.eere.energy.gov/biomass/pdfs/35523.pdf>) as one of the 12 key “building block” renewable chemicals with great promise in terms of cost, versatility, and sustainability. Glucaric acid is produced from renewable sources, has a favorable environmental profile, and has the potential for widespread applications across many markets. Historically, however, low reaction yields coupled with large waste streams have kept the cost

of glucaric acid production prohibitively high, denying formulators the opportunity to incorporate this versatile chemical into their product lines.

Missoula, Montana (USA)-based Rivertop Renewables has developed a breakthrough technology to produce renewable chemicals such as glucaric acid. Based on more than 10 years of research in the labs of Donald E. Kiely, a professor emeritus of carbohydrate chemistry from the University of Montana, Rivertop’s proprietary oxidation technology can produce salts of glucaric acid and other building block chemicals at an economical price and at commercial scale.

Rivertop has refined its oxidation technology into a catalytic process that reduces the amount of chemical inputs and consumption, minimizes the production of waste, and increases the yield of valuable end-use products. The oxidation platform is adaptable to feedstocks beyond glucose such as xylose, arabinose, and galactose, as well as other mono- and polysaccharides. As the cost of these feedstocks comes down or as specialty applications drive demand, Rivertop will explore the commercialization of other sugar acids, such as xylaric, arabinaric, and galactaric acids.

A high-performance ingredient in detergents

Using its proprietary oxidation technology, Rivertop has begun to produce glucarate-based products designed as detergent builders. Initially the company aims to replace the legacy ingredient, tripolyphosphate, as well as newer alternatives that are either too costly or that underperform. While phosphates have historically been used due to their effectiveness and low cost, their negative impacts on water supplies have forced governments around the world to ban their use.

Other alternatives to phosphates, such as citrate, can serve as detergent builders in both automatic dishwashing and laundry detergents, but their inability to sequester typical levels of calcium in the wash water has frustrated customers and forced the industry to look

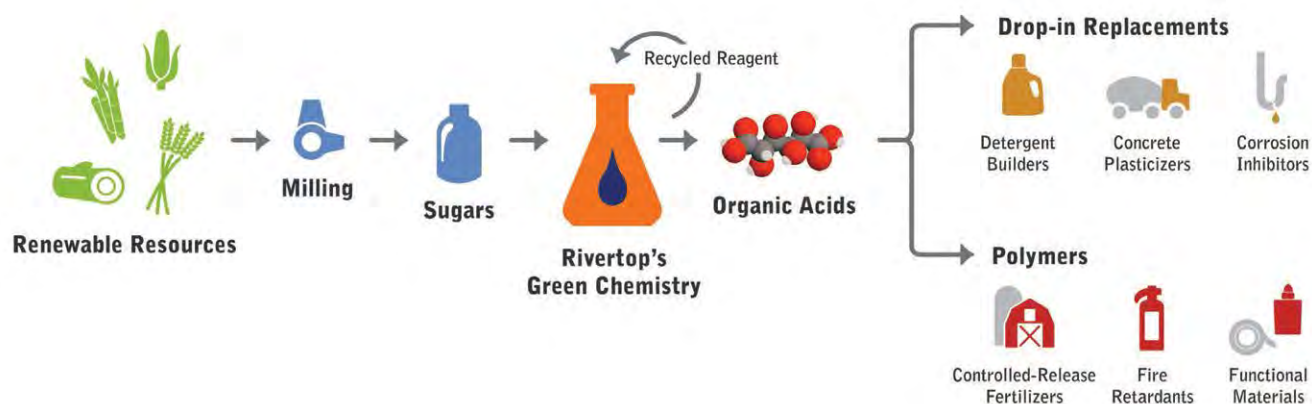


FIG. 1. The proprietary oxidation technology used to convert sugar into organic acids and products is represented in this flow chart.

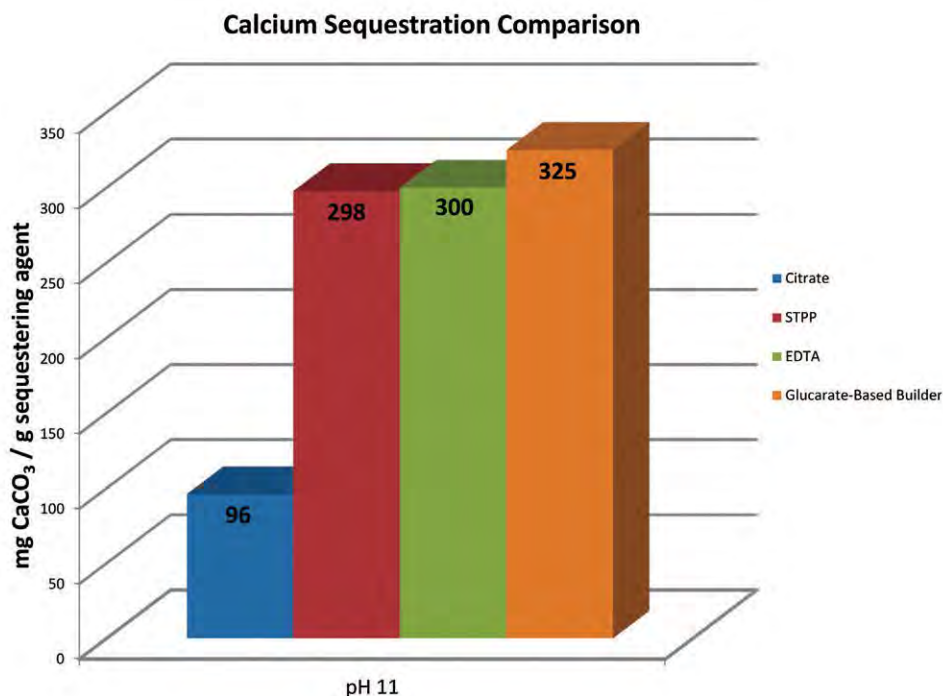


FIG. 2. This bar graph compares calcium sequestration for citrate, sodium tripolyphosphate (STPP), ethylenediamine tetraacetic acid (EDTA), and glucaric acid. Courtesy of Rivertop Renewables.

for better solutions. Polymer dispersants offer a partial alternative, but their applications are limited by cost and concentration constraints.

Research has shown that glucarate is a highly effective calcium sequestering agent when formulated with aluminate or borate at pH levels typical to automatic dishwashing detergents. Additionally, glucarate is an effective corrosion inhibitor, an added benefit for the protection of silverware and dishwashers.

Rivertop's chemists began testing their glucarate builders in consumer dishwashers under controlled conditions in the third quarter of 2011, and they have begun to work with industry partners on advanced formulations to meet specific needs of manufacturers and consumers.

Ultimately Rivertop hopes to provide a suite of cleaning product solutions capable of meeting the growing global demand for phosphate replacement.

Beyond detergents

While detergents will serve as the initial and lead application of Rivertop's glucarate products, the versatility of this green chemical will allow the company to enter additional markets that are in need of cost-competitive chelating agents, corrosion inhibitors, concrete additives, and starting materials for bio-based polymers and chemicals.

Many of the best innovations in industrial water chemistries have come from the detergent industry. Research by Rivertop and others strongly suggests that glucaric acid salts can prevent both scale and corrosion in critical water systems, including manufacturing equipment, bridges, and highways. The company's third-party tests have demonstrated effective corrosion prevention in road de-icers. The biodegradability of Rivertop's glucarates adds value as demands for water conservation increase.

Glucaric acid has also shown broad potential in functional materials such as concrete admixtures and wallboard dispersants. As a concrete admixture, glucaric acid has already met ASTM standard C494 for set retarding and water reduction, adding strength, increasing flowability, and managing set time.

Early research suggests glucaric acid-based polymers are also applicable for adhesives, films, and gels, where they allow for high performance with increased biodegradability.

Feedstocks

Glucose will serve as the initial feedstock for the company's green chemistry technology, but Rivertop's oxidation process offers versatility as a platform process for producing value-added products from a wide variety of

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FIG. 3. Rivertop's product testing automatic dishwasher machines. Photo by Todd Goodrich/ University of Montana.

renewable, agricultural feedstocks. The process can use a variety of sugar feedstocks, including mono- and polysaccharides, to produce a portfolio of renewable chemicals. Although future chemicals will be alike in basic form, the products from different sugars offer unique properties that will enable the company to fine tune performance in different applications as well as open up entirely new uses.

Currently Rivertop sources its glucose from corn—the cheapest and most abundant source of sugar in the United States. However, the company continues to investigate other potential sources for low-cost sugars such as algae and biomass.

Commercialization plans

Beginning in 2012, Rivertop plans to start production with capacity capable of up to 6–10 million pounds (2.7–4.5 million kg) of product annually through contract manufacturing. To further optimize the cost efficiency of the process and achieve additional cost optimization, Rivertop will build a “semi-works” production facility (the last step in scaling the

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Briefs

Bunge North America (White Plains, New York, USA) has purchased C.F. Sauer's Dean Foods margarine operations, according to the *Richmond Times-Dispatch* (Virginia, USA) newspaper. Sauer operates two production and packaging facilities: one in Richmond and one in New Century, Kansas, USA. The latter will close at an unspecified date. The two Dean Foods facilities have an annual capacity of nearly 400 million pounds (180 million kg) of margarine. (Richmond's Dean Foods Co. is separate from the giant Dean Foods based in Dallas, Texas, USA.)

■■■

In August 2011, India put into force the Food Safety and Standards Act of 2006. This legislation legally empowers the Food Safety and Standards Authority of India (FSSAI) to handle all food safety issues in India. FSSAI was created to enact science-based standards for articles of food and "to regulate their manufacture, storage, distribution, sale, and import to ensure availability of safe and wholesome food for human consumption," the FSSAI website notes.

■■■

The stars of the soybean world—at least in terms of stress resistance—come from a little village in Sweden, called Fiskeby. US Department of Agriculture (USDA) scientists were working on screening thousands of soybean varieties to generate the family tree of North American soybeans when they found the Fiskeby varieties, which also got high marks for salt, ozone, and drought tolerance.

■■■

Mega-research firm Battelle (Columbus, Ohio, USA) says it is close to being able to commercialize a soy-meal diaper. To be more precise, Battelle has created soy-based superabsorbent polymers that could replace up to a third of the petroleum-based polymers used in disposable diapers. The project is funded by the United Soybean Board and the Ohio Soybean Council. ■

News & Noteworthy



Malaysia to develop its own certification scheme

Malaysia announced in August 2011 that it will develop a certification scheme to ensure that oil crushed by the world's No. 2 palm oil producer is sustainable.

According to Malaysia's *Business Times* newspaper, Commodities Minister Bernard Dompok said the country had to act on its own.

"This is at a preliminary stage," Dompok was quoted as saying during a working visit to promote Malaysian commodities in Australia.

"But we will go ahead because the Roundtable on Sustainable Palm Oil (RSPO; Zurich, Switzerland) keeps on changing its goal posts on how to produce sustainable palm oil," he added, referring to a body of planters and environmental groups (principally the World Wildlife Fund) set up in 2004 to certify sustainably produced palm oil.

Indonesia, the No. 1 palm oil producer, plans to issue its own certification for planters beginning in 2012 "on growing concerns that the RSPO has been dominated by green groups and sales of eco-friendly palm oil have been slow," the *Times* article said.

Malaysian Palm Oil Council Chief Executive Officer Yusof Basiron was quoted as

saying the Malaysian scheme will emulate the one by Indonesia, which is mandatory, and where offenders could be punished by law.

For its part, the RSPO said in August 2011 that three major US companies—the world's largest retailer, Wal-Mart Stores, Inc.; global confectionery producer, The Hershey Co.; and financial services firm, Citigroup—all recently joined RSPO. The organization also said that it had seen a 20% increase in membership (currently at 650 member organizations from 50 countries) in the first six months of 2011.

Australian olive oil standard debuts

It is official: Standards Australia—a not-for-profit organization recognized by the Australian government as the primary non-governmental standards body in Australia—approved a new voluntary olive oil labeling standard in July 2011.

Calling it "a benchmark for olive oil quality to ensure consumers get the product they pay for," Colin Blair, Standards Australia, told the *Olive Oil Times* (*Times*) that "olive oil can be found in virtually every kitchen

CONTINUED ON NEXT PAGE

pantry, and this standard will result in better quality products for everyday consumers.”

The new Australian Standard for Olive and Olive-Pomace Oils will, according to Standards Australia and the *Times*:

- Clearly outline different grades of oil—whether fresh or refined;
- Unambiguously define what constitutes extra-virgin olive oil;
- Include the most current and effective testing methods for quality and authenticity;
- Provide a technical basis for “best before” claims;
- Provide labeling requirements to minimize consumer confusion;
- Crack down on misuse of words such as “premium,” “super,” “pure,” and “light” or “lite”;
- Require substantiation of words describing country/region of origin;
- Require substantiation of processing methods (e.g., cold pressed, first extraction); and
- Accommodate the natural variations that occur in different countries, olive varieties, and regions, without compromising the ability to test and verify quality.

New Zealand opted out of the voluntary standard. Katherine Rich, chief executive officer of the New Zealand Food & Grocery Council, was quoted by the *Times* as saying that grocers there feared that olive oil producers in the Mediterranean, who provide more than 95% of the olive oil sold in New Zealand, “will struggle to meet the new rules as drafted.”

In February 2011, the International Olive Council (IOC; Madrid, Spain) issued a statement noting the ways in which the draft standard differed from the provisions in the IOC trade standard. “The most notable discrepancies,” the statement said, “could become barriers to international trade or make it easier for adulteration.”

Australian olive oil expert Richard Gawel disagreed that the new chemical standard will be a barrier to trade. “The foreword to the standard states that any divergence from the IOC standards was based on solid data collected regarding the ranges in the natural chemistry of Australian olive oils,” the *Times* quoted Gawel as saying.

“What this has meant was that a couple of standards were relaxed,” he added. “If anything, this should make free trade easier. Common sense would dictate that free trade is restricted when standards are tightened, not relaxed.”

Australians reportedly consume about 40 million liters of olive oil per year, which is the highest per capita consumption outside of the Mediterranean region, according to the *Times* article.

China is increasing investment in South America

A new report by Rabobank’s Food & Agribusiness Research and Advisory (FAR) department examines the exponential rise of Chinese investments in South America, particularly in Brazilian and Argentine agribusiness.

According to the report:

- China’s investment projects in South American agriculture reflect a combination of factors, including its interest in securing long-term food supplies and expanding its sourcing options, as well as being an attempt to diversify investment portfolios from US treasuries into commodities, and

possibly signaling a response to an internal supply-demand imbalance.

- China is further developing its historical trading relationship with Brazil, particularly through investments in oil, energy, minerals, and, increasingly, agriculture.
- Owing to stricter regulation of foreign land ownership in Brazil and Argentina, China has changed its investment model, investing in infrastructure rather than land in exchange for crops.
- The flow of deals with Brazil is expected to continue, if a more balanced trade relationship follows; the outcome will have profound effects on Brazil’s political and economic trajectory, and will shape how China pursues relationships in the rest of South America. Brazil has more resources that could be put into crop production than any other country in the world, according to Rabobank.

The volume of investment projects by Chinese companies in South America has been expanding exponentially since 2007, Rabobank says. Brazil, in particular, provides an enormous potential market for Chinese exports and has historically been a key partner for China in the energy, manufacturing, and other sectors.

China has a continuing need to secure soybean and corn supplies—a need that matches well with South America’s productive strengths. With grain stocks at historically low levels, the world will continue to look to South America for incremental production increases.

Kraft to split in two

Kraft Foods Inc. (Northfield, Illinois, USA) said in August 2011 that it plans to split into a \$16 billion North American grocery business and a \$32 billion global snacks business, possibly by the end of 2012.

The grocery business would include Kraft Macaroni & Cheese, Maxwell House coffee, Oscar Mayer lunch meats, and Philadelphia cream cheese. The snacks business would feature Oreo cookies, Trident gums, Cadbury chocolates, and Jacobs coffee, according to FoodProcessing.com.

Coconut oil-based coating for pipelines

Mexican scientists are developing a coating from coconut oil to protect pipelines from rust in an effort to find a replacement for the products currently being imported by state-owned oil giant Petróleos Mexicanos, or Pemex, the research project’s director told the EFE News Services in late July 2011.

The formulation is still in the laboratory stage, but it “has been shown to be competitive” with commercial products, project director Jorge Ascencio reportedly said in a statement.

The project is being conducted at the Physical Sciences Institute in the central state of Morelos with the support of the National Autonomous University of Mexico, the National Science and Technology Council, and the government of the southern state of Guerrero, EFE said.

The oil from coconuts, which are abundant in Mexico’s tropical areas, separates the water that damages pipelines from the petroleum, Ascencio said.

“We call it Coco-Guerrero Inhibitor. It is the equivalent of an imidazoline (a corrosion prevention substance) and what comes next is learning how to make it on a large scale and at low cost,” EFE quoted Ascencio as saying.

Canola is Canada's cash crop

Canola's contribution to the Canadian economy has grown to \$15.4 billion annually, or about \$1.4 billion more than when last measured by the Canola Council of Canada (CCC).

"The canola industry has grown and so has our contribution to the Canadian economy," said CCC president JoAnne Buth in a news release.

A report, titled *The Economic Impact of Canadian Grown Canola and its End Products on the Canadian Economy*, was released at the Canola Council of Canada annual convention in Saskatoon in July 2011. It was developed by LMC International, Ltd., an agribusiness research firm based in Oxford, UK.

The study is based on 2007/08, 2008/09, and 2009/10 data, whereas the last CCC study of economic benefits of canola to Canada was based on data up to 2008. The former study pegged economic benefits at \$14.1 billion. The report (pdf) is available at <http://tinyurl.com/CanolaReport>.

US court actions of interest

In July 2011, a federal judge in California, USA, refused to dismiss proposed class actions alleging that Ben & Jerry's and Breyers ice cream products were falsely advertised as "all natural."

Filed after the Center for Science in the Public Interest, a citizen action group based in Washington, DC, USA, drew attention to the issue, the complaints argue that the two units owned by Unilever PLC "misrepresented ice cream containing 'Dutch' or 'alkalized cocoa' as 'all-natural,'" even though the ingredient is purportedly processed with potassium carbonate. The defendants had sought to dismiss both actions because plaintiffs did not demonstrate an injury resulting from the "all natural" claim and could easily have applied for a refund if dissatisfied.

Noting that the plaintiffs may very well "have no actionable claims," the court reasoned that, "If the plaintiffs did indeed purchase the ice cream based on the representation that it was 'all natural' and if that representation proves to be false, then they arguably have suffered an injury in fact."

In another action, a federal judge in California granted class certification in a suit alleging that Diamond Foods, Inc. (Stockton, California, USA) has since 2006 misbranded its shelled walnut products and misled consumers by using "express and implied statements about the positive effects of omega-3 fatty acid consumption on health." The labels at issue featured a heart symbol banner with the phrase "Omega 3 2.5 g per serving" and a statement that "the omega-3 in walnuts can help you get the proper balance of fatty acids your body needs for promoting heart health. In fact, according to the Food and Drug Administration [FDA], supportive but not conclusive research shows that eating 1.5 oz (43 grams) of walnuts per day, as part of a low saturated fat and low cholesterol diet, and not resulting in increased caloric intake, may reduce the risk of coronary heart disease."

After the FDA issued a February 2010 warning letter about these claims, a consumer filed a complaint alleging that Diamond used language not authorized by FDA and that its products "did not provide the health benefits that were claimed on the package labels." The plaintiff then moved to certify a class of all persons who purchased "Diamond of California Shelled Walnut products in various sizes after March 22, 2006, until the present bearing labels" with the heart symbol banner and structural claim. ■



Sustainability watch

The partnership between DuPont and AquaChile has resulted in a yeast-based aquaculture feed ingredient that provides a new land-based source of eicosapentaenoic acid (EPA; 20:5n-3), the companies said in a news release.

The partnership began in 2007 with an initial focus on Atlantic salmon. Farming of salmon and trout is an estimated \$10 billion annual business globally and is growing 6–10% per year, DuPont said.

Aquaculture, including salmon production, currently uses about 50% of the fishmeal and 80% of the fish oil produced from the global catch of feeder fish.

DuPont says it has developed a yeast that is rich in EPA to replace the fish oil in the salmon diet, greatly reducing the need for feeder fish. Currently, about four kilograms of feeder fish are used to produce the fish oil needed to raise one kilogram of farmed salmon. The new yeast diet requires only one kg of wild fish per kg of salmon, or 75% fewer feeder fish, while maintaining the levels of omega-3 fatty acids required for the salmon to be healthy and nutritious.

This new approach to salmon aquaculture has been successfully implemented in AquaChile's commercial farms in the Patagonia region of Chile, the companies said. The first salmon from these farms were scheduled to be introduced in September 2011 to limited customers through market testing in the United States. ■

MEMBERSHIP APPLICATION

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This Code has been adopted by AOCS to define the rules of professional conduct for its members. As a condition of membership, it shall be signed by each applicant.

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Signature of Applicant _____

Australia's Mission NewEnergy Ltd. announced on August 10 that for the fiscal year ending June 30, 2011, the company had experienced a net loss of A\$20.5 million (US\$21.9 million), a 79% decrease from the preceding fiscal year. Revenue for the year was A\$16.9 million, an increase of 3% from 2010. Mission NewEnergy currently has contracts with over 100,000 farmers, who are cultivating jatropha across five Indian states. Nathan Mahalingam, chief executive officer of the company, said, "Once the trees reach maturity, Mission will have an integrated business that produces biofuels that are forecast to be cost competitive with petroleum products at \$52 per barrel."

■■■

Royal Dutch Shell, the petroleum company, has stopped supplying gasoline mixed with 10% ethanol (E10) at its service stations in the Australian state of Victoria. Even though the fuel was priced about \$0.04 per liter cheaper than full-strength gasoline, it was not popular with customers. Shell will, however, continue to market E10 in the rest of Australia

■■■

The first trans-Atlantic commercial flight powered by biofuel landed in Madrid, Spain, on August 3, 2011. The Aeromexico Boeing 777 left from Mexico City and traveled the 9,000 km distance in 11 hours. The fuel was a blend of 70% conventional kerosene plus 30% biofuel derived from *Jatropha curcas*, grown in the Mexican states of Chiapas, Puebla, Veracruz, Yucatan, and Michoacan.

The director general of the company, Gilberto López Meyer, highlighted the fact that production costs related to the biofuel made from jatropha are still 10 times higher than traditional aviation fuel, but he also stressed that the greater the demand for environmentally friendly biofuels, the quicker production costs will diminish (<http://tinyurl.com/Mexico-Madrid>).

■■■

The Indonesian government announced in August that it would conduct pilot studies on the production of cellulosic bioethanol from the empty stems and midribs of oil palms remaining after the

CONTINUED ON NEXT PAGE

Biofuels News



A US Marine Corps MV-22 Osprey lifts off from Naval Air Station Patuxent River, Maryland, during a successful biofuel test flight. The tiltrotor aircraft flew at altitudes of up to 25,000 feet (7,600 meters) on a 50:50 blend of camelina-based biofuel and standard petroleum-based JP-5 fuel. (US Navy photo)

GENERAL

Add another to list of aircraft flying on biofuel

A US Marine Corps MV-22 Osprey tilt rotor aircraft flew on biofuels for the first time on August 10 at the Naval Air Station, Patuxent River, Maryland. The craft was flown at altitudes of up to 25,000 feet (7,600 meters) on a 50:50 blend of camelina-based and standard petroleum-based JP-5 aviation fuel

The MV-22 is a multi-mission aircraft, combining the functionality of a helicopter with the long range and high speed of a turboprop aircraft.

Secretary of the Navy Ray Mabus said, "[T]hese types of fuels will . . . increase our energy efficiency and help lead the nation toward a clean energy economy."

The MV-22 is the fourth Navy aircraft to test this biofuel blend successfully. The fifth test, also successful, was carried out on August 24 with a T-45 aircraft, which is used

to train pilots on carrier and tactical mission operations.

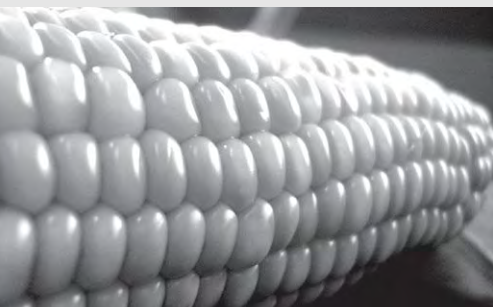
Fuel standards to rise in US, Canada

Corporate average fuel economy standards were first enacted by the US Congress in 1975 to increase the fuel economy of cars and light trucks sold in the country. Recent announcements have updated these standards and established goals for heavy trucks as well.

Cars, light trucks. US President Barack Obama announced an agreement on July 29 to increase the fuel economy standards for cars and light-duty trucks to an average of 54.5 miles per gallon (mpg: or 10.1 liters per 100 kilometers), while reducing greenhouse gas emissions to 163 grams per mile (101 grams per kilometer) by model year 2025. The 13 automakers participating in the agreement—Ford, GM, Chrysler, BMW, Honda, Hyundai, Jaguar/Land Rover, Kia, Mazda, Mitsubishi,

CONTINUED ON NEXT PAGE

harvest of the fruits. The project will first aim to produce 10 liters of ethanol per day. Indonesia already produces starch-based bioethanol, mostly from corn, sugarcane, and cassava. Funding comes from the Korea International Cooperation Agency, with technical assistance from the Korea Institute of Science and Technology and ChangHae Ethanol Co. Ltd. (Jeonju, South Korea). Pilot plant operation is expected to begin before the end of 2012. Bioethanol researcher Yanni Sudiyan told *The Jakarta Post* that one metric ton of oil palm stems could produce 150 liters of bioethanol, but the product would be less pure than the 99.5% needed for use in motor engines.



Economist Ronald Plain of the University of Missouri Extension Service (Columbia, USA) pointed out in August that more corn will fuel US gas tanks in the next year than will feed US livestock and poultry. This conclusion came from analysis of the US Department of Agriculture Crop Product and Supply/Demand Report showing cuts to yield attributable to adverse weather during the 2011 growing season. The estimate is that ethanol production will use 200 million more bushels of corn than farm animals eat.



The business research and consulting firm Frost and Sullivan presented its Asia Pacific Green Excellence Award for Product Innovation in Bioenergy to Neste Oil (Espoo, Finland) on August 25. The citation ranked Neste as the best performer for its product profile and business commitment to sustainability and environmental accountability in the category of Chemicals. Neste is well known for its premium-grade renewable diesel. Frost and Sullivan also recognized Algaetech International Sdn. Bhd., Kuala Lumpur, Malaysia, for Service Innovation in Algae Technology; in particular, its contributions to sustainability were acknowledged. ■

Nissan, Toyota, and Volvo—taken together account for over 90% of all vehicles sold in the United States. The United Auto Workers union, as well as the State of California, were integral to reaching this agreement.

In this new program, automakers need to increase the fuel efficiency of cars by 5% annually from 2017 to 2025. Efficiency for light trucks will need to rise 3.5% annually during 2017–2020 and 5% annually thereafter to 2025.

The 2025 standard builds on the already established standards, which are set to reach 35.5 mpg by 2016. Government estimates are that consumers will have saved \$1.7 trillion at the pump over the life of the program in 2025 (www.whitehouse.gov/sites/default/files/fuel_economy_report.pdf). Twelve billion barrels of oil also will not have been consumed. A person purchasing a new vehicle in 2025 will save \$8,200 in fuel costs when compared with a similar vehicle in 2010.

As might have been anticipated, reactions to the announcement were mixed. They ranged from the Natural Resources Defense Council (www.nrdc.org/transportation/go60mpg), which urged a final target above 60 mpg, to a claim by the American Road and Transportation Builders Assoc. that such an increase would result in the loss of more than \$65 billion in federal funding (through fuel taxes) for state and local highway, bridge, and transit improvements (<http://tinyurl.com/ARTBAestimate>). Others predict increases in highway deaths in accidents as cars are downsized to achieve increased fuel economy.

Heavy trucks. On August 9, Obama announced fuel standards developed by the US Department of Transportation and the Environmental Protection Agency for work trucks, buses, and other heavy-duty vehicles (i.e., gross vehicle weight rating exceeding 8,500 pounds, or 3,900 kilograms). Medium- and heavy-duty vehicles are far less numerous than passenger cars and trucks; they make up just 4% of the vehicles on the road, but account for 17% of transportation oil consumption.

Cost savings for American businesses are predicted to be \$50 billion over the life of the program (model year 2014 to 2018 vehicles), on top of the \$1.7 trillion predicted for cars and light trucks (<http://tinyurl.com/WhiteHouse-HDtrucks>).

Semi-trucks will be required to achieve up to approximately a 20% reduction in fuel consumption by 2018, saving up to four gallons of fuel for every 100 miles traveled. Standards for heavy duty pickup trucks and

vans will be determined by the fuel they use—diesel or gasoline. The outcome will be a savings of about one gallon of fuel for every 100 miles traveled. And vocational vehicles—including delivery trucks, buses, and garbage trucks—will be required to reduce fuel consumption by approximately 10% by model year 2018. As a result these trucks could save an average of one gallon of fuel for every 100 miles traveled.

The Engine Manufacturers Assoc. and the Truck Manufacturers Assoc. praised the new standards. Joe Rajkovic, director of regulatory affairs for the Owner Operator Independent Drivers Assoc. commented, however, “They also totally overlooked the most effective fuel-savings method of all—driver training, which is responsible for 35% of fuel economy and which costs far less than any new technology. . .” (http://www.truckinginfo.com/news/news-detail.asp?news_id=74382). And the American Trucking Associations suggested that, in addition to the new fuel economy standards, a speed limit of 65 miles (105 kilometers) per hour should be imposed for all vehicles.

Canada also announced on August 9 that it would start to regulate greenhouse gas emissions from heavy trucks starting in the 2014 year, as part of the development of common North American standards.

Growth of biofuel use slows in the EU

Biofuel consumption continued to increase in the European Union (EU) in 2010, but at a slower pace than in preceding years. In the transportation sector, use increased by only 1.7 million metric tons of oil equivalent (Mtoe) in 2010, compared with 2.6 Mtoe in 2009. Total consumption in 2010 was probably about 13.9 Mtoe.

These observations come from the EurObserv'ER (www.eurobserv-er.org) barometer, a project supported by the European Commission that measures the progress made by renewable energies in each renewable energy sector and in each member state of the European Union in an as up-to-date way as possible.

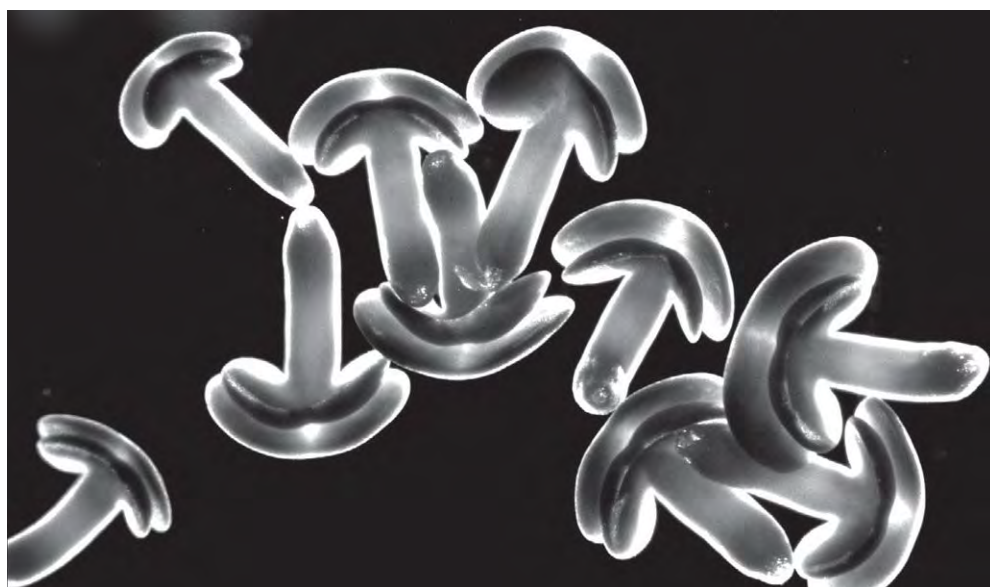
Growth in bioethanol fuel consumption was 26.1% between 2009 and 2010, whereas that of biodiesel consumption was 11.1%. The lack of interest in vegetable oil consumption for fuel is becoming stronger (down 14.3%) and may still be attributable to increased German taxation on this biofuel. Greater

detail is available at www.eurobserv-er.org/pdf/biofuels_2011.pdf.

Modeling oil production in plants

Scientists at the US Department of Energy's Brookhaven National Laboratory (BNL; Upton, New York) have developed a computational model for analyzing the metabolic processes in rapeseed plants—particularly those related to the production of oils in their seeds. Their goal is to find ways to optimize the production of plant oils having potential as renewable resources for fuel and industrial chemicals. The model is described in two articles by Jordan Hay and Jörg Schwender in *The Plant Journal* (67:513–525; 526–541, 2011).

The BNL team constructed a computational model of a large-scale metabolic network of developing rapeseed (*Brassica napus*) embryos, based on information mined from biochemical literature, databases, and prior experimental results that set limits on certain variables. The model includes 572 biochemical reactions that play a role in the seed's central metabolism and/or seed oil production, and



These developing embryos were excised from a growing rapeseed plant. The embryos accumulate seed oils, which represent the most energy-dense form of biologically stored sunlight, and have great potential as renewable resources for fuel and industrial chemicals. (Source: Brookhaven National Laboratory, Upton, New York, USA.)

incorporates information on how those reactions are grouped together and interact.

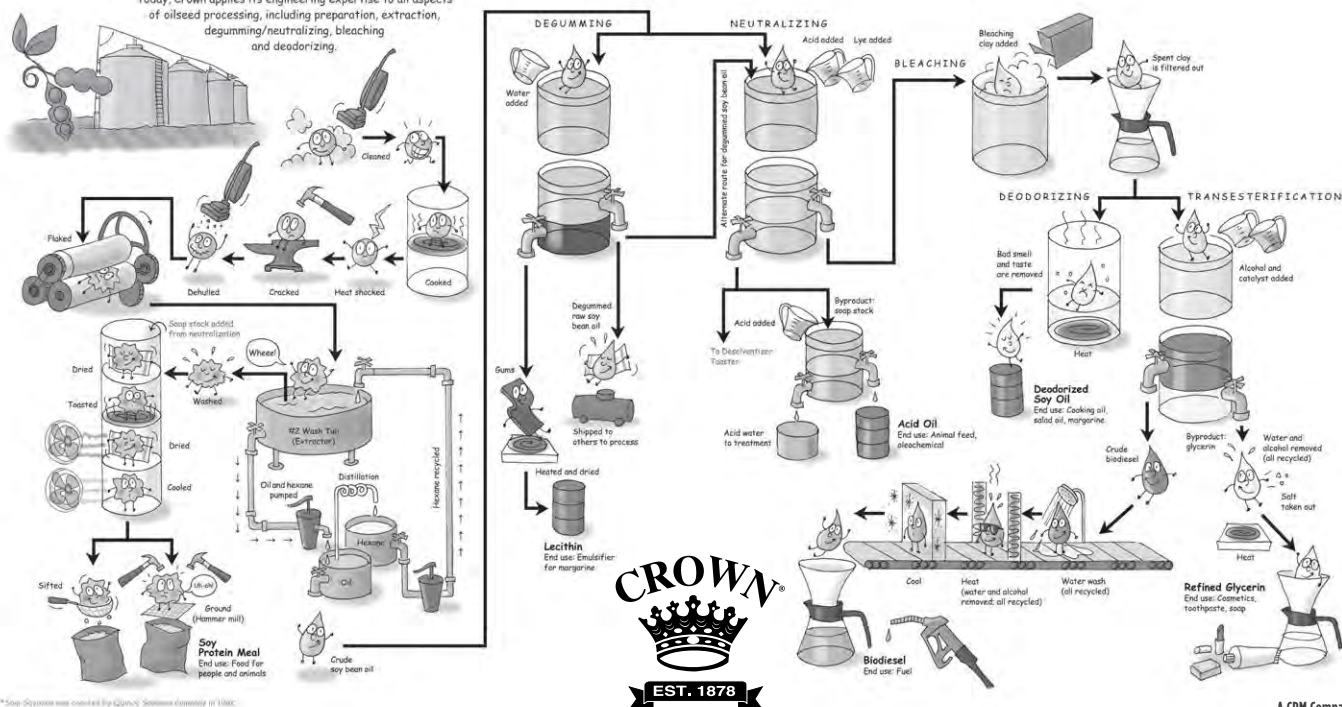
The researchers first tested the validity of the model by comparing it to experimental results from carbon-13 tracing studies using

a relatively simple reaction network. Experimental results were largely consistent with the model.

The scientists then used the model to simulate more complicated metabolic

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processes—for example, changes in oil production or the formation of oil precursors in response to changes in available nutrients (such as different sources of carbon and nitrogen), light conditions, and other variables.

The model allows researchers to assess the potential effects of genetic modifications in a simulated environment. In a BNL statement, Schewender said, “The model has helped us construct a fairly comprehensive overview of the many possible alternative routes involved in oil formation in rapeseed, and categorize particular reactions and pathways according to the efficiency by which the organism converts sugars into oils. So at this stage, we can enumerate, better than before, which genes and reactions are necessary for oil formation, and which make oil production most effective.”

Camelina start-up project

At the end of July the US Department of Agriculture created four new Biomass Crop Assistance Program (BCAP) project areas in six

states to expand the availability of nonfood crops for use in manufacturing liquid biofuels. Two of the new BCAP project areas encompass 51,000 acres (21,000 hectares), half in the state of California and the other half in Washington and Montana.

Camelina will be grown on these acres in rotation with wheat, and AltAir Fuels (headquartered in Seattle, Washington) will process oil from camelina seeds into aviation fuel, renewable diesel, and specialty chemicals. AltAir facilities will be located at or near traditional petroleum refineries, leveraging existing infrastructure including blending and distribution to airports. One plant will be constructed in Bakersfield, California, with initial production expected in late 2012.

The US Farm Service Agency accepted applications through September 16 for five-year contracts with landowners and operators to grow camelina under the BCAP. In this program, camelina producers would receive a base-soil-rental-plus-50% incentive. For example, if a farm's soil rent is \$30/acre, the farmer would receive a \$45/acre annual incentive payment (<http://tinyurl.com/BCAPincentive>).

Increasing rates of biofuel synthesis

Biotechnology research at Rice University (Houston, Texas, USA) has identified a new method for rapidly converting simple glucose into biofuels and petrochemical substitutes. Using the microbiological workhorse *Escherichia coli*, Clementina Dellomonaco and co-workers reported in *Nature* (476:355–359, 2011) that they were able to engineer the organism to reverse one of the most efficient of all metabolic pathways—the β -oxidation cycle—to produce *n*-alcohols, fatty acids, and 3-hydroxy-, 3-keto-, and *trans*- Δ^2 -carboxylic acids.

On a cell-per-cell basis, the bacteria produced butanol, which can be substituted for gasoline in most engines, about 10 times faster than any previously reported organism.

Ramon Gonzalez, associate professor of chemical and biomolecular engineering at Rice, was lead co-author of the *Nature* study. His team reversed the β -oxidation cycle by selectively manipulating about a dozen genes in *E. coli*. They also showed that selective

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manipulations of particular genes could be used to produce fatty acids of particular lengths, including long-chain molecules such as stearic and palmitic acids.

The reversed β -oxidation also should be possible in any industrial organism, said Gonzalez in a statement released by Rice (<http://tinyurl.com/RiceGonzalez>).



ADM provides sustainable soybeans to Europe

On August 10, Archer Daniels Midland Co. (ADM; Decatur, Illinois, USA) announced that it had achieved International Sustainability and Carbon Certification (ISCC) to supply sustainably grown soybeans for the European market.

The ISCC was developed to guarantee that biofuels and biomass for biofuels are produced in compliance with recent European Union (EU) legislation that requires, by January 2011, all biofuels and biomass in Germany to be certified according to the EU Renewable Energy Directive (RED) requirements. RED legislation is intended to enforce social, labor, and environmental requirements for the production and importation of biofuels.

To qualify for certification, companies must meet strict criteria for sustainable production and reduce emissions of greenhouse gases over the entire production chain. ADM and selected farmers in South America underwent intensive audits to evaluate the sustainability of their business practices and processes, as well as traceability within the supply chain.

ADM's crushing facilities in Hamburg and Mainz, Germany, will process up to 250,000 metric tons of sustainable soybeans by the end of the fourth quarter of 2011, the company said.

JATROPHA

Bharat, SG Biofuels to work together

Bharat Renewable Energy Ltd. (BREL), a unit of Bharat Petroleum, India's second-largest petroleum company, and SG Biofuels (SGB; San Diego, California, USA) announced in August their program to work together to develop and cultivate elite hybrids of *Jatropha curcas* for production of biodiesel in India. About 86,000 acres (35,000 hectares) will be involved in this phase of the project.

M.V. Radhakrishnan, chief executive officer (CEO) of BREL, said in a company statement, "With the genetic diversity of their *jatropha* hybrid material, combined with ability to produce large volumes of hybrid seed, SG Biofuels is an ideal partner to work with to successfully develop, validate, and scale *jatropha* as the primary source for biodiesel in India."

The first task is to produce high-performing hybrid varieties of *jatropha* that are adapted to growing conditions in different areas of India. The SGB germplasm library

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of *jatropha* currently totals more than 12,000 genotypes. The company will work with BREL to select, test, and scale the highest-yielding, most commercially viable hybrid varieties for growing in regions in India.

Kirk Haney, CEO of SGB, said in an interview with BiofuelsDigest.com (<http://tinyurl.com/Bharat-SGBiofuels>), "The days of selling seed with a service program that consists of 'Good luck' are over."

In a company statement, Haney said, "Our partnership with BREL is a great example how collaborations across the entire value chain—from crop science and agronomics to

POS Bio-Sciences Announcement

Mr. D.A. (Dale) Kelly, President and CEO of POS Bio-Sciences, is pleased to announce the following position changes within the POS management and scientific team:



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Vice President,
Technology

Dr. Green previously served as Director of Technology.



Udaya Wanasundara, Ph.D.
Principal Scientist,
Lipids and Co-Products

Dr. Wanasundara previously served as Senior Scientist.



Nelson Tang, Ph.D.
Principal Scientist,
Proteins and Plant Extracts

Dr. Tang previously served as Senior Scientist.

downstream refining and logistics—are the key to the successful scaling of jatropha.”

According to the Asian Development Bank, the current cultivation of jatropha and other nonedible oilseeds will need to increase by nearly 80 million acres to meet India's biodiesel targets of blending 20% biodiesel with 80% petrodiesel for the diesel market.

ETHANOL

Bacteria lead to cracked pipes

US production of ethanol for fuel has been rising quickly, topping 13 billion gallons in 2010. With the usual rail, truck, and barge transport methods under potential strain, existing gas pipelines might be an efficient alternative for moving this renewable fuel around the country. But research carried out by the US National Institute of Standards and Technology (NIST) shows that bacteria that feed on ethanol, producing acid, boost fatigue crack growth rates in pipelines by at least 25 times the levels occurring in air alone.

The NIST team evaluated fatigue-related cracking in two common pipeline steels immersed in ethanol mixtures. Ethanol and bacteria are known to cause corrosion, but this was the first study to examine their effects on pipeline steel. Research leader Jeffrey Sowards said, “These [increases] are important data for pipeline engineers who want to safely and reliably transport ethanol fuel in repurposed oil and gas pipelines.”

Preliminary tests also suggested that glutaraldehyde, a biocide used in oil and gas operations, may help control bacterial growth during ethanol transport.

Small engines and E10

An article in *The Altoona Mirror* newspaper (Pennsylvania, USA) highlighted problems that consumers are experiencing with small engines fueled with E10 (10% ethanol + 90% gasoline). Dan Bardell, service manager of a boat center, said “We have had about four [boat motors] totally shut down while on Raystown Lake due to the fuel. The ethanol deteriorates the fuel line.”

According to the owner of the Small Engine Shop in Altoona, “It is mostly with the



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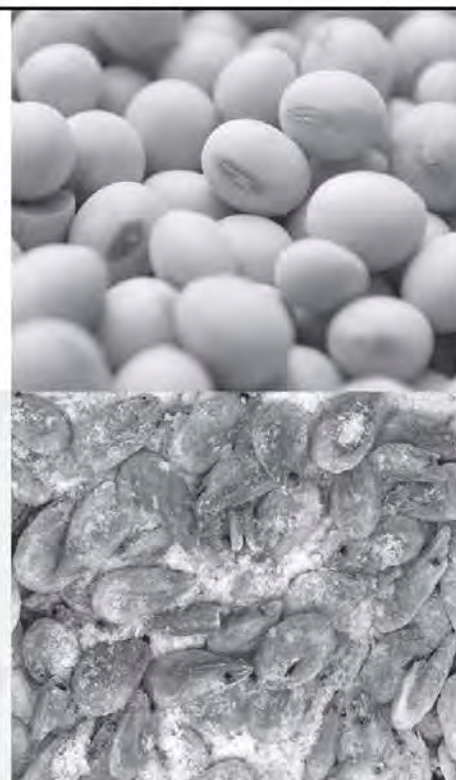
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two-cycle engines—lawn mowers, string trimmers, leaf blowers, and chain saws. They [the federal government] are now talking about going to E15. That will affect four-cycle engines; they will start blowing up next.”

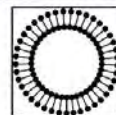
Fuel stabilizers are available for small engines running on E10, but another suggestion is to use the fuel for these small engines quickly so that the ethanol does not have a chance to evaporate or to form gums that clog engine filters, carburetors, and injectors (<http://tinyurl.com/AltoonaEthanol>). ■



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Briefs

German scientists led by Jan Philipp Schuchardt at Leibniz University conducted a small, randomized, double-blinded crossover trial to compare the uptake in 12 healthy young men of 1,680 milligrams of two EPA + DHA formulations derived from fish oil (re-esterified triglycerides or ethyl esters), and one from krill oil (mainly bound with phospholipid). The highest incorporation of EPA+DHA into plasma phospholipid—which did not reach significance—was brought about by krill oil, followed by fish oil triglycerides and ethyl esters. EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid) are long-chain polyunsaturated fatty acids linked with a host of health benefits, including cardiac health.

The study appeared in *Lipids in Health and Disease* (doi:10.1186/1476-511X-10-145).

■■■

The European Food Safety Authority will conduct a formal review of long-chain omega-3 intake levels in the European Union following a German Federal Institute for Risk Assessment (BfR) report that suggested an upper safe intake level of 1.5 grams/day. Currently, there is no upper limit in the European Union; the US Food and Drug Administration has recommended 3 grams/day. The BfR report found increased cholesterol levels, greater risk of cardiovascular mortality among long-term users with cardiovascular disease, inhibited immune systems in the elderly, and anemia as possible adverse effects, according to www.Nutraingredients.com.

■■■

Researchers at the University of Sydney in Australia reported that people with the greatest average intake of vitamin A had a 47% lower chance of developing hearing loss, whereas those taking more vitamin E reduced their risk by 14%. The study, in *The Journal of Nutrition, Health & Aging* (doi:10.1007/s12603-011-0119-0), suggested that the antioxidants may reduce age-related hearing loss by countering damage to the inner ear from reactive oxygen species. ■

Health & Nutrition News



Omega-3 fatty acids: \$13 billion global market

Awareness of omega-3 fatty acids as being among the most important nutrients for physical and mental health has reached critical mass, according to a new report on “Omega-3: Global Product Trends and Opportunities” from Packaged Facts, a division of Market-Research.com.

Correspondingly, the number of consumers who are seeking out products with high omega-3 content has increased dramatically over the past few years. In the US market, for example, 9% of grocery shoppers buy high-omega-3 food or beverage products in a typical grocery shopping trip, and the percentage of adults who take fish oil supplements has climbed from 8% in 2006 to 17% in 2011.

In addition, consumers increasingly regard health and beauty care products as extensions of the foods they eat. What has emerged, according to David Sprinkle, publisher of Packaged Facts, is a new (and sometimes paradoxical) continuum of nutrient-positioned products extending from whole foods and fortified/functional foods

through to nutritional supplements and personal care products. In the case of pet owners, this continuum also extends to pet foods, treats, supplements, and grooming products—essentially replicating the range of human products available.

Packaged Facts estimates that global consumer spending on omega-3 food and beverage products (excluding fish), health and beauty care products (including supplements), and pet products will reach \$13 billion in 2011. Consumer demand for omega-3 products will continue growing briskly over the 2011–2015 forecast period and will influence the activities of marketers worldwide across various categories of consumer packaged goods, including the private-label arena.

Hurdles do remain for the omega-3 products market, the report notes. The medical and regulatory communities have not yet arrived at a consensus on the optimal intake of omega-3 fatty acids, or the relative benefits of increased consumption of marine- vs. plant-based omega-3 fatty acids. Correspondingly, there is confusion among consumers who associate “omega-3” with fish and fish oil rather than flax or other

CONTINUED ON NEXT PAGE

plant-based sources that are used in omega-3 fortification of foods. Nonetheless, favorable European regulatory changes for omega-3 health claims are expected by the end of 2011—changes that Packaged Facts says should ultimately further boost the omega-3 product marketing environment globally.

For further information about the report, visit www.packaged-facts.com/Omega-Global-Product-6385341/.



The impact of fish oil on cognition and brain structure

Researchers at Rhode Island Hospital's Alzheimer's Disease and Memory Disorders Center in Providence (USA) have found positive associations between fish oil supplementation and cognitive functioning as well as differences in brain structure between users and nonusers of fish oil supplements. The findings suggest possible benefits of fish oil supplements on brain health and aging. The results were reported at the July 2011 International Conference on Alzheimer's Disease, in Paris, France.

Lori Daiello, a research scientist at the hospital, led the study. Data for the analyses were obtained from the Alzheimer's Disease Neuroimaging Initiative (ADNI), a multicenter, US National Institutes of Health-funded study that followed older adults with normal cognition, mild cognitive impairment, and Alzheimer's disease for over three years with periodic memory testing and brain MRI (magnetic resonance imaging) scans.

The study included 819 individuals, 117 of whom reported regular use of fish oil supplements before entry and during study follow-up. The researchers compared cognitive functioning and brain atrophy for patients who reported routinely using these supplements to those who were not using fish oil supplements.

Daiello found that compared to nonusers, users of fish oil supplements exhibited better cognitive functioning during the study. However, this association was significant only in those individuals who had a normal baseline cognitive function and in individuals who tested negative for a genetic risk factor for Alzheimer's disease known as APOE4. (This is consistent with previous research.)

The unique finding, however, was the clear association between the use of fish oil supplements and brain volume. As was the case with the cognitive outcomes, these observations were significant only for those who were APOE4 negative.

Daiello says, "In the imaging analyses for the entire study population, we found a significant positive association between fish oil supplement use and average brain volumes in two critical areas utilized in memory and thinking (cerebral cortex and hippocampus), as well as smaller brain ventricular volumes compared to nonusers at any given

time in the study. In other words, fish oil use was associated with less brain shrinkage in patients taking these supplements during the ADNI study compared to those who didn't report using them."

Daiello continues, "These observations should motivate further study of the possible effects of long-term fish oil supplementation on important markers of cognitive decline and the potential influence of genetics on these outcomes."

Omega-3 fatty acids reduce anxiety in healthy students

A new study gauging the impacts of consuming more fish oil showed a marked reduction both in inflammation and in anxiety among a cohort of healthy young people.

Previous work on eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA)—the long-chain omega-3 polyunsaturated fatty acids found in fatty cold-water marine fish—has suggested that the compounds might play a role in reducing the level of cytokines in the body, thereby reducing inflammation.

Psychological stress has repeatedly been shown to increase cytokine production, so researchers led by Janice Kiecolt-Glaser at The Ohio State University (OSU; Columbus, USA) wondered if increasing omega-3 intake might mitigate that process, thereby reducing inflammation.

To test their theory, they turned to a familiar group of research subjects—medical students. Previous work by this OSU group showed that stress from important medical school tests lowered students' immune status.

"We hypothesized that giving some students omega-3 supplements would decrease their production of proinflammatory cytokines, compared to other students who only received a placebo," explained Kiecolt-Glaser, a professor of psychology and psychiatry.

"We thought the omega-3 would reduce the stress-induced increase in cytokines that normally arose from nervousness over the tests."

The team assembled a field of 68 first- and second-year medical students who volunteered for the clinical trial. The students were randomly divided into six groups, all of whom were interviewed six times during the study. At each visit, blood samples were drawn from the students, who also completed a battery of psychological surveys intended to gauge their levels of stress, anxiety, or depression. The students also completed questionnaires about their diets during the previous weeks. Half the students received omega-3 supplements while the other half were given placebo pills.

"The supplement was probably about four or five times the amount of fish oil you'd get from a daily serving of salmon, for example," explained Martha Belury, professor of human nutrition and a co-author of the study.

Part of the study, however, did not go according to plans.

Changes in the medical curriculum and the distribution of major tests throughout the year, rather than during a tense three-day period as was done in the past, removed much of the stress that medical students had shown in past studies.

"These students were not anxious. They were not really stressed. They were actually sleeping well throughout this period, so we didn't get the stress effect we had expected," Kiecolt-Glaser said.

But the psychological surveys clearly showed an important change in anxiety among the students: Those receiving the omega-3

supplement showed a 20% reduction in anxiety compared to the placebo group.

An analysis of the blood samples from the medical students showed similar important results.

“We took measurements of the cytokines in the blood serum, as well as measure[ing] the productivity of cells that produced two important cytokines, interleukin-6 (IL-6) and tumor necrosis factor α (TNF α),” said Ron Glaser, professor of molecular virology, immunology & medical genetics and director of the OSU Institute for Behavioral Medicine Research.

“We saw a 14% reduction in the amounts of IL-6 among the students receiving the omega-3.” Since the cytokines foster inflammation, “anything we can do to reduce cytokines is a big plus in dealing with the overall health of people at risk for many diseases,” he said.

While the study showed the positive role omega-3 supplements can play in reducing both anxiety and inflammation, the researchers are not willing to recommend that the public start adding them to the daily diet.

“It may be too early to recommend a broad use of omega-3 supplements throughout the public, especially considering the cost and the limited supplies of fish needed to supply the oil,” Belury said. “People should just consider increasing their omega-3 through their diet.”

Soy a no-go against bone loss

Soy isoflavone supplementation did not ease the symptoms of menopause or protect against bone loss in women, according to US researchers.

After two years of follow-up, there were no differences in changes in bone density or menopausal symptoms between women taking soy isoflavone supplements and those taking a placebo, although women taking isoflavones did have more hot flashes (48.4% vs. 31.7%).

Silvina Levis of the University of Miami led the study, which was reported in the *Archives of Internal Medicine* (15:1363–1369, 2011).

To clarify previous findings, the researchers conducted a single-center randomized, controlled, double-blind trial, in 248 women, ages 45 to 60, between 2004 and 2009. All of the women were within five years of the start of menopause, and had a bone mineral density (BMD) T score of -2.0 or higher at the lumbar spine or total hip. (Persons with osteopenia have a T-score between -1.0 and -2.5 . This signifies an increased fracture risk but does not meet the criteria for osteoporosis.) The subjects were randomized to placebo or to daily administration of 91 mg genistein plus 103 mg of daidzein (the two primary isoflavones in soy).

In an invited commentary, Katherine Newton of Group Health in Seattle, Washington, USA, and Deborah Grady of the University of California San Francisco (USA) wrote that questions remain about the efficacy of soy for specific groups. For example, they point out that equol—a bacterially derived product of daidzein metabolism—is believed to be more biologically active than daidzein, but only 25% to 50% of women metabolize daidzein into equol. (See *inform* 19:718–721, 2008.)

Even though the study found no benefits for equol producers, Newton and Grady said that in order to assess equol producer status accurately, equol levels should have been measured immediately after ingestion of daidzein.

In addition, they suggested that clinicians may need to move “away from the hope of a one-size-fits-all therapy for menopausal

symptoms [toward] using existing treatments to target the symptoms that disturb patients most,” adding that nonhormonal therapies, such as selective serotonin reuptake inhibitors and gabapentin, may be effective treatments.

Saturated fat—the ultimate comfort food?

“Comfort food” apparently does provide comfort—literally—according to a small study led by Lukas Van Oudenhove, a medical doctor and postdoctoral fellow at the University of Leuven in Belgium. Saturated fat, in particular, seemed to render the 12 nonobese subjects less vulnerable to sad emotions, even when they did not know they were eating fat.

In the study, Van Oudenhove and his team removed all subjective experience (taste, smell, and the like) by feeding the volunteers through an unmarked stomach tube. Subjects were more positive after listening to sad music and seeing sad faces if their stomachs were full of lauric acid vs. a simple saline solution, which suggests that emotional eating operates on a biological as well as psychological level, the scientists said.

The study is among the first to suggest that the effect of food on mood is “really independent of pleasant stimuli,” said Giovanni Cizza, an obesity and neuroendocrinology researcher at the National Institute of Diabetes and Digestive and Kidney Diseases, in Bethesda, Maryland, who was not involved in the study and spoke to the *USA Today* newspaper. “It is even more rooted in our biology.”

“Evolution has made every aspect of feeding as rewarding as possible,” Van Oudenhove told the newspaper. “These days it may not be a good thing anymore. When food is available anywhere, then it may be a bad thing, leading to obesity or eating disorders in some people.”

Functional MRI (magnetic resonance imaging) brain scans taken during the experiment showed that the fatty solution seemed to reduce activity in parts of the brain that are involved in sadness and that respond to gloomy music.

The study appeared in the *Journal of Clinical Investigation* (doi:10.1172/JCI46380).

Bioactive peptides from seaweed

Seaweed and other “macroalgae” could rival milk products as sources of bioactive peptides, Irish researchers conclude in a review article in the *Journal of Agricultural and Food Chemistry* (doi:10.1021/jf201114d).

Maria Hayes and colleagues note increased interest in using bioactive peptides, now obtained mainly from milk products, as ingredients in functional foods. Their review of almost 100 scientific studies concluded that some seaweed proteins work similarly to the bioactive peptides in milk products by lowering blood pressure in a manner similar to that of ACE inhibitor drugs. (Angiotensin-converting enzyme inhibitors reduce peripheral arterial resistance by inactivating an enzyme that converts angiotensin I to the vasoconstrictor angiotensin II.)

“The variety of species and the environments in which they are found and their ease of cultivation make macroalgae a relatively untapped source of new bioactive compounds, and more efforts are needed to fully exploit their potential for use and delivery to consumers in food products,” Hayes and her colleagues conclude. ■

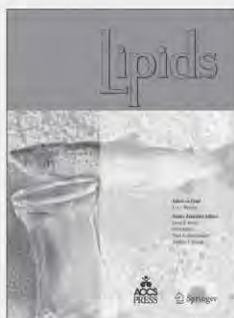
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Briefs

And the winner of this month's Egregious Lawsuit Award is: After taking almost two months to review 675,000 pages of documents and transcripts of a dozen depositions, a three-judge panel in the US Seventh Circuit Court of Appeals ruled that a diamond-shaped pattern embossed on toilet paper is not entitled to trademark protection. The action involved the Georgia-Pacific Co. against Kimberly-Clark Corp.

■■■

Codexis announced in July 2011 that it will collaborate on detergent alcohols with technology and engineering firm Chemtex, which is owned by Italy's Gruppo Mossi & Ghisolfi. The companies will develop and produce second-generation detergent alcohols made from cellulosic biomass that will be trademarked *CodeXol* and will be used in the household products market. Codexis (Redwood City, California, USA) will develop proprietary enzymes for use with Chemtex's PROESA pretreatment technology.

■■■

At press time, Switzerland's Lonza Group Ltd. had extended its original July 2011 tender offer for biocides company Arch Chemicals (Norwalk, Connecticut, USA). Following completion of the transaction, *Chemical Week* magazine said that Lonza will have "the world's leading microbial control business with 2010 pro-forma sales in that market of about \$1.6 billion."

■■■

The International Cooperation on Cosmetics Regulation (ICCR) held its fifth annual meeting June 28–July 1, 2011, in Paris, France, to discuss issues related to cosmetics and cosmetic-like drug/quasi-drug products. ICCR is an international group of cosmetic regulatory authorities from Canada, the European Union, Japan, and the United States. Topics included alternative test methods, nanotechnologies, safety assessment principles, trace contaminants, and involvement of interested parties in ICCR. For a complete report, see <http://tinyurl.com/ICCR-5>. ■

Surfactants, Detergents, & Personal Care News

Ecolab purchases Nalco

Ecolab Inc.—already the largest maker of industrial and institutional cleaning chemicals—will add industrial water-treatment services to its portfolio through its purchase of Nalco Holding Co. for \$5.4 billion in cash and stock.

The purchase, which was announced in July 2011, will help Ecolab (Minneapolis, Minnesota, USA) expand in a world where 40% of the population will be living in water-scarce regions by 2025, Chief Executive Officer (CEO) Douglas M. Baker told *Bloomberg Businessweek* magazine.

Nalco (Naperville, Illinois, USA) is involved in lawsuits related to the use of its Corexit dispersant during the clean-up of the 2010 oil spill from BP Plc's well in the Gulf of Mexico. Baker said BP has provided Nalco with "very strong" indemnification against the claims, according to the *Bloomberg* account.

Nalco CEO Erik Fyrwald reportedly will continue to run Nalco units after the merger.

Combined revenues of \$11 billion will grow at the upper end of the 6% to 8% rate that has been forecasted by both companies, Baker said.

The transaction is expected to close in the fourth quarter of 2011.

SC Johnson innovates

SC Johnson & Son, Inc. (Racine, Wisconsin, USA) has introduced to the North American market an all-in-one cleaning system with a single hand-held sprayer that holds three of the five concentrated cleaner cartridges on offer at once.

The concentrated cleaner cartridges include: Windex (for glass), Fantastik (for kitchens), Scrubbing Bubbles (for bathrooms), Pledge (for furniture), and Shout (for carpets).

The company is also test marketing concentrated pouches of its Windex window-cleaning solution, sold as "Windex Mini."



The concentrated formulation initially will only be sold online. The SC Johnson website promises that the product "requires 90% less plastic than a standard 26 fluid ounce (0.8 liter) trigger bottle" and "avoids transporting 22.4 fluid ounces of water."

This is not the first introduction of concentrated products that consumers can mix at home. Arm & Hammer pulled its concentrated products from the market; sales of other such products have been restricted to specialty and smaller grocery store chains, according to a report by Greenbiz.com.

"We're going to learn our way in. This is about progress, not perfection," said SC Johnson spokesperson Jam Stewart, as quoted by Greenbiz.com. "It was important to get this out there and get this in the hands of consumers."

CONTINUED ON NEXT PAGE

AkzoNobel buys Chinese surfactants maker

Specialty chemicals manufacturer AkzoNobel (Amsterdam, the Netherlands) has increased its Asian presence in the surfactants market by acquiring Shandong-based Boxing Oleochemicals. The purchase is expected to close in the last quarter of 2011.

Boxing supplies nitrile amines and derivatives for a variety of industrial applications including personal care products, according to CosmeticsDesign.com. "The company specializes in surfactants and supplies a portfolio of 100 ingredients and specializes in a range of amines, diamines, and ammonium salts, together with oleic acid and glycerine," the report noted.

Global enzyme market continues to grow

The global market for industrial enzymes is expected to reach \$3.74 billion by the year 2015, according to a new report from Global Industry Analysts, Inc. (GIA; San Jose, California, USA).

Key factors driving market growth include new enzyme technologies aimed at enhancing cost efficiencies and productivity, as well as growing interest among consumers in substituting petrochemical products with other organic compounds such as enzymes. Other causes of market growth include increasing demand from textile manufacturers, animal feed producers, detergent manufacturers, pharmaceutical companies, and cosmetics vendors.

The global market for industrial enzymes was stable throughout the recent turmoil in the global economy and grew moderately during 2008–2009. Demand for industrial enzymes in mature economies such as the United States, Western Europe, Japan, and Canada was also stable, while the developing economies of the Asia-Pacific, Eastern Europe, Africa, and the Middle East emerged as the fastest-growing markets for industrial enzymes.

Increased demand for various specialty enzymes, polymerases, and nucleases, together with the robust growth in animal feed markets, is likely to ensure continued growth in the industrial enzymes market. Demand for the enzymes that are used in the production of ethanol, on the other hand, is likely to slow in the near future as several countries are re-evaluating the use of food-derived raw materials in the manufacture of ethanol.

The United States and Europe collectively command a major share of the world

industrial enzymes market. However, the Asia Pacific is expected to register the highest compounded annual growth rate (CAGR) at more than 8.0%, GIA said.

Taken together, the United States and Europe currently represent the major share of the world's industrial enzymes market. The highest CAGR, however, is expected to reach more than 8.0% in the Asia Pacific market, according to the GIA.

Proteases constitute the largest product segment in the global industrial enzymes market. Carbohydrases are projected to be the fastest-growing product segment, with a CAGR of more than 7.0%. Lipases represent the other major product segment in the global industrial enzymes market, with high growth potential.

In terms of end use, food and feed represent the largest segment for industrial enzymes, GIA noted. Developing regions are expected to emerge as the fastest-growing consumers of industrial enzymes for food and feed applications, as the increase in per capita income in these regions will continue to drive the demand for meat.

Detergents constitute the other major end-use segment for industrial enzymes. Demand for detergent enzymes, however, is likely to be affected by the fluctuating prices of raw materials and continual innovations by manufacturers as they try to reduce costs. Nevertheless, a large percentage of mid- and low-tier detergent manufacturers are increasing the use of enzymes in their products in order to offer enhanced performance.

For more information about the report, which is titled "Industrial Enzymes: A Global Strategic Business Report," see www.strategyr.com/Industrial_Enzymes_Market_Report.asp.

Poplar tree leaf bud extract could fight skin aging

Antioxidants are popular antiaging ingredients in skin creams, and now scientists are reporting a new source—the leaf buds of poplar trees.

Xavier Vitrac and colleagues at the University of Bordeaux in France note that there is a long history of using poplar buds to treat various health problems, such as colds, sinusitis, sunburn, and arthritis. A substance found in beehives that is made from poplar buds (called propolis) also appears to have similar disease-fighting benefits. Propolis' effects seem to be due to poplar bud compounds,

but very little is known about these substances. To see whether poplar buds are a good source of antioxidants for skin creams, the researchers decided to test an extract from the buds.

The group found that poplar bud extract had moderate antioxidant activity and demonstrated antiaging effects on cells in the laboratory. "The collective antioxidant properties and transcriptional effect of this extract suggest potential antiaging properties that could be utilized in cosmetic and nutraceutical formulations," the scientists say.

The study appeared in the *Journal of Agricultural and Food Chemistry* (59:4527–4536, 2011).

Manhattan College offers cosmetics degree

Manhattan College (New York, USA) has designed the first master's of science program in cosmetic engineering to be offered in the United States.

The program is the brainchild of Ann Marie Flynn, associate professor and chairperson of Manhattan's chemical engineering department. An article in the *New York Daily News* newspaper reports that she "developed a wish list from engineers and turned it into four different classes."

About 15 students are enrolled in the new program and will study emulsion technology; advanced process theory; advanced processing techniques (including mixing, atomization, pumping, and drying); and industrial regulation and quality.

The year-long program will also be applicable to the food and pharmaceutical industries, the newspaper article noted.

EPA goes after glymes

The US Environmental Protection Agency has proposed a new rule that would require manufacturers, importers, and processors of 14 types of glymes to secure EPA approval before introducing any new products. Existing uses will be exempt from the regulation.

Glymes comprise a little-known subclass of glycol ethers and are primarily used as solvents in a variety of consumer products, including detergents, carpet cleaners, and paints.

If the regulation is adopted, "the EPA can require companies to conduct tests to rule out unreasonable risk before it will approve new uses of the compounds," according to *Scientific American* magazine. ■

People News/ Inside AOCS

Weller receives Jefferson Science Fellowship

AOCS member **Curtis Weller** was named one of 13 Jefferson Science Fellows for 2011–2012. Weller is a professor of food and bioprocess engineering at the University of Nebraska-Lincoln (USA).

The Jefferson Science Fellowship program was developed to strengthen science and technology capacity and literacy in the US Department of State (DOS). The program is financed by the DOS and coordinated by the National Academies. It brings experienced, tenured scientists and engineers from American universities to the DOS or the US Agency for International Development (USAID) for one year.

Fellows are given assignments either at headquarters in Washington, DC, or at US missions abroad. Weller will be advising policymakers in the DOS on a variety of topics related to global food systems, food processing, and sanitation for food and drinking water.

Weller, who began his assignment August 15, has extensive research experience with value-added processing of agricultural commodities and physical properties' determination of food and bioproducts. His work includes recovery and use of lipids in grain sorghum and predicting microbial growth in meat products based on time and environmental conditions.

Weller is familiar with cereal processing in the Americas and parts of Africa and with the food processing industries in Europe, South Korea, and Tajikistan. He also has worked on integrated energy and animal production facilities, water conservation projects in processing facilities, and sanitary retrofit of processing equipment.

Jefferson Science Fellows return to their academic careers following their DOS or USAID assignments but remain available to

the US government as expert consultants for short-term projects over the following five years.

New Fellows of ISBAB

Three AOCS members—**Ching T. Hou**, **Randall J. Weselake**, and **Suk Hoo Yoon**—were elected as Fellows of the International Society of Biocatalysis and Agricultural Biotechnology (ISBAB). The official recognition will be held at the 7th ISBAB annual meeting at Kyoto University, Kyoto, Japan, on October 11, 2011.

Hou is presently a senior research chemist at the Renewable Product Technology Research Unit, National Center for Agricultural Utilization Research, Agricultural Research Service, US Department of Agriculture, Peoria, Illinois. During his 50 years in industry and government research, he has worked with edible oils; mycotoxins; petroleum biotechnology; and antibacterials, antifungals, antivirals and enzyme inhibitors, mainly from microbial sources. Hou is president of ISBAB and editor-in-chief of ISBAB's journal, *Biocatalysis and Agricultural Biotechnology*.

Weselake is a professor and Canada Research Chair in Agricultural Lipid Biotechnology in the Department of Agricultural, Food and Nutritional Science at the University of Alberta (Edmonton, Alberta). He also serves as scientific director of the Alberta Innovates Phytola Centre and is a guest researcher with the Plant Biotechnology Institute. Weselake has conducted extensive research on the biochemistry and molecular biology of



Weller



Hou



Weselake

WILLS HINTON STEPS DOWN

After 23 years with AOCS, Executive Vice President Jean Wills Hinton will step down as head of the organization at the end of 2011. Originally hired in 1988 as education director, she subsequently was named associate executive vice president and became executive vice president in 2001.



Wills Hinton

An Executive Search Committee (ESC) appointed by the AOCS Governing Board is working with JDG Associates, Ltd., an executive search firm based in Rockville, Maryland, USA, to identify candidates to replace Wills Hinton. The position title has been changed to "chief executive officer" to better reflect business realities.

At press time, the ESC planned to present several final candidates to the Governing Board at its October 26–28, 2011, meeting. Following interviews and deliberation by the Board, the new head of AOCS will first be announced on www.aocs.org.

The ESC members include Chair Ian Purtle (AOCS president in 2009–2010), Keith Grime (AOCS president in 2010–2011), Tim Kemper (AOCS treasurer), Mark Matlock (AOCS president in 2003–2004), and Deland Myers (current AOCS vice president).

Wills Hinton resigned because her family relocated outside the Champaign-Urbana, Illinois, area. She leaves the Society with healthy financial reserves and a Foundation that is actively supporting new product initiatives to fulfill the mission of AOCS.

"I am excited about the role AOCS will play in the future and about the energy a new staff executive will bring to the organization," said Wills Hinton. "I am also grateful for having had the opportunity to meet and grow in friendship with such wonderful people from all over the world." ■

CONTINUED ON NEXT PAGE

storage lipid biosynthesis in oil crops and cattle.

Yoon is a principal research scientist in the Innovative Technology Research Division and concurrently director of the International Cooperation Office of the Korea Food Research Institute. He has been working on lipid chemistry and biotechnology for 33 years, including lipid oxidation and prevention, refining and processing of fats and oils, single-cell oil, structured lipids using lipase and phospholipase. He is presently secretary/treasurer of the AOCS Biotechnology Division and secretary of the Asian Section.



Yoon

back to the Netherlands, and finally to Minnesota. In his latter years with Cargill, he focused his considerable engineering talents on energy conservation, biofuels, and bio-industrial substitutes for petroleum-derived products.

In 1998 **Edwin N. Frankel** retired from the Northern Regional Research Center (US Department of Agriculture, Agricultural Research Service) and took up a new position with the Department of Food Science and Technology at the University of California–Davis, and published 32 papers in various aspects of lipid oxidation and antioxidants between 1998 and 2011. He has now retired again—or at least lowered his level of activity—and is working part time for the new UC–Davis

Olive Oil Center to improve chemical and sensory standards for extra virgin olive oil in California. (See *inform* 22:13, 58, 387–387,



Purtle

2011, for further information regarding the UC–Davis Olive Oil Center.)

Yeh recognized

The Northern California/Nevada section of the American Institute of Chemical Engineers awarded **Bryan Yeh** their 2011 Professional Progress Award. This award was in recognition of Yeh's work with the Northern California/Nevada section as well as his contributions to the chemical engineering profession. Yeh is currently assistant vice president at Science Applications International Corporation and manages their biofuel, food protection, and food security work. He has a degree in chemical engineering from the University of Wisconsin, an MBA from the University of Minnesota, and is a registered professional engineer in the state of California.



Frankel

List named Fellow

Gary List, recently retired from the US Department of Agriculture–Agricultural Research Service, National Center for Agricultural Utilization Research, Peoria, Illinois, was elected a Fellow of the Division of Agricultural and Food Chemistry of the American Chemical Society. ■

Retirements

Ian Purtle retired in June from his position with Cargill Inc. (Hopkins, Minnesota, USA) as vice president and chief scientist for sustaining energy. Purtle served as vice president of AOCS in 2008–2009 and president in 2009–2010, the centennial year of AOCS.

Purtle spent most of his career with Cargill, first in the Netherlands in 1972, then back to Australia—his birthplace—then

In Memoriam

AKIRA MORI



Mori

Akira Mori, who was associated with Lion Corporation (Tokyo, Japan) for over 50 years, died May 12, 2011, at the age of 91.

He joined Lion Fat and Oil Co. in 1949, and was named director of the company's research laboratories in 1971. He became executive general manager of the chemical business division of the (now) Lion Corporation in 1975, and executive general manager of the international division in 1980. In 1984 he was made vice president of research and development (R&D).

Mori was named vice president of Lion in 1987, as well as executive general manager of R&D headquarters. He retired from the company in 1989, at that time becoming director and adviser for Lion Corporation. He fully retired from the company in 1999.

Mori graduated from Kyoto University in 1944 with a bachelor's degree in engineering from the department of fuel chemistry. He received a doctorate in engineering from the same school in 1971.

He was especially active in promoting the oils and fats industry through professional organizations. Mori served as vice-president of the Japan Oil Chemists' Society (JOCS) in 1973–1974, and president in 1985–1986. He was also president of ISF (the International Society for Fat Research) in 1988–1989.

Mori joined AOCS in 1987. He was a member of the Surfactants and Detergents Division, and was instrumental in organizing the joint JOCS-AOCS meeting held in Honolulu in 1986 as well as the 1988 JOCS-ISF meeting held in Tokyo. He also helped put together the World Conference on Oleochemicals into the 21st Century, held in Kuala Lumpur, Malaysia, in 1990. Mori served on the Editorial Advisory Board for *inform* from 2000 to 2003.

Mori was named an AOCS Fellow in 2003.

ED G. COREY

Ed Corey, co-founder in 1996—with Bruce Kerr—and co-owner of Isotek LLC in Oklahoma City, Oklahoma, USA, died on June 29, 2011, at the age of 64. Isotek is an agricultural and environmental testing laboratory, serving clients needing agricultural testing in more than two dozen states, and environmental testing mostly in two states.

Corey was an active participant in the AOCS Approved Chemists program, concentrating on tallow and grease, oilseed meal, and olive oil.

He attended Cameron University in Lawton, Oklahoma, graduating with his bachelor's degree in science in 1972.

In an email recollection, Kerr wrote, "In addition to his knowledge of chemistry, Ed was also very knowledgeable when it came to computers. He was also quite capable when it came to fixing certain instruments used in analytical testing, particularly gas chromatographs."

Survivors include his wife Carol, two stepsons, a brother, and six grandchildren.

Book Review

Canola, Chemistry, Production, Processing, and Utilization

James K. Daun, N.A. Michael Eskin,
and Dave Hickling (eds.)

AOCS Press, 2011, 372 pages

ISBN: 978-098189365-5, \$225 (nonmembers) or \$175 (members)

Albert J. Dijkstra

This recent book on *Canola, Chemistry, Production, Processing, and Utilization* is the fourth volume in the *AOCS Monograph Series on Oilseeds*; earlier books dealt with (i) olive oil, (ii) soybeans, and (iii) gourmet and health-promoting specialty oils. Since canola was developed in Canada, it is only logical that all authors and editors are Canadian, be it that some of them were born and educated outside Canada. Accordingly, not all authors are native English speakers, but either their English became fluent after they had moved to Canada or the editors have done a good job. The result is that the text reads very well indeed.

The international background of the authors may also be the reason that the book has a truly international outlook. Not only does it cover what has been done and is being done in Canada but, in general, it also pays attention to what happens elsewhere. This should make the book of interest the world over. However, this international outlook does not apply to the chapters dealing with agronomy and processing, which are limited to practices in Western Canada and the United States, respectively.

Accordingly, the section on degumming does not mention that in Canada, acid degummed oil is/was often subjected to a dry degumming step to remove residual phosphatides. In the dry degumming process, a degumming acid such as phosphoric acid is finely dispersed in the oil so that it liberates phosphatidic acid from its calcium and magnesium salts, which are then adsorbed onto bleaching earth. The bleaching earth also removes the excess degumming acid. The process takes advantage of the fact that canola oil requires a fair amount of bleaching earth anyway. The section does not mention the use of phospholipase enzymes in degumming, and its description of the chemistry of degumming is somewhat confused. Given the phosphorus content of crude canola oil of ~500 parts per million, the use of phospholipase C to increase degummed oil yield might well be justified.

Most of the authors hold or held research positions, and this is clearly reflected in the number of literature references listed; this amounts to ~10 pages for the 35-page chapters describing genetic engineering approaches and meal nutrition and utilization, respectively. More practically oriented chapters describing agronomy and processing contain only a single page of references. In the book as a whole, the pages listing references amount to ~14% of the total

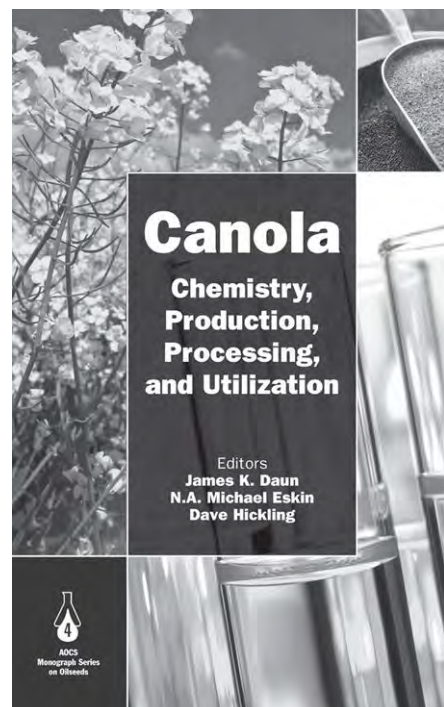
number of pages. Several chapters include references dating from 2010; they include websites, so I cannot but conclude that the references in the book constitute a valuable element that will retain its value for quite some time. Sadly enough, some names lack accents (Sjoberg instead of Sjöberg), but I have come across other books published by AOCS Press that were much worse in this respect.

I also have to congratulate the editors on the fact that the various chapters show almost no overlap; the book covers the subject area in an efficient manner, in sufficient depth and breadth for those involved with canola in one way or another. For a proper understanding, these readers should enjoy a level of education that enables them to study articles in their field as published in the scientific journals in our sector. Readers who are studying chapters outside their specific sphere of interest will be able to understand these chapters and thereby gain valuable background information that can often be highly relevant to their own work. As an example, a plant breeder should be aware of meal nutrition and utilization, but that also holds for a processor producing the meal.

The first chapter of the book, titled "Origin, distribution and production," provides a historical overview of rapeseed and canola. Its extensive bibliography mentions a single work (by L.Å. Appelqvist and AOCS Fellow Ragnar Ohlson) that covers more or less the same field as the book under review. However, this work dates from 1972. This means that the book under review is in fact long overdue. This is yet another reason why I foresee a healthy demand for this book.

The figures and tables in the book are clear. They support the text in a fully adequate manner. Upon examination of Table 6.6, I was glad to see that the numerical data were aligned in such a way that the decimal points were in a straight line. Then I looked at other tables and saw that this was not generally the case. As a word of advice to the copyeditor, it is best to maintain a unity of style.

Although officially retired, Albert J. Dijkstra remains active as an author, editor, inventor, and scientific consultant with more than 30 years' experience in food oil chemistry and processing. He can be reached at albert@dijkstra-tucker.be.



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Extracts & Distillates

The role of acyl moiety in the formation and reactions of steryl ester hydroperoxides

Lehtonen, M., *et al.*, *Eur. Food Res. Technol.* 233:51–61, 2011.

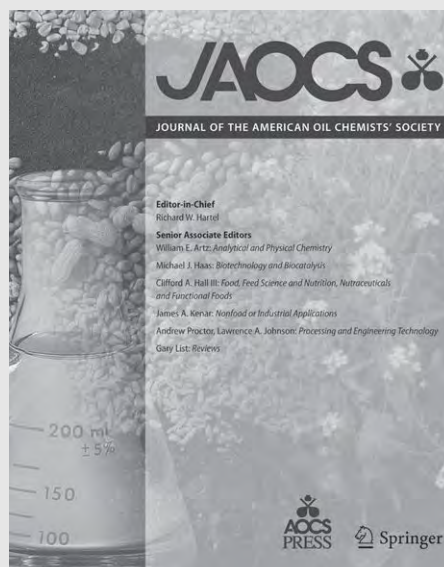
Nowadays, several types of food products are fortified with plant sterols because of their cholesterol-lowering properties. Therefore, it is also important to study the oxidation behavior of sterols and their conjugates. In the present study, the autoxidation of intact steryl fatty acyl esters was investigated by following the formation and decomposition of these esters' primary hydroperoxides. The effects of the unsaturation of the acyl moiety on the sterol oxidation were investigated by oxidizing pure cholesteryl fatty acyl esters at 100°C. A previously introduced HPLC-ELSD [high-performance liquid chromatography-evaporative light-scattering detection] method was further developed to follow the primary oxidation of steryl and acyl moieties individually. Peroxide values and secondary oxidation products of sterol were determined to confirm the obtained results and to follow further reactions. In the case of cholesteryl oleate and linoleate, the primary hydroperoxides of the steryl and acyl moieties were initially measurable at the same time point. As the unsaturation of the acyl moiety was increased, the induction period of the sterol oxidation was shortened and the rate of hydroperoxide formation increased. Moreover, the hydroperoxides started to decompose earlier. The maximum content of primary hydroperoxides was higher in cholesteryl stearate (64 mg/g) and oleate (78 mg/g) than in cholesteryl linoleate (40 mg/g). Thus, the degree of unsaturation of the acyl moiety also clearly affects the oxidation behavior of the steryl moiety.

Integration of lipidomics and transcriptomics data towards a systems biology model of sphingolipid metabolism

Gupta, S., *et al.*, *BMC Systems Biol.* 5:26, 2011.

Background: Sphingolipids play important roles in cell structure and function as well as in the pathophysiology of many diseases.

AOCS Journals



Journal of the American Oil Chemists' Society (September)

- Direct determination of glycidyl esters of fatty acids in vegetable oils by LC-MS, Blumhorst, M.R., P. Venkitasubramanian, and M.W. Collison
- Determination of polyunsaturated fatty esters (PUFA) in biodiesel by GC/GC-MS and ¹H-NMR techniques, Chopra, A., A.K. Tewari, S. Vatsala, R. Kumar, A.S. Sarpal, and B. Basu
- Fatty acids, tocopherols and sterols of *Cephalocroton cordofanus* in comparison with sesame, cotton, and groundnut oils, Mariod, A., B. Matthäus, and I.H. Hussein
- ¹H- and ¹³C-NMR characterization of the molecular components of the lipid fraction of Pecorino Sardo cheese, Scano, P., R. Anedda, M.P. Melis, M.A. Dessì, A. Lai, and T. Roggio
- Influence of turbidity grade on color and appearance of virgin olive oil, Gordillo, B., L. Ciaccheri, A.G. Mignani, M.L. Gonzalez-Miret, and F.J. Heredia
- A comprehensive GC-MS sub-microscale assay for fatty acids and its applications, Bigelow, N.W., W.R. Hardin, J.P. Barker, S.A. Ryken, A.C. MacRae, and R.S. Catolico
- Oxidative evolution of virgin and flavored olive oils under thermo-oxidation processes, Issaoui, M., G. Flamini, M.E. Hajaj, P.L. Cioni, and M. Hammami
- Optimization of the solvent-free lipase-catalyzed synthesis of fructose-oleic acid

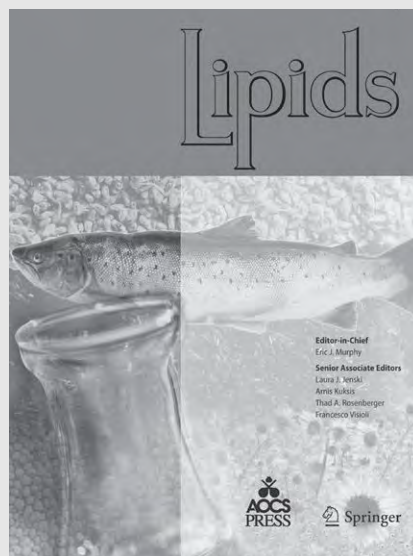
ester through programming of water removal, Ye, R., and D.G. Hayes

- Changes in total polar compounds, peroxide value, total phenols and antioxidant activity of various oils used in deep fat frying, Karakaya, S., and Ş. Şimşek
- Oxidation of crude corn oil with and without elevated tocotrienols, Dolde, D., and T. Wang
- Influence of proportion of skin present during malaxing on pigment composition of cold pressed avocado oil, Wong, M., O.B.O. Ashton, T.K. McGhie, C. Requejo-Jackman, Y. Wang, and A.B. Woolf
- Changes in tocochromanol content in seeds of *Brassica napus* L. during adverse conditions of storage, Gawrysiak-Witulska, M., A. Siger, J. Wawrzyniak, and M. Nogala-Kalucka
- Antioxidant activity and total phenolics of propolis from the Basque Country (Northeastern Spain), Bonvehí, J.S., and A.L. Gutiérrez
- Micellization of beta-carotene from soy-protein stabilized oil-in-water emulsions under *in vitro* conditions of lipolysis, Malaki Nik, A., A.J. Wright, and M. Corredig
- Antioxidant and prooxidant activity behavior of phospholipids in stripped soybean oil-in-water emulsions, Cardenia, V., T. Waraho, M.T. Rodriguez-Estrada, D.J. McClements, and E.A. Decker
- Catalytic synthesis of fatty acid methyl esters from extremely low quality greases, Ngo, H.L., Z. Xie, S. Kasprzyk, M. Haas, and W. Lin
- Vernonia oil: conversion to a mixture of tertiary amines including *N,N*-dimethyl-(12*S*,13*R*)-epoxy-*cis*-9-octadecenyl amine, Johnson, N.S., and F.O. Ayorinde
- Effect of water on the ethanolysis of waste cooking soybean oil using a tin(II) chloride catalyst, da Silva, M.L., A.P. Figueiredo, A.L. Cardoso, R. Natalino, and M.J. da Silva
- Impact of the North Dakota growing location on canola biodiesel quality, Haagenson, D.M., and D.P. Wiesenborn
- Protein recovery in aqueous extraction processing of soybeans using isoelectric precipitation and nanofiltration, de Moura, J.M.L.N., K. Campbell, N.M. de Almeida, C.E. Glatz, and L.A. Johnson

- Continuous hydrolysis of cuphea seed oil in subcritical water, Eller, F.J., J.A. Teel, and D.E. Palmquist

Lipids (September)

- Mifepristone treatment results in differential regulation of glycerolipid biosynthesis in baby hamster kidney cells expressing a mifepristone-inducible ABCA1, Hauff, K.D., R.W. Mitchell, F.Y. Xu, T. Dembinski, D. Mymin, X. Zha, P.C. Choy, and G.M. Hatch
- Ethanol extract of propolis promotes reverse cholesterol transport and the expression of ATP-binding cassette transporter A1 and G1 in mice, Yu, Y., Y. Si, G. Song, T. Luo, J. Wang, and S. Qin.
- Acute up-regulation of adipose triglyceride lipase and release of non-esterified fatty acids by dexamethasone in chicken adipose tissue, Serr, J., Y. Suh, S.-A. Oh, S. Shin, M. Kim, J.D. Latshaw, and K. Lee
- Dietary conjugated linoleic acid induces lipolysis in adipose tissue of coconut oil-fed mice but not soy oil-fed mice, Ippagunta, S., T.J. Hadenfeldt, J.L. Miner, and K.M. Hargrave-Barnes
- *trans*-18:1 and CLA isomers in rumen and duodenal digesta of bulls fed n-3 and n-6 PUFA-based diets, Shen, X., D. Dannenberger, K. Nuernberg, G. Nuernberg, and R. Zhao
- Isomerization of vaccenic acid to *cis* and *trans* C18:1 isomers during biohydrogenation by rumen microbes, Laverroux, S., F. Glasser, M. Gillet, C. Joly, and M. Doreau
- Isolation of a novel oil globule protein from the green alga *Haematococcus pluvialis* (Chlorophyceae), Peled, E., S. Leu, A. Zarka, M. Weiss, U. Pick, I. Khozin-Goldberg, and S. Bousiba
- Changes in the composition of triacylglycerols in the fat bodies of bumblebee males during their lifetime, Jiroš, P., J. Cvačka, R. Hanus, J. Kindl, E. Kofroňová, and I. Valterová
- Efficient and specific conversion of 9-lipoxygenase hydroperoxides in the beetroot. Formation of pinellic acid (Communication), Hamberg, M., and U. Olsson
- LipidomeDB data calculation environment: online processing of direct-infusion mass spectral data for lipid profiles (Methods), Zhou, Z., S.R. Marepally, D.S.



Nune, P. Pallakollu, G. Ragan, M.R. Roth, L. Wang, G.H. Lushington, M. Visvanathan, and R. Welti

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Many of the intermediates of sphingolipid biosynthesis are highly bioactive and sometimes have antagonistic activities, for example, ceramide promotes apoptosis whereas sphingosine-1-phosphate can inhibit apoptosis and induce cell growth. Therefore, quantification of the metabolites and modeling of the sphingolipid network is imperative for an understanding of sphingolipid biology. Results: In this direction, the LIPID MAPS Consortium is developing methods to quantify the sphingolipid metabolites in mammalian cells and is investigating their application to studies of the activation of the RAW264.7 macrophage cell by a chemically defined endotoxin, Kdo(2)-Lipid A. Herein, we describe a model for the C-16-branch of sphingolipid metabolism (i.e., for ceramides with palmitate as the N-acyl-linked fatty acid, which is selected because it is a major subspecies for all categories of complex sphingolipids in RAW264.7 cells) integrating lipidomics and transcriptomics data and using a two-step matrix-based approach to estimate the rate constants from experimental data. The rate constants obtained from the first step are further refined using generalized constrained nonlinear optimization. The resulting model fits the experimental data for all species. The robustness of the model is validated through parametric sensitivity analysis. Conclusions: A quantitative model of the sphingolipid pathway is developed by integrating metabolomics and transcriptomics data with legacy knowledge. The model could be used to design experimental studies of how genetic and pharmacological perturbations alter the flux through this important lipid biosynthetic pathway.

Distribution of lipids in human brain

Veloso, A., *et al.*, *Anal. Bioanal. Chem.* 401:89–101, 2011.

The enormous abundance of lipid molecules in the central nervous system (CNS) suggests that their role is not limited to structural and energetic components of cells. Over the last decades, some lipids in the CNS have been identified as intracellular signalers, while others are known to act as neuromodulators of neurotransmission through binding to specific receptors. Neurotransmitters of lipidic nature, currently known as neurolipids, are synthesized during the metabolism of phospholipid precursors present in cell membranes. Therefore, the anatomical identification of each of the different lipid species in human CNS by imaging mass spectrometry (IMS), in association with other biochemical techniques with

CONTINUED ON NEXT PAGE

spatial resolution, can increase our knowledge on the precise metabolic routes that synthesize these neurolipids and their localization. The present study shows the lipid distribution obtained by MALDI-TOF [matrix-assisted laser desorption ionization-time of flight] IMS in human frontal cortex, hippocampus, and striatal area, together with functional autoradiography of cannabinoid and lysophosphatidic acid receptors. The combined application of these methods to postmortem human brain samples may be envisioned as critical to further understand neurological diseases, in general, and particularly, the neurodegeneration that accompanies Alzheimer's disease.

Drug targeting of sphingolipid metabolism: sphingomyelinases and ceramidases

Canals, D., *et al.*, *Brit. J. Pharmacol.* 163:694–712, 2011.

Sphingolipids represent a class of diverse bioactive lipid molecules that are increasingly appreciated as key modulators of diverse physiologic and pathophysiologic processes that include cell growth, cell death, autophagy, angiogenesis, and stress and inflammatory responses. Sphingomyelinases and ceramidases are key enzymes of sphingolipid metabolism that regulate the formation and degradation of ceramide, one of the most intensely studied classes of sphingolipids. Improved understanding of these enzymes that control not only the levels of ceramide but also the complex interconversion of sphingolipid metabolites has provided the foundation for the functional analysis of the roles of sphingolipids. Our current understanding of the roles of various sphingolipids in the regulation of different cellular processes has come from loss-of-function/gain-of-function studies utilizing genetic deletion/downregulation/overexpression of enzymes of sphingolipid metabolism (e.g., knock-out animals, RNA interference) and from the use of pharmacologic inhibitors of these same enzymes. While genetic approaches to evaluate the functional roles of sphingolipid enzymes have been instrumental in advancing the field, the use of pharmacologic inhibitors has been equally important in identifying new roles for sphingolipids in important cellular processes. The latter also promises the development of novel therapeutic targets with implications for cancer therapy, inflammation, diabetes, and neurodegeneration. In this review, we focus on the status and use of pharmacologic compounds that inhibit sphingomyelinases and ceramidases, and we will

review the history, current uses and future directions for various small molecule inhibitors, and will highlight studies in which inhibitors of sphingolipid-metabolizing enzymes have been used to effectively treat models of human disease.

Complex chromatographic determination of the adulteration of dairy products: A new approach

Chmilenko, F.A., N.P. Minaeva, and L.P. Sidорова, *J. Anal. Chem.* 66:572–581, 2011.

A new approach to complex chromatographic determination of the adulteration of dairy products was proposed, based on the determination of not only the total fatty acid composition but also the composition of the sterol fraction and the concentration of *trans*-isomers of fatty acids. Procedures for the chromatographic identification of low-fat dairy products were developed, including the extraction of a water-milk-alcohol emulsion with a hexane-ether mixture followed by the chromatographic determination of the sterol fraction and *trans*-isomers.

Matrix-assisted laser desorption ionization imaging mass spectrometry in lipidomics

Fernandez, J.A., *et al.*, *Anal. Bioanal. Chem.* 401:29–51, 2011.

The relevant structural, energetics, and regulatory roles of lipids are universally acknowledged. However, the high variability of lipid species and the large differences in concentrations make unraveling the role played by the different species in metabolism a titanic task. A recently developed technique, known as imaging mass spectrometry, may shed some light on the field, as it enables precise information to be obtained on the location of lipids in tissues. A review of the state of the art of the technique is presented in this manuscript, including detailed analysis of sample-preparation steps, data handling, and the identification of the species mapped so far.

Ether lipids

Magnusson, C.D., and G.G. Haraldsson, *Chem. Phys. Lipids* 164:315–340, 2011.

This review article provides a comprehensive and up-to-date review on the naturally occurring 1-*O*-alkyl-*sn*-glycerol ether lipids and their methoxylated congeners, 1-*O*-(2'-methoxyalkyl)-*sn*-glycerols. These are biologically active compounds,

ubiquitously found in nature as diacyl glyceryl ether lipids and phosphoether lipids. The occurrence and distribution of these compounds in nature are extensively reviewed; their chemical structure and molecular variety, their biosynthesis and chemical synthesis and, finally, their various biological effects are described and discussed.

Essential fatty acid supplementation of DHA and ARA and effects on neurodevelopment across animal species: a review of the literature

Davis-Bruno, K., and M.S. Tassinari, *Birth Defects Res. B* 92:240–250, 2011.

Docosahexaenoic acid (DHA) and arachidonic acid (ARA) are long-chain essential fatty acids used as supplements in commercial infant formula. DHA/ARA-deficient states are associated with adverse neurological outcomes in animals and humans. Preterm infants are at risk for DHA/ARA deficiency. A few clinical reports on the effects of fatty acid supplementation have shown benefit in preterm, low birth weight, and normal infants in the first year of life, whereas others did not. Studies in animals have reported shortened gestation, fetal growth retardation, reduced infant body mass, and increased fetal mortality with consumption of fatty acids during pregnancy. To understand the data that support fatty acid supplementation in infant formula, a review of the animal model literature was undertaken, to examine the effects of DHA/ARA on neurodevelopment, including the effects on visual acuity. Several points emerged from this review. (i) Animal studies indicate that requirements for DHA/ARA vary depending on developmental age. Alterations of the ratio of DHA/ARA can impact developmental outcome. (ii) The available studies suggest that while supplementation of DHA/ARA in an appropriate ratio can increase tissue levels of these fatty acids in the brain and retina, tissues sensitive to depletion of fatty acids, the benefit of routine supplementation remains unclear. Few studies measure functional outcome relative to changes in physiologic pools of DHA/ARA after supplementation. (iii) Animal literature does not support a clear long-term benefit of replenishing DHA/ARA tissue levels; and administration of these fatty acids at concentrations above those in human milk suggests adverse effects on growth, survival, and neurodevelopment. ■

Patents

Published Patents

Recombinant microalgae cells producing novel oils

Franklin, S., *et al.*, Solazyme, Inc., US7935515, May 3, 2011

Disclosed herein are obligate heterotrophic microalgae cells containing an exogenous gene. In some embodiments the gene is a sucrose utilization gene, and further disclosed are methods of manufacturing triglyceride oils using sugar cane or sugar beets as a feedstock in a heterotrophic fermentation. In other embodiments the feedstock is depolymerized cellulosic material. Also disclosed are cells that produce medium-chain fatty acids at levels not produced in non-recombinant cells of the same species and genus.

Method of enhancing reproductive function of mammals by feeding of conjugated linoleic acids

Bauman, D.E., *et al.*, Cornell Research Foundation, Inc., BASF, AG, US7935730, May 3, 2011

This invention provides methods for improving reproductive performance of lactating dairy cows and other mammals. The method in the case of cows comprises feeding to the cows a composition comprising conjugated linoleic acids (CLAs) *cis-9 trans-11* and *trans-10 cis-12*. When these CLAs are fed daily to dairy cows starting at or prior to calving, and continued after parturition, an improvement in reproductive performance is observed.

Method for continuous production of biodiesel fuel

Leveson, P.D., and J.P. Gaus, Nextgen Fuel, Inc., US7935840

An apparatus and method for the continuous production of biofuel by the transesterification of a triglyceride. The apparatus comprises a high shear homogenizer; a reaction chamber; a gravity-driven separation device; an evacuated packed thin film stripper; a counter-current pack water contactor; and an evacuated packed spray drier wherein each component operates with minimal heat and mass transfer resulting in a high capacity process with a reduced footprint.

Process for preparing a rapidly dispersing solid drug dosage form

Parikh, I., *et al.*, Jagotec AG, US7939105, May 10, 2011

Rapidly dispersing solid dry therapeutic dosage form comprised of a water-insoluble compound existing as a nanometer or micrometer particulate solid which is surface stabilized by the presence of at least one phospholipid, the particulate solid being dispersed throughout a bulking matrix. When the dosage form is introduced into an aqueous environment, the bulking matrix is substantially completely dissolved within less than 2 minutes thereby releasing the water-insoluble particulate solid in an unaggregated and/or unagglomerated state. The matrix is composed of a water-insoluble substance or therapeutically

useful water-insoluble or poorly water-soluble compound, a phospholipid and optionally also at least one non-ionic, anionic, cationic, or amphipathic surfactant, together with a matrix or bulking agent and if needed a release agent. The volume weighted mean particle size of the water-insoluble particle is 5 μm or less.

Ruminant feedstock dietary supplement

Zuccarello, W.J., *et al.*, Church & Dwight Co., Inc., US7939117, May 10, 2011

This invention provides a rumen-bypass dietary supplement in compacted particulate form. The supplement has the capability to transport fatty acid calcium salt and between about 65–96% of rumen-protected undegraded amino acid content to the post-ruminal digestive system of a ruminant. A feedstock containing the supplement for ruminants beneficially improves feed efficiency and body growth. The feedstock also is adapted to improve the lactational performance of dairy cattle.

Method of preventing flavor component from degradation

Inaba, E., *et al.*, Taiyo Kagaku Co., Ltd., US7939120, May 10, 2011

The present invention relates to a deterioration preventive for a flavor component, which is an oil-in-water and/or -polyhydric alcohol type emulsion, comprising an extracted tocopherol, wherein δ -tocopherol is contained in an amount of 45% by weight or more of a total tocopherol, ferulic acid and/or a derivative thereof, and a polyglycerol fatty acid ester; a deterioration preventive for a flavor component, which is an oil-in-water and/or -polyhydric alcohol type emulsion comprising (i) the above-mentioned extracted tocopherol, (ii) ferulic acid and/or a derivative thereof, and (iii) an emulsifying agent having an HLB [hydrophilic-lipophilic balance] of 9 or more; a flavor for foodstuff, comprising the above-mentioned deterioration preventive; an emulsion flavor for foodstuff, comprising the above-mentioned extracted tocopherol, a catechin; and a polyglycerol fatty acid ester; and foodstuff comprising the above-mentioned deterioration preventive for a flavor component, the above-mentioned flavor for foodstuff, or the above-mentioned emulsion flavor for foodstuff.

Marker composite for medical implants

Borck, A., *et al.*, Biotronik VI Patent AG, US7939146, May 10, 2011

An X-ray marker for medical implants made of a biocorroderable metallic material, wherein the X-ray marker composite includes 1–40 weight parts of a carrier matrix having a melting point greater than or equal to 43°C, which comprises 90 wt% or more at least one triglyceride; and 60–99 weight parts of a radiopaque marker component which is embedded in the carrier matrix.

Amphiphilic derivatives for the production of vesicles, micelles and complexants, and precursors thereof

Grinberg, S., *et al.*, Ben Gurion University of the Negev Research and Development Authority, US7939562, May 10, 2011

Amphiphilic derivatives composed of at least one fatty acid chain are derived from natural vegetable oils such as vernonia oil,

lesquerella oil, and castor oil, in which the several reactive groups such as epoxy, hydroxyl, and double bonds can be modified to polar and ionic groups. The head group of the amphiphilic derivative may be in the main fatty acid chain or in a side chain. The amphiphiles are useful for the formation of vesicles and micelles and for use as complexants and surfactants.

PUFA polyketide synthase systems and uses thereof

Weaver, C.A., *et al.*, Martek Biosciences Corp., US7939716, May 10, 2011

Disclosed are the complete polyunsaturated fatty acid (PUFA) polyketide synthase (PKS) systems from the bacterial microorganisms *Shewanella japonica* and *S.olleyana*, and biologically active fragments and homologs thereof. More particularly, this invention relates to nucleic acids encoding such PUFA PKS systems, to proteins and domains thereof that comprise such PUFA PKS systems, to genetically modified organisms (plants and microorganisms) comprising such PUFA PKS systems, and to methods of making and using the PUFA PKS systems disclosed herein. This invention also relates to genetically modified plants and microorganisms and methods to efficiently produce lipids enriched in various polyunsaturated fatty acids (PUFAs) as well as other bioactive molecules by manipulation of a PUFA PKS system.

Image-bearing member protecting agent, protective layer forming device, image forming method, image forming apparatus and process cartridge

Tanaka, S., *et al.*, Ricoh Co., Ltd., US7941087, May 10, 2011

To provide an image-bearing member protecting agent used in an image forming method which includes applying or attaching the agent onto a surface of an image bearing member, the agent including: a fatty acid metal salt (i) and an inorganic lubricant (ii) wherein the inorganic lubricant (ii) has an average particle diameter of 0.1 μm to 14 μm .

Deicing composition

Stokes, D.B., *et al.*, FMC Corp., US7943057, May 17, 2011

A deicing composition is provided. The composition includes a potassium or sodium salt of a carboxylic acid and a lithium salt of a carboxylic acid or lithium nitrate, wherein the molar ratio of lithium to potassium or lithium to sodium is from 10% to 80%.

Nanogels and their production using liposomes as reactors

Kazakov, S., *et al.*, Polytechnic Institute of New York University, US7943067, May 17, 2011

The present invention includes a method for preparing polymer hydrogel spherical particles on a nanometer scale (nanogels). The method includes encapsulating hydrogel-forming components into liposomes, diluting the large unilamellar liposomes suspension to

prevent polymerization outside the liposomes, and polymerizing the encapsulated hydrogel-forming components. The lipid bilayer may be solubilized with detergent. The phospholipid and detergent molecules and their micelles may then be removed by dialysis. The resulting nanogels may then be dried by evaporation in a temperature gradient. Poly(acrylamide) poly(*N*-isopropylacrylamide) and poly(*N*-isopropylacrylamide-*co*-1-vinylimidazole) hydrogel particles with a diameter from 30 to 300 nm were detected and characterized by dynamic light scattering technique. The solvent, temperature, pH, and ionic sensitivities of the nanogels were studied.

Fatty acid by-products and methods of using same

Tran, B.L., and D.L. Kouznetsov, Nalco Co., US7942270, May 17, 2011

Methods and compositions for separating materials are provided. In an embodiment, the present invention provides a method of separating a first material from a second material. For example, the method can comprise mixing the first material and the second material in a slurry with a beneficiation composition. The beneficiation composition can comprise one or more fatty acid by-products derived from a biodiesel manufacturing process. Air bubbles can be provided in the slurry to form bubble-particle aggregates with the first material and the bubble-particle aggregates can be allowed to be separated from the second material.

Process for the production of diacylglycerol

Lai, O.M., *et al.*, Universiti Putra Malaysia, Golden Hope Research Sdn. Bhd., US7943335, May 17, 2011

The present invention provides a process for producing a diacylglycerol, which comprises, reacting triacylglycerol with water and an enzyme preparation to obtain a mixture comprising of diacylglycerol, monoacylglycerol, and free fatty acid; removing water content in the mixture by way of dehydration; and separating monoacylglycerol, free fatty acid, and residual triacylglycerol by at least one separation method to obtain a high-purity diacylglycerol. An oil or fat composition comprising of diacylglycerol obtained from the process and phytosteryl esters and/or ferulic acid esters in an amount of from 0.5% to 25% by weight of diacylglycerol is also provided.

Phospholipases, nucleic acids encoding them and methods for making and using them

Gramatikoa, S., *et al.*, Verenum Corp., US7943360, May 17, 2011

The invention provides novel polypeptides having phospholipase activity, including, e.g., phospholipase A, B, C, and D activity, patatin activity, lipid acyl hydrolase (LAH) activity, nucleic acids encoding them and antibodies that bind to them. Industrial methods, e.g., oil degumming and products comprising use of these phospholipases, are also provided.

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



Minutes of the 2011 AOCS Annual Business Meeting

The 102nd AOCS Annual Business Meeting began with a short video that highlighted AOCS activities and accomplishments during the past year.

The meeting was then called to order by AOCS President Keith Grime at 7:20 a.m., Tuesday, May 3, 2011, at the Duke Energy Convention Center in Cincinnati, Ohio, USA.

President Grime welcomed the participants and gave special thanks to Annual Meeting General Chairperson Warren Schmidt and Annual Meeting Technical Chairperson James Kenar. He then gave his retiring president's address, noting that AOCS has focused its strategy on improving its financial health, increasing communication and networking tools for AOCS constituents, streamlining and focusing the governance and operating structure of the Board, increasing its global reach, and continuously improving its core competencies. Grime was pleased to report that "it has been a year of progress, growth, and transition." Finally, Grime discussed the importance of staying aware of the ever-growing concept of sustainability. Serious science will be necessary to make sustainability a reality. AOCS membership covers the breadth and depth of chemical disciplines from natural to synthetic sources and can create forums to build the bridge between the two areas. He urged participants to create discussions and meetings focused across the disciplines to drive the science forward to viable solutions.

President Grime called AOCS Secretary Sevim Erhan to the podium to present the minutes from the 2010 business meeting—unless someone made a motion to approve the minutes as published in the April 2011 issue of *inform*. The motion to approve the minutes as published was made, seconded, and approved by a voice vote.

President Grime noted that changes to the AOCS bylaws were presented to the membership for a vote during last Board election and that the changes were approved. Grime also gave the participants a chance to vote in person for the bylaw changes as presented. After a show of hands, the changes were approved.

AOCS Foundation Chairperson Mike Boyer took the podium and reported that the Foundation was celebrating its 25th anniversary. He discussed upcoming Foundation activities and initiatives, and encouraged participants to consider making an investment in the AOCS Foundation.

Grime passed the AOCS gavel to incoming President Erich Dumelin. Grime was then presented with the Past President's key and AOCS Award winners were recognized.

Following the presentation of Awards, President Erich Dumelin addressed the participants, stating that although the Society started more than a century ago with a small group of chemists, the premises it was built on—exchange of information, networking, and technical expertise—remain the same today. "AOCS continues to adapt to the changing world around it, to ensure that it provides relevant tools for the professionals it serves," he said. In the coming year, AOCS will continue to focus on expanding its network to meet the increasing demands brought on by the globalization of our business and the broad scope of issues AOCS addresses. AOCS is uniquely positioned to accomplish these goals and can be successful in growing its global network with the participation of its constituents.

With no further business, President Dumelin adjourned the meeting at 8:03 a.m. Annual Meeting General Chairperson Warren Schmidt took the podium to introduce the keynote speaker, Robert Chouffot, general manager of higher olefins and derivatives at Shell Chemical LP and president of Shell Chemical LP, Shell Chemicals US Operating Company.

Interested in contributing to *inform* magazine?

Do you have a story that would be perfect for the pages of *inform*? *inform* magazine is actively seeking the contributions of you and your colleagues. Contact *inform*'s managing editor at kheine@aoacs.org for more information.

AOCS Board Petition to Nominate

For each annual election of AOCS Governing Board officers, the membership may nominate up to two additional member-at-large candidates by petition. Petitioned candidates receiving at least 50 AOCS member signatures will be added to the ballot approved by the Governing Board. Preference will be given to the first two petitioned candidates meeting the eligibility requirements as outlined here. Petitioned nominations must be received at the AOCS Headquarters no later than **October 30, 2011**.

Petition forms can be obtained by visiting [http://aoacs.files.cms-plus.com/AboutUsPDFs/2011 Petition.pdf](http://aoacs.files.cms-plus.com/AboutUsPDFs/2011%20Petition.pdf).



Please mail completed petitions with at least 50 AOCS signatures to: AOCS Nominations and Elections Committee, P.O. Box 17190, Urbana, IL 61803-7190 USA or fax to: Amy Lydic, +1 217-693-4852.

2010-2011 AOCS Laboratory Proficiency Program winners

The AOCS Laboratory Proficiency Program (LPP), formerly known as the Smalley Check Sample Program, is the world's most extensive and respected collaborative proficiency testing program for oil- and fat-related commodities, oilseeds, oilseed meals, and edible fats. More than 500 chemists participate to verify their lab's quality control. Participants use AOCS or similar methods for sample analysis and then compare their results with those from a large cross-section of other laboratories using the same methods and samples. For more information, contact Evelyn King at AOCS Technical Services (phone: +1 217-693-4815; fax: +1 217-693-4859; email: evelynk@aocs.org).

Aflatoxin in Corn Meal

First Place

Sarah Ruiz
Sean Holleran
Eurofins Central Analytical
Labs
Metairie, LA 70001
USA

Honorable Mention

Steven Stroh
IDALS
Ankeny, IA 50021
USA

Aflatoxin in Corn Meal Test Kit

First Place

Eric Stone
Illinois Dept. of Agriculture
Springfield, IL 62702
USA

Honorable Mention

Michael Marquard
General Mills Inc.
Golden Valley, MN 55427
USA

Honorable Mention

Janet Smith
Fieldale Farms Corp.
Baldwin, GA 30511
USA

Aflatoxin in Cottonseed

First Place

Dan Hengst

Covance Laboratories
Madison, WI 53704
USA

Aflatoxin in Milk

First Place

Martha J. Chinakwe
Alabama Dept. of Agriculture
& Industries
Montgomery, AL 36107
USA

Aflatoxin in Peanut Butter

First Place

Diana Kavolis
Andy Yehl
The Hershey Company
Hershey, PA 17033
USA

Aflatoxin in Peanut Paste

First Place (tie)

Laboratory One
JLA Argentina SA
Cordoba, X 5809 BAS
Argentina

Mariana Astore
SGS Argentina S.A.
Buenos Aires, C1088AAJ
Argentina

Honorable Mention

JL Analytical Services
Modesto, CA 95358

Honorable Mention

JLA Brasil Laboratorio de
Analises

Marilia, Sao Paulo 17052-330
Brazil

Aflatoxin in Peanut Paste Test Kit

First Place

Quality Assurance Technical
Team
Algood Food Co.
Louisville, KY 40258-1896
USA

Honorable Mention

Quality Assurance Technical
Team
Algood Food Co.
Louisville, KY 40258-1896
USA

Honorable Mention

Pat Passmore
American Blanching Co.
Fitzgerald, GA 31750
USA

Cholesterol

First Place

Eugenia Buliga
Sue Bigg
Maxxam Analytics
Mississauga, ON L5N 2L8
Canada

Honorable Mention

Paulette Manemann
Ann Lindgren
Hormel Foods LLC
Austin, MN 55912
USA

Honorable Mention

Jana Pogacnik

Shur-Gain/Maple Leaf Foods
St-Hyacinthe, QB J2R 1S5
Canada

Cottonseed

First Place

Donald Britton
Mid-Continent Laboratories
Memphis, TN 38101
USA

Cottonseed Oil

First Place

Donald Britton
Mid-Continent Laboratories
Memphis, TN 38101
USA

Edible Fat

First Place

James Houghton
Golden Foods/Golden Brands
Louisville, KY 40208
USA

Honorable Mention

Eddie L. Baldwin
Helen Cianciolo, Howard
Payne
Stratas Foods Technology
Center
Bartlett, TN 38133
USA

Honorable Mention

Ed Paladini, J. Pickle, D. David
H. Sidhu, R. Manalang, D.
Simmons
California Oils Corp.
Richmond, CA 94804
USA

Honorable Mention

Deborah McRoberts
Golden Foods/Golden Brands
Louisville, KY 40208
USA

Feed Microscopy**First Place**

Yuan-Te Fu
NCDA & CS Food & Drug
Protection
Raleigh, NC 27607
USA

Honorable Mention

Michael Olivarez
Office of the Texas State
Chemist
College Station, TX 77843
USA

Second Place

Piotr Czajkowski
Provimi Polska
Chelmno, 86-200
Poland

Third Place

Elizabeth Krzykwa
Canadian Food Inspection
Agency
Ottawa, ON K1A 0C6
Canada

Fish Meal**First Place**

Carl W. Schulze
New Jersey Feed Laboratory
Inc.
Trenton, NJ 08638
USA

Honorable Mention

Cecilia Palomino
SGS Del Peru S A C
Callao 1, 27-0125
Peru

Fumonisin in Corn**First Place**

Jerome J. King
Midwest Laboratories Inc.
Omaha, NE 68144
USA

Gas Chromatography**First Place**

Pete Cartwright
New Jersey Feed Laboratory
Inc.
Trenton, NJ 08638
USA

Honorable Mention

Linda S. Mc Laren
Loders Croklaan
Channahon, IL 60410
USA

Honorable Mention

Analytical Team
Bunge Oils
Bradley, IL 60915
USA

Honorable Mention

Paul Thionville, Shani Jolly
A. Thionville, Nancy Trosclair
Boyce Butler
Thionville Laboratories, Inc.
New Orleans, LA 70123
USA

Honorable Mention

Valdosta Laboratory
ADM Valdosta
Valdosta, GA 31601
USA

Honorable Mention

QC Laboratory
ADM Clinton
Clinton, IA 52732
USA

Honorable Mention

Quincy Laboratory
Stratus Packaging
Quincy, IL 62305
USA

Honorable Mention

Ardin Backous
Anders Thomsen
Eurofins Scientific
Des Moines, IA 50321-3157
USA

Honorable Mention

Eddie L. Baldwin, Helen
Cianciolo

Howard Payne
Stratas Foods Technology
Center
Bartlett, TN 38133
USA

AOCS/GOED Omega-3 Nutraceutical Oils**First Place**

Marvin Boyd, Jr.,
Roger Keith Barnhill, Tiffany
James
Shaun Huynh
Eurofins Central Analytical
Labs
Kingstree, SC 29556
USA

Honorable Mention

Michael Potvin
Mark Arsenault
Ocean Nutrition Canada
Dartmouth, NS B2Y 4T6
Canada

Marine Oil**First Place**

Health and Science Center
Omega Protein, Inc.
Reedville, VA 22539
USA

Honorable Mention

Cecilia Palomino
SGS Del Peru S A C
Callao 1, 27-0125
Peru

Honorable Mention

Marvin Boyd, Jr.
Shaun Huynh, Tiffany James
Eurofins Central Analytical
Labs
Kingstree, SC 29556
USA

Marine Oil Fatty Acid Profile**First Place**

Otelia Robertson
Health and Science Center
Omega Protein Inc.
Reedville, VA 22539
USA

Honorable Mention

Chris Lirette
Erin Stipe
Eurofins Central Analytical
Labs
Metairie, LA 70001
USA

Honorable Mention

Analytical Services
POS Bio-Sciences
Saskatoon, SK S7N 2R4
Canada

Mixed Seed**First Place—Canola**

Marnie MacLean
Canadian Grain Commission
Winnipeg, MB R3C 3G7
Canada

First Place—Safflower

Tuyen Mai
Div. of Intertek Caleb Brett
St. Rose, LA 70087
USA

First Place—Sunflower

Paul Thionville, Shani Jolly
A. Thionville, Nancy Trosclair
Boyce Butler
Thionville Laboratories, Inc.
New Orleans, LA 70123
USA

NIOP Fats and Oils**First Place**

Renato M. Ramos
Admiral Testing Services, Inc.
Luling, LA 70070
USA

Honorable Mention

Ramesh Patel
Mumtaz Haider
SGS North America
Deer Park, TX 77536
USA

Nutritional Labeling**First Place**

Sonia Bouchard
CFIA Food Lab
Longueuil, PQ J4K 1C7
Canada

Honorable Mention

Eric de Ronde
Chris Lirette, Erin Stipe
Eurofins Central Analytical
Labs
Metairie, LA 70001
USA

Oilseed Meal**First Place**

Frank Fuentes
Southern Cotton Oil Co.
Lubbock, TX 79404
USA

Honorable Mention

Lynn Hawkins
Michael Hawkins, John Peden
Barrow-Agee
Memphis, TN 38116
USA

Honorable Mention

Trevor Meredith
Solbar Hatzor
Ashdod, 77121
Israel

Honorable Mention

Frank Tenent
Edgar Tenent
K-Testing Lab Inc.
Memphis, TN 38116
USA

Honorable Mention

Paul Thionville, Shani Jolly
A. Thionville, Nancy Trosclair
Boyce Butler
Thionville Laboratories, Inc.
New Orleans, LA 70123
USA

**Oilseed Meal
100% Crude Fiber****First Place**

Mike White
Brian Eskridge
ATC Scientific
North Little Rock, AR 72114
USA

Honorable Mention

Lynn Hawkins
Michael Hawkins, John Peden
Barrow-Agee

Memphis, TN 38116
USA

Honorable Mention

Paul Thionville, Shani Jolly
A. Thionville, Nancy Trosclair
Boyce Butler
Thionville Laboratories, Inc
New Orleans, LA 70123
USA

Honorable Mention

Frank Fuentes
Southern Cotton Oil Co.
Lubbock, TX 79404
USA

Honorable Mention

Frank Tenent
Edgar Tenent
K-Testing Lab Inc.
Memphis, TN 38116
USA

Honorable Mention

Brad Newton Beavers
Carolina Analytical Services
Bear Creek, NC 27207
USA

**Oilseed Meal
100% Moisture****First Place**

Frank Fuentes
Southern Cotton Oil Co.
Lubbock, TX 79404
USA

Honorable Mention

Frank Tenent
Edgar Tenent
K-Testing Lab Inc.
Memphis, TN 38116
USA

Honorable Mention

Lynn Hawkins
Michael Hawkins, John Peden
Barrow-Agee
Memphis, TN 38116-3507
USA

Honorable Mention

Trevor Meredith
Solbar Hatzor
Ashdod, 77121
Israel

Honorable Mention

Gordon Whitbeck
John Dillard
A & A Laboratories Inc.
Springdale, AR 72764
USA

**Oilseed Meal 100%
Nitrogen Ba 4d-90****First Place**

Sandy Holloway
Intertek Americas
Memphis, TN 38113
USA

Honorable Mention

Trevor Meredith
Solbar Hatzor
Ashdod, 77121
Israel

**Oilseed Meal 100%
Nitrogen Ba 4e-93****First Place (tie)**

Gordon Whitbeck
John Dillard
A & A Laboratories Inc.
Springdale, AR 72764
USA

First Place (tie)

Ardin Backous
Anders Thomsen
Eurofins Scientific
Des Moines, IA 50321-3157
USA

Honorable Mention

Paul Thionville, Shani Jolly
A. Thionville, Nancy Trosclair
Boyce Butler
Thionville Laboratories, Inc.
New Orleans, LA 70123
USA

Honorable Mention

Pete Cartwright
New Jersey Feed Laboratory
Inc.
Trenton, NJ 08638
USA

**Oilseed Meal
100% Oil****First Place**

George Ducsay
Bruce Kerr
Isotek LLC
Oklahoma City, OK 73127
USA

Honorable Mention

Lynn Hawkins
Michael Hawkins, John Peden
Barrow-Agee
Memphis, TN 38116-3507
USA

Honorable Mention

Donald Britton
Mid-Continent Laboratories
Memphis, TN 38101
USA

Honorable Mention

Jillian Krieger
LDM Foods
Yorkton, SK S3N 3X3
Canada

Honorable Mention

Trevor Meredith
Solbar Hatzor
Ashdod, 77121
Israel

Olive Oil—Part A**First Place**

Xenikakis Polydoros
Eas Sitias
Union of Agri Co-Op of Sitia
Sitia, Crete 72300
Greece

Honorable Mention

Rodney Mailer
NSW Dept. of Industry and
Investment
Wagga Wagga, NSW 2650
Australia

Olive Oil—Part B**First Place**

Giorgio Cardone
Chemiservice Srl
Monopoli, Bari 70043
Italy

Olive Oil—Part C**First Place**

Giorgio Cardone
Chemiservice Srl
Monopoli, Bari 70043
Italy

Palm Oil**First Place**

Yang Lai Yap
PGEO Edible Oils Sdn Bhd
Prai 13600
Malaysia

Honorable Mention

Kooi Eng Tan
PGEO Edible Oils Sdn Bhd
Sitiawan, Perak 32000
Malaysia

Honorable Mention

Cheah Ping Cheong
Indelab Sdn Bhd
Port Klang, Selangor 42000
Malaysia

Peanut Seed**First Place**

Edenton Analytical Team
Tina Harrell
JLA USA
Edenton, NC 27932
USA

Honorable Mention

Brownfield Analytical Team
Andrea Pando
JLA USA
Brownfield, TX 79316
USA

Phosphorus in Oil**First Place**

Annlouise Lomnitz
Aarhus Karlshamn
Karlshamn, SE-37482
Sweden

**Solid Fat Content
by NMR****First Place**

Ed Paladini, J. Pickle, D. David
H. Sidhu, R. Manalang, D.
Simmons
California Oils Corp.
Richmond, CA 94804
USA

Honorable Mention

Eddie L. Baldwin, Helen
Cianciolo
Howard Payne
Stratas Foods Technology
Center
Bartlett, TN 38133
USA

Soybean Oil**First Place**

Mike White
Brian Eskridge
ATC Scientific
North Little Rock, AR 72114
USA

Honorable Mention

Frank Hahn
Hahn Laboratories Inc.
Columbia, SC 29201
USA

Soybeans**First Place**

Renato M. Ramos
Admiral Testing Services
Luling, LA 70070
USA

Honorable Mention

Eric de Ronde
Eurofins Central Analytical
Labs
Metairie, LA 70001
USA

Specialty Oils**First Place**

Chemistry Lab
Certified Laboratories of NCA
Merced, CA 95341
USA

Tallow & Grease**First Place (tie)**

Jose Garcia
National Beef Packing
Company
Liberal, KS 67901
USA

First Place (tie)

Adalberto Coronado
National Beef Packing
Company
Liberal, KS 67901
USA

Honorable Mention

Paul Thionville, Shani Jolly
A. Thionville, Nancy Trosclair
Boyce Butler
Thionville Laboratories, Inc.
New Orleans, LA 70123
USA

Honorable Mention

Ramesh Patel
Mumtaz Haider
SGS North America
Deer Park, TX 77536
USA

Honorable Mention

Jean-Francois Harvey
Sanimax Aci Inc



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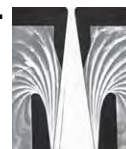
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Web: www.jmpedroni.com



2011–2012 AOCS Certified Laboratories

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Springdale, AR 72764 USA
+1 479-756-1270
Gordon Whitbeck, John Dillard

Admiral Testing Services, Inc.

12111 River Rd.
Luling, LA 70070 USA
+1 504-734-5201
Renato M. Ramos

ATC Scientific

312 North Hemlock
North Little Rock, AR 72114 USA
+1 501-771-4255
Mike White, Brian Eskridge

Barrow-Agee Laboratories, Inc.

1555 Three Place

Memphis, TN 38116 USA
+1 901-332-1590
Michael Hawkins, Lynn Hawkins

Carolina Analytical Services LLC

17570 NC Hwy 902
Bear Creek, NC 27207 USA
+1 919-837-2021
Jennie Stewart, Brad Beavers

Eurofins Scientific

2200 Rittenhouse St.
Suite 150
Des Moines, IA 50321 USA
+1 515-265-1461
Ardin Backous, Kent Karsjens

Hahn Laboratories, Inc.

1111 Flora St.
Columbia, SC 29201 USA

+1 803-799-1614
Frank M.Hahn

Intertek Agri Services

160 East James Dr. Suite 200
St. Rose, LA 70087 USA
+1 504-602-2100
Tuyen Mai

K-Testing Laboratory, Inc.

1555 Three Place Suite A
Memphis, TN 38116 USA
+1 901-525-0519
Edgar Tenent, Frank Tenent

Minnesota Valley Testing Lab

2 North German
New Ulm, MN 56073 USA
+1 507-233-7171
Joel Sieh

Nutreco Canada

8175 Rue Duplessis
St- Hyacinthe, QC J2R 1S5 Canada
+1 450-796-2555
Jana Pogacnik

SGS North America, Inc.

151 James Drive West
St. Rose, LA 70087
+1 504-469-6401
William Spence

Thionville Laboratories, Inc.

5440 Pepsi St.
Harahan, LA 70123 USA
+1 504-733-9603
Paul Thionville, Shani Jolly, Boyce Butler, Andre Thionville

Charny, PQ G6X 3R4
Canada

Trace Metals in Oil

First Place (tie)

Laurie Russell
Ag Processing Inc.
Eagle Grove, IA 50533 USA

First Place (tie)

Patricia Harris, Cindy Brown
Jennifer Ranatza
Eurofins Central Analytical Labs
Metairie, LA 70001 USA

trans Fatty Acids by GC

First Place

Yen Shi Shih
Weston Food Laboratories

Enfield, NSW 2136
Australia

Honorable Mention

A. Janssens
S. van de Ven
SGS Nederland B.V.
Spijkenisse, 3208 LD
The Netherlands

Honorable Mention

Jesus Gomez Salgado
Industrial de Oleaginosas
Americanas
San Jose, 6651-1000
Costa Rica

Honorable Mention

Eugenia Buliga
Sue Bigg
Maxxam Analytics
Mississauga, ON L5N 2L8

Honorable Mention

Analytical Services

POS Bio-Sciences
Saskatoon, SK S7N 2R4
Canada

Honorable Mention

Quincy Laboratory
Stratas Packaging
Quincy, IL 62305 USA

trans Fatty Acids by IR

First Place

QA/QC Laboratory
ADM Mankato Refinery
Mankato, MN 56001 USA

Unground Soybean Meal

First Place

Sherry Muse
Ag Processing Inc.

St. Joseph, MO 64504
USA

Honorable Mention

Frank Hahn
Hahn Laboratories Inc.
Columbia, SC 29201 USA

Honorable Mention

Sharon Spicer
Ag Processing Inc.
St. Joseph, MO 64504 USA

Vegetable Oil Color Only

First Place

George Hicks
Dallas Group
Jeffersonville, IN 47130 USA ■

CALENDAR (CONTINUED FROM PAGE 541)

Industry—2011, Kiev, Ukraine. Information: APK-Inform Agency: +380 562 320795, +7 495 7894419, e-mail: ramazanova@apk-inform.com; www.agrimarket.info/conferences/oil2011.

November 28–30, 2011. Canadian Renewable Fuels Summit, The Westin Hotel, Calgary, Alberta. Information: www.greenfuels.org/en/industry-information/summit.aspx.

November 29–December 1, 2011. Food Ingredients Europe 2011 Exhibition, Paris, France. Information: www.fi-events.com.

December

December 1–2, 2011. International Algae Conference: Microalgae and Aquatic Biomass, Berlin, Germany. Information: www.algaecongress.com.

December 7–8, 2011. Bioenergy International Asia Expo & Conference, Kuala Lumpur Convention Centre, Kuala Lumpur, Malaysia. Information: www.biofuelsinternationalexpo.com/asia.

December 7–10, 2011. Vinachem International Chemical Industry Exhibition, Tan Binh International Exhibition & Convention Center, Ho Chi Minh City, Vietnam. Information: www.vietfair.vn; www.chemvina.com.

December 8–10, 2011. 17th Lipid Meeting, BIO CITY LEIPZIG, Leipzig, Germany. Information: www.lipidmeeting.de.

December 10–13, 2011 International Conference on Soaps, Detergents & Cosmetics, Nehru Centre, Mumbai, India. Information: www.isdcconference.com.

2012

January 29–February 11, 2012. Genetic and Molecular Basis of Obesity and Body Weight Regulation, Santa Fe Community Convention Center, Santa Fe, New Mexico, USA. Information: www.keystonesymposia.org/Meetings/ViewMeetings.cfm?MeetingID=1171.

February 26–March 2, 2012. ApoE, Alzheimer's and Lipoprotein Biology, Keystone Resort, Keystone, Colorado, USA. Information: www.keystonesymposia.org/Meetings/ViewMeetings.cfm?MeetingID=1182.

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

March 4–6, 2012. GEAPS [Grain Elevator and Processing Society] Exchange, Minneapolis Convention Center, Minnesota, USA. Information: www.geaps.com.

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

March 11–16, 2012. Pittcon 2012 Conference & Expo, Orange County Convention Center, Orlando, Florida, USA. Information: www.pittcon.org.

March 15–16, 2012. HPCI [Home and Personal Care Ingredients] Congress India, Bombay Exhibition Centre, Mumbai, India. Information: www.hpci-congress.com.

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

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

April 1–3, 2012. 80th Oil Mill Operators Short Course. Wichita, Kansas, USA. Information: Rich Clough, phone: +1 979-862-2262; fax: +1 979-845-2744; email: rclough@tamu.edu; http://foodprotein.tamu.edu.

April 22–24, 2012. Hydrocolloid Conference, Westin Hotel, Valencia, Spain.

Information: email: dseisun@hydrocolloid.com.

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

April 29–May 2, 2012. 103rd AOCS Annual Meeting & Expo, Long Beach Convention and Entertainment Center, Long Beach, California, USA. Information: phone: +1 217-359-2344; fax: +1 217-351-8091; email: meetings@aocs.org; http://AnnualMeeting.aocs.org.

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

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

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

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

June 18–21, 2012. BIO [Biotechnology Industry Organization] International Convention, Boston, Massachusetts, USA. Information: http://convention.bio.org.

June 25–29, 2012. Institute of Food Technologists' Annual Meeting and Expo, Las Vegas, Nevada, USA. Information: www.ift.org.

October 29–31, 2012. Singapore 2012: World Conference on Fabric and Home Care, Shangri-La Hotel, Singapore. Information: phone: Mindy Cain, +1 217-693-4827; email: mindyc@aocs.org; www.singapore.aocs.org. ■

SOY & BREAST CANCER (CONTINUED FROM PAGE 546)

"I believe that early exposure is the key in order to see the protective results in adult life," Hilakivi-Clarke said. "For that reason, we cannot make recommendations based on the Shu data—the exposure of Chinese women to isoflavones is very different."

Would she recommend soy foods to her best friend if the friend had breast cancer?

"If she had never consumed soy before and wants to improve her overall diet by adding it, it would be fine to include at the level of about 1/2 serving per day (or several full servings per week). But I would tell her she absolutely should not take isoflavone supplements."

Shu herself says that questioning the applicability of data in Asian women "is understandable." Thus, she and others pooled data from three US studies with her original data from Chinese women. In all, the team evaluated postdiagnosis soy food intake and breast cancer outcomes of 18,312 women between the ages of 20 and 83 years.

The pooled study was presented at the 102nd Annual Meeting of the American Association for Cancer Research in April 2011 (<http://tinyurl.com/AACR-pooled>). "We did not see any adverse effect related to eating soy food," Shu said of the study, adding that there was no sign of a risk of recurrence. "There was some suggestion that soy foods may be beneficial."

One of the pooled US cohorts in the research presented at AACR is from a study led by Bette Caan of Kaiser Permanente in Oakland, California, USA. Entitled Women's Healthy Eating and Living (WHEL), the study is a randomized, controlled trial of more than 3,000 early-stage breast cancer survivors, with a median follow-up of 7.3 years from the time of enrollment (*Cancer Epidemiology,*

Biomarkers & Prevention 20:854–858, 2011). Results showed that consuming up to 1/2 serving of soy foods per day did not increase breast cancer recurrence among women previously diagnosed with breast cancer, and was associated with lower mortality among such women. (Neither result reached significance.)

"When one considers the limitations of animal research, that the clinical data show isoflavone exposure doesn't adversely affect markers of breast cancer risk, and the epidemiologic data from China and the United States indicating postdiagnosis soy consumption improves the prognosis of women with a history of breast cancer, it is pretty clear that the totality of the evidence has shifted in favor of the safety and potential benefit of soy foods," says Mark Messina.

Moving forward

As is the case with all things scientific, more work is needed. But my months of research and reading have left me feeling perfectly comfortable with continuing to eat a variety of whole soy foods. [A note of caution: Each breast cancer patient needs to do her own review of the research and make her own decision. If it isn't wise to generalize data from Asian women to Western women, it is even less wise to blindly follow the decision of one health and nutrition writer.]

My daily—costly—supplement regimen now includes long-chain omega-3 fatty acids in the form of triglycerides, curcumin with piperine, glucosamine and chondroitin, and 600 International Units of vitamin D3 with co-factors.

Curcumin (a phytochemical in turmeric) has shown promise as an anticancer agent; I added it (with co-factor piperine, which is necessary to increase the bioavailability of

curcumin) to my armamentarium. Resveratrol (one of the bioactive phytochemicals in red grapes) has also shown promise, but it is a mixed agonist/antagonist. Until there is more literature to review demonstrating that it doesn't aid cell proliferation, I will not take it in supplement form.

Why the D3? Studies show that women with serum 25-hydroxyvitamin D levels above 40 nanograms/milliliter have less debilitating joint pain and stiffness, a very common side effect of adjuvant therapy with aromatase inhibitors. Why omega-3 fatty acids? Because an observational study focusing on post-initial treatment breast cancer patients monitored over a seven-year period found that women in the highest third of long-chain omega-3 consumption (more than 153 mg/day) were 40% less likely to die from breast cancer compared with women in the lowest third.

Even more important, however, in terms of holding recurrence at bay—or reducing the risk of breast cancer, for that matter—is weight loss and exercise. Adipose tissue manufactures estradiol, the most potent of the body's estrogens, and outcomes of obese breast cancer patients are not as good as slender patients. Then, too, at least 15–20 metabolic equivalents of exercise per week has been associated with a significant reduction in the risk of recurrence of breast cancer. (To learn more about metabolic equivalents, see www.dslrf.org/pdfs/Great_Reads_MarieMurphyBCRisk.pdf.)

And now for the question that remains unanswered: Have I pulled the welcome mat for recurrent cancer or am I just making very expensive urine? Only time will tell.

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

SUGAR TO GLUCARIC ACID (CONTINUED FROM PAGE 552)

company's technology prior to a full commercial facility), co-located with the company's headquarters in Missoula. A larger, global-scale glucaric acid production facility will follow, with an anticipated capacity of 60 million pounds per year. Rivertop's first commercial facility is expected to be built in the Midwestern United States, in proximity to an abundant supply of low-cost, readily available glucose.

Only the beginning

The future of the cleaning products industry is one in which high product performance and competitive pricing will continue to be the benchmark; however, the growing importance to consumers of product sustainability and environmental impact will play a larger role in purchasing decisions. Manufacturers already see this coming and,

in turn, are searching for cost-effective, reliable solutions. Of course, consumer preference is not the only power at play in this process, as increasingly stringent governmental regulations will also drive the movement toward sustainable materials.

With low-cost, biodegradable glucaric acid, Rivertop Renewables has found a phosphate replacement for detergents that is effective and cost competitive. It has also identified a product that can move beyond the cleaning industry to serve multiple industries now and in the future. Glucaric acid may just be the start, as Rivertop's oxidation technology can utilize a variety of sugars from numerous renewable, sustainable feedstocks such as cellulose and algae.

Tyler N. Smith is director of research and development at Rivertop Renewables. He can be contacted at tyler@rivertop.com.



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Melamine in the feed and food chain

Tanja Calitz and Christian W. Cruywagen

In 2007, *The New York Times* reported melamine adulteration in animal feed to be an “open secret” in China after the newspaper had interviewed the general manager of a chemical company who admitted to selling melamine residues to animal feed companies. The exportation of melamine-tainted feed ingredients from Chinese feed companies caused international havoc during 2006 and 2007, when a large number of household pets died as a result of renal failure attributable to eating contaminated food.

In 2008, the world was shocked again when the Chinese government confirmed the deaths of six babies and reported that 296,000 babies had fallen ill after consuming melamine-tainted infant formula. In this case, the infant formula was adulterated with pure melamine after the formula had been manufactured. The cause of the deaths and illnesses was crystal formation in the kidneys of the babies, which resulted in renal failure.

Melamine as a protein adulterant

Melamine ($C_3H_6N_6$, or 1,3,5-triazine-2,4,6-triamine) is an industrial chemical used in the manufacture of plasticware, tabletops, paints, concrete, and fire retardants. Pure melamine contains 667 g/kg of nitrogen (N) on a molecular weight basis (Merck, 2001), compared to 467 g/kg of N in urea. The crude protein content of feed is calculated from its N content (AOAC, 2000). Therefore, the crude protein content ($N \times 6.25$) of pure melamine is 4,167 g/kg—substantially higher than that of pure urea (2,917 g/kg). Thus, melamine can be used as an artificial way to increase the crude protein content of a specific feed ingredient.

Melamine is manufactured by a distillation process from molten urea. This results in an effluent that is cooled, concentrated, and crystallized to yield melamine (Lahalih and Absi-Halabi, 1989). During the crystallization phase, a large amount of wastewater is produced. The wastewater still contains various distillation products, including melamine, oxytriazines, and polycondensates. Due to possible pollution hazards, the wastewater cannot be disposed of as such, thus the solids are concentrated into a solid form for disposal. This solid waste product typically contains 70% melamine, 23% oxytriazines (cyanuric acid, ammeline, and ammelide), and 7% polycondensates, such as melam, melam, and melon (Kirk-Othmer, 1978).

In 2004, owing to increased demand, China produced 260,000 metric tons (MT) of melamine. By 2006, mainland China had a serious surplus of the chemical. Between 2002 and 2007, the price of urea (feedstock for melamine) increased dramatically, which negatively impacted the profitability of melamine production. As a result, the surplus melamine was used as a protein adulterant for feeds and milk. Even though the Chinese government implemented new laws to eliminate the practice of adulteration, adulterated corn and wheat



FIG. 1. These melamine-cyanurate complex crystals were formed in vitro by use of solutions containing reagent grade chemicals. Photograph taken through a 20× objective lens. Bar = 45 μ m. (The red line is not relevant for this article.) Figure taken from Reimschuessel, R., et al., Evaluation of the renal effects of experimental feeding of melamine and cyanuric acid to fish and pigs, *Am. J. Vet. Res.* 69:1217—1228 (2008). Reprinted with permission from the publisher.

gluten had been exported to many countries and such products may still be in circulation in many parts of the world.

Melamine toxicosis in animals

Melamine may react with cyanuric acid on a 1:1 basis to form melamine cyanurate, a crystalline complex held together by an extensive two-dimensional network of hydrogen bonds (Perdigão *et al.*, 2006). These two-dimensional hydrogen bonds start to build a three-dimensional structure, which results in the formation of spoke-like crystals (Fig. 1).

These crystals were identified as the main culprit in causing the renal failure observed during the 2006–2007 pet food incident (He *et al.*, 2008) (Fig. 2).

Melamine toxicosis in humans

In humans, the end product of nucleic acid metabolism is uric acid. Humans do not secrete the enzyme uricase (urate oxidase). Therefore, melamine may form closely related hydrogen-bonded complexes with uric acid, which has a similar N-formylformamide group in the 4, 5, and 6 positions in the six-membered ring (Ogasawara, 1995). This complex is what led to the illness and deaths in babies who consumed the melamine-tainted infant formula (Lam *et al.*, 2009).

Melamine as nitrogen source for ruminants

During the 1950s and 1970s, researchers studied the use of melamine and its related compounds in ruminant diets, in an attempt to identify potential nitrogen sources. These early studies produced various results. Clark *et al.* (1966) reported that, in sheep weighing 35 kg, an intake of more than 10 g of melamine per day resulted in crystalluria and death, whereas an intake of 7 g/d showed no ill effect. MacKenzie (1966) reported weight loss and mortalities in sheep that ingested 9.9 and 19.6 g of melamine per day. Newton and Utey

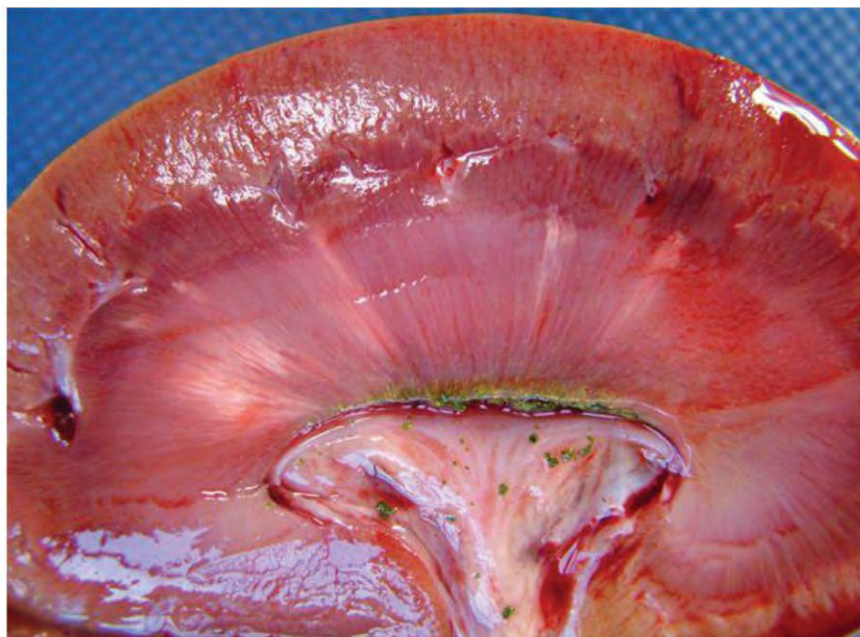


FIG. 2. Yellow/brown melamine cyanurate crystals, such as those seen in this dog kidney, were the main cause of renal failure during the 2006–2007 pet food incident. Courtesy of Vet Diagnostix, Pietermaritzburg, South Africa.

(1978) determined that steers could consume 45 g of melamine per day without any negative effects. Even though these researchers had different approaches in determining the potential use of melamine as a nitrogen source, they agreed that melamine was not an efficient nitrogen source for ruminants.

Melamine transmission to edible animal products

The Department of Animal Sciences at Stellenbosch University (South Africa) took great interest in studying melamine transmission

to animal products because South Africa imported 600 MT of melamine-tainted corn gluten meal (60% crude protein) from China near the end of 2006. Following the 2007 pet food recall, the Department of Agriculture quarantined 308 MT of the product, but unfortunately some of it found its way to the animal feed industry. Toward the end of 2008, melamine was found in the milk of some South African dairies.

Melamine transmission from feed to milk. Cruywagen *et al.* (2009) were the first to report studies of the transmission of dietary melamine to cows' milk. The source of melamine in the experimental diet was the Chinese melamine-tainted corn gluten 60, analysis of which showed a melamine concentration of 15.1 g/kg. The cows received an experimental diet that resulted in a melamine intake of 17.1 g/d. This study confirmed that a pathway exists for the transmission of melamine from feed to cow's milk. The study also showed that melamine appeared in the milk as soon as 8 hours after first ingestion. The melamine concentration peaked within 56 hours after first ingestion of the melamine-containing diet. The excretion efficiency (grams of melamine ingested/grams of melamine excreted into milk) ×

100 was 2.1%. Upon melamine withdrawal, when cows received a diet containing no melamine, levels of melamine were undetectable in the milk after 152 hours.

Melamine transmission from feed to meat. Cruywagen and coworkers (2011) carried out an experiment to determine the apparent absorption and excretion rates of melamine in sheep consuming 69 g melamine/day/animal, as well as to determine whether melamine would be deposited in meat. Results indicated that dietary melamine was in fact deposited in the meat, liver, and kidneys of these animals. The apparent absorption rate of ingested melamine was 76.7%.

information

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Approximately 3.6% of the ingested melamine was deposited in the meat, and the major excretion routes of dietary melamine were urine (54%) and feces (24%). The researchers postulated that the remaining 18% of ingested melamine, which could not be accounted for, was distributed among the blood, gastrointestinal tract, and organs not sampled in the trial. However, Newton and Utley (1978) found that rumen NH_3 concentrations increased in steers that ingested melamine. Therefore, they hypothesized that melamine is at least partly degraded in the rumen. This hypothesis was confirmed by a recent *in vitro* study at Stellenbosch University (Calitz, unpublished data), where it was observed that 13.6% of the melamine sample had degraded in rumen liquor.

Melamine transmission to eggs. In another study at Stellenbosch University, melamine-adulterated poultry feed given to laying hens for a 10-day period resulted in the transmission of dietary melamine to the eggs. Melamine appeared in the eggs one day after the initial ingestion of melamine and peaked three days after the initial melamine ingestion. Analysis of the sampled eggs indicated that melamine primarily concentrates in the albumin of the egg. The transfer efficiency of melamine from feed to eggs was calculated to be 0.7–0.8%. No detectable levels of melamine were observed within four days after the withdrawal of melamine-contaminated feed.

Melamine transmission from fertilizer to grass. Melamine has been used in fertilizers in the past as a source of slow-release nitrogen. This led to a trial wherein Kikuyu grass (*Pennisetum clandestinum*) was planted in small buckets and fertilized with melamine-contaminated Gluten 60. The application rate was equivalent to 8.8 kg melamine/ha. Melamine was detected in the grass (228 ppm) as early as 1 week after fertilization. At 17 weeks after it was fertilized, the grass samples contained no detectable levels of melamine.

If one takes into consideration that melamine is taken up by plants that have been fertilized with melamine-containing fertilizer, cows grazing these pastures possibly would consume melamine, which in turn could end up in the milk. Another trial at Stellenbosch University studied the effect on milk of cows grazing on melamine-fertilized pastures. Cows that grazed on the melamine-fertilized pasture in the morning had measurable melamine in their afternoon milk. Furthermore, Calitz (unpublished data) confirmed that the feces of these cows contained melamine, which could re-contaminate the pasture.

As mentioned previously, 78% of dietary melamine is excreted via urine and feces. Therefore, melamine-containing fertilizers may result in a continuous melamine transmission cycle. Pastures are fertilized with melamine-containing fertilizer, and melamine is taken up by the plants. Cows consume the plants and urinate and defecate on the pastures, returning melamine to the soil where it can again be taken up by the plants and ingested by grazing cows. Therefore, fertilizers should also be free from melamine adulteration.

Melamine in feed and food products

Throughout 2008, various feed and food products were reported to have been adulterated with melamine. Britain and several European countries imported melamine-tainted soya products from China. France imported 300 MT of melamine-tainted soy which was used in poultry diets. Foods, mostly in Asian countries, that reportedly contained melamine included products such as infant formula, cheese-cake, cookies, coffee, sweets, pasta, and rice. Companies affected by melamine adulteration and that had to recall their products included

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Melamine adulteration is an ongoing threat

During February 2010, Chinese inspectors confiscated 72 MT of melamine-tainted milk powder and 38 MT of melamine-tainted milk. On July 9, 2010, *Asia News* reported that the problem of food security was far from being resolved, as a batch of milk had again been found in China that contained 500 times the amount of melamine that was permitted. During late August, Reuters news agency reported that 103 MT of melamine-tainted milk powder had been seized in mainland China. Again in March 2011, CNN reported that Chinese authorities had seized 26 MT of melamine-tainted milk powder.

Quality assurance programs

The adulteration of feed and food ingredients with melamine has led to increased security checks, routine chemical analyses, and improved traceability with the importation of feed ingredients. It is important for all countries that import feed and food ingredients to be cautious of ingredients from suspicious suppliers, and to make sure that a good quality assurance program is always in place. However, one must consider the fact that before melamine-tainted feed ingredients

were identified as an important culprit threatening animal and human health, large quantities of these feed ingredients were imported by many countries. It is highly unlikely that governments would have been able to have quarantined all of the ingredients. Hence, one is only left to wonder what will happen when the dust settles.

Tanja Calitz is a Ph.D. student in the department of animal sciences at Stellenbosch University, South Africa. A recipient of the South African Society for Animal Science's Bronze Medal in 2011, her research focuses on post-absorption partitioning kinetics of melamine and melamine excretion pathways in dairy cows. She can be contacted at tcaltiz@gmail.com. Christian Cruywagen is a professor in animal nutrition in the department of animal sciences at the Stellenbosch University. His research focuses on the nutrition of dairy cattle and calves, with 102 scientific and popular articles to his credit. Cruywagen is a member and current chair of the Agricultural Microscopy Division of AOCS. He can be contacted at cwc@sun.ac.za.



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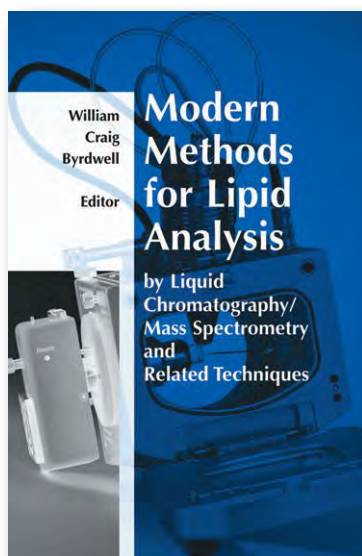
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New dietary guidelines and labeling initiatives accelerate shift toward more healthful oils

David Piller

The following article is based on the Hot Topic Symposium "New Horizons for Healthful Oils: Innovative Approaches to Meeting Government Guidelines," which was presented during the 102nd AOCS Annual Meeting & Expo, held in Cincinnati, Ohio, USA, May 1–4, 2011.

In 2010, the US government announced the latest release of its nutrition guidelines. Though these guidelines are updated every five years, this one was accompanied by great fanfare since it marked the end of the iconic Food Pyramid in favor of a simpler plate diagram divided into the basic food groups. Although the plate grabbed most of the headlines, another more subtle, but no less significant, change was revealed in these guidelines. Put simply, the guidelines now tell consumers not only to reduce their intake of bad fats, but to replace them with good fats.

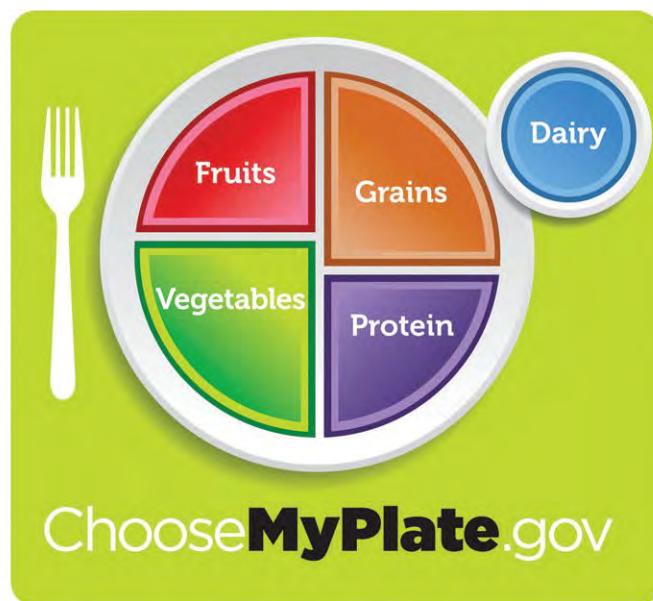
Along with these guidelines is a renewed focus by the US government on labeling initiatives. With new research showing the health benefits of some oils and a slew of new or upcoming requirements for providing clear and accurate nutritional information, the need for the food industry to find innovative solutions to these changes has never been greater.

Focus shifts to healthful oils

Since 1980, the US Department of Agriculture and the US Department of Health and Human Services have jointly published "Nutrition and Your Health: Dietary Guidelines for Americans." These guidelines were designed to identify the latest scientific evidence and present recommendations that help guide Americans toward making informed choices about their diet. For most of this publication's 30 years, the recommendations on the use of dietary fats have been fairly consistent: Use them sparingly or avoid them altogether.

With a focus toward reducing all fats, a trend developed throughout the 1980s and especially into the 1990s toward developing foods that were either low-fat or no-fat. This trend, according to AOCS member Patricia Kearney, president and chief executive officer of PMK Associates (Alexandria, Virginia, USA), led to some unfortunate consequences. "To make foods low-fat, manufacturers replaced the fat with refined carbohydrates," she explains. "Since refined carbohydrates are very much like sugar, this turned out to be a big mistake. Refined carbs can actually increase the risk of heart disease and diabetes."

It wasn't until the 2000s, says Kearney, that the scientific community began to distinguish between healthful and unhealthful fats. "In the 2000s, we turned a corner," she says. "We recognized more



The US Department of Agriculture's MyPlate logo emphasizes fruits and vegetables.

clearly that it was the type of fat, not total fat, that we need to be concerned with." In the 2005 edition of the nutrition guidelines, a recommendation states: "Keep total fat intake between 20 [and] 35 percent of calories, with most fats coming from sources of polyunsaturated (PUFA) and monounsaturated fatty acids (MUFA), such as fish, nuts, and vegetable oils." This, says Kearney, is significant, because it is the first time healthful fats were officially recognized in the guidelines.

In 2010, the language was much more specific: Consume less than 10% of calories from saturated fatty acids by replacing them with MUFA and PUFA. "Using the word 'replace' seems subtle, but it's a big switch," says Kearney. "It's actually a very significant change from the days when we were told to use fats sparingly." Replacing saturated fatty acids, she says, with MUFA and/or PUFA has been shown to lower both total and low-density lipoprotein (LDL) blood cholesterol levels, which in turn helps lower the risk of cardiovascular disease. The guidelines actually recommend reducing saturated fat intake even further, stating that the 10% figure is an interim step and the real goal should be to limit saturated fat intake to 7% of total calories while also increasing intake from polyunsaturated and monounsaturated sources.

Though oils are not a food group, and are in fact not even visible in the new plate icon, Kearney says they are emphasized in the guidelines because they contribute essential fatty acids and vitamin E to the diet. Oils are naturally present in foods such as olives, nuts, avocados, and seafood. Many common oils are extracted from plants,

DIETARY FAT RECOMMENDATIONS AROUND THE GLOBE

The 2010 US dietary guidelines tell Americans to consume less than 10% of their calories from saturated fatty acids by replacing them with monounsaturated fatty acids (MUFA) and polyunsaturated fatty acids (PUFA). What recommendations on fat intake are the rest of the world getting? Peter Jones, director of the Richardson Centre for Functional Foods and Nutraceuticals at the University of Manitoba (Winnipeg, Canada), says that recommendations differ substantially, but all countries recommend that less fat, particularly saturated fat, is desirable. Here's a compilation from Jones of the recommendations for some of these countries:

Canada

- Include a small amount 30 to 45 mL (2 to 3 tablespoons) of unsaturated fat each day including oil used for cooking, salad dressings, margarine, and mayonnaise.
- Use vegetable oils such as canola, olive, and soybean.
- Choose soft margarines that are low in saturated and *trans* fats. Limit butter, hard margarine, lard, and shortening.
- Specifically limit the intake of the following fats: butter, lard, shortening, coconut oil, palm kernel oil, palm oil.

United Kingdom

- Total fat should not exceed 35% of total energy.
- Saturated fat should not exceed 11% of total energy.
- *trans* Fats should not exceed 2% of total energy.
- MUFA recommended intake is 13% of total energy.
- Replace saturated fat sources with rapeseed, olive, sunflower, soybean, and sesame oils.
- Increase fatty fish intakes to increase omega-3 fat intake.

European Union

- Saturated fat intakes should be kept as low as possible.
- Four percent of total energy is an adequate intake of linoleic acid (omega-6 fatty acid).
- 0.5 percent of total energy is an adequate intake of alpha-linolenic acid (omega-3 fatty acid).

Japan

- Total fat intakes should be less than 30% of total calories, ideally less than 25% of total calories.
- Saturated fat intakes should be less than 7% of total calories.

Korea

- Total fat should not exceed 15–25% of total energy.

Philippines

- Total fat should not exceed 20–30% of total energy.

Australia

- Total fat intake
 - Moderate fat consumption in normal weight individuals is 30% total energy.
 - Overweight or obese persons should limit total fat to 20–25% total energy.
- Saturated fat intake
 - Saturated and *trans* fat intakes should be less than 10% total energy.
- Omega-6 fatty acid intake should be 6–8% of total energy.
- Omega-3 fatty acid intake should be increased.

such as canola, corn, olive, palm, peanut, safflower, soybean, and sunflower oils.

Since 2004, the FDA has released health claims on omega-3 fatty acids, MUFA from olive oil, unsaturated acids from canola oil, and corn oil. These claims all state that there is sufficient scientific evidence that these components may reduce the risk of coronary heart disease.

Finding the right oils

Beginning in 2005 with the recognition of healthful oils and continuing with the even more dramatic recommendations of 2010, there is a growing sense of urgency for food scientists and companies to find ways to lower saturated fat and eliminate *trans* fats in foods and replace them with oils higher in MUFA and PUFA content.

Much work still needs to be done, not the least of which is determining what oils provide consumers with the greatest health benefits. Peter Jones, director of the Richardson Centre for Functional Foods and Nutraceuticals at the University of Manitoba (Winnipeg, Canada), says a study is underway to help answer that question.

The Canola Oil Multi-Center Intervention Trial, or COMIT, is a nutritional study being conducted by the University of Manitoba, Pennsylvania State University (State College, USA), Laval University (Quebec City, Canada), and the University of Toronto (Canada). In the trial, participants consume meals containing 50 to 60 grams of one of five oils per day for intervals of one month.

The goal of the study, says Jones, is simple but ambitious: "We want to determine which fatty acids are best for our brains and our bodies." In the study, researchers will first compare two different forms of canola oil, both of which are rich in MUFA but at different levels. Second, they will compare those oils against other typical dietary oils and then compare them against a new hybrid oil rich in omega-3 fats that are found typically in fish oils.

Results from the study and other research are vital for companies that not only know they face the challenge of incorporating more healthful oils into their products but also know the rules concerning how they label their products and what information they need to provide—including, potentially, more information on MUFA and PUFA—are also about to change.

Labeling gets renewed focus

Despite the ongoing research and extensive information available to consumers, the stark reality is that the overall obesity rate in the United States currently stands at more than 30% and cardiovascular disease remains the country's No. 1 killer. A fundamental question still exists: How do we inform consumers about what foods are optimal for good health without confusing them or putting them off? This question vexes scientists, government officials, and marketers alike. It's clear that many people are heeding the advice contained in the guidelines, but it's far from enough. In spite of the recommendation to limit saturated fatty acids to less than 10%, a June 2010 Report of the Dietary Guidelines Advisory Committee stated, "Current usual intakes of saturated fats are in excess of this recommendation for more than half of the total American population. More than 75% of children, aged 1 to 13 years, and 50% of older children and adults consume more than 10% of calories as saturated fats." With these statistics in mind, the US government is sharpening its focus on many fronts to present dietary information in the clearest and most visible way possible.

Back of package labeling: The panel's getting a makeover

In 1990, the Nutrition Labeling and Education Act became federal law. The law, which went into effect in 1993, authorized the US Food and Drug Administration (FDA) to require nutrition labeling on most food packaging. With a few updates along the way, including the addition of *trans* fat and food allergens in 2006, Nutrition Facts panels became fixtures on food packages. In fact, these "back of pack" panels have become such fixtures that FDA is launching a review to determine what changes need to be made to enhance their effectiveness. A review of the current Nutrition Facts panel is expected to be completed in the next five years.

Front of package labeling: clearing up the confusion

In recent years, says Kearney, a number of companies, coalitions, and non-profit organizations have been developing their own labeling initiatives by providing nutrition information on the front of their packages. These "front of pack" (FOP) labels have become widespread in the food industry. She explains these FOP labels can be categorized as follows:

- **Nutrient-Specific Systems:** These display the amount per serving of select nutrients from the Nutrition Facts panel on the front of the food package or use symbols based on claim criteria.
- **Summary Indicator Systems:** A single symbol, icon, or score is displayed to provide summary information about the nutrient content of a product.
- **Food Group Information Systems:** These systems use symbols that are awarded to a food product based on the presence of a certain food group or food ingredient.

With so many and such a wide range of FOP labels now in use, there is concern that consumers are suffering from information overload and may not understand what products are best for them. In response, the US government directed the Institute of Medicine (IOM) to review the science of FOP labels and make recommendations on how this labeling should be used in the future.

In the first phase of its study, an IOM committee reviewed current systems and issued a report in October of 2010. The committee said that it would be useful for FOP labeling to display calorie information and serving sizes prominently and that FOP systems should provide information on saturated fats, *trans* fats, and sodium. With respect to other nutrients displayed on current FOP labels, the committee advised that FOP systems limit this type information to those nutrients that have the greatest impact on the most pressing issue of obesity and its consequences, including cardiovascular disease, type 2 diabetes, and some types of cancer.

The second phase of the IOM study will focus on understanding what systems and symbols make the most sense to consumers. Based on this research, the IOM will issue its second report in late 2011 on what FOP systems are most effective and how they could be standardized in the future.

Coming soon: menu labeling

In March 2010, US President Barack Obama officially signed the much-debated health care reform bill. This bill affects a wide range

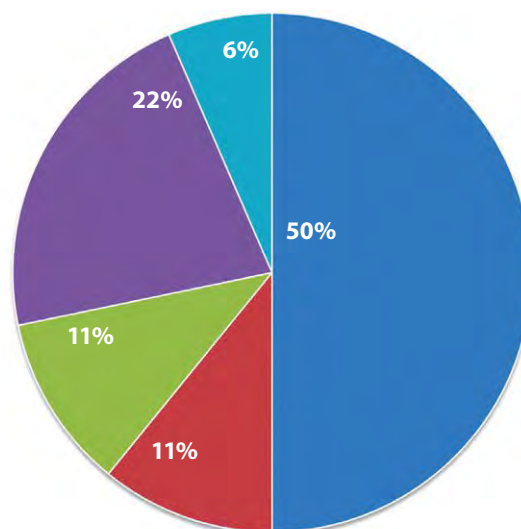
of industries beyond the health insurance and health care industries, including food service. One provision of the new law requires that most large restaurant chains and food retailers include nutrition labeling on their menus.

The new law applies mainly to restaurants that have 20 or more locations with essentially the same menu items at all locations. The law requires these restaurants to provide calorie counts on menus and menu boards for standard menu items and include a statement about daily caloric intake. In addition, restaurants will be required to have additional written nutrition information on hand and available by request. Types of additional data include: calories from fat, total fat, saturated fat, cholesterol, sodium, total carbohydrates, sugars, dietary fiber, and protein. The FDA is also proposing adding *trans* fat to the list of nutrient data that must be provided on request.

The requirements for adding MUFA and PUFA to nutrition labels are still under consideration, but it is clear from the most recent guidelines that they will most likely figure prominently on the food labels of the future.

David Piller is a freelance science and health writer based in Cincinnati, Ohio, USA. A professional writer for more than 20 years, he has produced feature articles, web content, marketing communications, and technical documentation for both public and private healthcare organizations.

SMARTBRIEF SKINNY ON SATURATED FATS



Global dietary guidelines have long demonized saturated fat. Here are the results of a recent *inform* SmartBrief poll that posed the question: In light of new research finding no association between saturated fat intake and heart disease or stroke, should global dietary guidelines:

- Maintain the current level of guidance
- Increase suggested levels of saturated fat consumption
- Further decrease suggested levels of saturated fat consumption
- Eliminate dietary guidance on saturated fats altogether
- Unsure



* Winner will be drawn randomly on November 1, 2011.
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Oils and fats community convenes in İzmir, Turkey

Sevim Z. Erhan

During the last decade, dramatic changes in information exchange via the Internet and social media have brought new opportunities in marketing, product, and business development. The Oils and Fats Market Update 2011 held in İzmir, Turkey, June 20–21, 2011, addressed these changes, giving senior executives of oils and fats traders, suppliers, producers, processors, and food and nonfood companies from around the world an unmatched opportunity to gauge the future and develop their businesses through face-to-face meetings with leading experts and reviews of current developments.

Organized by AOCS and chaired by Sefa Koseoglu, chief executive officer (CEO) of Bioactives World Forum (College Station, Texas, USA), the event showcased world-class speakers and promoted lively discussion among leading CEOs and decision makers as they delved into issues relevant to all aspects of oils and fats trade including production, trading, transportation, and regulations. Presentations and discussions highlighted the growing links between petroleum and vegetable oils and fat prices; recent investments in oilseed crushing capacity by Mercosur countries (Argentina, Brazil, Paraguay, and Uruguay) and Bolivia; the involvement and leadership of Russia and the Ukraine in the production and crushing of sunflowers; the Turkish edible fats and oils market; and worldwide trade issues and regulations, including meeting transportation, legislation, and public policies.

In contrast, the fourth World Conference on Oilseed Processing, Fats & Oils Processing, Biofuels & Applications, held in İzmir, Turkey, June 21–23, 2011, focused on day-to-day concerns and issues related to soybean, sunflower, corn, canola, olive, palm, and other tropical oils. Chaired by Sevim Z. Erhan, director of the US Department of Agriculture-Agricultural Research Service (USDA-ARS), Eastern Regional Research Center (ERRC; Wyndmoor, Pennsylvania), the three-day conference featured key invited presentations by industry experts in addition to volunteer oral and poster presentations.

This program was truly world-class, with input from fats and oils experts across the globe. It encompassed emerging technologies, process, products, and applications of oils in both edible and industrial utilization. Together, the conferences drew a diverse group of 468 participants from 36 countries. Attendees included scientists, technicians, equipment manufacturers, product formulators, plant engineers, processors, chemists, and sales and marketing executives.

Sevim Z. Erhan is director of the US Department of Agriculture, Eastern Regional Research Center, Wyndmoor, Pennsylvania, USA. She also serves as secretary of AOCS and can be reached at Sevim.Erhan@ARS.USDA.GOV.

PROGRAM HIGHLIGHTS

- A session on advancements in oil and oilseed processing chaired by Nurhan T. Dunford of Oklahoma State University (Stillwater, USA) and Taşkın Tuğlular, consultant, Turkey, featured a wide range of processing-related topics, including sustainable specialty oil processing, various applications of supercritical fluid technology for oil modifications, enzymatic oil degumming and soybean oil extraction, applications of specialty fats in Turkey, the latest developments in membrane processing of vegetable oils, and steam and energy cost savings in oilseed crushing facilities. Presentations from both academia and industry facilitated spirited discussion.
- A “Hot Topics in Processing” session chaired by Dunford and Okyar Yaylar, chairperson of the board of directors for the Edirne Yag Sanayi A.S. (Turkey), focused on food, feed and plant safety, and new trends in deodorization and vacuum production.
- Oil bleaching, ultrasound-assisted pretreatment of seeds, supercritical fluid extraction of algal lipids, continuous color quality control in oil processing plants, aqueous sunflower oil extraction using a twin-screw extruder, mechanical extraction of *Jatropha* oil, and a winterization technique that combines degumming and dewaxing steps during physical refining were discussed during a session on innovations in processing technology chaired by Dunford and Hakan Benli of Çukurova University, Turkey. Presenters included students and personnel from industry and universities in Turkey, Sweden, France, and Germany.
- A session on lipids as feedstocks for polymers, lubricants, and other industrial materials was chaired by Helen Ngo of the USDA-ARS ERRC, and Nicola Uccella of the University of Calabria (Italy). The papers presented underscored the need to develop more environmentally friendly industrial technologies that will allow the industry to move away from petroleum importation, while the research activities that were presented focused on expanding the use of fats and oils as feedstocks for polymers, lubricants, and other industrial materials. Zoran Petrovic of Pittsburg State University (Kansas, USA) gave two presentations on polyester-urethane elastomers formed from vegetable oils, focusing on the thermal, mechanical, and dielectric properties of polyurethane products. Joseph Perez of Pennsylvania State University (State College, USA) presented information on a proposed reaction mechanism and chemical structure of a thermal polymerized soybean base oil. Perez showed that the polymerized oils were mainly dimeric products. They were generated under neat conditions at high temperatures and under high pressures, and possessed excellent viscosity index number and lubricity. Ngo presented her research on converting lipids to high-value industrial

CONTINUED ON NEXT PAGE

products using environmentally friendly and economically feasible chemocatalytic approaches. She showed that the resultant biobased products have excellent lubricity and low-temperature properties as well as high thermal oxidative stability.

- A session on advances in by-product utilization co-chaired by Keshun Liu, National Small Grains and Potato Utilization Research Unit, USDA-ARS (Aberdeen, Idaho), and Melek Tuter of Istanbul Technical University (Turkey), featured speakers from Thailand, Taiwan, Egypt, USA, and Turkey. V. Klompong talked about antioxidants in extracts from indigenous Thai rice by-products. Taiwanese authors M. Yuliana, N.Y. Tran-Thi, and L.-H. Huynh, all of whom collaborated with Y.-H. Ju, spoke about extraction methods for phenols from cashew-nut shells, the anti-nutritional and amino acid profile of defatted Roselle (*Hibiscus sabdariffa* L.) seeds, and wax esters from activated sludge, respectively. Liu gave two presentations, one on the composition and functional lipid profiles of low-phyate barleys, and the other on the phenolic acid composition and antioxidant capacity of distillers dried grains with soluble as compared with corn. The session ended with a talk by S. Yucel of Turkey on rapid microwave-assisted transesterification of waste frying oil for biodiesel production.
- A late morning session on feedstocks and quality of alternative fuels co-chaired by K. Liu of USDA-ARS, and Ayse Aksoy of Istanbul Technical University, Turkey, began with a presentation by K. Tyssen of Intertek (Antwerp, Belgium) on evolutions and challenges in the quality monitoring of biodiesel. F. Zaccheria of the Istituto di Scienze e Tecnologie Molecolari- Consiglio Nazionale delle Ricerche, Milan, Italy, spoke about esterification of acidic oils over amorphous solid catalysts, while O.N. Celik (Eskişehir Osman-

gazi Üniversitesi, Turkey) gave a talk on effects of adding biodiesel to ultra low sulfur diesel on lubrication and wear properties.

- Biotechnology and other technology session chairs Casimir Akoh, University of Georgia (Athens, USA), and Neşe Şahin Yeşilçubuk, Istanbul Technical University, Turkey, included six presentations, four of them related to the use of supercritical carbon dioxide (SC-CO₂). As SC-CO₂ extraction has reached industrial scale, researchers have become interested in expanding its use. One presentation featured the use of SC-CO₂ in transesterification reactions with canola oil and canola stearin. Using SC-CO₂ to dry edible aerogels formed from β -glucan was also discussed. This approach shows potential for the delivery of bioactives in various product applications. Other presentations included a consideration of the cost of oil recovered from flax hulls by SC-CO₂ extraction, the coupling SC-CO₂ extraction with membrane technology, and an investigation of the effect of SC-CO₂ processing on the performance of reverse osmosis membranes. The two presentations unrelated to SC-CO₂ reported on (i) the direct production of conjugated linoleic acids over ruthenium supported on zeolites, which will have the potential for use in different industries including coatings, paints, and polymers as well as in the food industry, and (ii) the production of low-calorie structured lipids from *Echium* oil and lauric acid in the presence of a 1,3-specific lipase enzyme. The potential of *Echium* oil, a unique plant-based source of omega-3 fatty acids that is very rich in stearidonic and α -linolenic acids, was explored for the production of structured lipids.
- An informal discussion on process efficiency was hosted by *inform* magazine and moderated by AOCS Technical Director Richard Cantrill. Read about it at www.aocs.org/efficiency.

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FIG. 1. Crude canola oil is brown in color due to color bodies and other impurities. Conventional refining removes all of these (including some desirable nutrients), resulting in an almost colorless oil. Minimal refining yields a straw-colored oil that retains many of the desirable nutrients present in unrefined oil. Photo courtesy of Saeed Mirzaee Ghazani.

Minimal refining of canola oil: effects on phytosterols and tocopherols

Researchers at the University of Guelph in Ontario, Canada, have developed a minimal refining method that improves the nutritional profile of canola oil while reducing capital costs and environmental impacts.

Saeed Mirzaee Ghazani

Canola oil was introduced to the world in 1974 after Canadian plant breeders used conventional breeding techniques in *Brassica napus* and *B. rapa* seeds to lower the amount of two harmful components, erucic acid (less than 2%) in canola oil and glucosinolates (less than 30 $\mu\text{M/g}$) in canola meal. Since then, several genetically modified versions of canola have been developed to produce high-lauric, high-stearic, and high-oleic acid and low-linolenic acid canola oils.

Canada produces more than 2.5 million metric tons (MMT) of canola oil per year. The country is the largest canola oil exporter in the world, annually exporting more than 2 MMT of canola oil to other countries such as the United States and China. Compared to other commodity vegetable oils, canola oil contains the lowest concentration of saturated fatty acids (<7%), is a good source of omega-3 fatty acids (9–11% α -linolenic acid), and, after olive oil, has the highest amount of monounsaturated fatty acids (about 60% oleic acid). Moreover, there are some important minor nutrients in canola oil, including phytosterols, tocopherols, and phenolic components. The total amount of phytosterols in canola oil ranges from 8,000 to 10,000 mg/kg—twice the level of sterols in soybean oil.

Phytosterols can reduce levels of bad cholesterol (low-density lipoprotein) in people with high levels of blood cholesterol. A daily intake of 2 grams of phytosterols has been shown to reduce bad cholesterol by 8–14%. Canola oil contains relatively high amounts of tocopherols (600–700 mg/kg), which protect unsaturated fatty

acids against oxidation. α -Tocopherol, generally known as vitamin E, protects cell membranes from damage. Canola oil also contains more phenolic components than other common vegetable oils. For example, the natural antioxidants canolol (4-vinyl syringol) and plastoquinone-8 are predominantly found in canola oil.

Crude canola oil contains a number of impurities that must be removed for safe human consumption. The purpose of refining is to remove such undesirable components from crude oils with minimal damage to desirable components and minimal oil loss. However, during conventional refining, about 30–45% of the phytosterols and tocopherols and most of the canolol are lost.

Conventional oil refining

Conventional oil refining consists of degumming, neutralization, bleaching, and deodorization stages. During these processes many undesirable components such as free fatty acids, gums, trace metals, pesticides, and oxidized products are removed. These components may cause darkening, foaming, smoking, and precipitation during refining, as well as off-flavors and decreased thermal and oxidative stability in the final product if they are not removed. Some chemicals, such as pesticide residues and oxidized components, are potentially harmful to the body. Therefore, some refining is necessary to produce safe, high-quality canola oil.

Soluble gums should be removed from crude oils because, during crude oil storage, they settle and create an unsightly gelatinous precipitate. Moreover, emulsions can be formed, which lead

to increased oil loss during refining. Gums also cause crude oils to darken during storage and accelerate the development of off-flavors in the final product.

Two traditional methods of canola oil degumming are water degumming and acid degumming. Water degumming uses the addition of 2% water, while acid degumming uses a combination of water and acid, predominantly concentrated phosphoric or citric acid, to remove non-hydratable gums before centrifugation. The addition of appropriate amounts of sodium hydroxide to crude oils during the neutralization process converts free fatty acids to soaps, which are continuously separated by centrifugation. In a final step, neutralized oil is washed with hot water to remove the remaining soaps. The effluent water is separated by a second centrifugation, and the washed oil is sent to a vacuum dryer to remove any traces of water before storing or bleaching.

Activated or natural bleaching clays are used to remove color bodies (carotenoids and chlorophylls) and other impurities, such as trace metals and oxidized products, from neutralized oils. After canola oil is heated to 90–110°C under vacuum, 0.5–2% bleaching clay is added to the oil and mixed for 20–30 minutes. Spent bleaching clays are then removed by filtration.

Deodorization is a steam distillation process that occurs during the final stage of refining edible oils. The main purpose of deodorization is to remove flavor and odor components and extend the shelf life of the final product. Deodorization also removes other impurities such as residual amounts of free fatty acids, oxidized products, and pesticides. Most deodorizers work at high temperatures (220–260°C) and low vacuum (3–5 mm Hg). After deodorization, canola oil is cooled, filtered, and sent to storage tanks.

Although refining removes undesirable components, it unfortunately decreases the amount of desirable nutrients such as tocopherols, polyphenols, and sterols. This not only affects the nutritional value of refined oils but also leads to a decrease in their product quality and shelf life as natural antioxidants are lost and undesirable artifacts formed. Furthermore, a number of potentially detrimental components such as *trans* fatty acids, polar components, polymers, cyclic fatty acids, and fatty acid and 3-monochloro-1,2-propanediol esters may be produced.

After canola oil acid degumming, reductions of 5–6% in total sterols and 1–5% in total tocopherols have been reported. In degummed canola oil, the amount of free sterols increases while the amount of esterified sterols decreases. The reason is that during acid degumming, phosphoric acid acts as a catalyst for hydrolyzing esterified sterols. Neutralization with sodium hydroxide leads to further reductions in phytosterol and tocopherol content in canola oil, 22% and 12%, respectively.

During the bleaching process total tocopherol content falls. Some tocopherols in canola oil may be oxidized at the bleaching temperature (100–110°C) or absorbed to the clay. After bleaching with activated bleaching earth, the amount of esterified sterols also decreases. This may be due to the acid-catalyzed hydrolysis of sterol esters. Finally, in the deodorization stage about 23–28% of total tocopherols and almost 40% of the free phytosterols are lost during distillation. Also, some parts of sterols undergo dehydration to form steradienes during bleaching (acid-catalyzed dehydration) and deodorization (dehydration by heat).

Minimal refining method

Minimal refining refers to the process of removing undesirable components found in crude canola oil while retaining the greatest amount of nutrients found in this oil. This method is currently being studied in

the food science department at the University of Guelph in Ontario, Canada.

In minimal refining, canola oil is first degummed at 70°C by using phosphoric or citric acid and 2% water. To minimize the degradation of sterols and tocopherols, the degummed canola oil is then neutralized with a weaker alkali, such as calcium hydroxide, instead of sodium hydroxide. Conventional hot water washing to remove soapstocks and other materials is replaced by filtration through a natural clay absorber such as diatomaceous earth or Magnesol® (synthetic magnesium silicate). The bleaching step is also modified.

First, silica clays, such as Trysil® silica, were used instead of activated bleaching earth, which has negative effects on sterols, mainly through hydrolysis of sterol esters. Second, instead of conventional dry bleaching at 100–110°C, wet bleaching at 70–80°C with water at 0.3–0.9 wt% reduced the negative impact on tocopherols, and, third, the deodorization step in the minimal refining method was omitted to preserve natural canola oil flavor and nutrients. However, deodorization is a very efficient method to remove any pesticides present in the oil. Omitting this deodorization step would therefore potentially result in an oil with high pesticide concentrations. Thus, we will also assess the potential of using different oligosaccharides and polysaccharides to bind and remove pesticides from the oil, so that the deodorization step can be omitted. As we stated before, omitting deodorization would preserve high concentrations of micronutrients (phytosterols, tocopherols) and natural flavors in the oil, with obvious beneficial nutritional and sensory benefits.

Preservation of nutrients by minimal refining method

In recent years, different kinds of chemical and physical refining methods such as silica refining, biological refining, refining by membrane, and neutralization with solvent have been introduced. Some offer advantages, such as lower environmental impact and minimal oil loss; but high capital cost, low efficiency of separation, and other factors limit their use.

On the other hand, our studies have shown that most of the tocopherols and sterols remained in the oil after neutralization by calcium hydroxide. Because this type of deacidification is carried out at room temperature and because calcium hydroxide is a weaker alkali than sodium hydroxide, it has a minimal effect on nutrients, especially tocopherols. Calcium hydroxide is cheaper than sodium hydroxide, and the soap produced (calcium soap instead of sodium soap) can be used as animal feed.

Minimal refining has a smaller environmental impact compared to conventional refining methods, because the natural clays absorb the soap and other impurities without any use of hot water. As a result, no energy is required to heat water and no wastewater is produced. Bleaching at lower temperatures leads to less tocopherol oxidation, and using silica instead of activated bleaching clays leads to the generation of a lower quantity of filter cake and resultant oil loss. Minimally refined canola oil has greater stability and longer shelf life because of the high amounts of natural antioxidants that remain in the oil.



Saeed Mirzaee Ghazani is a master's student in the food science department at the University of Guelph in Ontario, Canada. He can be contacted at smirzaee@uoguelph.ca.

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