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over the accuracy and usefulness  
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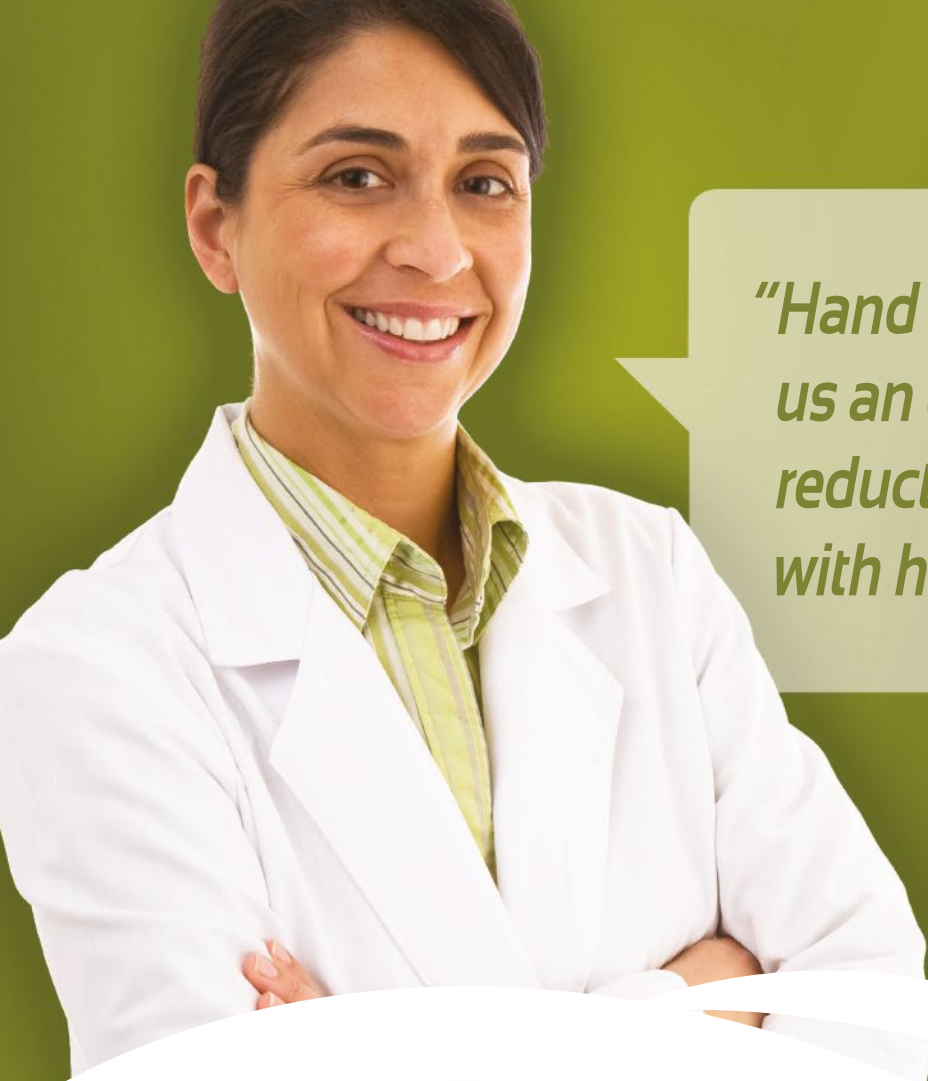
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- Eliminating Food Waste Within the Berry Market BY KEVIN PAYNE
- Misconceptions About Real-Time Visibility in the Cold Chain BY GISLI HERJOLFSSON
- How to Survive Your Worst Food-Safety Nightmare BY CHARLES BREEN AND STACEY STEVENS
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# From The Editors

**F**ood Quality & Safety magazine has a new contributor: The American Council on Science and Health (ACSH). The organization will be providing content for the new Did You Know? column (see page 46). I have been a member of this group for years and been peripherally involved for even longer. The organization has a large group called the Board of Scientific Advisors that helps ACSH develop its position papers. My mother, Dr. Elizabeth Fleming Stier, was a member of this group when she was on the Food Science faculty at Rutgers, so I was actually exposed to its work many years ago. I've also used the ACSH's [Thanksgiving Holiday Menu](#) document over the years as a teaching aid. This tongue-in-cheek piece describes a typical Thanksgiving dinner and highlights the toxins that occur naturally in each item on the menu. It harks back to the "father of toxicology" Paracelsus (1493 - 1541) who coined the phrase, "only the dose makes the poison." This 500-year-old statement holds true today yet it seems to have been forgotten in the fearmongering with regard to foods and chemicals that takes place in today's world.



My fellow industry editor Dr. Purnendu C. Vasavada and I are also very pleased with our new [Editorial Advisory Panel](#) and thank each and every one of them for volunteering to help out and move the magazine forward. We have also recruited a group of persons from industry and academia to act as regular columnists for the magazine. These persons will start contributing in our next issue, the December/January issue. The columns will focus on current technical issues pertaining to food safety, food defense, regulatory compliance, and customer/consumer issues. We want these columnists to be creative and will allow them to get up on a "soap box" if need be.

We are excited at the direction we are going and look to you, our readers, to let us know not only how we are doing but how we can do better.

**Richard Stier**  
Co-Industry Editor



**PUBLISHER** Lisa Dionne Lento, ldionne@wiley.com  
**SENIOR ACCOUNT MANAGER** Ken Potuznik, kpotuzni@wiley.com  
**PROFESSIONAL EDITOR** Marian Zboraj, mzbzoraj@wiley.com  
**DESIGN** Maria Ender, mender@wiley.com  
**PRODUCTION** Claudia Vogel, cvogel@wiley.com  
 Jörg Stenger, jstenger@wiley.com  
 Elli Palzer, palzer@wiley.com  
**CO-INDUSTRY EDITOR** Purnendu C. Vasavada, PhD,  
 purnendu.c.vasavada@uwr.edu  
**CO-INDUSTRY EDITOR** Richard Stier, rickstier4@aol.com

#### Advertising Director

Dan Nicholas  
 111 River Street, Hoboken, NJ 07030  
 (716) 587-2181, dnicholas@wiley.com

#### Sales Office

U.S./CANADA/INTERNATIONAL  
 Ken Potuznik  
 29822 N 51st Place, Cave Creek, AZ 85331  
 (480) 419-1851 • fax (480) 718-7719  
 kpotuzni@wiley.com

#### Editorial Office

111 River Street, Hoboken, NJ 07030-5774, USA  
 Reprints: E-mail kpotuzni@wiley.com



#### Editorial Advisory Panel

**Ellen Bradley, CFS**  
 Principal Food Scientist,  
 River City Food Group LLC

**Vijay K. Juneja, PhD**  
 Lead Scientist,  
 Predictive Microbiology for Food Safety,  
 USDA-Agricultural Research Service

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 Department of Animal Science,  
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 Auditing Professionals, AFSAP

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 Certification, Office of International Affairs  
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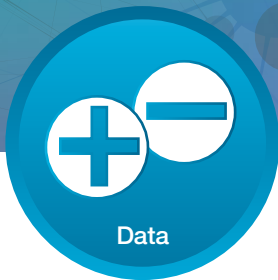
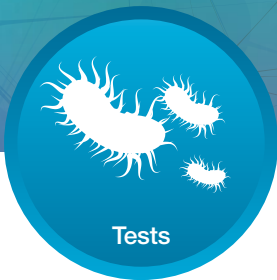
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# NEWS & NOTES



## FDA Updates

The U.S. FDA is examining its approach in using dairy food names like “milk,” “cheese,” or “yogurt” for labeling plant-based foods and beverages. The agency is considering whether to modernize standards of identity, which are regulations that set requirements

for the content and sometimes the methods used to produce certain foods. The regulations were established under the foods’ common names, such as “milk,” “yogurt,” and “cheddar cheese.” These names are recently appearing on the labels of plant-based products as part of the statement of identity. Some examples include “soy milk” or “almond milk” and “vegan mozzarella cheese.” FDA has concerns that the labeling of some plant-based products, which can vary widely in their nutritional content, is leading consumers to believe that those products have same key nutritional attributes as dairy products. The agency wants to ensure labeling plant-based products with names that include dairy foods is not misleading. Over the next year, the FDA will be looking at next steps, which will include issuing guidance for industry.

In addition, FDA recently published a Federal Register notice announcing the fees the agency will assess for issuing new export certification for certain foods. The new export certification and fees were authorized by FSMA amendments to the FD&C Act, which allow the agency to collect up to \$175 for export certification for food. On October 1, the agency began issuing and collecting fees for two new types of food certificates in accordance to this new FSMA authority: the Certificate to a Foreign Government and Certificate of Exportability. Exceptions include dietary supplements, medical foods, and foods for special dietary use. CFSAN will continue to issue a Certificate of Free Sale for dietary supplements, medical foods, and foods for special dietary use. FDA does not charge a fee for Certificates of Free Sale.

## General Mills Changing Nature Valley Labels After Pesticide Claim

As reported by Reuters, General Mills Inc. agreed to stop calling the oats in its Nature Valley granola bars 100% natural to settle a lawsuit by three consumer groups that said the bars contained small amounts of the pesticide commonly known as Roundup. Beyond Pesticides, Moms Across America, and the Organic Consumers Association on August 23 said the settlement calls for General Mills to remove the phrase “Made with 100% Natural Whole Grain Oats” from Nature Valley labels. The groups said independent tests showed that the granola bars contained 0.45 ppm of glyphosate, and that oats were the “most likely” source of the pesticide. While this was below the maximum 30 parts per million that the EPA recommends, the groups said General Mills’ label was deceptive and that “no reasonable consumer” would expect the bars to contain anything unnatural. A General Mills spokesman said the company settled to avoid the cost and distraction of litigation, and focus on making Nature Valley products “with 100% whole grain oats.”



## Trade Mitigation Programs

USDA’s trade mitigation package is aimed at assisting farmers suffering from damage due to trade retaliation by foreign nations. Producers of certain commodities can sign up for the Market Facilitation Program, which provides payments to cotton, corn, dairy, hog, sorghum, soybean, and wheat producers who have been significantly impacted by actions of foreign governments resulting in the loss of traditional exports. The sign-up period runs through Jan. 15, 2019, with information on [www.farmers.gov/mfp](http://www.farmers.gov/mfp). The USDA’s AMS is also administering a food purchase and distribution

program to purchase up to \$1.2 billion in commodities targeted by the retaliation. USDA’s FNS will distribute these commodities through nutrition assistance programs, such as The Emergency Food Assistance Program and child nutrition programs. In addition, the Agricultural Trade Promotion Program will help American farmers find and access new markets for their products. In total, USDA will authorize up to \$12 billion in programs, consistent with World Trade Organization obligations. Funding will be allocated to eligible participants in early 2019.

## Food Safety Guidelines for Tomato Supply Chain

United Fresh releases third edition of the Commodity Specific Food Safety Guidelines for the Fresh Tomato Supply Chain, referred to as the Tomato Guidelines. This document lays the foundation for a forthcoming update to the Tomato Metrics, a suite of audit standards specific to growing and packing tomatoes. The guidelines outline recom-

mendations for all parts of the fresh tomato supply chain: from outdoor and greenhouse growing to harvesting, field packing, packinghouse operations, repacking, fresh-cut operations through to retail and food service. While the format of the document is similar to the previous version, the content has been wholly reviewed and updated. Key

changes include recommendations around field packing, antimicrobial use and wash water monitoring, and re-use of cartons. The guidelines also reference the applicable provisions of the Produce Safety Rule in the context of fresh tomato practices. The Tomato Guidelines can be downloaded for free at [www.unitedfresh.org](http://www.unitedfresh.org).



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## Connecting Consumers with Product Information Online

GS1 has ratified a new global Web standard and guideline to help industry optimize the online shopping experience. As businesses deploy solutions leveraging the new standard, called GS1 Digital Link, brands and retailers can web-enable barcodes and provide consumers with a direct link to brand-authorized product content including expiration dates, nutritional data, dis-

count offers, and more. Additionally, the GS1 Mobile Ready Hero Images guideline standardizes the combination of product images and information viewed on mobile devices. The GS1 Digital Link leverages the ubiquity of the Web and data carriers to enable solutions that connect consumers to brand-authorized product information instantly via product packaging.



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## Business Briefs

The certification body **Perry Johnson Registrars Food Safety**, Troy, Mich., is now accredited under FDA's Accredited Third-Party Certification Program for the following program scopes: Produce Safety; Preventive Controls for Human Food; Juice HACCP, and Seafood HACCP.

**Intertek Group** acquires **Alchemy Systems**.

**Stay Fresh Foods** adds beverage co-packing services to its HPP tolling center in Pennsauken, N.J.

**Matthews Marking Systems** donates food label printer to **University of Holy Cross Food Science Program** to assist New Orleans food manufacturing industry with printing expiration dates.

**RSSL** opens a dedicated acrylamide laboratory.

**Solus Scientific** opens its first overseas operation: **Solus Scientific Solutions Inc.** in Cincinnati.

**Hygiena** completes acquisition of **Biomedal's** food safety division and enters into a strategic partnership with **Charles River Laboratories** to market, distribute, and support the Celsis dairy, food, and beverage product line.

FDA recognizes **International Accreditation Services**, Brea, Calif., as an accreditation body under the Accredited Third-Party Certification Program.

**United Fresh Produce Association** expands its industry relations team to serve members in following sectors: grower-shipper, wholesaler-distributor, fresh-cut processor, retail and foodservice, as well as industry service providers.

# Washington Report



## When Salads Turn Deadly

FDA still weighing risk, traceability rules for fresh produce

BY TED AGRES

In response to recent multistate outbreaks of pathogenic *E. coli* O157:H7 infections linked to romaine lettuce and leafy greens, nine prominent consumer and food safety groups have urged FDA to designate produce, particularly leafy greens, as a high-risk food category and to implement long-overdue Food Safety Modernization Act (FSMA) traceability requirements for them by the end of this year.

But that seems unlikely to happen, as FDA is continuing to take its time. Section 204 of the FSMA, enacted in January 2011, gave the agency one year to compile a list of high-risk foods and two years to propose enhanced record-keeping requirements for them. FDA, however, is still working on the list even as it grapples with new challenges, such

as implementing the produce safety rule, particularly the inspection of farms and other facilities that grow, harvest, pack, and hold fruits and vegetables for human consumption.

The FSMA final produce safety rule (Standards for the Growing, Harvesting, Packing, and Holding of Produce for Human Consumption) went into effect in January 2016 and compliance began in January 2018 for large farms (having more than \$500,000 in average annual sales). Smaller farms have until January 2019 or January 2020 to comply, depending on their annual sales. (FSMA has exemptions for very small farms, farms that only sell raw produce locally, such as at farmers markets, and those that grow crops for further processing, such as tomatoes for canned tomato sauce.)

“The FDA is committed to making sure that the standards designed to minimize the risk of contaminations are workable, and that farmers have the information and tools needed to effectively implement them,” wrote FDA Commissioner Scott Gottlieb, MD, and Deputy Commissioner Stephen Ostroff, MD, in a September [blog posting](#).

Accordingly, FDA has delayed routine farm inspections until spring 2019 to allow more time for guidance, training, technical assistance, and planning. It is also methodically working through such contentious issues as agricultural water testing and the safe use of raw manure on crops.

“We urge you to designate produce, including leafy greens, as a high-risk food category and propose regulations that will enhance product tracing for produce in the event of an outbreak,” nine major consumer and food safety groups urged FDA Commissioner Gottlieb in May. Among the groups signing the six-page letter were the Center for Science in the Public Interest, Consumers Union, Food & Water Watch, The Pew Charitable Trusts, and the Consumer Federation of America.

Noting that retailers now can trace the origin of certain produce shipments in mere seconds using blockchain and other advanced technologies, “it is no longer acceptable that the FDA has no means to swiftly determine where a bag of lettuce was grown or packaged,” the groups wrote.

In September, Walmart told its suppliers of leafy green produce they must implement IBM Food Trust network’s blockchain traceability technology before October 2019. “All fresh leafy greens suppliers are expected to be able to trace their products back to farm(s) (by production lot) in seconds—not days,” Walmart announced.

In 2014, FDA published a [draft methodology](#) for identifying high-risk foods and opened a docket for public comments. The methodology remains unfinalized. “Such a lengthy and resource-intensive process for identifying high-risk foods is at odds with the one- and two-year timeline that

Congress set out in FSMA,” the groups wrote, noting that produce, especially leafy greens, is “clearly” high-risk. An FDA spokesperson says the agency “has spent the years since the passage of FSMA developing and implementing rules that transform our food safety system from being reactive to preventive.”

The Bioterrorism Preparedness and Response Act of 2002 requires businesses in the food supply chain to maintain rudimentary one-step-forward, one-step-back traceability records. But farms are exempt from that rule. And while the produce safety rule does impose certain record-keeping requirements on covered farms, traceability coding is not one of them.

As required by FSMA, FDA has completed two product tracing pilot projects in conjunction with the nonprofit Institute of Food Technologists (IFT). Based on IFT’s findings, FDA in 2016 submitted a [report to Congress](#) with its own recommendations, the implementation of which the agency said “will be resource-dependent.”

While some recommendations are being implemented, the high-risk foods list and traceability mechanisms are not. “Without effective traceability, neither the agency nor industry can begin to address these challenges and prevent future outbreaks,” the food safety and consumer groups wrote.

### High-Risk Leafy Greens

Between 2009 and 2013, fresh produce was responsible for more than 58 percent of all foodborne illnesses due to *Listeria monocytogenes*, 51 percent of *E. coli* O157, 46 percent of *Salmonella*, and 33 percent of *Campylobacter*, according to a [recent report](#) from the Interagency Food Safety Analytics Collaboration.

This year has seen several multistate produce-related food safety outbreaks. Most prominently, an *E. coli* outbreak linked to romaine lettuce from the Yuma, Ariz., growing region sickened 210 people in 36 states, with 96 hospitalizations and five deaths. No specific farms, packing, or distribution facilities have been implicated. In June, FDA officials told a meeting of the Leafy Greens Food Safety Task Force, an ad hoc industry/government group, that canal water contaminated with manure from a nearby large cattle feeding operation may have been the source.

The Yuma romaine lettuce outbreak was not related to an earlier multistate outbreak of *E. coli* O157:H7 infections linked to leafy greens in the U.S. and romaine lettuce in Canada. That outbreak was associated with a different DNA fingerprint of the bacterium. Among the 21 people affected by that outbreak, nine were hospitalized and one died. The Public Health Agency of Canada identified ro-

And while the produce safety rule does impose certain recordkeeping requirements on covered farms, traceability coding is not one of them.

maine lettuce as the source of their infections, while U.S. investigators suggested a variety of leafy greens, but could not identify a specific type.

Also during the summer, more than 500 people became infected with the *Cyclospora cayatanensis* parasite after consuming salads from McDonald’s restaurants in 16 states. For this outbreak investigation, FDA used a new, real-time PCR detection method. *Cyclospora* is generally transmitted through feces-contaminated food and water. FDA investigated distribution and supplier information for romaine and carrots but results were inconclusive.

Separately, 250 laboratory-confirmed cases of *Cyclospora* infection were reported among people who ate pre-packaged Del Monte vegetable trays purchased from convenience stores in the Upper Midwest. As in the other cases, FDA’s traceback investigation did not identify a single source or potential point of contamination.

FDA’s long delay in issuing the high-risk food list and traceability requirements under FSMA Section 204 “is untenable in light of the recent unsolved outbreaks,” the food safety and consumer groups wrote. As David Acheson, MD, former FDA associate commissioner for foods and president and CEO of The Acheson Group, puts it, “Our tracking systems still don’t work. They take much too long and are too imprecise.”

### Industry Response

Dr. Acheson is concerned that the leafy greens industry, particularly the romaine lettuce sector, will suffer in sales much as spinach did after a massive *E. coli* outbreak in 2006 that sickened more than 300 people and killed three. Similarly, a *Salmonella* outbreak from salsa in 2008 was initially blamed on tomatoes, but eventually linked to peppers from Mexico.

“Because it took so long to trace the contamination and determine peppers as the actual culprit, the tomato industry was ravaged as consumers began avoiding tomatoes altogether based on advice from states and FDA,” Dr. Acheson says. The scare ended up costing the tomato industry hundreds of millions of dollars in lost sales.

Growing and shipping records, when they exist, are often handwritten and the types of information they contain can vary from company to company. Traceback becomes even more difficult when a single production lot of bagged salad may contain romaine and other leafy greens from multiple ranches.

“Better recordkeeping at businesses producing and distributing the nation’s food would increase the speed and effectiveness of outbreak investigations and recalls,” says Sandra Eskin, food safety project director, The Pew Charitable Trusts. “FDA can and should spur these improvements.”

The produce industry, of course, has not been waiting for FDA and has launched a number of initiatives to tackle the traceability conundrum. For example, following a series of nationwide *E. coli* outbreaks in 2006 from produce, California farmers and industry groups established the California Leafy Greens Marketing Agreement (LGMA). LGMA provides a mechanism for verifying that farmers follow established food safety practices for lettuce, spinach, and other leafy greens. Member companies sell and ship produce only from farmers who comply with LGMA-accepted food safety practices, including mandatory USDA audits and state inspections.

The Produce Traceability Initiative (PTI), sponsored by the Canadian Produce Marketing Association, GS1 US, the Produce Marketing Association, and the United Fresh Produce Association, aims to help drive voluntary whole-chain traceability by

(Continued on p. 47)

# Pathogen Patrol



## Tuning In to *Toxoplasma*

This globally pervasive parasite impacts human behavior and health

BY LINDA L. LEAKE, MS

If you're feeling more entrepreneurial than usual, or more interested in pursuing business-related activities or studies, you may be infected with *Toxoplasma gondii* (*T. gondii*).

Implausible as this may seem, a recent study conducted by researchers at the University of Colorado (CU), Boulder, demonstrates that *T. gondii*-positive individuals are more likely to major in business and more likely to pursue a management and entrepreneurship emphasis than those not infected with the organism, according to Stefanie Johnson, PhD, associate professor of management in the CU Leeds School of Business and the lead author of the study.

Dr. Johnson and her colleagues point out that the protozoan parasite that infects

an estimated 2 billion people worldwide has been linked to behavioral alterations in humans.

"While disciplines such as business and economics often rely on the assumption of rationality when explaining complex human behaviors, growing evidence suggests that behavior may concurrently be influenced by infectious microorganisms," Dr. Johnson relates. "The goal of our study was to investigate how infection by a globally distributed parasite, through its potential influence on individual human behavior, is associated with local to large-scale cultural and business-related outcomes, specifically entrepreneurship.

"Using a saliva-based assay, we found that, of the 1,495 CU undergraduate stu-

dents who participated, the 22 percent that tested IgG positive for *T. gondii* exposure were 1.4 times more likely to major in business and 1.7 times more likely to have an emphasis in 'management and entrepreneurship' over other business-related emphases, when compared with the students who tested negative," Dr. Johnson elaborates.

To understand patterns of infection among professional entrepreneurs, Dr. Johnson's team collected data from 197 individuals attending entrepreneurship events. Among those 197 participants, the *T. gondii*-positive individuals, also determined by saliva tests, were 1.8 times more likely to have started their own business compared with other attendees.

As an additional endeavor, the CU researchers evaluated global patterns of toxoplasmosis (the disease caused by *T. gondii*) and entrepreneurship.

"We compiled national statistics from 42 countries spanning the last 25 years and found the infection prevalences of *T. gondii*, which range from 9 percent in Norway to 60 percent in Brazil," Dr. Johnson relates. "We combined those statistics with the Global Entrepreneurship Monitor of entrepreneurial activity, and the results proved to be a consistent, positive predictor of entrepreneurial activity at the national scale. We believe all of our findings emphasize the hidden role of parasites as potential drivers of complex human behavior and economic outcomes."

### Foodborne Illness: Not the Cat's Meow

More than 40 million men, women, and children in the U.S. carry *T. gondii*, CDC reports, but very few exhibit symptoms, courtesy of the immune system usually keeping the parasite from causing illness. Nonetheless, toxoplasmosis is considered to be a leading cause of death attributed to foodborne illness in the U.S.

Estimates suggest that 23 percent of adolescents and adults are infected with *T. gondii*, and CDC says the parasite accounts

for 24 percent of deaths due to foodborne illness in the U.S.

Cats and other felids are the only hosts in which the parasite can complete its entire life cycle, and the only animals that excrete, in their feces, the environmentally resistant and infectious stage called the oocyst. This knowledge came to light in 1970, thanks to landmark research led by Jitender Dubey, DVM, PhD, a microbiologist with the USDA ARS Animal Parasitic Diseases Laboratory (APDL), Beltsville, Md.

The tissue form of *T. gondii* (a microscopic cyst consisting of bradyzoites, the asexual third stage of the parasite) can be transmitted to humans by food. CDC explains that people become infected by

Thermal death curves for the interaction of temperatures and times required to kill *T. gondii* in meat have been generated in closely controlled scientific studies.

eating undercooked, contaminated meat, especially pork, lamb, and venison; accidental ingestion of undercooked, contaminated meat after handling it and not washing hands thoroughly; or eating food that has been contaminated by knives, utensils, cutting boards, or other foods that had contact with raw, contaminated meat.

Moreover, people can accidentally swallow the oocyst form of the parasite. CDC points out that this can occur after cleaning a cat's litter box when the cat has shed *Toxoplasma* in its feces; after touching or ingesting anything that has come into contact with a cat's feces that contain *Toxoplasma*; by ingestion of oocysts in contaminated soil, such as by not washing hands after gardening, or eating unwashed fruits or vegetables from a garden; or drinking water contaminated with *T. gondii*.

A serological test that can distinguish oocyst transmitted toxoplasmosis from tissue cyst transmitted toxoplasmosis in humans has been developed by ARS APDL. "Thousands of serum samples representing *Toxoplasma* infected people from the

U.S. and other countries were tested," says Dolores Hill, PhD, an ARS APDL parasitologist. "Results of this investigation indicate that more than 70 percent of infected humans acquired their infection by exposure to oocysts."

"Given recent evidence that many people become infected by ingesting oocysts, we must ascertain which foods confer greatest risk, and devise ways to remove or

inactivate those oocysts without eroding such foods' nutritional quality, flavor, or palatability," notes Benjamin Rosenthal, SD, also an ARS APDL parasitologist.

#### Food Safety Issues and Attention

"Infected animals harbor tissue cysts, and human consumers can be infected by ingestion of these cysts in raw or under-

(Continued on p. 16)

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(Continued from p. 15)

cooked meat,” Drs. Hill and Dubey note, adding that just one (potentially infective) tissue cyst may be present in 100 grams of meat. “Virtually all edible portions of an animal can harbor viable *T. gondii* tissue cysts, and tissue cysts can survive in live food animals for years.”

Dr. Hill and H. Ray Gamble, PhD, director of the National Academy of Science’s Fellowships Office, emphasize that animals exposed to this parasite rarely show signs of infection. “Animals are infected by ingestion of oocysts from the environment; or by predation of infected animals such as mice, birds, and other wildlife; by consumption of undercooked meat scraps; and in some species, through in utero transmission,” they relate.

### Inactivating *T. Gondii*

Thermal death curves for the interaction of temperatures and times required to kill *T. gondii* in meat have been generated in closely controlled scientific studies. “From these data, we know that *T. gondii* is killed in 336 seconds at 120 degrees Fahrenheit, in 44 seconds at 131 degrees Fahrenheit, and in six seconds at 142 degrees Fahrenheit,” Drs. Hill and Gamble note. “These times and temperatures apply only when the product reaches and maintains temperatures evenly distributed throughout the meat.”

Thermal death curves have also been developed to establish the effect of cold treatment on the viability of *T. gondii* in meat, Drs. Hill and Gamble continue. “Although tissue cysts remain viable at temperatures slightly below freezing, 11.2 days at 20 degrees Fahrenheit and 25 days at 30 degrees Fahrenheit, parasites are inactivated almost instantaneously at temperatures of 15 degrees Fahrenheit and lower,” they say.

Recent studies in Dr. Hill’s lab tested the effect of five variables—salt/brine concentration, water activity, pH, temperature, and time—on inactivation of *T. gondii* bradyzoites in pork during preparation of dry-cured pork sausage. “Results indicated that encysted *T. gondii* bradyzoites do not survive the early stages of the dry-curing process, resulting in rapid inactivation of bradyzoites, rendering these products safe from risk with respect to *T. gondii* transmission to human consumers,” Dr. Hill reports.

“While meat products have been identified as an important source of *T. gondii* infections in humans, overall, the prevalence of viable *T. gondii* in U.S. retail meat, including beef, pork, and chicken, is very low, according to research,” Drs. Hill and Gamble emphasize.

**Dr. Johnson and her colleagues point out that the protozoan parasite that infects an estimated 2 billion people worldwide has been linked to behavioral alterations in humans.**

### Risk Assessment Studies

Several recent studies assessed the risk associated with consuming meat products potentially infected with *T. gondii*. Abani Pradhan, PhD, an associate professor in the Department of Nutrition and Food Science at the University of Maryland, College Park, and his collaborators performed a systematic quality-effects meta-analysis to provide a quantitative estimate of *T. gondii* prevalence in meat animals.

*T. gondii* prevalence in non-confinement raised pigs ranked the highest (31.0 percent), followed by goats (30.7 percent), non-confinement raised chickens (24.1 percent), lambs (22.0 percent), confinement raised sows (16.5 percent), and confinement raised market pigs (5.6 percent).

“These results indicate that *T. gondii*-infected animals are a food safety concern,” Dr. Pradhan explains. “The computed prevalence can be used as an important input in quantitative microbial risk assessment models to further predict public health burden.”

Dr. Pradhan and his team also evaluated the effects of meat processing on the survival of *T. gondii*. “The critical steps for inactivating *T. gondii* tissue cysts along the meat production-to-consumption chain were identified through a qualitative farm-to-retail exposure assessment framework,” he relates. “We then developed dose-response models to predict *T. gondii* infection in humans from ingestion of *T. gondii*-infected meats.”

These researchers performed two farm-to-table quantitative microbial risk assessment studies to quantify the public health burden associated with consumption of fresh pork and domestically produced lamb in the U.S.

“In the context of available data, based on the sensitivity analysis, we identified cooking as the most effective method to influence human health risk,” Dr. Pradhan points out.

### Pharmaceuticals in Progress

There are promising new drug candidates in the pipeline to treat *T. gondii* infections in both animals and humans, according to Wes Van Voorhis, MD, PhD, a professor of allergy and infectious diseases and director of the Center for Emerging and Re-emerging Infectious Diseases at the University of Washington (UW), Seattle.

“One exciting new drug targets a protein kinase in *T. gondii* that has been shown as essential for host cell entry and intracellular growth,” Dr. Van Voorhis says. “The target is calcium-dependent protein kinase 1 that appears to have moved from the plant world to the *T. gondii* genome. There is no mammalian equivalent, so targeting it does not harm human cells.”

The Van Voorhis laboratory at UW, along with several collaborators, have worked together to perfect this drug in animal models, Dr. Van Voorhis reports.

“We now have a late pre-clinical candidate that is effective against *T. gondii* in vitro and in mouse and pregnant sheep models of *T. gondii* infection, protecting both mothers and lambs,” he relates. “This drug is safe in juvenile and adult animals, as well as pregnant animals, and is ready for final safety testing and submission to the FDA for first testing in humans. The drug shows activity in the brain against the latent, bradyzoite form of toxoplasmosis, bringing hope to the idea that treatment with this drug can arrest and eliminate brain infection, even in the latent form.” ■

Leake, doing business as Food Safety Ink, is a food safety consultant, registered SQF contract auditor, and award-winning freelance journalist based in Wilmington, N.C. Reach her at [LLLeake@aol.com](mailto:LLLeake@aol.com).

**For extended coverage on *Toxoplasma*, go to the October/November 2018 issue on [www.FoodQualityandSafety.com](http://www.FoodQualityandSafety.com).**





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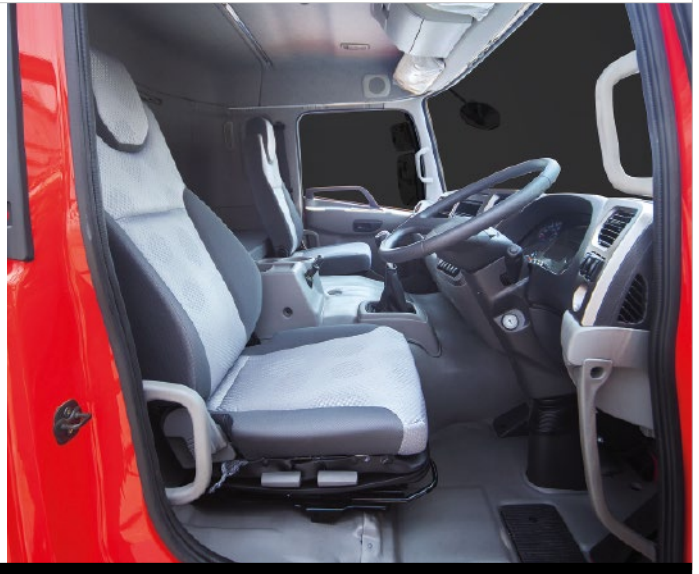


# Industry Insights

## Combating the Driver Shortage

Food manufacturers must work with trucking companies to find solutions to efficiently transport products and prevent loss

BY FRANK GRANIERI



The transportation and logistics industry has been struggling with the driver shortage for the past 15 years, but manufacturing companies are beginning to feel the impact of the shortfall firsthand, with the food and beverage industry being no exception. According to a recent survey from the Institute for Supply Management, food manufacturers are finding it difficult to deliver their products on time post-production. As a result, both trucking and manufacturing companies must together find a way to adapt to the trucking capacity shortage.

### Driver Shortage Challenges

According to the American Trucking Association (ATA), at the end of 2017 the trucking industry was short 51,000 drivers, up from 36,000 in 2016. As companies do everything within their power to retain current drivers and attract new ones with a diverse array of recruitment initiatives and bonus incentives, the ATA still predicts 2018's numbers will trend even higher. The effects of the driver shortage become more pronounced among carriers and shippers

as, coupled with rising driver compensation and diesel fuel costs, rates to transport goods also continue to go up. Dry goods not requiring refrigeration or other special handling now cost more than \$1.85 per mile to ship, an almost 40-cent increase from a year ago.

The shortage runs the risk of disrupting the food and beverage industry's supply chain, particularly in shipping food products from manufacturers and distributors to end users, like grocery and convenience stores. The industry already runs a lean supply chain, but this becomes less manageable when service and lead times are affected. In the Institute for Supply Management's recent survey of manufacturers, those in the food and beverage sector noted that the trucking capacity shortage was impacting delivery times and delaying product deliveries. For retailers operating with minimal back stock, these delays can lead to inventory shortages producing substantial losses. According to the Food Marketing Institute, grocers lose \$75 billion a year in sales due to out-of-stock or unsaleable goods, often the direct result of late deliveries. Freight costs are now a pressing concern for major food manufacturers, with many of the top publicly traded brands discussing transportation budget increases during recent earnings calls.

### Tackling the Driver Shortage

Transportation and logistics companies confronting issues head-on have implemented many quick solutions, such as pay raises, signing bonuses, and shorter hours where feasible. However, when looking to partner with a shipping provider, food and beverage companies should consider those that have implemented more long-term solutions for attracting and retaining drivers. Such programs might include:

- Future driver apprenticeship programs targeting high school students to provide a pipeline of drivers and address the



three-year career vacuum created by government regulations prohibiting anyone under 21 from obtaining a CDL Class A license;

- Dock-to-Driver programs allowing employees to progress from performing dock operations to a non-CDL driver, followed by enrollment in a Class A CDL training program; and

The effects of the driver shortage become more pronounced among carriers and shippers as, coupled with rising driver compensation and diesel fuel costs, rates to transport goods also continue to go up.

- Truck driving academies, certified by the Professional Truck Driver Institute, which pay employees their wages during the program and upon successful completion guarantee them employment with a company.

In addition to seeking a transportation partner with long-term recruitment, training, and development plans in place to grow its driver numbers, food and beverage companies should also seek a provider offering uniquely engineered solutions and services capable of improving the efficiency of their supply chains. Below are examples of areas where a partner should be able to provide support.

**Engineered solutions.** Perhaps the most important trait to look for in a logistics provider is one that can deliver a comprehensive evaluation of current transportation supply chains and tailor a custom solution to alleviate long-term driver staffing issues.

**Tracking.** Select a company that is equipped with the latest shipment tracking technology, so any delays can be immediately communicated to the customer.

**Bundle services.** Look for a trucking company that can also house and distribute manufactured goods to control the entire supply chain.

**Dedicated fleets.** Consider a transportation and logistics company that offers dedicated fleets and solutions to meet customer-specific needs.

While the driver shortage remains a source of daily discussion in the transportation and logistics industries, its widespread impact on all sectors of the economy touches upon many ordinary, yet essential, aspects of our daily lives. Like all industries dependent upon quality transportation

services, the food and beverage industry will experience some negative impacts of the shortage. But by seeking out a logistics partner focused on meeting customer needs and overcoming these challenges, food and beverage companies can expect to be in a more secure position. ■

**Granieri**, COO of A. Duie Pyle and a member of the company's Board of Directors, joined Pyle in 2012 with more than 15 years of transportation industry, logistics, and executive management experience. Reach him at [frank.granieri@aduiepile.com](mailto:frank.granieri@aduiepile.com).

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**METTLER TOLEDO**

# *Organic Food's Rapid Rise Brings Growing Pains*

Public debates are raging on over the accuracy  
and usefulness of product labels

BY **LORI VALIGRA**



Organic farming started as a small and simple movement frequently associated with 1960s hippies and back-to-the-landers, but today organic food has grown into a complicated big business, reaching a broad array of consumer plates through all types of retailers and raising questions about the accuracy of product labels.

Organic produce accounts for at least 5.5 percent of the food Americans buy from retailers, according to the Organic Trade Association. In a May 2018 survey, the Washington, D.C., trade association found organic food sales in the U.S. rose 6.4 percent from 2016 to 2017 to hit a new record of \$45.2 billion.

And organic food is no longer only available in specialty health food stores. Online websites and big-box stores like Walmart and Costco have joined traditional organic food sellers including Whole Foods, which itself last year was purchased by Amazon. Each is selling billions of dollars' worth of organic food per year through extensive distribution webs, according to The Balance Small Business website.

"Organic has arrived. And everyone is paying attention," Laura Batcha, CEO and executive director of the Organic Trade Association, said in a prepared statement in May, when the organization released its market study.

"Our survey shows there are now Certified Organic products in the marketplace representing all stages of the life cycle of a product or a company—from industry veterans to start-ups that are pioneering leading-edge innovation and benefits and getting shelf space for the first time," she says. "Consumers love organic, and now we're able to choose organic in practically every aisle in the store."

Consumers who buy organic food typically will pay more for it because of its perceived health benefits. Some will fork an extra 20 percent or more for organic vegetables, according to The Hartman Group, Bellevue, Wash., a food and beverage research company.

But the growing desire for organic food, the broad array of places to buy it, and the hundreds of organic items for sale at any

given retailer are causing growing pains for the organic industry and consumers.

That includes a public debate over the accuracy and usefulness of product labels. Some experts argue that many consumers are trying to eat healthy, but are confused over exactly what it is they are buying.

There is widespread misunderstanding about all types of food among consumers, Michigan State University finds in its Food Literacy and Engagement Poll in 2017. For example, more than one-third of Americans do not know that foods without genetically modified ingredients still contain genes as part of their makeup, as do all foods.

In the first of two [2018 polls](#), the university found that consumers consider labels very important to what they buy. Some 61 percent of respondents say labels are influential or very influential in their food-buying decisions. And 53 percent say they avoid eating foods that contain chemicals.

When it comes to trusting scientists involved in food safety, the 2018 poll finds that 52 percent trust academic scientists, 48 percent trust government scientists, and 33 percent trust industry scientists.

"I think from polling we see that most Americans are misinformed or disengaged when it comes to food and what the information on the labels means," says Sheril Kirshenbaum, co-author of the Michigan State University Food Literacy and Engagement polls.

"Labels are being used to market a product, but they're also being used for information about it, so they're making people confused," she says. "Most people don't know what 'organic' means."

But that doesn't stop shoppers from seeking organic products. The university's second poll of 2018, due out to the public in the fall, finds that 53 percent of American's polled will check a label for the word "organic."

Some 56 percent say they buy organic food. The most popular reason is that they think it is healthier. They also say it is more

*(Continued on p. 22)*



(Continued from p. 21)

natural, avoids pesticides, avoids GMOs, is safer, is better for them, and is better for animal welfare. Others cite family and friends or doctors as steering them toward organic foods.

The forthcoming poll found people who don't buy organic think it is too expensive or isn't any healthier or safer than conventional food.

Millennials turn out to value organics the most, buying more organic food and willingly paying higher prices for it.

### Labeling: What's in a Word?

With so many choices of organic foods—more than 400 alone to buy at Walmart, for example—and so much money at stake, some experts question whether marketers are taking advantage of overwhelmed consumers with the ingredients included on their labels.

The controversy over labels has been brewing for several years, but it came to a head in August with an op-ed piece in [The Wall Street Journal](#) by Henry Miller, MS, MD, a former FDA official who, among other things, founded that organization's Office of Biotechnology. Dr. Miller is now the Robert Wesson Fellow in Scientific Philosophy and Public Policy at Stanford University's Hoover Institution.

In the *Journal's* opinion piece entitled "The Organic Industry is Lying to You," Dr. Miller asserted that FDA is uneven in its policing of organic labels. As an example, he wrote that FDA warned a Massachusetts bakery about including the word "love" in its ingredient's list. And the Whole Foods website, he said, claims organic foods are grown "without toxic or persistent pesticides." Dr. Miller wrote that organic farmers do sometimes rely on synthetic and natural pesticides to grow their crops. Some of the pesticides are produced by the plants to defend themselves.

One of Dr. Miller's biggest complaints was the so-called "absence claims"—for instance, labeling a food like orange juice that has no fat to begin with as "fat free." Dr. Miller wrote that FDA usually comes down hard on such claims because to claim something is absent it must be present in the first place.

He said the non-GMO label is a particular offender in labeling, for example, there is a non-GMO label on Hunt's canned crushed tomatoes even though there are no genetically modified organism tomatoes on the market.

"Consumers need aggressive FDA action to curb these abuses and level the playing field," Dr. Miller wrote.



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"The FDA isn't enforcing its labeling mandate," he tells Food Quality & Safety.

Dr. Miller says the term organic does not imply the health of a food, and he sees it being used as a marketing tool to the detriment of some consumers who can barely afford to buy food products.

"Studies show people in poor neighborhoods may be avoiding fresh food because they can't afford organic, which they think is healthier," he says.

Dr. Miller's op-ed drew strong letter responses in [The Wall Street Journal](#) from both the Center for Food Safety, a Washington, D.C., nonprofit environmental advocacy program, and the Organic Trade Association.

"The organic industry isn't hiding anything," wrote Cameron Harsh, organic and animal programs director at the Center for Food Safety, in a response to Dr. Miller's commentary. "The truth is organic farming has a baseline prohibition of harmful chemicals. Transparent processes are required by law allowing certain synthetic products to be used only when all other measures have failed.

"They must go through rigorous, public review to prove their use 'would not be harmful to human health or the environment' and must be re-reviewed every five years," he added. "We aren't being duped; choosing organic is the best way to reduce dietary exposure to pesticides."

Batcha of the Organic Trade Association wrote that food with the USDA organic label is rigorously monitored. "No other agricultural system operates under the comprehensive and rigorous set of federal regulations and standards by which organic farmers choose willingly to abide," she said in her response.

Dr. Miller responded to their letters a couple of weeks later in [The Wall Street Journal](#), quoting Dan Glickman, who was agriculture secretary in 2000 when the federal organic standards were approved.

"I am proud to say these are the strictest, most comprehensive organic standards in the world," Glickman said in 2000.

Although Glickman embraced organic food, saying he sometimes buys organic frozen foods, [The Washington Post](#) said he made clear that the new organic seal does not imply the organic foods are either safer or more nutritious.

"The organic label is a marketing tool," he said at the time. "USDA is not in the business of choosing sides, of stating prefer-

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**...more than one-third of Americans do not know that foods without genetically modified ingredients still contain genes as part of their makeup, as do all foods.**

ences for one kind of food, one set of ingredients or one means of production over any other.”

FDA Commissioner Scott Gottlieb, MD, also weighed in on Dr. Miller's [comments via Twitter](#), saying he soon would release more detailed information on what different terms mean on food packaging to help consumers best use claims like organic and antibiotic free.

In other tweets, Dr. Gottlieb said the FDA and USDA have different roles in the oversight of organic foods. USDA regulates use of the term “organic” on food labels, while FDA oversees general food labeling compliance and food safety issues.

USDA became responsible for regulatory oversight of organic standards and accreditation of organic certifying agents under the National Organic Program (NOP), which was signed into law in 2000. The USDA Organic seal was subsequently introduced. Today, there are more than 24,000 certified organic operations throughout the U.S., according to the Organic Trade Association.

It is unclear to what extent the booming market for organic foods may be overloading certification operations.

The Idaho State Department of Agriculture (ISDA), the largest of 15 certifiers in that state, had to stop accepting new certifications in August 2017 because of the large volume of applications. It certifies 260 operations as organic. In August 2017, the number of certified organic food operations ISDA was handling was up 40 percent from four years before. It hired more inspectors in 2016, 2017, and this year.

“There was so much growth and we wanted to make sure certification was done correctly for our current clients, so we placed a temporary cap on new applications,” says ISDA organic program manager Gwen Ayres. She says it is unclear when ISDA will be able to lift the cap.

Organic growers can still try to get certified by other organizations, she says.

### Is the USDA Organic Label Enough?

While the USDA Organic label intends to define in detail what is or isn't organic food, advances in agriculture, food preparation, and internationalization all have conspired to challenge traditional definitions. A number of organic farmers also want to consider environmental impacts of organic practices in labeling.

Some organic food contains trace amounts of non-organic food parts, like spices, which are allowable up to a certain per-

*(Continued on p. 25)*



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(Continued from p. 23)

centage. Also in question are growing techniques such as hydroponics, a process used to grow vegetables in water with nutrients.

The Real Organic Project, based in East Thetford, Vt., wants an add-on label to the USDA Organic label. The group of organic farmers says there are a lot of good things about the USDA NOP rules. But it objects to rules that allow hydroponics and concentrated animal feeding operations to be certified as organic. It announced a pilot farm inspection program in July.

"But the farm products from a tiny minority of factory farms now being certified are at odds with the original intent of organic farming," the project's website says. "Unfortunately, these few factories produce a large and growing proportion of the food labeled organic on the market today."

Another effort was announced in March by the Rodale Institute, Dr. Bronner's, Patagonia, and others that are members of the Regenerative Organic Alliance.

The alliance launched its Regenerative Organic Certification program in March. It, too, looks for an organic standard focused on soil health and ecological land management, pasture-based animal welfare, and fairness to farmers and workers.

And some farmers and food producers are using new technology to improve yields. For example, USDA is currently reviewing comments on labeling for foods that may be bioengineered.

Gwendolyn Wyard, the OTA's vice president of technical and regulatory affairs, stands by the USDA as the standards-keeper for organic products.

"Unlike other eco-labels and add-on claims, the USDA Organic label is the only one that is backed by a federal standard, third-party certification and federal oversight," she writes in an email response to questions from Food Quality & Safety. She says the standards provide full traceability from farm to table.

She said the OTA does welcome efforts to improve agricultural practices through standards development. OTA, she says, supports Rodale, for example, for recognizing USDA Organic as the foundation and baseline requirement for its regenerative organic agriculture standard.

"It is critical that add-on labels serve as a mechanism to support the organic standards rather than compete with organic," she says. "The use of add-on labels should not devalue the organic existing standards and all the hard work that goes into the rigorous practices and certification requirements."

One challenge for the organic industry under the current administration is a scale-back on the USDA's efforts to engage in organic standards development, Wyard says.

"This is a challenge for the organic sector, and is also at the root cause for the add-on label schemes we see emerging," she says. "Although the intent is valuable, multiple certifications, audits, and inspections are a perennial challenge, particularly for farmers."

She says shoppers can get label fatigue with all the standards and become even more confused.

"The OTA stresses the importance of ensuring that additive certification schemes and label statements will not inadvertently confuse consumers and lead to a misconception that the organic standards do not cover fundamental requirements such as soil health and animal welfare," she says. ■

Valigra is a writer based in Harrison, Maine. Reach her at [lvaligra@gmail.com](mailto:lvaligra@gmail.com).



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# Food Quality & Safety Award Winner



## Got Chocolate-Flavored Quality and Safety?

The 2018 Food Quality & Safety Award winner

Forbes Chocolate can hook you up | BY LINDA L. LEAKE, MS

**C**ongratulations are in order for Umpqua Dairy Products, Roseburg, Ore. In 2017, this Beaver State enterprise captured the coveted first place award in the Lowfat Chocolate Milk 2% category in the World Dairy Expo Championship Dairy Products Contest. Competing in that particular class against 10 other dairies from across North America, Umpqua Dairy scored a near-perfect 99.8 percent to seal the victory in this rigorous competition sponsored by the Wisconsin Dairy Products Association.

As a result of this shining achievement, congratulations are also in order for The

Benjamin P. Forbes Company, Broadview Heights, Ohio. That's because the latter, also known as Forbes Chocolate, produced the chocolate that flavored Umpqua Dairy's award-winning chocolate milk.

"While the Forbes Chocolate name is not on the award, it is very gratifying to know that we produce a product of such high quality that it is cited as 'the best of the best' in North America," says Keith Geringer, president at Forbes Chocolate.

High quality, indeed; accolades should definitely not stop here. A round of applause is due to Forbes Chocolate because this Buckeye State developer and manu-

facturer of cocoa and flavor powders has been honored with the prestigious 2018 Food Quality & Safety Award. The annual Award, presented by Food Quality & Safety magazine, recognizes the dedication and achievement of an organization that uploads the highest food standards supported by quantifiable results.

"We are a family-owned company founded on the principles of integrity, hard work, gratitude, and consideration," says Mike Sandy, plant manager. "Forbes has a commitment to its customers to provide quality products with responsive and flexible service."

The Forbes Chocolate product lines showcase a wide spectrum of flavors, including cocoa powders in several strengths, colors, and fat ranges, Sandy relates. "Additionally, we offer inclusions, such as chocolate chips, flakes, and drops. Our flavor powders include strawberry, vanilla, and orange cream, to name a few. To meet market demand, we offer our customers a variety of seasonal flavors, as well."

Forbes Chocolate purveys powdered ingredients to dairy processors, ice cream manufacturers, supplement and nutraceutical makers, and bakery and snack companies throughout North America.

### Legacy of Forward Thinkers

The company was founded in 1901 in Cleveland, Ohio, by Benjamin P. Forbes, who began his career in the chocolate business working for the iconic Milton Hershey.

In the late 1920s, Forbes developed a new method for making chocolate milk. Rather than using syrup, which was the industry standard, he created a powder mix that dramatically changed the flavored milk industry. This innovator continued with the business until his death in 1976 at age 103.

His son, Benjamin F., ran Forbes Chocolate for 10 years before selling in 1985 to its general manager, Darwin (Dar) Geringer. Dar spent 58 years with the company until his death in 2004.

Dar's brothers, Dennis and Doug, also worked for the company and were eventually joined by Dar's son Keith in 1986.

With Keith Geringer at the helm, the company moved in 2007 to its current 70,000-square-foot facility—triple the size of the former plant Dar built. “This newest facility features state-of-the-art processing equipment, a full-service lab staffed with food scientists, and everything needed to efficiently meet the needs of our customers,” Sandy boasts.

“In the food industry, technological advancements are key due to the industry being influenced by the demands of consumers,” Sandy believes. “Forbes Chocolate has always strived to bring innovative ideas to our facility, not only to improve product safety and/or quality, but also to improve employee safety and quality, for the two are intertwined in our processing.”

### Recent Improvements

Forbes has recently invested in several new technologies to improve the quality and safety of its products.

“In November 2017, we replaced our old dust collector system,” Sandy says. “Forbes Chocolate works with all powder materials, so we create a high level of dust particles throughout our manufacturing process. As part of our continuous improvement measures, we installed a more advanced HEPA (high efficiency particulate air) filter system. The new dust

collector system contains 12 regular filters and six separate Camfil XH Absolute HEPA filters, and allows for 99.97 percent to 99.99 percent efficiency. This becomes an extremely critical control measure when we run allergen containing products due to the risk of cross-contamination. The new air filters provide an ultra-clean air environment while at the same time are energy efficient.”

Another improvement was updating product labeling equipment and software in January 2017. “As a supplier of bulk ingredients that are further processed by our customers into items such as chocolate milk and ice cream products, it is imperative that we maintain a level of transparency regarding our finished products,” Sandy emphasizes. “With more companies implementing online and data management systems, such as barcoding software, we decided it would be beneficial for our company to update our finished product labeling technology to include barcoding on all labels, as well as add additional quality measures such as a ‘Best By’ date and a ‘Manufactured in the USA’ statement to better serve the requirements and needs of our customers.”

The Forbes calibration program has recently undergone several positive changes. “Starting at the end of 2016, with full implementation at the beginning of 2017, we moved to include the bulk super sac scales as part of our annual calibration

program,” Sandy points out. “Prior to this change, we utilized the check weigher as the main quality point for final net weight verification. Adding this extra calibration verifies, to a higher degree, the numerical accuracy of the raw materials that we put into our finished products. In addition, we added daily internal scale calibrations to those used in our laboratory for research and development purposes. This addition increases the accuracy of the ingredients used in the samples supplied to customers, which in turn provides them with a more accurate representation of the product they will ultimately be purchasing from our company.”

As Forbes Chocolate is processor of dry ingredients, the risk for contamination or pathogen activity is relatively low due to the nature of the materials because they contain low water activity and are stored in ambient conditions, Sandy notes. “However, this does not prevent us from continually monitoring our facility and verifying that the investments and changes we have made have been effective,” he emphasizes.

### Quality Assurance Priorities

The Forbes team sincerely believes its devotion to product quality assurance and safety reaps measurable benefits for themselves and their customers.

“Forbes Chocolate’s commitment to customer service is what helps us stand out in a niche sector of the food industry,” says Ellon Waters, the firm’s quality assurance and lab manager. “We continually strive to meet customer expectations through ongoing employee training, maintaining Safe Quality Food Level 3 certification, implementing innovative new product lines, and personally following up with customers regarding issues, requests, or comments they may have.”

All Forbes Chocolate products are either Star-K or Star-D kosher certified as applicable, and there’s an ever-growing line of organic and halal certified offerings.

Waters emphasizes that providing customers with high-quality product not only leads to an increase in customers’ production and overall sales, but also benefits them regarding their end products. Case in point: Umpqua Dairy.

Additionally, several of Forbes’ larger customers annually award their top sup-

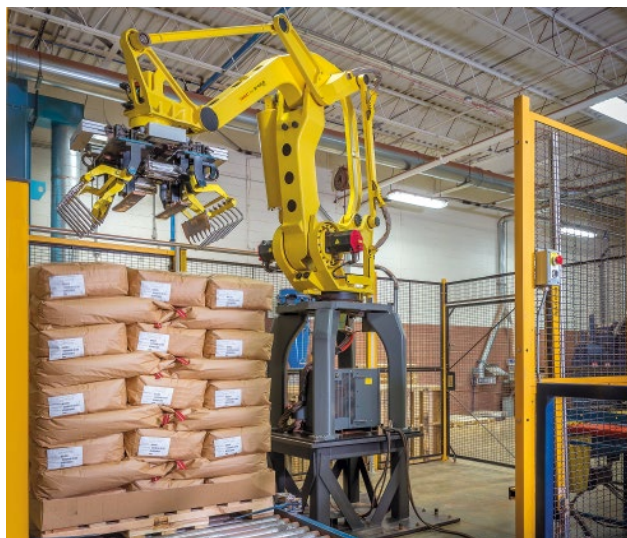
*(Continued on p. 28)*



Ribbon blenders are ideal for Forbes Chocolate’s powder blending applications.



The company's facility safely and effectively utilizes bulk bag unloaders.



Forbes's robotic palletizers help improve throughput and enhance quality.

(Continued from p. 27)

pliers based on product quality and customer support. In 2017, Forbes Chocolate was awarded the "Outstanding Supplier" award by a major nutraceutical manufacturer for the second consecutive year.

### Sustainable Cocoa, Sustainable Lives

A firm commitment to sustainable cocoa is an integral part of Forbes' business. "We've been offering Organic Certified cocoa products for many years and in 2014 we moved toward adding both Non-GMO Project Verified and Fair Trade Certified items to our product line," notes Alexis Minnich, Forbes' regulatory manager.

Forbes Chocolate relies on Ghana for supplying a large portion of its cocoa. In return, the company wanted to financially support a program in the West African country that was both empowering and sustainable. To that end, starting in 2015, Forbes embraced The Akumanyi Foundation, Columbus, Ohio, a nonprofit organization founded in 2014 that works to help at-risk youth and vulnerable women.

Among other endeavors, The Akumanyi Foundation has established a vocational program that teaches Ghanaian women and children trade skills, such as sewing, which is an integral part of the community and economy, as well as other vocational training. This foundation has built a school, a bakery, and set up several volunteer service opportunities in which U.S. college students can participate.

This program is running in Bawjiase and Swedru, towns in Ghana's Central Region. Currently the program is sponsoring some 21 women. The enrollees train with seamstress five days a week for three years. At the end of the three years, participants are equipped with the skills necessary to open their own seamstress businesses.

"We feel it is very important to give back to the communities that contribute so much to what we do," Minnich says. "We hope to improve the lives of the people in Ghana by working with an organization that uses the money efficiently to make a direct and lasting impact on improving their quality of life."

Closer to home, Forbes Chocolate is proud to offer a variety of endowments and annual scholarships at several U.S. universities to support education in the agricultural and dairy industries. There are three endowments at Ohio State University and one each at the University of Georgia, North Carolina State University, Pennsylvania State University, and West Virginia University. Scholarships go to Cumberland University, Louisiana Tech University, and South Dakota State University.

### Company Pride

Waters reports that 2017 saw an overall increase in sales (by poundage) of 5 percent for the year, with seven months reporting higher numbers than those of 2016. "This trend has continued into 2018

with the first quarter showing a strong growth in sales," she notes.

"The long-standing relationships that we have maintained with both our customers and our suppliers are evident by our accomplishments as a raw material supplier," Sandy relates. "We continue to grow along with our customers and we base our success on their achievements. Implementing new technologies, updating old machinery, attending training sessions, and advancing food safety and quality policies are just a few of the measures that we utilize here to preserve our customer commitments."

Sandy is quick to credit each member of the Forbes team for their contributions to the company's success, which includes the recent Food Quality & Safety Award.

"Forbes Chocolate is a company made up of a small, family-like workforce," Geringer adds. "At Forbes Chocolate we all take pride in offering quality products, while staying current with food industry regulations and satisfying customer expectations. Due to the dedication of our staff, we have been producing a high-quality, safe product for well over a hundred years, and with the leadership we have in place we will continue to do so for the next hundred. We all work hard day in and day out to produce a product that lives up to our company motto: Quality First." ■

**Leake**, doing business as Food Safety Ink, is a food safety consultant, registered SQF contract auditor, and award-winning freelance journalist based in Wilmington, N.C. Reach her at [LLLeake@aol.com](mailto:LLLeake@aol.com).

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# Quality

SHELF LIFE



## Determining Product Shelf Life

Shelf-life determination involves considering microbiological, physical, and chemical deterioration and using analytical and sensory methods to assess product quality

BY CAROL ZWEEP

Consumers expect to purchase high-quality, fresh food, but recently, they've also begun to look for foods with fewer or no food additives or preservatives, pressuring manufacturers to reformulate products to meet growing clean label demands and to ensure food safety and brand protection. Manufacturers are also challenged with determining and maximizing the shelf life for products that are exposed to varying conditions in the supply chain. Shelf life touches on all the issues mentioned, and shelf-life determination is an essential requirement in providing safe, quality food products to consumers.

### What Is Shelf Life?

There are many definitions of shelf life provided by governments and organizations. The Institute of Food Science and Technology defines shelf life as “the period of time during which the food product will remain safe; be certain to retain its desired sensory, chemical, physical, microbiological, and functional characteristics; where appropriate, comply with any label declaration of nutrition data,

when stored under the recommended conditions.” Both food safety and quality are important aspects of acceptable shelf life. Although pathogens are usually monitored during shelf-life studies, a suitable food safety program is the best way to ensure the product's safety.

### Factors Affecting Shelf Life

Both intrinsic and extrinsic factors influence the shelf life of food products.

Intrinsic factors include the following.

**Initial quality.** For perishable food, the initial microbial load will influence the shelf life. Using ingredients that have already started to deteriorate (e.g. old oil) or overprocessing can result in loss of texture or nutrients (e.g. vitamin C).

**Inherent nature of the product.** Fresh or perishable foods have an inherently shorter shelf life than shelf-stable foods. The low water activity of a product such as rice makes it an inherently shelf stable food, for example.

**Product formulation.** The addition of preservatives or antioxidants can extend the shelf life of the product. Formulation changes such as replacing the type of acid,

removing nitrates from a processed meat, and reducing the amount of added salt can also change the shelf life of the product.

The following are extrinsic factors.

**Processing methods.** Thermal processing will reduce (e.g. pasteurization) or eliminate (e.g. sterilization) microbes and extend the shelf life of the product. Other gentle processing techniques such as high pressure processing can also be used to reduce initial microbial levels.

**Packaging.** For shelf-stable products, the barrier of the package can affect the shelf life. For example, moisture absorption for a cracker will affect the crispness of the product and a moisture barrier is required. If the product has a large fat component (e.g. potato chips), fat oxidation affects the shelf life and an oxygen barrier is required. Light protection may also be required. Without light protection, milk is susceptible to vitamin degradation and off-taste due to light-induced oxidation.

**Transportation and storage conditions.** Exposure of the product to variable temperatures and relative humidity in the supply chain (including the retail environment) can affect the shelf life of foods. For refrigerated products, higher-than-optimal temperature storage can accelerate microbial growth. Oxidation reactions are also accelerated by higher temperature exposure, thus shortening the shelf life of products.

**Consumer handling.** After purchase, transfer of food from the store to home can result in higher temperature exposure. Consumer refrigerators can also be at higher-than-optimal storage temperatures. Once the package is opened, the shelf-life date assigned by the food manufacturer is no longer applicable.

### Understanding the End of Shelf Life

What constitutes the end of shelf life? The end point can be indicated from relevant food legislation, guidelines provided by government or professional organizations, or the use of acceptable industry practices. Often acceptability limits are chosen based on self-determined end points. For the most part, the food industry relies on sensory perception as an indicator of product failure. Product acceptability may be determined when there is a significant difference in the ag-

## Once a good analytical indicator has been established, then further routine shelf-life studies on the same product can use the analytical indicator to determine the end of the product's shelf life.

ing sample compared to a fresh sample by using discrimination testing (e.g. paired comparison, triangle, duo-trio, etc.). Descriptive analysis with expert panelists describes the change in sensory attributes (e.g. odor, taste, appearance, and texture) and can indicate consumer rejection. Although acceptance testing or use of consumer panels for acceptability can be more accurate, it is seldom used since a large number of panelists are required, resulting in a more time-consuming and expensive process.

A commonly used approach is to establish key analytical and sensory attributes that are correlated to consumer acceptability parameters. Once a good analytical indicator has been established, then further routine shelf-life studies on the same product can use the analytical indicator to determine the end of the product's shelf life (e.g. peroxide results indicate fat oxidation and rancidity of baked goods).

### How to Conduct a Shelf-Life Study

There is no universal protocol for direct determination of shelf life. Examples of guidance documents for determining the shelf life of food have been issued from the New Zealand Government and the Food Safety Authority of Ireland. The 10 steps below outline a methodical approach to setting up a shelf-life study.

**1. Define objective.** What is the reason for the shelf-life study? The shelf-life study can be initiated due to development of a new product, a formulation change, or an alternate package evaluation.

**2. Identify mode of deterioration.** End of shelf life is specific to different food commodities. For chilled foods, the end of shelf life is attributed to elevated spoilage microbial levels. Other modes of deterioration may be oxidation of fats as in fried snack foods, vitamin degradation as in fruit juices and starch retrogradation or staling of breads.

**3. Define key attributes to monitor.** Microbial examination, chemical analy-

sis (e.g. lipid oxidation and vitamin degradation), physical testing (e.g. color and viscosity) or sensory evaluation can be monitored throughout the shelf-life study. Note that a key part of establishing the usefulness of any analytical measurement is the correlation with sensorial changes.

**4. Select test methods.** For chemical analysis, lipid oxidation could be monitored by measuring peroxide, free fatty acid, or thiobarbituric acid reactive substances formation. Sensory evaluation could be determined by various methods such as discrimination and descriptive or acceptance testing.

**5. Set storage conditions.** Select the variables such as temperature, relative humidity, and lighting conditions. Product storage conditions can be optimal, typical or average, or worst-case scenario. The variables can also be fixed or fluctuating to simulate real-life product exposure during storage, distribution, and the retail environment.

**6. Set target end point and testing frequency.** For product with a short shelf life (seven to 10 days), evaluation can be performed daily or every two days. For moderate shelf life (three weeks) and long shelf life (one year), testing can be done at the initial point, end point, two to three occasions in between, and one point beyond the end point.

**7. Determine appropriate test and control samples.** Set the ingredients, process, and packaging for the shelf-life study. Test samples should be from the same batch to minimize variation and enough samples should be stored for duplicate or triplicate testing. Select the appropriate sensory control; if the product deteriorates over time, use freshly manufactured product or chill or freeze samples to ensure minimal deterioration.

**8. Perform shelf-life study.** Store the samples under conditions outlined in the study and test at the selected intervals.

**9. Analyze results.** In the absence of standards (legal or voluntary), manufac-

turers must set their own end point based on microbiological, chemical, or sensory criteria. The shelf-life date is usually assigned as the last day of an acceptable sensory score or analytical results. The preliminary shelf-life date can be conservative and based on the worst-case manufacturing and storage scenario.

### 10. Monitor and confirm shelf life.

Once the product has been introduced into the market, sample at the distribution and retail levels and adjust the shelf-life date accordingly.

### Accelerated Shelf-Life Testing

Lengthy real-time studies have led food processors to seek methods that accelerate shelf-life testing. One of the most common methods to accelerate oxidative reactions is to store product at elevated temperature. For simple systems, such as fat and oil, there is a direct relationship between oxidation rate and temperature. This mathematical equation can be used only if there is a correlation between the storage behavior under normal conditions and under accelerated conditions. In reality, foods are more complex and reactions may occur that would not proceed at normal temperature storage. Increasing storage temperature may lead to changes that affect the deterioration process such as melting of solid fats, crystallization of amorphous carbohydrates, increased water activity, denaturation of proteins, and decreased solubility of gases. Relative humidity may also affect reaction rate. Accelerated shelf-life testing is not applicable for short shelf-life chilled foods where microorganisms flourish at different temperatures.

It's important to understand the mode of food deterioration to establish the product's shelf life. Product formulation, process conditions, and storage conditions are important factors for product shelf life. Careful consideration of experimental design and test parameters is essential for accurate shelf-life evaluation. The shelf life of commercial products should be monitored and adjusted as required. Following these considerations will help ensure a safe, quality food product that meets customers' expectations. ■

**Zweep** is senior manager of packaging, product development, and compliance for NSF International. Contact her at [czweep@nsf.org](mailto:czweep@nsf.org).

# In The Lab

MEASUREMENT METHODS



## How Fresh Is Your Bread?

Quantifying how rapidly bread will stale using texture analysis

BY ROBERT G. MCGREGOR AND ERIC CHIANG

**P**urchasing a loaf of bread is a near-everyday experience for many consumers. Choice of brand depends primarily on what is important to the consumer in terms of taste and texture. One additional consideration is how fresh the bread remains for an extended period of time after it is bought. Aging of bread is referred to as “staling.” The average person thinks of it as hardening of the bread with a firmer and less-desirable texture.

### Texture Tests

Bakeries, especially large ones, conduct texture and staling tests on daily production batches to ensure that performance criteria for freshness and life expectancy are satisfied. The instrument used for testing is called a texture analyzer, which works by pushing a probe into the food item being evaluated. Rate of penetration by the probe is specified in the test method. A load cell inside the instrument measures the resistance to penetration and records

the force in scientific units of grams, or Newtons. Choice of load cell force range and resolution is typically indicated in the method. When testing sliced breads in the U.S., 4,500-gram load cell with resolution of 0.5 grams is generally sufficient. Higher capacity load cells are available from manufacturers of texture analyzers if needed.

Figure 1, on page 33, shows a cylindrical probe with a 36-millimeter (mm) diameter positioned above two bread slices. It is called TA-AACC36 and comes from a specification created by the American Association of Cereal Chemists. This is the preferred choice when evaluating sliced bread for firmness and springiness. It is a relatively inexpensive item and attaches to any texture analyzer with standard M3 threaded coupling.

### Texture Profile Analysis

The standard method for characterizing bread is a two-cycle test called Texture Profile Analysis (TPA). The probe pushes down into two bread slices stacked on top of one another at 1 mm/second to a depth of 4 mm. The instrument begins to record the measured force after a trigger load of 5 grams is detected. When the probe reaches 4 mm, it reverses direction and returns to its starting position. While this takes place, the bread will spring back to some extent. The probe then commences its second penetration cycle. The point of contact may take place slightly later than the first cycle because the bread does not fully recover to its original position. The probe pushes down again to a distance of 4 mm and records the measured force as before. The peak force measured during the second cycle may be lower due to internal structural damage during the first compression cycle.

Preparation of samples for the staling test involves placement of bread slices on a tray. Removal from the original packaging allows exposure to room humidity for a defined time interval to accelerate the staling process. Four-hour increments are a typical choice. The above TPA test is conducted on fresh slices taken out of the packaging while those on the tray remain untouched for four hours before testing.

Figure 2 shows graphical data from the TPA test on fresh bread slices (Sample A) versus those that have been left on the



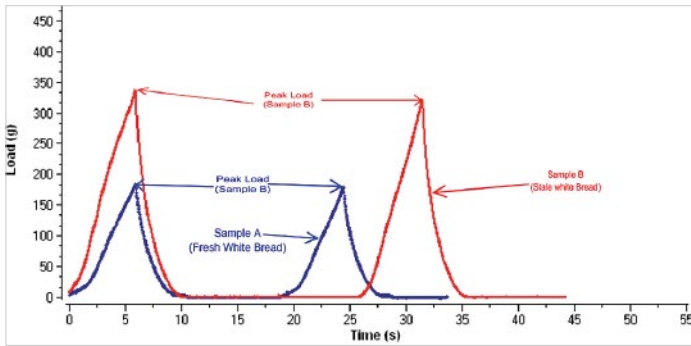


Figure 2. TPA test data on fresh and stale bread.

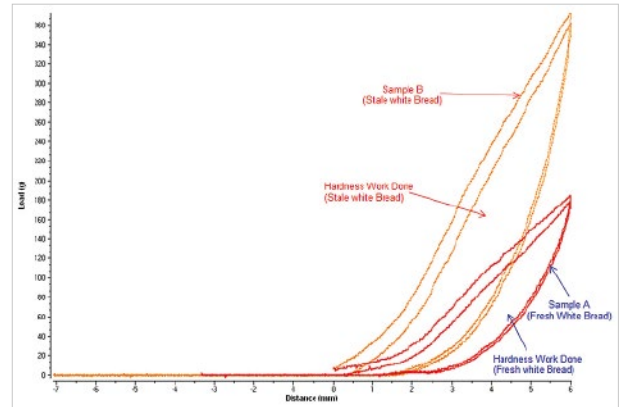


Figure 3. Same TPA test plotting force versus distance.

tray to stale (Sample B). The y-axis is registered in units of grams force while the x-axis is simply the timeline in seconds. Sample A exhibits a peak load of 184.5 grams on the first cycle when the probe has compressed the bread slices to a depth of 4 mm. The second cycle has a slightly lower peak load of 179 grams. Sample B by comparison has higher peak loads of 371.5 grams and 361.5 grams on cycles 1 and 2, respectively.

Sample A is softer as indicated by the significantly lower peak force values com-

STATISTICAL REPORT							
#	Sample Description	Results	Hardness	Hardness	Hardness	Springiness	
	Product Name	Batch Name	Sample	Cycle 1	Cycle 1	Cycle 2	
				g	mJ	g	mm
1	Bread	White-Fresh	8	184.50	4.54	179.00	5.08
2	Bread	White-Stale	11	371.50	9.75	361.50	5.34
			Minimum	185	4.5	179	5.08
			Maximum	372	9.8	362	5.34
			Average	278	7.1	270	5.21
			Standard Deviation	132	3.7	129	0.18

Table 1. Summary of measurements and calculations.

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pared to Sample B. The bread's internal structure has changed during the four-hour staling process to become more firm and rigid. The consumer will obviously notice the higher resistance to biting and chewing the slices that constitute Sample B.

Plotting the data using force versus distance for the same tests produces the graph in Figure 3, making it easy to perform mathematical calculations that quantify the amount of work done to compress the bread slices. The area under each curve is the equivalent work value for Sample A and Sample B respectively during the first compression cycle. Unit of measurement for work done is millijoules. Sample A has a value of 4.54 while Sample B is 9.75. This calculation confirms that the consumer will easily sense the difference between fresh and stale bread slices.

### Springiness Index

The final parameter used to evaluate the samples is "springiness." This is technically defined as the ratio of spring-back distance compared to the maximum deformation. Both samples recovered almost completely after each cycle, therefore, the

spring back distance is close to the 4 mm compression distance. Springiness in both cases is relatively close to 1.

Springiness index is the ratio of springiness to the actual deformation after the completion of cycle 1. Since each slice recovered substantially to its original thickness, the actual deformation of each slice was relatively small compared to the thickness of the slice. Therefore, the springiness index will be a numerical value much greater than 1. Sample A is 5.08 and Sample B is 5.34. Comparatively speaking, fresh and stale slices were fairly similar.

The obvious advantage of TPA is the ability to numerically quantify behavior of bread slices with deformation tests that simulate biting and chewing. (See the compiled measurement data in Table 1.) Comparing test data to standards for freshness and staling provides a meaningful yardstick to ensure that each batch meets customer expectations. ■

McGregor is director of high-end lab instrument sales at AMETEK Brookfield, Instrumentation & Specialty Controls Division. Reach him at bob.mcgregor@ametech.com. Chiang is sales manager, texture, for the company. Reach him at eric.chiang@ametech.com.



Figure 1. Texture analyzer with cylindrical probe.



# Proficiency Testing Mitigates Risk in New ISO 17025

Helping laboratories objectively detect and correct problems within a risk-based environment | BY ROBIN STOMBLER

**T**he International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) issued their latest edition outlining the general requirements for the competence of testing and calibration laboratories, known as ISO/IEC 17025:2017. For food laboratories, ISO 17025 outlines how a competent laboratory should operate from framework and resource requirements to management and process systems. In essence, for a laboratory to generate accurate measurement results, it must build and engage an able structure for that testing. Proficiency testing is a necessary component of this formation.

ISO 17025 defines proficiency testing as the “evaluation of participant performance against pre-established criteria by means of inter-laboratory comparisons.” Inter-laboratory comparisons take place when two or more laboratories perform and evaluate the same or similar items, within predetermined conditions.

Food laboratories should be aware of how ISO 17025:2017 differs from its predecessor version of 2005. Somewhat similar to the risk-based approach adopted through the implementation of the Food Safety Modernization Act (FSMA),

ISO 17025 applies what it calls risk-based “thinking” that integrates more flexibility and performance-based requirements in its 2017 edition. The updated version of the standard now aligns more closely with other relevant standards for the quality of medical laboratories (ISO 15189) and quality management (ISO 9001).

In order to monitor performance, laboratories under ISO 17025 must compare test results with results from other laboratories. There are two noted avenues for conducting this planned monitoring review: proficiency testing and other inter-laboratory comparisons. The purpose of proficiency testing, and other comparison practices, is to drive improvement in the quality and accuracy of measurements made within the laboratory.

ISO 17025 requires that data from these comparison exercises be analyzed and used to improve a laboratory’s functions. If the data show that test results register outside of predetermined criteria, a laboratory must address the variation and take action to prevent the performance and reporting of test results that are not fit for their intended purpose.

To address the risks associated with lab testing, laboratories, through their management systems, must seek oppor-

tunities for improvement. Laboratories must identify and demonstrate that those actions are pursued. ISO 17025 includes proficiency testing as an external measure to assess the validity of the laboratory’s test in order to drive improvements.

## Already in Play

ISO 17025 is already referenced in federal regulation and guidance documents. In its final rule on accreditation of third-party certification bodies that conduct food safety audits, FDA noted a requirement to use a laboratory accredited under ISO/IEC 17025:2005 or another laboratory accreditation standard that provides at least a similar level of assurance for validity and reliability of analytical results. The agency’s draft guidance on the control of *Listeria monocytogenes* in ready-to-eat foods recommends taking action to ensure that a testing laboratory is knowledgeable, and suggests determining whether the laboratory is accredited to a standard such as ISO 17025.

The Food Safety and Inspection Service (FSIS), an agency with the USDA, accredits nonfederal analytical chemistry laboratories to analyze meat and poultry food products. This FSIS Accredited Laboratory Program recommends that participating laboratories follow standardizing procedures such as ISO 17025.

FSMA contains a provision for laboratory accreditation for the analyses of foods. Section 202 of the law calls for the development of model standards that laboratories must meet to be accredited. As FDA reviews existing standards for guidance, ISO 17025 may well become the basis for these model standards.

Laboratories that are accredited to the previous 2005 version of ISO 17025, while still valid, have three years to transition to the new version.

## Proficiency Testing Providers

When it comes to externally provided proficiency testing services, ISO 17025 explains that these services must be suitable in support of the activities of the laboratory. One way to assess the competency of a proficiency testing provider for food laboratories is by its accreditation to ISO/IEC 17043:2010. ISO 17043 accreditation

(Continued on p. 47)

# Manufacturing & Distribution

COLD CHAIN



SOURCE: OSISOFT

## The Current State of the Cold Chain

Storage and transportation is a challenge for food shippers trying to meet the increased demand for fresh and frozen food | BY JIM ROMEO

**T**he growing demand for perishable food is challenging food shippers to find sufficient cold transport and storage. This demand is propelled by health-conscious consumers around the world, seeking more fruits and vegetables, fresh and frozen, all year long. Suppliers are busy building temperature-controlled facilities and using refrigerated trucks, trailers, containers, and other technology to meet this growing demand with quality and safety.

Consider the market for bananas. They are the most consumed fresh fruit in the U.S., with an annual consumption of just over 11 pounds per person. Many shipments of this popular fruit come from Central and South America. Since shippers seek the most optimal shipping route, the Port of Tampa decided to build a cold storage facility to accommodate inbound ship-

ments. Completed and opened this year, it can receive nearly 4,000 pallets of bananas in a given week. For example, the facility receives Chiquita bananas from Ecuador so they can go into storage and await distribution to markets throughout the U.S.

Going to Tampa instead of further up the Eastern Seaboard to Philadelphia (where many cold storage facilities are located) saves about three days in the supply chain timeline for these perishable items. Such careful calculation and concern have gained heightened importance in this robust global market.

Slightly more than 20 percent of fresh fruits were imported about 40 years ago, compared to just under 50 percent today. Additionally, about 5 percent of vegetables were imported over the same period, compared to about 35 percent today. Almost half of fresh fruit and nearly one-third of

fresh vegetables consumed in the U.S. are imported from other countries.

According to USDA's quarterly report from late 2017, shipments of refrigerated fruit and vegetables have been increasing since 2000. The report states, "At 7.72 million tons, reported shipments of refrigerated fruit and vegetables in the fourth quarter of 2017 were the third highest on record for any fourth quarter, behind 2016 at 8.05 million tons and 2011 at 7.99 million tons. As a whole, the reported annual tonnage for 2017 was the highest on record at 33.6 million tons, an 0.5 percent increase from 33.4 million tons reported in 2016." Additionally, spot rates for some refrigerated trucks have reached 40-year highs.

This trend has created a logistics problem; too many fresh and frozen goods, with too few assets to store and transport them.

### Increased Demand, Logistics Shortage

"The overall shortage in the trucking industry is hitting the less-than-truckload cold transport hard," says Mark Nelson, CEO of Perishable Shipping Solutions, a Youngstown, Ohio-based company that runs a fulfillment service for food companies serving online food shopping networks. "We continually experience shipping delays and no-shows. It's one thing to have a trucking company quote a high price; but they often confirm shipments and drivers don't show. This is a common occurrence."

Tal Paperin, vice president of business development for Israel-based KSW Solutions, a consulting firm whose services include logistics consulting, says public concern in food safety is growing. "In the past, consumers weren't so interested in where their food came from, how it was stored, or how it was transported," he explains. "But that's changing. Companies are serving a more health-conscious consumer as well as many more concerned about food safety."

"With the Internet, people are more aware of the food transportation and stor-

*(Continued on p. 36)*



(Continued from p. 35)

age industry,” continues Paperin. “Not just consumers, but even people working in quality control in the grocery store pay attention. This awareness has stimulated heightened demand for fresh foods, worldwide. Consumers want fresh food all the time, from wherever it’s grown. Cold transport makes that possible. A tightening in the supply of cold transport not only makes such fulfillment more difficult, but also could jeopardize the safety of food that could perish with any substandard cold storage or transport.”

Paperin goes on to talk about the new technologies in storage as well as the new logistics and sales chains, so foods will be stored and transported in different ways. For example, he says, “Currently, the majority of Driscoll’s berries come from California; but they will be able to buy berries from Peru and sell to Germany directly, rather than just importing to Holland and distributing throughout Europe. Places that are known for poor food quality will be ignored in favor of places that have better supply chain logistics and quality.”

Consumer demand for fresh food has opened new trade routes and caused nations from distant continents to capitalize on cold transport to meet the rising needs. Sue Rutherford, vice president of marketing for ORBCOMM in Rochelle Park, N.J., says the global trade in perishable food is growing at about 4 percent per year; trade within and between some nations is expanding even faster. New trading routes are also opening, for instance between Latin America and China, as global economic relations and dynamics shift. Demand for cold storage and transport will continue to grow worldwide, especially in nations that currently lack a well-developed cold chain infrastructure, including India, China, Africa, and Southeast Asia, particularly Indonesia. However, mature

economies like the U.S. and Europe also need to address cold storage capacity that is aging and/or in the wrong locations for emerging industry dynamics.

### Technological Improvements

Rutherford says digitization is helping improve food quality while aiding the supply chain. Technology allows vigilant monitoring of food shipments and inventory, so it may be appropriately stored for advantageous lengths of time, while remaining safe for market where and when it reaches it.

For instance, ORBCOMM provides Industrial Internet of Things (IIoT) telematics and sensor hardware, network connectivity, and cloud software that enable remote visibility and control of refrigerated trailers, containers, and perishable cargoes in-transit and in-facility.

“Companies are looking to have more data and to use it better,” Rutherford explains. “In cold chain, investment in telematics and sensor technology, such as we provide, has initially been driven in many cases by regulatory compliance with the FDA Food Safety Modernization Act, other food safety regimes like Hazard Analysis and Critical Control Points, and related transport safety rules. But technology is now being used in many other ways to help companies maximize utilization of the assets, improve cargo care, and get a more proactive control over their cold chain.”

These developments open the market aperture for food supply. “The outlook is absolutely positive in opportunity terms, but regulatory, capacity, and investment headwinds continue,” she notes. “What we see is companies turning to data and digitalization to give themselves much better insight and control over cargo care in transit, asset, and proactive cold chain management.”

Jeff Van Pelt is a principal with OSIsSoft, which collects, analyzes, and visualizes

large amounts of big data and IoT data from various sources for real-time decision-making in several industries, including cold transport.

“There’s an opportunity for companies to take better advantage of technology and data, from manufacturing, warehousing, and distribution, to connect the cold chain and provide real-time visibility throughout the process,” he explains. “The availability of sensors to collect massive amounts of data, and for systems to collect, harmonize, and store that data for analysis, provides an opportunity for significant efficiency gains.”

Van Pelt says that domestic investments in newer, more technologically advanced storage facilities are providing more efficiency. The global demand for fresh and temperature-sensitive products requiring cold chain capabilities is increasing the need for the appropriate logistics services.

### Cold Chain Suppliers and Food Brands

Food companies are looking to cold chain logistics providers as more than a proffer service; they consider them representatives of their brand. According to the Global Cold Chain Alliance’s (GCCA) 2018 Customer Demand Research Report, which surveyed some 200 food companies in 14 countries, food companies see cold chain providers as extensions of their brand and key performers to ensure food safety. When the food companies were asked what top business trends will most impact their company, the No. 1 response (122 of the 200 respondents) was “food safety and protecting the brand.”

In the survey, one of the respondents replied explicitly, “It’s a shared journey, absolutely. I think it has to be, because [the cold chain providers] are effectively stewards of our quality program and our brand.”

GCCA’s report summarized the next turn in the economic dynamic of increased demand. Temperature-sensitive food in a global transportation market, where supply lags but technology is greatly advancing, will rely heavily on suppliers that respond to this market.

Like the Chiquita bananas that find their way into Tampa’s cold storage facilities, the increasing volume of imported

fruits, vegetables, and other perishable foods will only grow more. Cold chain suppliers must expand to meet this need. New technology will help, as will the acquisition of new logistics assets. Cold chain logistics providers, from ships to rail carriers, telematics developers to warehouse providers, will all be expected to play an important role: to serve as an extension of the food brand that delivers quality food, safely. All eyes are on cold chain logistics.

GCCA's report summarizes it succinctly: "Cold chain providers must find opportunities to position themselves as an integral part of the customer's food, safety and brand initiatives. Nothing is more important to food manufacturers than ensuring the safety of their food. Cold chain providers are experts in that process and critical to it. To be an extension of the brand, providers must create dialogue and build the brand into the conversation when communicating with customers." ■

**Romeo** is a journalist focused on business and technology and is based in Chesapeake, Va. Reach him at [freelance-writing@yahoo.com](mailto:freelance-writing@yahoo.com).

## Location Matters: Turning to Inland Ports

BY **NICOLE BATEMAN**

Trucking delays can often exceed seven days in major markets, which leaves food far from fresh. Seafood and other perishable foods that come from coasts need to be flown inland and get to their destinations quickly. Metropolitan cities with the heaviest wait times throughout the Midwest include Chicago, Detroit, Columbus, Cincinnati, and Kansas City.

Producers need alternatives to get their goods to the final destination. Many are turning to inland ports—with access to highways, rail, and air—to serve as central transportation hubs and help overcome current transportation challenges.

For example, the Midwest Inland Port is a multi-modal hub located in Decatur, Ill., that delivers both domestic and international flexibility for companies through a well-positioned transportation corridor connecting the Midwest to the East, West, and Gulf Coasts of North America.

While retailers use various approaches to address perishability during ship-

ment—such as picking and shipping produce that ripens en route or cutting fruit in-store—the most common request from grocers is simply more frequent deliveries with tighter time windows.

Decatur's geography allows for a one-day truck drive distribution reach to more than 95 million consumers within a 500-mile radius. It also has a 2,000-acre airport with 8,400-foot runways capable of supporting wide-body cargo aircraft. The quick-access airport benefits companies transporting seafood and other perishable foods that need to be flown in for Midwest territory distribution.

Getting fresh goods to market that are still fresh upon arrival remains a major challenge for retailers around the country. Taking advantage of inland ports can relieve some pressure for companies that need quick turnaround and transport times.

**Bateman** is an executive director at Midwest Inland Port. Reach her at [nbateman@decaturedc.com](mailto:nbateman@decaturedc.com).

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## Logistically Speaking, Timing Is Everything

Logistic strategies to ensure products are delivered safely and on time at final destination

BY JANET PAPWORTH

**T**he threat of spoilage and waste are sizable economic concerns for food distributors. Food that arrives at its destination unsafe for human consumption represents lost sales and wasted resources.

One of the most important (and most challenging) factors in the safe transport of food is timing.

Agricultural products like produce and meat have a particularly short window for safe transport before they pose a health threat, but they're not unique in this regard; any food item is susceptible to timing concerns. Even packaged food products and dry goods like cereals and grains have expiration dates, and the longer they're in transit to their destination, the more risk they're exposed to. Improper handling—such as inadequate refrigeration or too much moisture in shipping containers—can cause spoilage, waste, and food poisoning.

### ERP Systems

Our understanding of the safest conditions for food transport continues to evolve, shaping the development of regulations and industry best practices. Food safety laws such as FDA's Food Safety Modernization Act and the United Nations' Codex Alimentarius keep pace with new developments, and individual food produc-

tion companies implement new internal practices to ensure safe and successful transportation of goods. Following these regulations and best practices requires extensive communication at every step and with every party involved in the process.

However, much of the communication about specifications and timelines is still done the old-fashioned way: using paper documents or phone calls. Not only is this inefficient, it's also prone to error. That's why many food distributors are looking to enterprise resource planning (ERP) systems to strengthen and streamline their quality control processes.

An ERP system serves as a central electronic database and communication tool that all involved parties can access. The shipping conditions (such as packaging, temperature, and vehicle preparation) required per customer or per food type can be saved in one location. These requirements can be used to generate tests and checks for personnel to complete during loading or unloading. Results and records of these operations are stored electronically via mobile devices, making it easier and faster for supply chain managers to create audit trails or to prove compliance with regulations. The accessibility and efficiency offered by an ERP can prevent most communication-related quality control issues before they arise.

While the goal of full, real-time visibility into the whole supply chain is probably at least a few years away, widespread adoption of ERP technology can get the logistics industry one step closer, saving valuable time while still ensuring every safety measure is met.

### Ripening En Route

Timing is a key factor in getting any kind of food to consumers for safe consumption, but it's especially crucial in the cold chain. Strict guidelines about packaging, labeling, and transportation have been developed to prevent widespread foodborne illness. Though much of the focus on disease prevention targets animal products (especially deli meats and soft cheeses), fruits and vegetables bring their own risks. Overripe or damaged produce is highly susceptible to decay or infection. While packaging and handling precautions can minimize damage in transport, ensuring that food arrives at the correct ripeness for consumption can be a tricky undertaking.

Some produce items—like citrus fruits, berries, and watermelons—do not ripen on their own after they've been harvested. These crops need to be harvested at or near the peak of ripeness, which makes long-distance shipments more time-sensitive. However, some fruits—such as avocados, bananas, and most stone fruits (except for cherries)—ripen naturally after being harvested. Growers and distributors take advantage of this by harvesting these items before they're ripe and allowing them to finish ripening while in transit. For these fruit items, efficient transportation and climate control measures like refrigeration and ethylene controls can help reduce the risk of over ripeness or spoilage in transit.

Promising new technological advances, such as wireless sensors that can detect spoilage in produce containers, present exciting potential for the future of safety in the food supply chain. In the meantime, preventing damage or unnecessary exposure to pathogenic conditions requires food companies and transporters to stay vigilant. This means shortening the supply chain wherever possible to reduce the time to market and ensuring that each step in the cold chain adheres to temperature and climate controls.

### Localized Distribution Centers

Like many other links in the global supply chain, food distributors are starting to take a page from Amazon's logistics playbook. Over the past decade, the e-commerce giant has pioneered and (more or less) perfected an alternative to the traditional hub-and-spoke model favored by most large-scale logistics operations. Instead, their decentralized model relies on moving distribution centers closer to the final user, allowing for quicker deployment and shorter shipping times.

With its acquisition of Whole Foods, Amazon has signaled its plan to apply this method to food distribution. By treating each Whole Foods store as its own distribution center, Amazon has been piloting two-hour delivery at many stores while maintaining food quality and freshness.

For competing food companies, following this model may look like finding or building more food-grade warehouses in emerging markets to bring food closer to the final customer. This will certainly require more investment, but it will shorten the last leg of transportation, which is key for maintaining the freshness of products.

For non-agricultural products, this method may also mean moving the final steps of food manufacturing closer to the end location. For instance, some beverage manufacturers currently ship syrup or juice concentrates using bag-in-box methods, outsourcing the blending and bottling processes to smaller, more localized facilities. In addition to reducing the amount of necessary shipping capacity, this method can help ensure products arrive in consumers' hands at peak freshness.

### Working with Outside Experts

Finding carriers that are reliable and transparent enough about their processes to ensure the safety of the products in transit is a big challenge. Each category and type of food has unique shipping requirements that must be adhered to, and the consequences of failure to comply can be severe. With regular recalls and public health scares, the potential damage to a company's reputation makes these concerns very real.

In addition, sourcing enough capacity is also a pain point for many food supply chain managers. This problem can be especially pronounced for time-sensitive

shipments during peak season. Take cherries, for example; every September and October, air capacity is completely saturated carrying cherries from California and the Pacific Northwest to China, where there is a huge market for the fruit. Finding capacity to transport cherries (or any other food product) during this time can be extremely competitive, as shipments are often booked far in advance of harvest.

For both of these common issues, it can be useful for food producers and distributors to outsource all or part of their logistics puzzle to a third-party logistics partner. By turning over the most challenging elements of the supply chain to an expert, shippers can expand the network of trustworthy carriers available to them. For example, when CAI Logistics moves frozen

*(Continued on p. 47)*

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# ELD Mandate for Sanitary Transportation Compliance

Mandated electronic logging devices can help motor carriers monitor every aspect of data, including FSMA

BY SANDY ROSENFELD

**T**he Food Safety Modernization Act (FSMA) was signed into law in January of 2011 as a means to give FDA authority to regulate the way food is grown, harvested, and processed. Within FSMA includes regulations specific to the sanitary transportation of food to protect food from farm to table. Motor carriers are specifically held responsible regarding prevention practices during transportation that create food safety risks. These risks include failure to adequately clean vehicles between loads, failure to protect food, and failure to properly refrigerate throughout the trailer. The rule applies to all shippers, loaders, carriers, and receivers.

Specific to the trucking industry, the regulations establish requirements for four key areas: 1) vehicles and transportation equipment, 2) transportation operations, 3) training, and 4) records. Under the regulations, the design and maintenance of equipment must be kept up to date to ensure transported food does not become

unsafe for consumption at any time. The measures taken during the process of transportation to ensure food safety, such as adequate temperature controls, preventing contamination, and protection of food from contact with non-food items, are all covered under transportation operations. Training of carriers and utilizing best practices and documentation is required under the act throughout the carrier and shipper transport process. The question for motor carriers is how the process of records and maintenance will be examined and how fines may be enforced.

## The Right Documentation and Use of Data

Food safety remains at the heart of FSMA with documentation being required for compliance. Since documentation is critical, the widespread adoption of recently mandated electronic logging devices (ELD) will help significantly.

FSMA is requiring compliance that may create new challenges for shippers,

carriers, and receivers trying to maintain standards of food products during transport, loading, and delivery processes. Shippers will need to document and communicate their food safety requirements to carriers in areas of equipment, operations, and training. Failure to provide documentation of the compliance can result in fines, cargo claims, and criminal sanctions.

This is where the ELD conversation comes into play, as not all ELD systems are created equal. Now that the ELD mandate is official, fleet managers are being forced to make an important initial decision: Do I view the ELD mandate as a “necessary evil” and spend the least amount to meet compliance, or do I go “all-in” and realize the true value of the data it provides?

Thinking strategically about the data that fleets need to provide proper documentation for FSMA is critical, but the right ELD goes well beyond this spectrum and can help manage the fleet’s overall per-

...the right ELD goes well beyond this spectrum and can help manage the fleet’s overall performance, including driver behaviors and vehicle life cycle options.



formance, including driver behaviors and vehicle life cycle options. It can also assist with reefer trailer monitoring to help with FSMA compliance. Organizations must make a thorough and methodic “due diligence” approach to their ELD decision.

### More Than Just the ELD

In addition to the ELD, motor carriers should focus on the equipment design and specification phase of their truck procurement strategies, which can not only help in FSMA compliance, but can improve their organization’s financial bottom line.

Working with a consultative partner during specifications, with details such as ribbed flooring in refrigerated trailers that make it easier to clean, for example, can ease the burden of compliance and

operations. But data extracted in the ELD and other aspects of operations can really pay off, including the identification of costly expenditures in maintenance and repair.

By using data analytics, motor carriers can monitor every aspect of data including FSMA to help determine the right life cycle of each truck. In addition to avoiding FSMA fines, data are helping save millions in bottom-line expenses with asset acquisition

strategies. By doing so, fleets will ensure a stronger compliance record with FSMA, and will realize better bottom-line savings that can be utilized for critical business expansion opportunities or driver recruitment programs. ■

**Rosenfeld** is a Certified Transportation Professional and an expert on Department of Transportation regulations and Compliance Safety Accountability compliance. She also adds a customer-based perspective to fleet management analytical reporting. Reach her at [rosenfeld@fleetadvantage.com](mailto:rosenfeld@fleetadvantage.com).

## Transportation Regulations in FSMA

- **Temperature monitoring and control:** Addressing issues of improper refrigeration and temperature control.
- **Cross-contamination:** Pertains to improper sanitation/disposal of wastewater, backhaul, or HazMat, and improper segregation of food/non-food in same trailer leading to contamination.
- **Sanitation:** Addresses improper packing materials, loading practices/sanitation, loading patterns, and washing of trailer.
- **Training:** Training of shippers, loaders, carriers, and receivers in sanitary transportation practices and documentation of the training.
- **Validation and food safety plan:** Monitoring of food safety programs and documentation that must be followed.—S.R.



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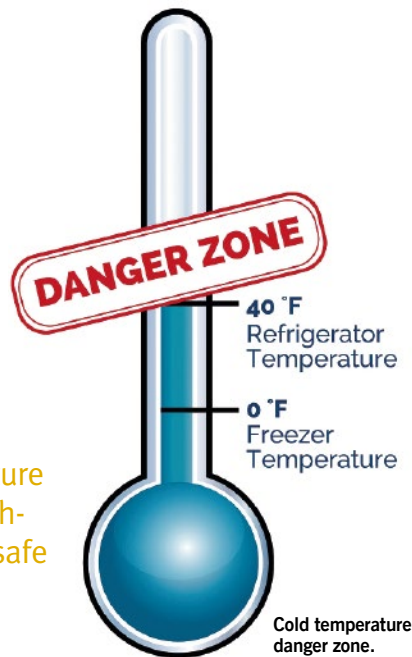
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# Avoiding the Danger Zone with Temperature Monitoring

Tips for using a remote temperature monitoring system to keep perishables within the recommended safe temperature range

BY **ROB FUSCO**



When the temperature of food reaches the danger zone between 40 degrees Fahrenheit and 140 degrees Fahrenheit, bacteria like *Staphylococcus aureus*, *Salmonella enteritidis*, *Escherichia coli*, and *Campylobacter* can grow to dangerous levels and cause illness. At those temperatures, bacteria can double in number in as little as 20 minutes. For these reasons, food manufacturers, distributors, warehouses, and retailers must make sure that refrigerated and frozen foods stay cold until they are purchased or served.

Temperature monitoring, recording, and data logging technologies make that job a lot easier.

## Remote Monitoring Systems

Although commercial refrigerators and freezers come equipped with thermometers, many don't have a way to alert users if the temperature strays out of the safe zone or if the power goes out. Having personnel check and record the temperature around the clock is impractical and unreliable. Just because the air and products inside of the unit feel cold, that doesn't mean it is the appropriate temperature to maintain food safety.

A remote monitoring system can help companies in the food industry comply

with FDA regulations, maintain accurate records, and, most importantly, keep food safe. These systems have alarms that send notification via phone call, text, or email to designated contacts when a temperature falls outside a preset range.

The base unit is the heart of the monitoring system. It pulls data (like temperature, humidity levels, etc.) from the sensors that are placed in key areas in a refrigerator or freezer. Users can select a base unit that communicates via a phone landline, Ethernet, or cellular connectivity. The system's internal rechargeable battery backup ensures continuous monitoring and alerts in the event of a power outage.

## Alarm Notifications

When a monitoring system identifies a change in status outside of the preset range, it immediately sends alerts to people on the contact list. If users don't want all of their personnel to receive notifications at the same time, some devices can be programmed to send alerts in a tiered fashion or on a schedule. Multiple communications methods provide extra assurance that the alert will be received.

It's a good idea to check the number of people the system can reach and if the system automatically cycles through the contact list until someone responds. Some

systems allow for flexible scheduling, so that off-duty personnel don't receive alerts.

## Programming and Status Check

For optimal performance, select a cloud-based system that delivers real-time status of all monitored conditions and sensor readings on demand. Options to access sensor readings include calling to check status, viewing a web page, or accessing it via an app on a mobile device. If a cloud-based system isn't selected, users will be limited to logging in through a local area network. Both allow for programming changes, access status conditions, and review of data logs.

## Temperature Probes and Buffers

There are different methods that measure temperature inside a refrigerator or freezer. The most basic instrument is the thermometer, which reads and displays temperature in the same simple device, while probes and sensors connect the environment or items being measured to more complex monitoring devices.

**Temperature sensor probe.** Sensors are basic devices that detect or measure temperature or other physical properties. A temperature probe is a metal sensing rod that can be inserted into a refrigerator or freezer. Sensor probes inside the cool storage unit detect or measure temperature or other physical properties. They are connected via wires or wirelessly to the monitoring device, which continually displays and records the temperature readings.

A key distinction between a sensor and a probe is that a probe is much more resistant to harsh conditions. A temperature probe can withstand temperatures that are too cold for most sensors or contact-type switches. Because they are durable, temperature probes can be placed in cold and wet environments that could ruin electronics or be inappropriate for a thermometer.

Most commercial-grade refrigerators have access ports to allow for third-party temperature probes, which is best practice. However, users can drill a hole in the side, insert the probe and then seal the hole, or simply place the probe in the refrigerator and run the wire through the door opening. The gasket around the door should make a strong enough seal around the wire to keep the outside air from seeping in.

SOURCE: SENSAPHONE



Temperature sensor display with glass bead buffer.

**Temperature buffer.** A sensor probe can be used with or without a temperature buffer, which acts as a cushion against temperature fluctuations in a freezer or refrigerator. A typical buffer is a bottle filled with glycol solution or glass beads. A probe is then inserted into the bottle. Buffers help to mimic the temperature of the food in your refrigerator or freezer. Without a buffer, the probe or sensor measures the atmosphere inside the storage unit, which can change rapidly with defrost cycles, door openings, or fans circulating the air. The air temperature of the storage unit changes much more quickly than the temperature of food products, so a buffered probe reading more accurately represents the temperature of the stored goods.

Buffers also reduce false alarms caused by slight changes in the air temperature inside the unit. False alarms are not only a nuisance, they can cause the data logs to record misleading information, which can make it seem like a facility is not maintaining compliance.

**Wireless probes.** A hardwired monitoring system connects sensors to the base device with wires. A wireless system uses built-in radio transmitters to communicate data readings to the monitoring system. A wireless temperature probe offers more flexibility in the placement of the probe, sensor, and remote monitoring system.

Because it is important to keep an ongoing record of temperatures to document that food is stored properly, select a monitoring system that logs and stores data. For information on how automatic data logging can help, see “Upgrading the Clipboard” article on page 44.

#### Additional Monitoring

A simple measure to maintain safe temperatures is to monitor the power at each refrigerator or freezer’s outlet with a power-out sensor. If a breaker trips and power is lost at the cooling unit, monitoring the power provides ample time to take correc-

tive action, rather than waiting until temperature limits are at a dangerous point.

Users might also want to monitor the room or building that houses their cold storage units or the refrigerators and freezers themselves. Magnetic reed switches are used with monitoring systems to detect unauthorized entry or intrusion. They are usually installed on doors or windows to detect opening and closing. Placing them on the doors of cold storage units lets users know when they are opened during off hours or if they have not been closed at the end of a work day or shift.

#### Final Thoughts

It’s vital for public health to keep perishable food products within the recommended safe temperature range throughout the cold chain. Remote monitoring systems and data loggers protect food inventory 24/7 and provide an audit trail documenting storage at proper temperatures. Because these devices are inexpensive and easy to install and maintain, they are a cost-effective way to prevent a potentially devastating problem. ■

**Fusco** is director of business development with Sensaphone. Reach him at [rfusco@sensaphone.com](mailto:rfusco@sensaphone.com) or 877-373-2700.

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#### 7

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## Upgrading the Clipboard

Since monitoring refrigerator or freezer conditions can be especially tricky with human error, data loggers can help accurately document temperatures in cold storage

BY **STEPHEN B. KNUTH**

**T**hose of us in the food industry have all seen the ill-fated clipboard tracking temperature outside of the walk-in cold food storage unit. Historically, monitoring food temperatures in refrigerators has been conducted manually, adhering to a schedule and tracking the temperature at intervals on a piece of paper. But what happens when the employee tasked with monitoring the hourly temperature gets delayed? What if they just plain forget?

I've seen employees who have forgotten to track the temperature throughout the day and fill in the end-of-day temperature for the entire day. They're running the risk that if there was a spike in temperature outside of safe ranges during the day, the entire contents of the cold storage unit could be ruined, but they wouldn't know it because they didn't check the temperature. Not only is it wasting food and money, but it's also putting consumers, real people, at risk.

### Tracking Temperatures

Food handlers have the responsibility to ensure that consumers receive safe food products. That assurance starts with monitoring temperatures during the cold chain. Monitoring food storage can be especially tricky with human error. To adhere to federal regulations, companies must implement a quality management system to measure, control, and document temperatures. The best way to accomplish these three responsibilities is with a data logger. Data loggers report temperature data at set intervals to help monitor safe refrigerator or freezer conditions.

Traditional data loggers offer a step up from the unpredictable, human-based monitoring approach. Loggers ensure accurate data throughout the day and, with a USB connection, data can be downloaded manually to a computer. However, downloading the data manually presents problems. Users either have to remove the logger from the cold environment or take

the computer into the cold storage area to download the data. Neither of these are productive. Taking the logger out can disrupt its recording and standing in a freezer downloading data is, well, cold.

### The Issues with Data Shuttles

For this situation, data shuttles can be advantageous. Data shuttles are small handheld devices that attach to the logger to collect its data. Shuttles are easy to carry around and collect data from multiple loggers without having to remove the logger from its environment or taking a computer into the walk-in. The issues with data shuttles are physically collecting data at the end of the day and the shuttle's memory filling up.

If users download the shuttle's gathered information at day's end, they will find out after the fact if the temperature went out of the safe range. The only recourse is to discard the storage contents. Users don't want to find out hours later that everything has thawed and is now ruined. Depending on the size of the cold storage, whether it's a small walk-in or a warehouse, and the contents of the refrigerator, throwing out tarnished goods can be an expensive mistake.

Similarly, depending on the necessary interval rate, data can fill up in the shuttle before someone can download the information to a computer. This can cause readings to be lost, so users won't be aware if something detrimental occurred and can't prove to regulators the temperature history. An employee would have to routinely check the shuttle. But as with the clipboard, an employee is being relied upon to remember to check the data shuttle.

### Automated Data Collection

Automated, network-connected data loggers can solve both problems. They eliminate the human element and data loss with real-time monitoring, internet connections, and alerting. Another plus is the cost-effectiveness. Technology improvements have driven the cost of connected data loggers down to the point where their cost is trivial compared to the complications that could arise by not monitoring in real time.

Automated loggers work with the user's schedule and can eliminate many

risks. The user specifies intervals and there is no need to remember to physically walk around to the data loggers before they fill up. A network connected data logger is extremely reliable because it will notify the user through a network or cellular connection if temperatures go out of a pre-

**Users can know the exact moment temperature goes out of safe levels and the problem can be fixed in real time, negating the risk of ruining supplies.**

selected range. Depending on the network infrastructure and needs, loggers can connect to a wired LAN connection or with Wi-Fi to connect to the cloud.

If using automated data loggers with a wireless connection, users will need a radio connection to a router, data collector, or access point of some kind. This can be problematic with thick metal side walls, where the transmission range is dramatically limited, but there are ways to get around it.

One solution is to place the logger with its integrated antenna outside the freezer and run the sensors through the door gasket. Thin 2-millimeter diameter thermistor sensors are needed. However, if the sensor is not placed inside the walk-in by any significant margin, the sensor can be subject to thermal transitions when the doors open. Some loggers or software ignore those temperature transients caused by doors opening. Typically, this is a setting, but be sure to have that setting available; otherwise there will be false readings.

With large walk-in refrigerators, people may want to monitor a spot far away from the door or multiple points inside. To solve the former, thermocouple sensors with a long wire to feed the sensor inside can measure the temperature at distances far from the logger itself. Measuring temperatures at multiple locations can be accomplished with a two-channel logger and long thermocouples or wireless loggers that connect using a 900 MHz signal instead of the average 2.4 GHz Wi-Fi signal.

Those can be set up in multiple locations to then transmit to a repeater mounted on the outside wall of the walk-in. The repeater would then relay the signal to the access point, data collector, or base unit. The repeater solves the issue of the interrupted signals due to the metal walls of the walk-in.

### Ensuring Compliance

Those storing food in cold chain must also be fully aware of the Food Safety and Modernization Act (FSMA). When food is frozen, microbes go into a dormant stage, but when the food begins to thaw, microbes become active again and start multiplying to levels that can lead to foodborne illness. FSMA states that it is the federal government's right to inspect any food handling location at any time, so safe temperature data need to be proven. Data loggers facilitate thorough inspection and can allow for quicker compliance.

One way to track all temperature data over time to share with regulators is with WebStorage Service, T&D Corp.'s free cloud storage service. WebStorage Service stores temperature data collected by T&D data loggers. Data are retrievable and charted and can be viewed later. Food handlers can prove their temperature data and show regulators their safe practices.

FSMA also requires food handlers to develop a plan that meets the guidelines for Hazard Analysis and Critical Control Points (HACCP), which should involve an automated data logger. Issues with data entry, misreading, and misinformation are the responsibility of the food handler, and failure to comply with these guidelines can result in seizure, injunction, and recalls, all of which can damage the reputation of the entire supply chain.

To adhere to HACCP, food handlers must establish critical limits for each CCP. This includes monitoring activities to ensure that the process is under control at each point in the food manufacturing process. Data loggers are essential to this adherence. Automated data loggers alert users via email, text, or push notification when temperature measurements go out of the set range. Users can know the exact moment temperature goes out of safe levels and the problem can be fixed in real time, negating the risk of ruining supplies.

### A Refrigeration Mishap Example

The need for flexible, automated data loggers to monitor and alert can be understood through Southern Wine & Spirits' refrigeration mishap. The winery hosts events for its visitors where they can test different beverage and food pairings. That means that the company needs to store food, such as cheese, vegetables, fruit, and seafood.

Last year, the kitchen had a few equipment failures with its refrigerators and freezers. Food safety regulations state that once products go above the 40 degrees Fahrenheit safe zone, staff have only about four hours to get it back to temperature before the food has to be discarded. These equipment issues inconvenienced the kitchen, as staff had to move food between fridges several times to keep everything fresh.

The chef and his assistants had previously tracked temperatures using thermometers integrated into their storage units. But when the team would be busy preparing food for long stretches of time or left for the night or weekend, they couldn't check the temperatures as often as needed.

To keep this from happening again, Southern ordered wireless temperature data loggers to monitor each storage unit. Wired systems weren't practical given the kitchen layout. Southern attached the loggers to the front of the units using Velcro tabs, and the data loggers' external sensors were secured inside the refrigerator. An Ethernet network base station was also installed to collect the logger readings automatically.

Now the data loggers automatically take temperature readings once an hour and check for alarm conditions every five minutes. This way, Southern chefs can work knowing that an alarm will trigger whenever temperatures go outside safe limits, indicating that a fridge is failing and starting to warm up. The company also has the ability to report safe temperature data if ever necessary.

Using advanced data loggers in the food industry can prevent contamination issues. It's time to upgrade the clipboard. Network connected loggers can negate many food safety monitoring issues through temperature control, offsite monitoring, and notifications. ■

**Knuth** is the president of TandD U.S. Reach him at [sbkknuth@tandd.com](mailto:sbkknuth@tandd.com).

# Did You Know?



## How Cranberries Started the Chemophobia Craze

The scaremongering and confusion surrounding harmless trace chemicals in foods | BY HANK CAMPBELL

On Sept. 6, 1958, the “natural” food movement and chemophobia as we know it were born. On that day, the Food Additives Amendment of 1958, which modified the U.S. Food, Drug, and Cosmetic Act of 1938, came into force.

Also known as the Delaney Clause, it stated if a synthetic chemical could be shown to cause cancer in laboratory animals, the chemical must be banned. It also suggested if the exact same chemical was natural, it was safe. While this was immediately attacked as a baffling and unscientific approach to carcinogenicity, many lawyers were looking forward to decades of litigation.

As our understanding of the suite of diseases we call cancer has increased, so have the lawsuits. Consumer advocacy groups have made a fortune claiming products like coffee, red dye #2, movie theater popcorn, and Chinese food are harmful

because they contain a chemical that caused cancer in rats. Yet no one has been saved by the scaremongering that chemophobia brings.

### Rats Aren't Humans

The Delaney Clause was attacked by the science community for two important reasons, both of which still stoke public skepticism when someone claims the need to ban a chemical “at the drop of a rat.”

First, rats are not little people; they are a completely different species used only in exploratory studies. They can eliminate hazards in humans but cannot show them—ever. And don't forget, humans share 50 percent of their DNA with bananas, but bananas aren't used to create bans, so it makes as little sense to use rats.

Second, there were very few known carcinogens in 1958, and IARC, the International Agency for Research on Cancer, would not even come into ex-

istence until 1965. Today, California's Proposition 65 has 900 chemicals alone that statisticians think might lead to cancer. As a result, there are warning labels on everything from coffee pots to corkboards in, of all places, hospital cancer wards.

The ridicule by the public started as early as the lawsuits. That's because in November 1959 the Delaney Clause claimed its first victim: cranberries.

### The Great Cranberry Scare

During the month leading up to Thanksgiving 1959, Arthur Flemming, the Secretary of Health, Education, and Welfare, declared that because the FDA detected traces of the weed killer aminotriazole (C<sub>2</sub>H<sub>4</sub>N<sub>4</sub>) in some Ocean Spray cranberry products, these products needed to be banned.

Since chemophobia scaremongering was not common at that time, the public wasn't yet jaded and believed cranberries must be as harmful as cigarettes and radiation since the federal government issued a warning. Schools dumped cranberries into the garbage and restaurants took them off menus. Sales of canned cranberries plummeted 80 percent and Mamie Eisenhower, the first lady, made a public display of serving applesauce at Thanksgiving. Yet to the science community, the worry was over nothing.

Aminotriazole did sometimes create a thyroid issue, which could cause cancer in rats. But the dose required to do so was equivalent to a rat consuming 15,000 pounds of cranberries, every day, for its entire life.

The public quickly figured out this was ridiculous and politicians capitalized. During a presidential campaign stop in Wisconsin, Vice President Richard Nixon had four helpings of cranberries that tested positive for “contamination.” Not to be one-upped, his opponent, Sen. John F. Kennedy, drank two cranberry juice cocktails.

Nonetheless, the die was cast.

### All-Natural?

As a result of the Delaney-induced cranberry scare, “fear entrepreneurs” emerged and so-called “careorism” became a paid occupation. And thanks to increasingly precise detection methods and the use of statistics, hundreds of chemicals would

prove carcinogenic in animals and receive bans, if they were not already naturally found in a particular food.

Chemophobia over “synthetic” versus “natural” chemicals is still so prevalent today that to make a point, the American Council on Science and Health publishes a science lover’s Thanksgiving Holiday Menu each fall. It highlights popular, common dishes and the cancer-causing chemicals each contains that have been misleadingly associated with studies resulting in a rodent fatality. For example, organic turkey contains heterocyclic amines, which are rodent carcinogens and mutagens. Free-range beef prime rib also contains this—

plus benzene and psoralens, which have killed plenty of rats.

Vegetarians fare no better. Organic celery has the rodent cancer-causer caffeic acid, broccoli has allyl isothiocyanate, and potatoes have solanine, arsenic, and chaconine, along with caffeic acid and ethyl alcohol.

But the public is told chemicals are okay if those rat-killing cancer causes are natural. In reality, they are okay whether they are natural or not.

While activists still trot out new claims, which include BPA and Roundup weed killer, government scientists see through this chemophobia because they

aren’t bound by political manipulation of the evidence. Consumers should be just as skeptical. When there are claims of hypothetical hazards, they should keep a simple four-word question in mind: Where are the bodies?

By now, products that truly cause cancer, like cigarettes, are well-known. Everything else is people selling you something natural. ■

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**Campbell** is the president of the American Council on Science and Health, which has locations in New York City and Washington D.C. Reach him at [hank@acsh.org](mailto:hank@acsh.org).

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### **When Salads Turn ...** *(Continued from p. 13)*

using GS1 protocols to identify products, locations, and transactions, and using advanced electronic data management standards, such as blockchain technology.

PTI estimates that about 60 percent of produce cases currently carry PTI labels with GS1-issued company prefixes and 14-digit Global Trade Item Numbers in machine-readable barcodes. (Some of the shipments of contaminated Yuma romaine lettuce did carry barcodes, but these apparently were not scanned through the distribution system.)

Meanwhile, FDA is providing \$32.5 million in funding to 46 state agriculture departments to help implement the FSMA produce safety rule. The grants are for education and outreach programming and for compliance and enforcement. As part of the effort, the National Association of State Departments of Agriculture has developed a Model Produce Safety Implementation Framework for states to consider.

“When you consider how much fresh produce is consumed every day, much without any type of kill step, one has to ap-

plaud the produce industry in keeping the vast amount of produce really safe,” says Dr. Acheson.

But he urges vigilance. “We all need to take lessons from all the outbreaks regardless of the implicated source and work together to continue to improve traceability, to limit the impact of any contamination at any point in the chain, to protect consumers, and protect the industry as a whole,” Dr. Acheson says. ■

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**Agres** is an award-winning writer based in Laurel, Md. Reach him at [tedagres@yahoo.com](mailto:tedagres@yahoo.com).

### **Proficiency Testing Mitigates ...** *(Continued from p. 34)*

validates a proficiency testing provider’s technical competence and its operation of a quality management system.

For alternate inter-laboratory comparisons, laboratories would be well-served to have procedures for determining which external laboratories are

appropriate for conducting the comparison service. Records should document the criteria used, services selected, and actions taken.

Under ISO 17025, laboratories must adopt a process for assessing their risks. Participating in proficiency testing pro-

vides an objective way to help laboratories detect and correct problems within a risk-based environment. ■

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**Stombler** is director of the Food Laboratory Alliance and president of Auburn Health Strategies. Reach her at [rstombler@auburnstrat.com](mailto:rstombler@auburnstrat.com).

### **Logistically Speaking ...** *(Continued from p. 39)*

seafood, the temperature in the container must be kept at -10 degrees Fahrenheit. Some of the key steps to make that possible include pre-cooling the refrigerated truck, checking the temperature before loading, using temperature recorders to make sure the product remains frozen, and conducting check calls periodically so the driver is on track for pickup and delivery. And far from simply managing the nuts and bolts

of moving freight, an experienced logistics provider can ensure every carrier is compliant with global safety and regulatory requirements.

#### **Food Supply Chain of the Future**

The expansion of the global food trade in the past several decades has allowed the world’s population to gain access to a wider variety of foods than ever before, but

there are still many difficulties to address in the coming years. The strategies food distributors currently use to get food to its destination safe for human consumption aren’t foolproof and require a fair amount of human vigilance. But potential future technological solutions show promise for increasing visibility and speed to market while minimizing the threat of illness. ■

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**Papworth** is President of CAI Logistics—North America. Reach her at [jpapworth@caimoves.com](mailto:jpapworth@caimoves.com).

# NEW PRODUCTS



## Foreign Material Detection

The Low Density Foreign Material Detection and Removal System separates and inspects the top and bottom of the product for foreign material. Once found, the material is automatically rejected. The company says that the robust, simple-to-use systems are cost-effective to implement and maintain with 24/7 remote support. Users can identify/remove low density material such as soft and hard plastic, paper, cardboard, gloves, hairnets, etc. **ProSpec-tion Solutions LLC**, 816-256-5666, [www.prospectionsolutions.com](http://www.prospectionsolutions.com).

## Grocery Pallet

The XpressPal (XP) Grocery pallet is designed to ship finished goods from distribution centers to retail in grocery supply chains. Its top deck includes a molded-in texture to minimize load shifting. The texture increases friction, so goods are less likely to slip off the pallet. The pallet's top deck includes ergonomic handle holes so the pallet can be manually moved or unstacked, making it an applicable option for manual and automated systems. One-piece high-pressure injection-molded construction gives the pallet a high strength-to-weight ratio and the ability to withstand rugged handling. XP Grocery pallet's flow-through design eliminates areas where contaminants, such as dirt, dust, and liquid, can collect. **ORBIS Corp.**, 800-890-7292, [www.orbiscorporation.com](http://www.orbiscorporation.com).



## IoT for Restaurant Safety

FoodSafe.io, an IoT solution designed for restaurant food safety, incorporates handwashing monitoring, safety inspection guidance and monitoring, and cold storage monitoring to give owners a continuous view of food safety operations without distracting them from other necessary tasks. It includes wireless temperature sensors, called Whisker.Blocks, that measure air and food temperature, reporting values every 5 minutes; a software agent that monitors these sensors 24/7, generating alerts if problems occur; smart hand soap dispensers that measure the usage of hand soap, reporting such counts every 5 minutes; a FoodSafe.io application running on a tablet that keeps track of all required food safety checks; and an executive dashboard for viewing multiple locations. **Digital Six Laboratories Inc.**, 844-365-8647, [www.d6labs.com](http://www.d6labs.com).



## Leak Detection System

Rosemount CT4215 food and beverage leak detection system tests the seal and integrity of every bottle or package on a production line, detecting leaks at a sensitivity as low as 0.3 mm and automatically rejecting defective bottles or packages without slowing down production. It installs directly on the production line in a compact, self-contained unit. Customizable sampling heads are available for any package type including trays, pouches, bags, bottles, and boxes. The QCL laser technology measures CO<sub>2</sub> and other gases. A high-flow vacuum pump draws air from around the package or bottle and delivers this air to the measurement cell. If gas from a leaking product passes through the measurement cell, it will absorb some of the laser light. Less laser light reaching the detector means there is a leak. Any leak detected will trigger rejection. **Emerson**, 314-553-2000, [www.emerson.com](http://www.emerson.com).

## HILIC Column

Luna Omega SUGAR is engineered for carbohydrate separation and analysis from food and beverage matrices, such as milk, animal feed, wine, soda, and fruit, by hydrophilic interaction chromatography (HILIC). The stationary phase incorporates an amide polyol, amino group with linker, and polar endcapping, which together promote greater polar retention through a useful range of interaction mechanisms. By focusing on HILIC separations that utilize just acetonitrile and water, it becomes possible to overcome buffer strength inconsistency, high pH, peak suppression, lengthy buffer development time, and other mobile phase-related issues that may undermine sugar separations. The company says that users can now attain easier and better separations of monosaccharides, disaccharides, and oligosaccharides. **Phenomenex Inc.**, 310-212-0555, [www.phenomenex.com](http://www.phenomenex.com).

## In Other News

The 2.0 version of the free cloud-based **T&D Corp. WebStorage Service** is now available to provides more data tracking features, an improved user interface, and more options to manage compatible T&D data loggers.

**OSHA Kits.com** upgrades its Premium Food Safety Spill Kit to now include a set of proprietary tools designed to make cleanup faster and keep first responders safer.

**The Gluten Intolerance Group** accredits its **SCS Global Services** to provide Gluten-Free Certification Organization services to food and beverage companies.

USDA's FSIS readopts **Hygiena's BAX System** to detect harmful pathogens in meat, poultry, and eggs.

**Fera's Fapas Wine Proficiency Tests** are now open to testing laboratories across the globe following a successful first round of testing in Italy.



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# SCIENTIFIC FINDINGS

For access to complete journal articles mentioned below, go to “Food Science Research” located in October/November 2018 issue at [www.FoodQualityandSafety.com](http://www.FoodQualityandSafety.com), or type the headline of requested article in search box.



## **ARTICLE: Farm to Consumer - Factors Affecting the Organoleptic Characteristics of Coffee**

Reportedly, 60% of the quality attributes of coffee are governed by postharvest processing. This article establishes the relationship between different methods of postharvest processing of coffee and its varying organoleptic and sensory quality attributes. In view of the proven significance of each processing step, this review has been subdivided into three sections: secondary processing, primary processing, and postprocessing variables. Secondary processing addresses the immediate processing steps on the farm after harvest and storage before roasting. The primary processing section adheres specifically to roasting, grinding, and brewing/extraction—topics that have been technically addressed more than any others in the literature and by industry. The postprocessing attribute section deals generally with interaction of the consumer with products of different visual appearance. Also discussed are next-generation coffee processing technologies. **Comprehensive Reviews in Food Science and Food Safety, Volume 17, Issue 5, September 2018, Pages 1184-1237.**

## **ARTICLE: Detection of Allergenic Additives in Processed Meat Products**

The meat industry commonly uses various allergic additives in the production of processed products, such as legumes (soy, peas, beans), milk and egg preparations, cereals containing gluten (wheat, rye, barley, oats), and spices (celery, mustard). These meat additives have specific technological properties that help to create a texture or flavor profile, or affect the nutritional value. However, some of them, such as soy, mustard, milk, and egg white proteins, can cause severe allergic reactions. This paper examines the application of various recently established methods of detection of allergenic additives in processed meat products—for instance cold cuts and sausages. The new methods are based mainly on protein, DNA, and isoflavones or phytic acid analysis. The article also characterizes the latest trends in the development of research on methods that would enable quick and reliable identification of targeted allergens in meat products. **Journal of the Science of Food and Agriculture, Volume 98, Issue 13, October 2018, Pages 4807-4815.**



## **ARTICLE: Biofilms in the Spotlight – Detection, Quantification, and Removal Methods**

Microorganisms can colonize and subsequently form biofilms on surfaces, which protect them from adverse conditions and make them more resistant than their planktonic free-living counterparts. This is a major concern in the food industry because the presence of biofilms has significant implications for microbial food contamination and, therefore, for the transmission of foodborne diseases. Adequate hygienic conditions and various preventive and control strategies have consequently been developed to ensure the provision of safe and quality food with an acceptable shelf life. This review focuses on the significance of biofilms in the food industry by describing the factors that favor their formation. The interconnected process among bacteria known as “quorum sensing,” which plays a significant role in biofilm development, is also described. Also discussed are recent strategic methods to detect, quantify, and remove biofilms formed by pathogenic bacteria associated with food processing environments—focusing on the complexity of these microbial communities. **Comprehensive Reviews in Food Science and Food Safety, Volume 17, Issue 5, September 2018, Pages 1261-1276.**

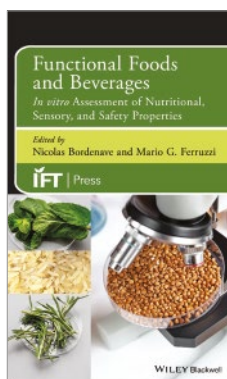


## **ARTICLE: The Aroma Volatile Repertoire in Strawberry Fruit**

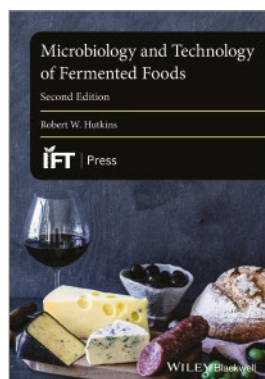
Aroma significantly contributes to flavor of strawberries, which directly affects their commercial quality. The strawberry aroma is complex as many kinds of volatile compounds are found in strawberries. This article explains the constituents of the biosynthesis of strawberry volatile compounds, and the effect of postharvest treatments on aroma profiles. Characteristic strawberry volatile compounds consist of furanones, such as 2,5-dimethyl-4-hydroxy-3(2H)-furanone and 4-methoxy-2,5-dimethyl-3(2H)-furanone; esters, including ethyl butanoate, ethyl hexanoate, methyl butanoate, and methyl hexanoate; sulfur compounds such as methanethiol, and terpenoids including linalool and nerolidol. As for postharvest treatment, the article discusses the overview of aroma volatiles in response to temperature, atmosphere, and exogenous hormones, as well as other treatments including ozone, edible coating, and UV radiation. Article also addresses future prospects for strawberry volatile biosynthesis and metabolism. **Journal of the Science of Food and Agriculture, Volume 98, Issue 12, September 2018, Pages 4395-4402.**

# Wiley Food Technology

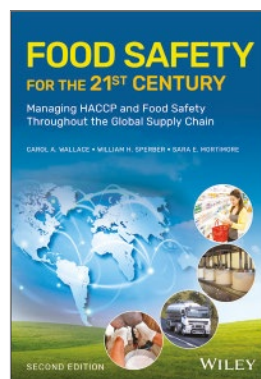
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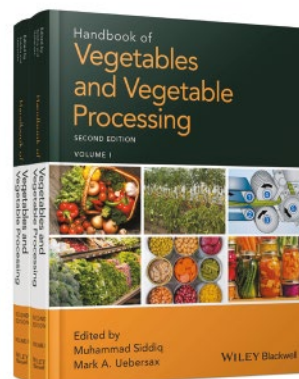
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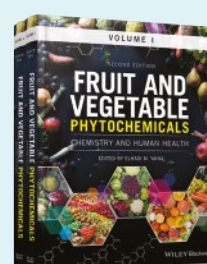
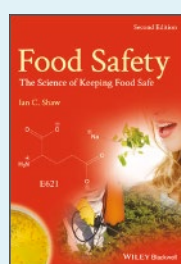
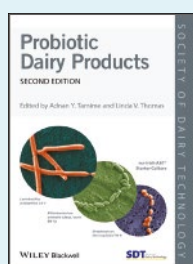
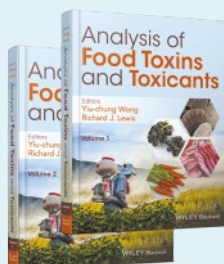
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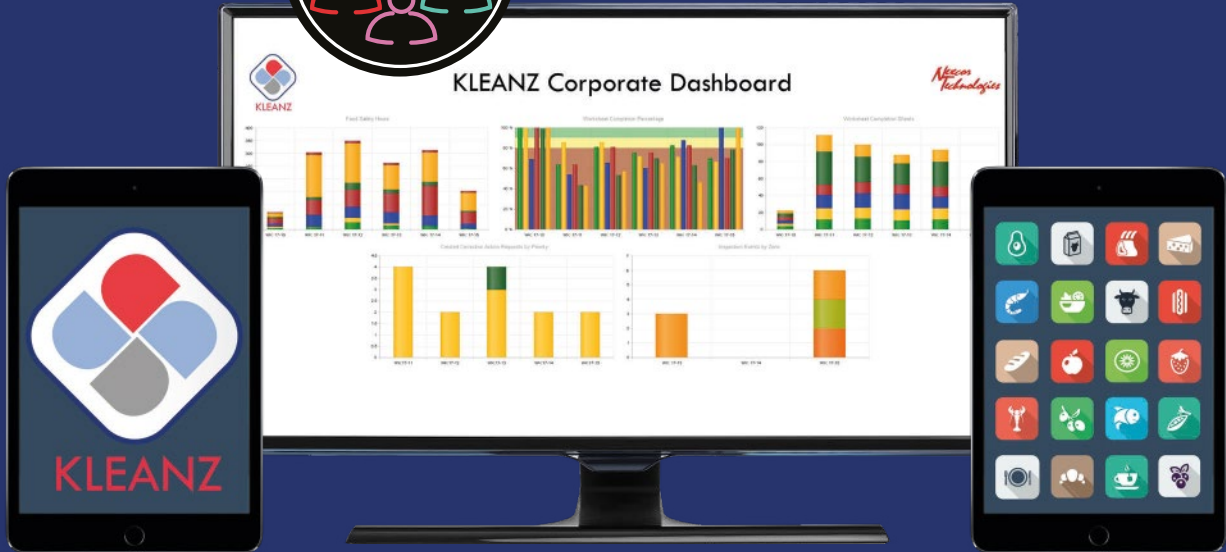
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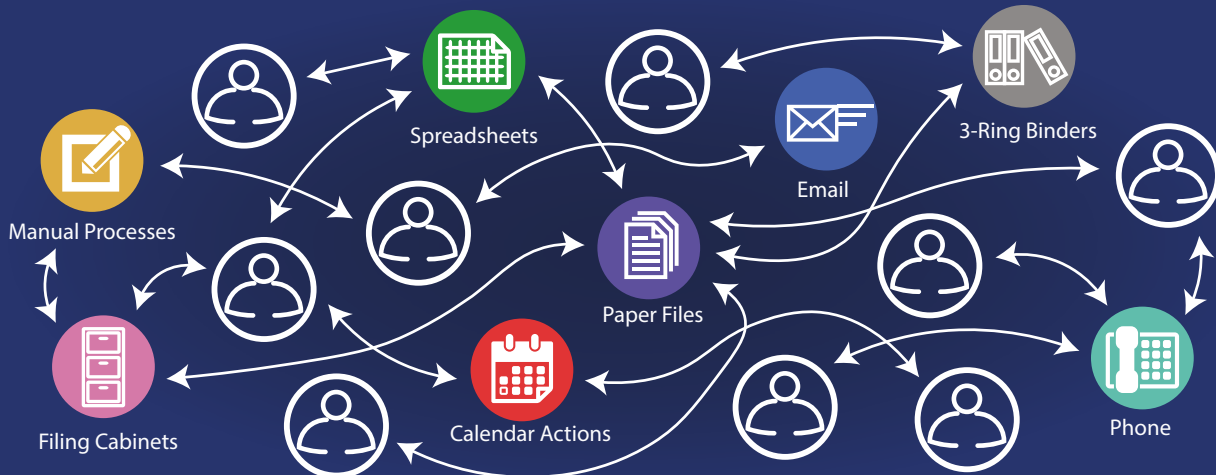
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All departments

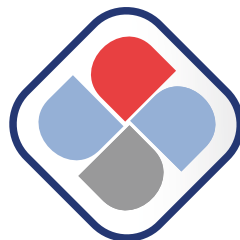


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