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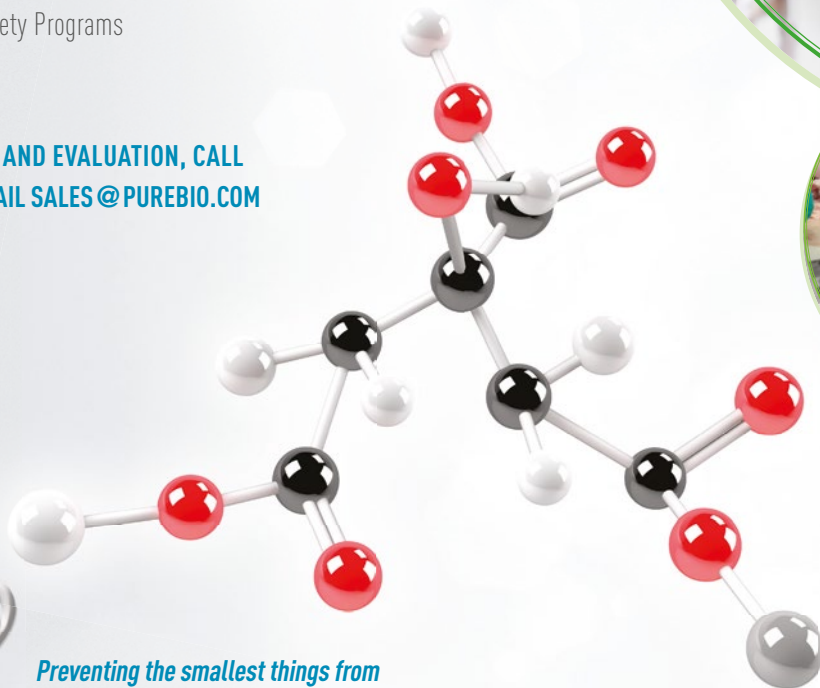
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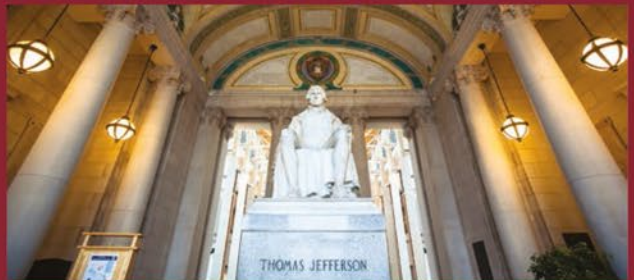




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**CORRECTION**

On page 38 of the December/January 2016 *Food Quality & Safety* issue, the headline for Michael Sperber's article was misspelled. The correct headline should have read: What Does it Really Take to be a Quality Manager?

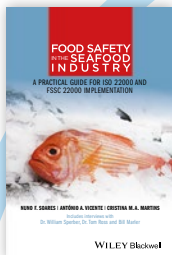


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# Latest Titles in Food Safety

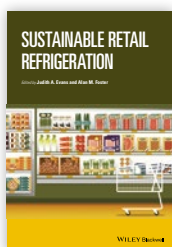


## Food Safety in the Seafood Industry: A Practical Guide for ISO 22000 and FSSC 22000 Implementation

**Nuno F. Soares, António A. Vicente, Cristina M. A. Martins**

*ISBN: 978-1-118-96507-8 • Paperback • 200 pages • March 2016*

Written in an accessible and succinct style, this book implementation brings together in one volume key information for those wanting to implement ISO 22000 or FSSC 22000 in the seafood manufacturing industry.

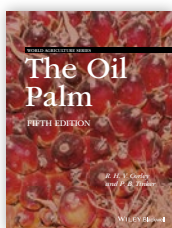


## Sustainable Retail Refrigeration

**Judith A. Evans, Alan M. Foster**

*ISBN: 978-0-470-65940-3 • Hardcover • 376 pages • January 2016*

This book draws together world experts on retail refrigeration. In a single resource, the authors cover the latest technologies and best current knowledge in the field.

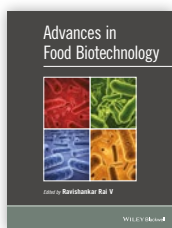


## The Oil Palm, 5<sup>th</sup> Edition

**R. H. V. Corley, P. B. H. Tinker**

*ISBN: 978-1-4051-8939-2 • Hardcover • 680 pages • December 2015*

This fifth edition features new topics - including the conversion of palm oil to biodiesel, and discussions about the impacts of palm oil production on the environment and effects of climate change.



## Advances in Food Biotechnology

**Ravishankar Rai V**

*ISBN: 978-1-118-86455-5 • Hardcover • 752 pages • December 2015*

This book provides an overview of the latest development in food biotechnology as it relates to safety, quality and security. The seven sections of the book are multidisciplinary and cover GMOs and food security issues, fermentation technology and much more.

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# From The Editor

**O**n Feb. 1, 2016, the CDC revealed that Chipotle Mexican Grill multi-state *E. coli* outbreak was officially over.

The FDA and CDC along with state and local officials have been investigating two separate outbreaks of *E. coli* O26 infections that were linked to food served at Chipotle in several states since last October. FDA conducted tracebacks of multiple widely-distributed ingredients, but since traceback can be difficult with Mexican-style foods because they often contain multiple ingredients, no product was identified as the culprit. The FDA also conducted investigations of some suppliers, but did not find any evidence that those suppliers were the source of the outbreak. Ultimately, investigators have not been able to pinpoint the ingredient responsible for the contamination.

Regardless of the reasoning behind the outbreak, Chipotle's sales and stock price have suffered. In an effort to reassure customers and investors, the organization's executives have been quick to talk up new steps the chain will implement to tighten food safety and prevent future food poisoning outbreaks.

Steve Ells, Chipotle founder and co-chief executive officer, comments that Chipotle's new food safety procedures will put it 10 to 15 years ahead of industry standards. Chipotle was even scheduled to shut down all of its stores nationwide on February 8 for a few hours to hold a national staff meeting about food safety conducted via a live satellite feed. "We're doing a lot to rectify this and to make sure this doesn't happen again," Ellis says.

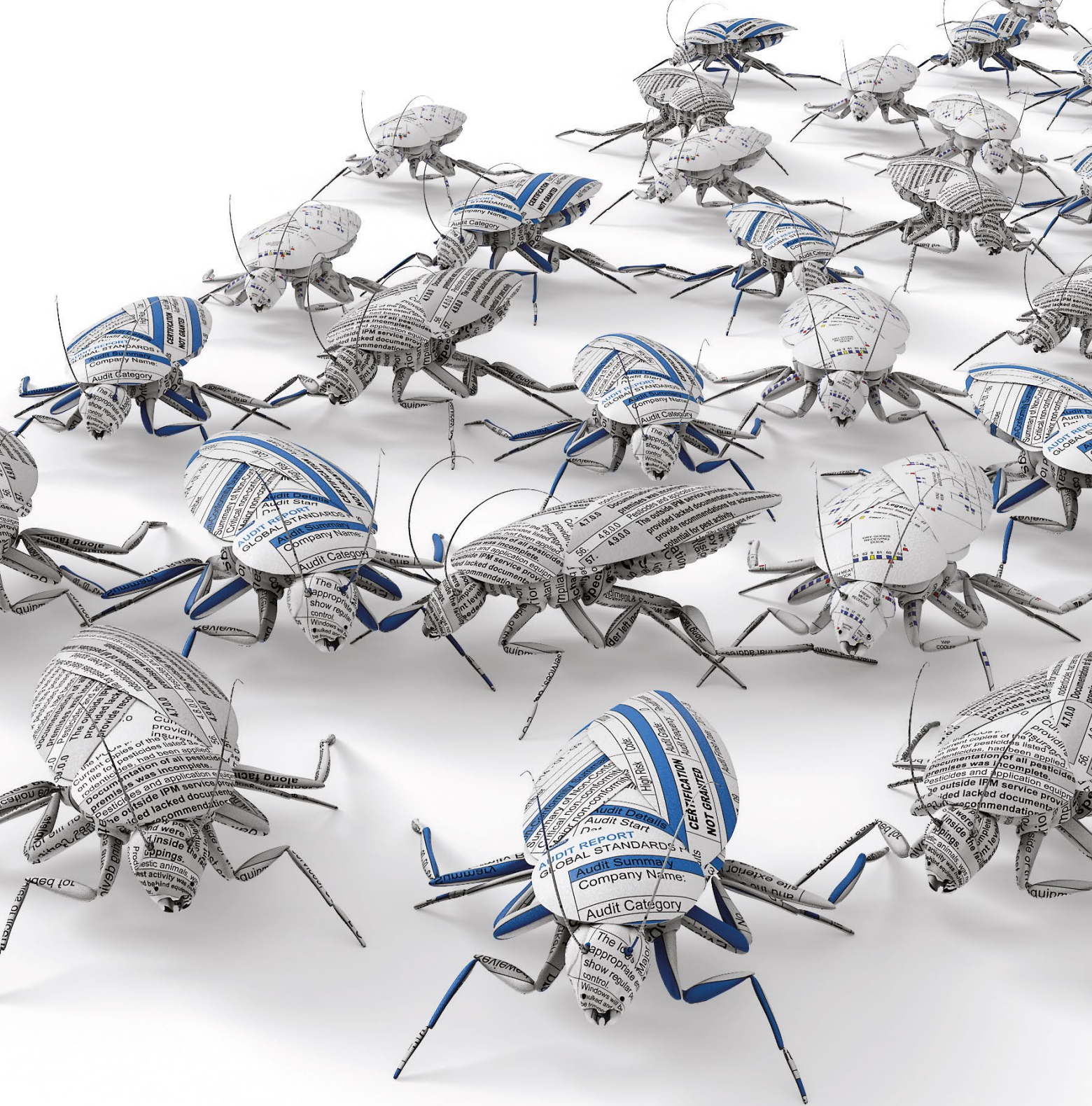
According to Darin Detwiler, senior policy coordinator for STOP Foodborne Illness, in the past, food companies have changed their food safety policies and procedures long after a crisis. "Whereas changes rarely took place as a result of pressure from consumer expectations or even political development, change came only after the impact of legislation, litigation, or regulation," says Detwiler. "...the Chipotle case can be seen as an example of food companies making needed change much sooner than in the past by pressures earlier, after, or even during a crisis. This change of heart towards food safety by Chipotle appears to be driven by a large and growing population of vocal stakeholders in the food industry—consumers!"

Detwiler and other industry experts are hopeful that food service and retail will use this unfortunate incident as an example to take a more proactive approach to enacting and enforcing food safety policies to provide safer food for all.

**Marian Zboraj**  
Editor







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# NEWS & NOTES



## Inspection Program for Siluriformes Fish

The final rule from USDA's FSIS establishes an inspection program for fish under the order Siluriformes, including catfish. Applying to both domestically-raised and imported Siluriformes fish, the rule was developed in order to implement provisions required by the 2014 Farm Bill. The rule becomes effective in March 2016. This date begins an 18-month transitional implementation period at which time all Siluriformes fish will be under the regulatory jurisdiction of FSIS and no longer regulated by the U.S. FDA. Before the effective date of the final rule, countries currently exporting product to the U.S. that wish to continue doing so must provide a list of establishments that currently export, as well as written documentation of their regulatory authority and compliance with existing FDA import requirements.

## Campbell Soup to Start GMO Labeling

As reported by [Reuters](#), Campbell Soup Co. says it will label all its U.S. products for the presence of ingredients derived from GMOs, becoming the first major food company to respond to growing calls for more transparency about contents in food. The world's largest soup maker breaks ranks with peers and says it supports the enactment of federal legislation for a single mandatory labeling standard for GMO-derived foods and a national standard for non-GMO claims made on food packaging. The company, which also makes Pepperidge Farm cookies and Prego pasta sauces, says it would withdraw from all efforts by groups opposing such measures. Several activist groups have been pressuring food companies to be more transparent about the use of ingredients, especially GMO-derived ones, amid rising concerns about their effects on health and the environment. Advocacy group Just Label It says Campbell's move was a step closer to reaching the goal of a federally crafted national GMO labeling solution. In 2014, Vermont

became the first U.S. state to pass a law requiring food companies to label GMOs on their products, which will come into effect in July 2016.



## Produce Safety Research

Fresno State's Food Science and Nutrition Department receives two grants for produce safety research and consumer education. Made possible by a \$100,000 grant from the Center for Produce Safety, Dr. Steven Pao, department chair, and Dr. Erin Dormedy will oversee a one-year study to evaluate and improve sanitizing treatments in stone fruit packinghouses. The study began in January 2016 and is conducted in partnership with the California Fresh Fruit Association and area stone fruit producers. It aims to determine natural microbial levels on contact surfaces in the sorting and handling process. Research will also evaluate potential pathogens and their growth on surfaces in different temperature and humidity conditions, and the effectiveness of cleaning treatments. Pathogens will be measured on sorting and sizing machinery to develop new methods for sanitizing the equipment onsite during the production process.

## Baking Process Kill Step Calculators

Whole wheat multigrain bread and cake muffins are the latest product profiles added to AIB International's catalog of [Baking Process Kill Step Calculators](#). These calculators allow commercial bakeries to validate their food safety preventive controls and accurately evaluate *Salmonella* destruction in bakery products. The interactive calculators work by using oven time and temperature parameters to automatically determine the total process lethality (e.g., 5 log) for *Salmonella*. If the desired log reduction is achieved for the baking process and pathogen of concern, the generated report can be used as guidance and supporting documentation for FSMA's validation and verification process. The free calculators can be downloaded at [www.aibonline.org](http://www.aibonline.org). Users will need Excel software and a data logger before beginning to use calculators.





### AGree Calls on Presidential Candidates to Take Action

AGree invites food system stakeholders to engage in an effort to elevate food, nutrition, and agricultural policies as a national priority. AGree issued a [Call to Action](#) in January 2016 urging presidential candidates to recognize that changes to these policies can strengthen the food and agricultural sector, which, in turn, will strengthen the nation. AGree, a bipartisan group that is aimed at driving positive change in the food and agriculture system, has engaged more than 2,000 food and agricultural thought leaders to identify key issues and develop consensus recommendations to ensure America continues to have a safe and affordable food supply. These recommendations are the basis of AGree's Call to Action, being presented to campaigns on both sides of the aisle.



### Ensuring Retailers Can Track Sources of Ground Meats

The new measure from USDA's FSIS is intended to improve the agency's ability to determine the source of foodborne illnesses linked to ground beef, stopping foodborne illness outbreaks sooner when they occur. FSIS is requiring that all makers of raw ground beef products keep adequate records of the source material, so that the agency can quickly work with the suppliers to recall contaminated product. This new requirement complements expedited traceback and traceforward procedures announced in August 2014 that enhance the agency's ability to quickly and broadly investigate food safety breakdowns. Establishments and retail stores that grind raw beef products must maintain the following records: the establishment numbers of establishments supplying material used to prepare each lot of raw ground beef product; all supplier lot numbers and production dates; the names of the supplied materials, including beef components and any materials carried over from one production lot to the next; the date and time each lot of raw ground beef product is produced; and the date and time when grinding equipment and other related food-contact surfaces are cleaned and sanitized.

## Business Briefs

**NSF International** acquires **AuthenTechnologies**, which provides next-generation DNA-based species identification services that improve the authenticity, safety, and quality of natural products, including dietary supplements, foods, and other consumer products. In addition, NSF acquires the **Burwater Pacific Group**, a food safety training, auditing, and consulting business based in New Zealand.

**Mérieux NutriSciences** acquires **Allabor Laboratorios Ltda** in Brazil and **Labser Laboratorio de Analisis y de Servicios avanzados Limitada** in Chile. With these new acquisitions, Mérieux now has 21 laboratories in South America.

**LRQA** reaches an agreement to become a member of the **Consumer Goods Forum**.

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# FSMA Update

## Training: One Size Doesn't

FDA is offering a variety of training options and delivery formats to help the food industry gain knowledge to meet FSMA requirements

BY TED AGRES

**F**or companies seeking to comply with requirements of the Food Safety Modernization Act (FSMA), developing and putting into practice new processes and procedures may not be enough. Many companies will also need to train their employees using FDA-approved curricula and have their food safety plans developed by “qualified individuals” who have successfully completed agency-approved training in the development and application of risk-based preventive controls.

Following last year’s publication of the final rules for five of the seven major FSMA regulations, industry now is under varying deadlines (depending on company size) to embrace new manufacturing processes and requirements for testing, monitoring, recordkeeping, and reporting. All these are designed to ensure that safety is built into every link of the food chain, from raw materials, to transportation, to storage. And employee education and training will become a key, mandatory component of this process.

The Preventive Controls Rule for Human Food (sections on current Good Manufacturing Practice and Hazard Analysis and Risk-Based Preventive Controls), for example, specifies that education and

training are no longer simply recommended but are binding. “Management is required to ensure that all employees who manufacture, process, pack, or hold food are qualified to perform their assigned duties,” FDA says in a [guidance document](#). “Such employees must have the necessary combination of education, training, and/or experience necessary to manufacture, process, pack, or hold clean and safe food. Individuals must receive training in the principles of food hygiene and food safety, including the importance of employee health and hygiene.”

The agency recognizes it plays a pivotal role in devising and making this training available to industry. To do so, FDA is working with public and private alliances and establishing cooperative agreements to develop and deliver [training curricula](#) for domestic and foreign businesses. “One size doesn’t fit all. The most important goal that the FDA expects of any training program is the outcome—that it advances knowledge among the food industry to meet FSMA requirements,” the agency says.

Because of this, FDA has adopted a three-pronged training development strategy. The first involves using already-established alliances funded primarily by FDA to develop and facilitate curricula for in-

dustry training. The second involves funding of cooperative agreements to develop training options for local food production systems and tribal operations. The third involves partnering with USDA’s National Institute of Food and Agriculture (NIFA) to

provide grants to establish a National Coordination Center (NCC) and four Regional Centers (RCs) that provide training for small food processors, small fruit and vegetable merchant wholesalers, and farms.

FDA will soon begin issuing guidance documents detailing the core criteria, learning objectives, and elements recognized for these training programs. “This is critical because the standardized curricula being developed by the alliances and the alternate curricula

to be developed through cooperative agreements are the only ones that will be officially recognized by the FDA,” explains David Acheson, MD, founder and CEO of The Acheson Group and a former FDA associate commissioner for foods.

### FSMA Alliances

Essential to crafting the training curricula are efforts by the following three public-private alliances.

[Produce Safety Alliance](#). This partnership created in 2010 between Cornell University, USDA, and FDA is developing standardized training to assist the domestic and foreign produce industry (including small and very small farms) and regulatory personnel to implement the Produce Safety Rule. The alliance will also develop a “train-the-trainer” course to certify trainers to support the produce industry.

[Food Safety Preventive Controls Alliance](#). Initiated in 2011 and coordinated by the Illinois Institute of Technology’s Institute for Food Safety and Health, this alliance is developing a standardized training and education program along with a technical information network to help companies comply with the preventive controls rules for human and animal food and the Foreign Supplier Verification Program. Efforts will include standardized training courses, distance education modules, and



other resources to help companies develop food safety plans, conduct hazard analyses, and implement preventive controls including how to monitor, verify, take corrective actions, and document such efforts.

**Sprout Safety Alliance.** Initiated in 2012 and coordinated by the Institute for Food Safety and Health, this alliance is developing training materials with techniques relevant to the Produce Safety Rule, specifically to enhance the safe production of sprouts. It will also develop a train-the-trainer course and develop materials to be used as benchmarks for others developing equivalent curricula.

While the standardized curricula produced by the three alliances are expected to meet the needs of most companies, there will be other instances when alternative curricula and delivery will be more appropriate, FDA acknowledges. The agency plans to fund the development of alternate training programs for targeted audiences through a range of cooperative agreements. Only curricula developed by the alliances and cooperative agreements will be those officially recognized by FDA and if other groups want to develop their own curricula, they should work closely with the established alliances, cooperative agreement partners, and the NCC and RCs. FDA will explain later how it plans to evaluate such training programs.

### **Cooperative Agreements, USDA Partnerships**

FDA has formed a five-year cooperative agreement with the National Association of State Departments of Agriculture (NSDA) to develop a set of best practices to implement the Produce Safety Rule. NSDA will also facilitate training programs for industry and for state regulators. Additionally, FDA will fund development of training programs targeted to “businesses that face unique circumstances and challenges in implementing FSMA,” including tribal communities and local food producers engaged in direct marketing, such as community, owner-operated, and family farms; sustainable and organic farms; small-scale processors; and beginning and socially disadvantaged farmers, among others.

FDA in January 2015 announced a collaborative partnership with USDA’s NIFA to establish the National Food Safety Train-

ing, Education, Extension, Outreach, and Technical Assistance Program. This competitive grant program will be geared toward owners and operators of farms, small food processors, and small fruit and vegetable merchant wholesalers. The program also will fund the NCC and the four RCs.

The International Food Protection Training Institute, a public-private organization established in 2009 to address public health needs, will receive \$600,000 in FDA funding over three years to establish the NCC, which will coordinate and support curriculum development and delivery through the RCs. The RCs, in turn, will be charged with understanding and communicating the range of training opportunities available to targeted businesses and groups in their regions.

In October 2015, NIFA awarded \$2.4 million in grants to universities to establish two RCs. The University of Florida, Gainesville, will establish the southern region RC and Oregon State University, Corvallis, will establish the western region RC. Both will work with state and local governments, other land-grant universities, and community organizations to support FSMA compliance in the produce industry. “It is critical that we provide relevant training and assistance to farmers, processors, and wholesalers, especially to those who may struggle to meet the [FSMA] requirements,” says Sonny Ramaswamy, NIFA director. “These newly established centers... will help producers and businesses across the country safely add value to agricultural products and expand their access to local, regional, and national markets.”

### **‘Qualified Individual’**

The preventive controls rule includes the new term “preventive controls qualified individual,” which FDA defines as “someone who has successfully completed certain training in the development and application of risk-based preventive controls or is otherwise qualified through job experience to develop and apply a food safety system.” The written food safety plan that food facilities are to create must be prepared, or its preparation overseen, by one or more preventive controls qualified individuals, the agency says in a [guidance document](#). The qualified individual is also charged with overseeing the validation that preventive controls are capable of

controlling identified hazards as well as overseeing the records review.

“It is clear from the final rules that FDA considers training to be a very important component of controlling food safety risks. That is why it has focused so much on the qualified individual requirements and the preventive control qualified individual,” Dr. Acheson explains. “The tools to do this training and what will be deemed adequate are now becoming clearer... It is going to be very important not only to undertake the training but also to keep very solid records of the training performed,” he says.

Of course, developing and supporting these training activities requires money, and FDA officials breathed a huge sigh of relief in mid-December 2015 after Congress passed and President Obama signed into law a \$1.1-trillion omnibus spending bill to fund the federal government through Sept. 30, 2016. FDA was a major winner, receiving \$2.72 billion in federal funding, an increase of \$132 million over last year’s budget. Funding for food safety initiatives, including implementing FSMA, were boosted by \$104.5 million, nearly the full \$109.5 million that the agency had requested. This represented a major victory for food safety advocates because earlier in the year, the House and Senate Appropriations Committees had recommended only \$41.5 million and \$45 million in food safety increases, respectively.

In addition to enabling FDA to ramp up its enforcement capacity, “the added resources for fiscal year 2016 will support efforts to educate food growers, processors, and importers about their new responsibilities under the law,” says Sandra Eskin, director of food safety at the Pew Charitable Trusts.

The omnibus bill also included more than \$1 billion for the USDA’s Food Safety and Inspection Service, \$1.6 million less than fiscal year 2015’s level but \$3.3 million more than the Obama administration had requested. The omnibus also repealed mandatory country-of-origin labeling, or COOL, requirements, staving off more than \$1 billion in annual tariffs that would have been imposed against U.S. companies by Canada and Mexico, as [authorized by the World Trade Organization last year](#). ■

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# Industry Insights



## Can Municipal Water Regulations Prevent Cross-Contamination?

Microbial contaminants could be in water that passes all EPA drinking standards, causing food plants to unknowingly incorporate contaminated water into their products

BY PHYLLIS BUTLER POSY

**F**ood and beverage manufacturers and processors in the U.S. operate on the premise that incoming municipal water is safe, and they will always receive notice of any anomaly *in time* to protect their processes and products in case of contamination.

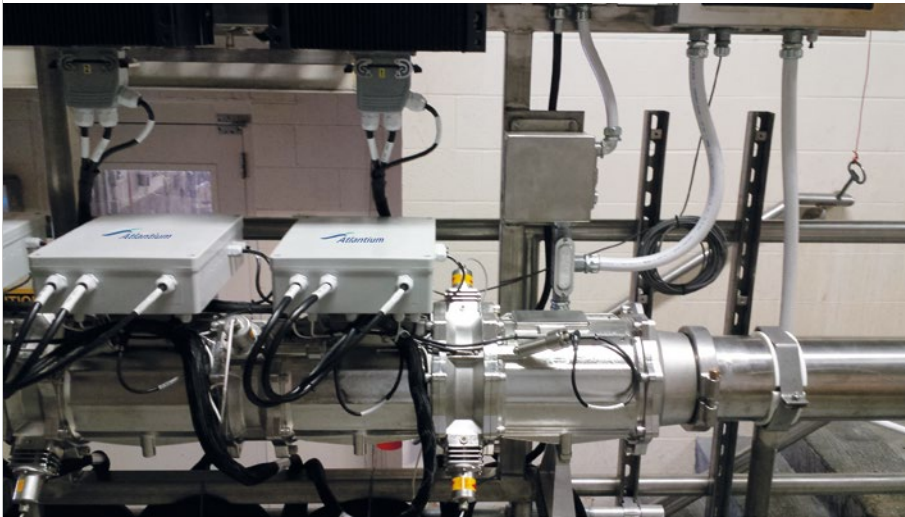
EPA drinking water regulations are cited as the rationale to give municipal water users a safe-harbor-like exemption to bypass water in their written food safety plans and not to evaluate their water integrity risks in a formal, analytical, or scientific way that facilitates planning, prevention, and risk mitigation.

At the same time, final Food Safety Modernization Act, or FSMA, rules make the food and beverage manufacturers responsible for ensuring that the water they use does not contaminate their product. But how sure can they really be that their incoming water is safe enough to mitigate the need for additional water safety precautions?

### Not Structured for Food Safety

The U.S. EPA rules that implement the Safe Drinking Water Act use a level of protection based on water consumption data for a household of four, the viability and virulence of the organisms of concern, and the effective dose considering stomach acid as an effective barrier and developed immunity based on repeated exposure to the same water source.

However, food manufacturing facilities don't have "stomach acid." A food manufacturing or packing plant "drinks" almost 90 percent of the water it takes, so its risk profile is significantly different than that of an individual. Most of the water a plant "drinks"—90 percent compared to the 5 percent for the individual—is used for product, or used for cleaning, cooling, making ice, or various processing tasks like pushing product through pipes. These uses give microbes an opportunity to find a niche and grow and thrive, in essence contaminating or infecting the facility. Sometimes the municipal water is used to wash



UV system on the incoming water supply protects a food plant in the U.S. against microbial contamination.

the outside of closures, containers for distribution, and cases—and this municipal water can transmit microbes through the food supply system. The 2010 Oregon dairy *Salmonella* outbreak illustrated this risk.

The EPA drinking water risk assessment yields rules for both prevention (treatment techniques) and performance assessment.

EPA preventive rules require water suppliers to meet the treatment standards (regardless of technique) for at least 95 percent of the water they distribute to the public. This provides about 5 percent flexibility from an operational standpoint (calculated by time or by volume). A system that does not achieve the 95 percent standard would have a treatment technique violation and would have to notify the public either in their annual Consumer Confidence Report or more immediately, depending on the circumstances.

Of course, no consumer—even if their flow rate is 500,000 gallons a day—would necessarily know if they were getting some of the allowable 5 percent off-spec water.

The theory is that 5 percent off-spec water would be dispersed enough that no individual intake would get enough to create serious contamination or illness. So a household is unlikely to be endangered by the small amount of off-spec water it would receive in the 300 gallons it would use during a day. But a food manufacturing facility could be significantly impacted based on its much higher consumption of 10,000 to 500,000 gallons a day. In food safety terms, this 5 percent threshold

would be the equivalent of allowing 5 of every 100 gallons produced at a milk plant to be at risk of not having been treated adequately to inactivate the pathogens inside, clearly not an appropriate food safety standard.

On the performance assessment side, many issues surface in using rules designed to make safe water for individuals and applying them to food manufacturing facilities. For example, will the sampling regime catch contamination? Positive total coliform samples on the weekly or monthly monitoring could require repeat sampling, trigger sampling or *E. coli* testing, or other assessment. But positive samples would be reportable as a violation only if the system takes less than 40 tests a month or if more than 5 percent of the samples are positive. A system that has a positive sample can take more samples and stay under the threshold for public notice or violation, so that food production facilities would be unaware of the contamination, masking potential food safety risk.

In addition, where public notification is required, samples reflect water already used and the announcements (boil water advisories included) serve to protect residents prospectively. But food manufacturers who had used contaminated water may have manufactured the product and even shipped it. They would rarely have enough information to understand the risk of contamination of their facility's piping and infrastructure. A food manufacturer could conceivably inoculate their pipes and internal water systems with difficult

to trace or treat microbes and probably go about business as usual.

These rules are designed to protect household drinking water and not food manufacturers, processors, or packagers who use water provided by the most conscientious and compliant of suppliers.

### Municipal Water Drawn from Deep Groundwater Wells

Many public water systems do not disinfect the water they provide to the public. As part of the research to evaluate the public health impact of this practice, the EPA chartered and funded the “WATHER” study, which took an epidemiological perspective on testing non-disinfected ground water supplies that met all the health standards. The multi-year study looked at public drinking water systems in Wisconsin. The state, like many others, does not necessarily require public drinking water systems disinfect groundwater supplies on the theory that the deep groundwater wells they draw from are safe and do not test as coliform positive.

**These rules are designed to protect household drinking water and not food manufacturers, processors, or packagers who use water provided by the most conscientious and compliant of suppliers.**

The WATHER team announced in 2012 that they had found infective viruses in drinking water samples in 14 Wisconsin communities that did not disinfect their water, with up to 25 percent of the samples positive for infective viruses. The study, published in a peer-reviewed journal, reported that up to 22 percent of the acute gastro intestinal illness experienced in the communities was directly associated with the drinking water viruses.

Wisconsin is probably typical of the situation in other states, and while the WATHER project studied only a small fraction of U.S. groundwater systems that do not disinfect the water they distribute to

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customers, there is no reason to assume that a WATHER-type study would find different results in any other state.

A similar study in Minnesota found comparable results. In fact, the joint Health Department/Department of Agriculture study found 22 of 245 samples positive for *Salmonella* out of the 14 percent of 567 un-disinfected municipal water supplies that were tested.

But whether or not the WATHER or Minnesota data is echoed in all the other states, for the next decade at least, drinking water rules, requirements, and enforcement actions will only protect municipal water to the extent needed to achieve safe drinking water for individual households and not necessarily safe food manufacturing water.

### Total Coliform Rule Complications

In February 2013, the EPA announced the final Revised Total Coliform Rule (RTCR), after a multi-year process to consider public water suppliers' concerns. Municipalities, authorities, water districts, and private water companies campaigned for reform, claiming the following.

1. Public notice rules are not useful; in a resource-constrained environment, money would be better spent fixing issues rather than notifying the public about them. The public doesn't really understand the data; giving them unnecessary information reduces their confidence in the public water supply and impacts their ability to get money to fix issues in the rate setting process.

2. Testing for indicators instead of targets is not conclusive. Coliforms are not necessarily pathogenic and do not always indicate fecal contamination. To the extent that a coliform-positive demonstrates a pathway, focus should be on "find and fix."

3. Most waterborne disease comes from viruses, which are not tested for or measured. As far back as 2002, data published by the EPA highlighted the presence of viruses in chlorinated water systems, and specifically in biofilms in pipes that connected the treatment plant to the distribution system. Research showed that viruses survived in groundwater and were infective, especially embedded in biofilms in chlorinated systems, where *Pseudomonas* biofilms are resistant to chemical disinfectants.



Dubbed "Find and Fix," the new regulatory scheme requires water suppliers to do an assessment of each significant safety problem and develop a plan to correct it.

In response to these and other concerns from its constituencies, the EPA reformulated the TCR by:

- Reducing monitoring frequency for many systems,
- Changing from coliforms to *E. coli* as the key indicator on the notion that it actually indicated fecal contamination,
- Changing most public notice requirements, and
- Moving away from boil water advisories except in the most onerous cases of clear and present danger in the immediate future, shifting the regulatory scheme towards corrective action.

Dubbed "Find and Fix," the new regulatory scheme requires water suppliers to do an assessment of each significant safety problem and develop a plan to correct it. Note that a corrective action can be to study the problem further. But as long as documentation of the problem and its corrective action is provided to the state within a 30-day period, both utility and regulator need take no further action. If the problem reoccurs within a specific time frame, the rules provide for a Level 2 Assessment and other measures, but not necessarily public notice.

Thus the RTCR will substantially reduce transparency, especially regarding information about safety problems that is available on a real-time basis to the public in general and food manufacturers in particular.

### Food Not on EPA's Radar

The bottom line is that once RTCR is fully implemented and rolled out nationwide in 2016, despite the anticipated challenges of aging infrastructure, reduced treatment budgets, lower repair budgets, and lower enforcement staff availability that will make water safety issues more rampant and more difficult to solve, there will be even less information and less protection for food manufacturers and processors who use municipal water.

The "[Identifying the Gaps in Understanding the Benefits and Costs of Boil Water Advisories](#)" report showed that less than 10 percent of over 508 notices reviewed for the first six months of 2010 would have been required to boil their water under the new rules. The study looked at the impact and costs and benefits of public notices and boil water advisories. It used data about the impact on local immediate water illness but did not consider outbreaks contributed by food manufactured in the communities subject to the boil water advisories. When questioned on this point, the study's primary author explained that food manufacturers were not specified constituents by the 42 states or the 12 water utilities that participated.

### Know Your Water

It is advisable to know your incoming water source, understand if your supplier buys finished water or treats it, and determine what percent of their output you receive. Institute a system to evaluate, monitor, and verify issues and changes in your specific supply such as checking on your state database for recent detections and violations, and whether you were notified of such; and finding out where you are located with respect to the treatment plant—are you at the end of the line or are there sampling points nearby that will provide information. ■

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# Across The Nation



## Marvelous Minnesota

The North Star State shines relative to food safety initiatives

BY LINDA L. LEAKE, MS

**Editor's Note:** This is the first installment of a year-long series that highlights the food safety initiatives, programs, and activities implemented in certain U.S. states.

If you love lakes, gophers, and exemplary food safety infrastructure and leadership, Minnesota is the place for you. Welcome to the incomparable Land of 10,000 Lakes, the indomitable Gopher State, a state that showcases strong and enviable food safety priorities and relationships among regulatory agencies,

academia, agriculture, industry, and consumers that are arguably second to none.

How did this seemingly idyllic situation come to be?

Minnesota citizens have a historical and inspiring commitment to public health, according to William Hueston, DVM, MS, PhD, ACVPM, a professor of veterinary medicine, public health, and public affairs who directs global leadership initiatives for the Center for Animal Health and Food Safety (CAHFS) at the University of Minnesota (UMN) College of Veterinary Medicine.

For starters, there has long been close collaboration between the Minnesota Department of Health's (MDH) foodborne disease epidemiologists and the MDH laboratory that handles samples from sick people, Dr. Hueston says. "The MDH Infectious Disease section focuses on ag-

The RRT has developed procedures and best practices for how a response team should function that have become models for other states.

gressive scientific investigation of disease outbreaks and documentation of findings in refereed scientific journals," he relates. "Not only do these professionals rapidly respond to foodborne disease, they also continue to raise the bar on the methods used to investigate and respond effectively to outbreaks."

Dr. Hueston is also quick to extol the food safety benefits of what he calls the unique partnership between Minnesota government agencies and UMN.

"There is a very strong epidemiology training program at the UMN School of Public Health (SPH) so that many, if not most, of the MDH epidemiologists have training and graduate degrees from UMN," he says. "And there is active recruitment of MDH and Minnesota Department of Agriculture (MDA) employees as adjunct faculty, so that UMN students get 'real' insights into the way government works and how to handle current foodborne illness challenges."

### Center of Excellence

As testament to the excellence and leadership exuded by the MDH and UMN SPH, on Aug. 31, 2012 the CDC designated Minnesota as an [Integrated Food Safety](#)

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[Center of Excellence](#) (CoE) to help fulfill its role in the Food Safety Modernization Act (FSMA). (To date, the designated Centers are Colorado, Florida, Minnesota, New York, Oregon, and Tennessee.)

The Minnesota CoE is facilitated by a joint partnership of the MDH and UMN SPH. Kirk Smith, DVM, MS, PhD, manager of the MDH Foodborne, Waterborne, Vectorborne, and Zoonotic Diseases Section, serves as director of the Minnesota CoE.

“In accordance with the FSMA legislation, we are committed to improving training, research, continuing education, and outreach related to food safety and the prevention of foodborne illness,” Dr. Smith says. “In particular, we work to identify and implement best practices in foodborne illness surveillance and outbreak investigation, and serve as a resource for local, state, and federal public health professionals who respond to foodborne illness outbreaks.”

With CDC’s support, the Minnesota CoE aims to provide technical help and training in epidemiological, laboratory, and environmental investigations of foodborne illness outbreaks; decrease the burden of foodborne illness using improved techniques in detection, investigation, control, and reporting; and use information gathered during outbreak investigations to prevent future illnesses and outbreaks.

“We believe we were doing a good job of detecting foodborne outbreaks in a speedy manner before the CoE was established,” Dr. Smith relates. “And we already had state-of-the-art surveillance. The CoE allows us to augment other work and translate our knowledge and tools to other states.”

### Rapid Response Team

Within the MDA Food and Feed Safety Division (FFSD), the [Rapid Response Team](#) (RRT) is charged with investigating food safety issues that arise as part of foodborne illness outbreaks or problems identified in food or animal feed facilities in Minnesota, according to Alida Sorenson, MPH, recall coordinator and an investigator for the RRT.

Founded in 2008, the RRT consists of technical experts in food manufacturing,



food inspection, microbiology, and epidemiology. There are two full-time RRT staff, and the remaining members are brought in on an as-needed basis, Sorenson notes.

“Members of RRT work closely with the epidemiologists at the MDH when people become sick from food,” Sorenson relates. “This team quickly traces contaminated foods back to their source to help identify the cause of an outbreak. The RRT was instrumental in helping to solve several large national outbreaks in recent years.”

In fiscal year 2015, the RRT was involved in 42 investigations, of which 83 percent were investigations into human illness and six resulted in a product recall. “As testament to RRT efficiency, some 60 percent of all 2015 investigations were completed in less than a month,” Sorenson points out. “And it is important to mention that the RRT assisted in the response to the widely publicized outbreak of highly-pathogenic avian influenza in Minnesota.”

The RRT has developed procedures and best practices for how a response team should function that have become models for other states. “Minnesota has mentored New York State in developing their own RRT, and just recently took on the mentorship of the newest RRT, Wisconsin,” Sorenson says. “Minnesota RRT mentorship responsibilities include regular check-ins with the mentee, providing guidance during response activities, and sharing procedural documents to assist in the development of the mentee state’s RRT.”

Minnesota is one of 20 states (18 funded by an FDA cooperative agreement, Minnesota included, and two with no FDA funding) that participate in the federal RRT program, says Carrie Rigdon, PhD, supervi-

sor of response, training, and outreach for the MDA FFSD.

“Minnesota has a strong network of expertise from government agencies, academia, and industry,” Dr. Rigdon adds. “The MDH has developed the ‘Minnesota Model,’ the gold standard for identification of outbreaks used by states across the U.S.”

### Food Safety Partnership

Established in 2002, the Food Safety Partnership (FSP) of Minnesota is a consortium of environmental health professionals, industry partners, and other stakeholders working together to protect the public health in the area of food safety.

An entity of the MDH, the FSP creates and facilitates a unified program for food safety in Minnesota, according to Sarah Leach, RS/REHS, planner-principal for the MDH.

“The FSP is open to regulators, industry, and the public, and we have some 3,652 subscribers to our website,” Leach says, noting that she is not aware of any other states that have such partnerships.

“The FSP provides a forum for diverse stakeholders to work together to advance food safety in our state,” Leach points out. “In particular, the video-conference and live streaming format of our regular FSP meetings provide opportunities for participation from across the entire state.”

Those regular video-conferences among its food safety professionals make Minnesota stand out, Leach emphasizes. “In Minnesota, staff from more than 30 regulatory agencies license and inspect our 30,000 retail food establishments,” she points out. “A challenge that comes with this diversity is to provide consistent and uniform regulation. Since 2012, MDH Food, Pools, and Lodging Services (FPLS) has convened ‘Regulators’ Breakfast’ video-conference meetings every other



month, during which we share announcements, discuss food code interpretations, and network with colleagues.”

Leach believes the MDH FPLS and the FSP impact Minnesota in a positive way. “We work hard every day to protect, maintain, and improve the health of all Minnesotans by promoting a strong food safety culture,” she emphasizes.

### Center for Animal Health and Food Safety

While the Minnesota CoE focuses primarily on detection, rapid investigation, and response, another UMN partnership, the aforementioned CAHFS, looks at the entire food system with an eye for prevention, according to Scott Wells, DVM, PhD, CAHFS director.

“Founded in 2001, CAHFS seeks to improve Minnesota and global animal health, food safety, and public health by building veterinary public health capacity, providing risk assessments and policy summaries, facilitating collaborative research, responding to emerging foreign animal diseases, and delivering relevant outreach,” Dr. Wells says.

Creating and facilitating strong working relationships among food systems professionals in the private sector, government, and academia are at the core of CAHFS, Dr. Wells notes. “CAHFS believes an interdisciplinary approach is required to successfully address food safety issues, drawing upon the knowledge, skills, and vision of all those involved,” he emphasizes. “Working with its partners, CAHFS strives to effectively address animal and food safety issues so that people and animals can live healthier lives.”

### Food Safety and Defense Task Force

Congratulations are in order for Minnesota’s pace-setting Food Safety and Defense Task Force, which celebrated its 25th anniversary in 2015.

Launched in 1990, Minnesota’s is one of the first such state task forces, if not *the original* task force, according to Joseph Scimeca, PhD, assistant vice president of global regulatory and scientific affairs in the Corporate Food Safety, Quality, and Regulatory Affairs Department of Cargill, Wayzata, Minn.

“My understanding is that now more than half the states have established similar task forces,” notes Dr. Scimeca, a Task Force member since 1999 and chair since 2005.

Comprised of 16 members appointed by the governor for four year terms, the Minnesota Task Force coordinates educational efforts about various aspects of food safety; providing advice and coordination to state agencies; serving as a source of information and referral for the public, news media, and other entities concerned with food safety; and making recommendations to the U.S. Congress, the Minnesota legislature, and others about appropriate actions to improve food safety.

“The Task Force is also a vehicle for the MDA to implement the provisions of FSMA related to stakeholder participation, outreach, education, and training for the new rules,” Dr. Scimeca says. “Additionally, the Task Force plays an important role as the bridge between officials of federal, state, and local food regulatory agencies, industry, academia, and consumers, as the U.S. moves toward implementation of an integrated food safety system.”

The Minnesota Task Force has sponsored one or two conferences or workshops each year since 2000, focusing on current food safety or defense issues and concerns.

“Our Task Force offers opportunities to stakeholders to gain new knowledge that may not be offered in any other format or venue,” Dr. Scimeca points out.

“Our overarching achievement is the long-standing establishment of a tripartite collaborative effort that includes industry, government, and academia, with the goal to advance food safety and defense in the state of Minnesota,” Dr. Scimeca relates. “Minnesota is well-recognized nationally for this strong tripartite partnership. A secondary benefit has been the facilitation of establishing relationships *within* each of these sectors. For example, the federal, state, and local governmental connectivity within our state is seen as a model for other states.”

These inter-sector relationships that have been forged over time serve Minnesota extremely well, Dr. Scimeca emphasizes. “Whenever the time comes for the sectors to collaborate, be it for investigating a foodborne disease outbreak, developing food safety and regulatory training for small and medium companies, collaborating in teaching college students how the food safety and public health system works, or hosting foreign governmental officials, Minnesota excels,” he boasts. ■

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For bonus content, go to [www.foodqualityandsafety.com](http://www.foodqualityandsafety.com) and search for “Minnesota’s Exemplary Food Safety Initiatives.”

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# Delivering Organic Integrity



Regulatory programs and certification processes are driving toward consistent, uniform standards for organically-produced agricultural products

BY **MILES MCEVOY**

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**T**he USDA's [Agricultural Marketing Service \(AMS\)](#) facilitates the strategic marketing of U.S. agricultural products in domestic and international markets. AMS supports producers, traders, and consumers of U.S. food and fiber products, including organic products, by ensuring fair trading practices and promoting a competitive and efficient marketplace.

The AMS [National Organic Program \(NOP\)](#) is responsible for developing and implementing the [USDA organic regulations](#). In this role, the NOP accredits and oversees the work of third-party organizations that certify the more than 27,000 organic farms and businesses in the U.S. and around the world. The NOP also enforces the organic standards and protects the integrity of the USDA organic seal from farm to market.

### The Basics

[Organic is a labeling term](#) for food or other agricultural products that have been produced using cultural, biological, and mechanical practices that support the cycling of on-farm resources, promote ecological balance, and conserve biodiversity in accordance with the USDA organic regulations. This means that organic operations must maintain or enhance soil and water quality, while also conserving wetlands, woodlands, and wildlife.

In addition, organic crop production prohibits the use of synthetic fertilizers, sewage sludge, irradiation, and genetic engineering; and organic livestock production prohibits the use of antibiotics, synthetic medicines, and hormones. Non-agricultural ingredients used in organic processed products must be approved by the [National Organic Standards Board](#), a Federal Advisory Committee whose 15 members are appointed by the Secretary and represent the full range of organic stakeholders. Only products that have been certified as meeting the USDA requirements for organic production and handling may carry the USDA organic seal or be labeled as organic.

### Certifying Organics

[Organic certification](#) verifies that farms or handling facilities located anywhere in the world comply with the USDA organic regulations and allows operations to sell, label, and represent products as organic. The organic regulations describe the specific standards

required for use of the word “organic” or the USDA organic seal on food, feed, or fiber products.

**Who certifies farms or businesses?** Farms or handling facilities can be certified by private, foreign, or state entities that are accredited by USDA. Called certifiers, these entities ensure that organic products meet all USDA organic standards.

Certifiers are a vital part of a complete and scalable system that supports organic integrity. In addition to conducting investigations when necessary, they inspect their certified organic operations at least once a year.

**What products can be certified?** The USDA organic regulations currently recognize four categories of organic products:

- Crops: a plant that is grown to be harvested as food, livestock feed, fiber, or used to add nutrients to the field;
- Livestock: animals that can be used for food or in the production of food, fiber, or feed;
- Processed products: items that have been handled and packaged (i.e. chopped carrots) or combined, processed, and packaged (i.e. soup); and
- Wild crops: plants from a growing site that are not cultivated.

**How does an operation become certified and maintain certification?** To become certified, an operation must apply to a USDA-accredited certifying agent. First, the producer or handler adopts organic practices and submits an application and fees to the certifying agent. This application includes a detailed description of the operation to be certified; a history of substances applied to land during the previous three years; a list of the products to be grown, raised, or processed as organic; and a written Organic System Plan describing the practices and substances to be used.

Once the certifier determines that the application contains sufficient information, an inspector conducts a thorough onsite inspection of the applicant's operation.

Following the inspection, the certifier reviews the application and the inspector's report to determine if the applicant complies with the USDA organic regulations. After any problems (or non-compliances) are corrected, the operation receives its organic certificate from the certifier.

After becoming certified, the organic producer or handler provides annual updates to its certifier. Every year, each certified

*(Continued on p. 22)*

## Local Food: More Than a Passing Trend

The 2015 A.T. Kearney local food consumer shopping survey finds that local food has made the leap from a “hot” consumer trend to a central growth driver for grocery retailers and restaurants.

A.T. Kearney surveyed more than 1,500 U.S. shoppers who indicated they are the primary shopper or share shopping responsibility in their households. The survey found almost all consumers (93%) associate local with “fresh,” which is the primary purchasing factor

for grocery consumers. Demand for local food is also expanding beyond produce, meat, and seafood. More consumers say local is an important attribute for prepared foods and dry groceries. For canned and jarred products, local increased in importance from 5% in 2014 to 13% in 2015; for prepared foods, the jump was from 10% to 23%; for bread, the increase was from 9% to 18%.

The “[Firmly Rooted, the Local Food Market Expands](#)” study incorporates the survey results and provides retail-

ers and restaurant operators with recommendations on how to tap into this important market.—*FQ&S*



**Organic cows must graze on organic pastures for the entire grazing season—at least 120 days a year—and they must receive at least 30 percent of their nutrition from pasture during the grazing season.**



(Continued from p. 21)

organic operation must be inspected by its certifier to verify that the operation is following its Organic System Plan. This process continues as long as the operation is certified.

Certifying agents also have the authority to conduct unannounced inspections of their certified operations. In fact, the NOP instructs certifiers to conduct unannounced inspections of at least 5 percent of their total certified operations annually. The NOP conducts audits of all certifying agents to ensure that they are properly implementing the organic regulations.

**What happens at an organic inspection?** Organic inspectors are trained to look critically at all aspects of an operation, including buffer zones that protect organic crops from substances used on neighboring farms, pest management practices, soil fertility, storage and preparation areas, and more. A handling inspector will inspect facilities, equipment, handling practices, labeling, storage, and more.

Inspectors also examine records—such as invoices, records of material applications, organic sales, harvest, and yield—that document farming and handling practices. During their visits, inspectors can even collect samples for residue testing; certifying agents use the results to identify and address instances in which

organic products may have unintentionally come into contact with prohibited substances, as well as to detect and deter fraud.

Inspections end with an exit interview, when inspectors review any areas of concern. Certifiers ultimately review each inspection report alongside the operation's Organic Systems Plan before issuing an organic certificate.

### Production that Safeguards Integrity

Having covered the basics of organic requirements and organic integrity checks and balances, let's take a closer look at what goes into making an organic product, such as cheddar cheese.

Before it can be turned into cheese, organic milk must come from a certified organic cow. The organic cow cannot be given growth hormones or antibiotics, and its feed must be 100 percent organic. Organic feed comes from land not treated with prohibited substances for at least three years prior to harvest and managed in a way that maintains soil fertility and minimizes erosion. The organic cows must graze on organic pastures for the entire grazing season—at least 120 days a year—and they must receive at least 30 percent of their nutrition from pasture during the grazing season.

Throughout their lives, organic animals are raised in living conditions that accommodate their natural behaviors and support

## Final Guidance on Natural Resources and Biodiversity Conservation

In January 2016, USDA's Agricultural Marketing Service published a Federal Register notice announcing [final guidance on Natural Resources and Biodiversity Conservation for Certified Organic Operations](#).

Conserving natural resources and biodiversity is a core principle of organic production. This final guidance provides organic certifiers and farms with examples of production practices that support conservation principles and comply with the USDA organic reg-

ulations, which require operations to maintain or improve natural resources. The final guidance also clarifies the role of certified operations, certifiers, and inspectors in the implementation and verification of these production practices.

In addition, the final guidance simplifies ways to reduce paperwork burdens for those domestic organic operations that participate in a USDA Natural Resources Conservation Service program. The guidance is now

part of the [National Organic Program Handbook](#).—FQ&S





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their health and welfare. If an animal gets sick and needs treatment with antibiotics or other drugs, the organic standards require that it receive these treatments and then be removed from organic production. In other words, product from treated animals can no longer be sold, labeled, or represented as organic.

After the organic cow is milked, the milk is transported to a certified organic processing facility to go through the “cheddaring” process, when an enzyme called “rennet” is added to separate the curd (semi-solid chunks) and whey (liquid). Rennet is an example of a non-agricultural substance that is allowed in organic food products.

Both the certified organic dairy farm and the cheese processing facility are inspected by certifiers at least once a year. These top-to-

**If an animal gets sick and needs treatment with antibiotics or other drugs, the organic standards require that it receive these treatments and then be removed from organic production.**

bottom inspections ensure that operations are meeting or exceeding all USDA organic regulations, maintaining important records, and following their written Organic System Plans. The dairy farmer’s organic farm plan outlines how he or she manages pastures, keeps the cows healthy, and maintains the land’s soil and water quality; while the cheese facility’s organic handling plan covers how organic ingredients are sourced and equipment is cleaned between batches, especially if the facility processes both organic and non-organic cheeses.

### Enforcing Regulations

To assure consumers that organic products meet consistent standards and to create a level playing field for certified organic producers and processors, the NOP reviews complaints alleging violations of the USDA organic regulations and carries out enforcement actions.

*(Continued on p. 24)*


# CHECK OUT OUR RECENTLY UPDATED WEBSITE!

**Fresh New Design**  
**Improved Mobile Optimization**  
**Social Sharing**  
**Enhanced Searchability**

**Food Quality & Safety**  
 FARM TO FORK SAFETY

The screenshot shows the Food Quality & Safety website homepage. At the top, there is a navigation menu with links for About Us, Safety & Sanitation, Quality, Testing, In the Lab, Manufacturing & Distribution, Food Service & Retail, Regulatory, Resources, and Award. A search bar is located on the right side of the header. Below the header, there is a large banner for "Automated Solutions in Detecting Adulteration" featuring a "DULTERATED GOODS" logo. The main content area is divided into several sections: "CURRENT ISSUE: APRIL/MAY 2015" with a featured article "Removing 'Food' From FDA"; "ONLINE EXCLUSIVE EXCLUSIVES" with articles on "Innovations in 3D Printed Food Outpacing FDA Regulations" and "Sanitation of Commercial Frozen Yogurt Machines"; "Eliminating the Threat of Bird Flu"; "Minimizing Microbiological Risks in Multiple-Use Containers"; "Testing Food for Glyphosate Residues"; and "Blowing the Whistle on Little Consistency in Cottage Foods Industry". On the right side, there is a "Current Issue" section for April/May 2015, a "Facebook" section, and a "Most Popular" list of articles.

[www.foodqualityandsafety.com](http://www.foodqualityandsafety.com)



Every year, each certified organic operation must be inspected by its certifier to verify that the operation is following its Organic System Plan.

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### Clif Bar Invests in Public Funding for Organic Crop Research

In June 2015, Clif Bar & Co. and Organic Valley named the University of Wisconsin-Madison (UW-Madison) as the recipient of the nation's first endowed chair focused on plant breeding for organic crops. The endowment, to be funded in perpetuity with a \$1 million gift from the companies and matched by a \$1 million gift from UW graduates John and Tashia Morgridge, funds research to develop crop varieties adapted to organic systems.

The UW-Madison Clif Bar and Organic Valley Chair in Plant Breeding for Organic Agriculture is the first of five organic research chairs to be led by Clif Bar. The company is now working with other organizations to raise an estimated total of \$10 million by 2020 to fund chairs dedicated to organic plant breeding.

UW-Madison's College of Agricultural and Life Sciences has been a leader in organic agricultural innovation—supporting Wisconsin's organic farms and researching organic systems including dairy, vegetable production, and forage. Recent discoveries include a new sweet corn variety adapted to organic farming systems. UW-Madison is also home to the nation's largest plant breeding research program.

With this new endowment, UW-Madison students will have faculty leadership to help them develop solutions for organic agricultural systems for generations.—*FQ&S*

**How does the complaint process work?** The NOP follows a well-defined set of steps when it receives a complaint. First, specialists review the complaint to see if it falls within the NOP's jurisdiction. Complaints outside of the NOP's jurisdiction are referred to the appropriate authorities, like USDA's Food Safety and Inspection Service, the FDA, or state public health agencies.

Second, the NOP determines if the complaint alleges an actual violation of the USDA organic standards. Third, the complaint must include sufficient evidence that organic standards are being violated. In all instances, the NOP thoroughly reviews the complaint and determines whether or not there is a violation of the USDA organic regulations.

#### **What are examples of violations?**

- Use of organic claims or the USDA organic seal by uncertified operations on product labeling and in market information, such as web pages;
- Presence of prohibited pesticides or other prohibited substances in agricultural products sold, labeled, or represented as organic;
- Use of uncertified co-packers or other handlers in the processing of agricultural products to be sold, labeled, or represented as organic; and
- Use of fraudulent organic certificates to market or sell agricultural products.

Operations that knowingly violate the USDA organic regulations can face penalties of up to \$11,000 per violation. Certified operations that violate the USDA organic regulations may receive notices of noncompliance or proposals to suspend or revoke their organic certification.

The USDA's processes and safeguards help protect the integrity of the organic label from farm to table, which has been critical to the sector's continued growth. USDA is also committed to connecting organic farmers and businesses with [resources](#), including conservation assistance, access to loans and grants, funding for organic research and education, and mitigation of pest emergencies. Organic certification cost share programs have the potential to offset the costs of organic certification for U.S. producers and handlers in all 50 states. ■

**McEvoy** is deputy administrator of the National Organic Program for the USDA Agricultural Marketing Service. Reach him at [Miles.McEvoy@ams.usda.gov](mailto:Miles.McEvoy@ams.usda.gov).





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# Safety & Sanitation

PEST CONTROL

## Controlling Pesky Birds in Commercial Food Facilities

Because bird droppings can contaminate food, as well as damage structures, certain species of birds are considered serious nuisance pests

BY JIM FREDERICKS, PHD

The damage done by pests can be extensive, from structural deterioration and contaminated product, causing facilities to lose money, to health issues, spreading illnesses that can make consumers sick. When thinking about the pests that most typically invade food facilities, cockroaches, rodents, flies, and stored product pests are most likely the first few to come to mind. However, pest birds are frequent threats to food facilities, too. And if birds aren't properly managed, they will waste no time in establishing their flocks and inflicting harm to property, product, and people.

### Why is Bird Management Important for Food Facilities?

Because bird droppings can contaminate food, as well as damage structures, certain species of birds are considered serious nuisance pests. Proper actions must be taken to exclude them from entering buildings,

as well as prevent them from nesting or gathering outside of facilities, where they pose a contamination hazard. The federal Food, Drug, and Cosmetic Act prohibits any conditions that could result in food contamination; therefore, it is necessary to discourage birds from nesting in exterior areas where fecal matter, feathers, or hazardous nesting materials could contaminate product or packing materials on loading docks.

Nests located inside, on roofs, or in the eaves of facilities are a health hazard both for employees and consumers. Bird droppings can enrich the soil below to promote growth of the fungus *Histoplasma capsulatum*, the spores of which can, when inhaled, result in histoplasmosis, a respiratory disease. The inhalation of just a couple of spores can cause mild cases in people, and the threat is most severe from nests or roosts that have been abandoned for a significant period of time. Once droppings have dried out,

the right conditions are more likely to develop that can cause spores to be released. Nests are also a draw for a variety of insects and ectoparasites that cannot be tolerated in any facilities handling food products.

Salmonellosis is another common illness spread by pest birds. *Salmonella* bacteria can be found in pigeons, sparrows, and starlings, all of which commonly invade food production and storage facilities. The illness can be spread to humans when infected bird droppings come in to contact with food, either from above or when the *Salmonella* organisms are carried on the feet or bodies of birds that land on food products.

### Common Pest Birds

European starlings, house (English) sparrows, pigeons, and Canada geese are four of the most likely bird species to cause problems in or around food storage and production facilities.

European starlings are likely best recognized for their tendency to gather in large, loud roosting flocks. Starlings are known to carry more than 25 diseases, including encephalitis, histoplasmosis, and salmonellosis. Ectoparasites—primarily mite species—are also associated with starling nests and droppings. Starlings will nest in just about any nook or crevice in and around structures. Because starling flocks can easily number in the high-hundreds, one flock can create a massive mess with their droppings.

House sparrows are not actually true sparrows, but a member of the weaver finch family. House sparrows are known to carry more than 29 diseases and ectoparasites, and they are considered one of the major carriers of St. Louis encephalitis. They prefer to nest in protected areas in, on, or near buildings such as structural ledges, gutters, light fixtures, and inside warehouses. Sparrows tend to re-use the same nesting sites over and over again. They feed mainly on seeds or grains. House sparrows are common invaders of warehouses and food processing plants, where their droppings could contaminate products.

Pigeons can be found in virtually every U.S. city and in most rural areas. They are notoriously dirty birds, capable of spreading more than 50 diseases and ectoparasites. They prefer feeding on seeds, grains, and fruits, but will really eat just about anything, including garbage, animal matter, and manure. They typically build their nests on ledges of structures and roost on perches that are high off the ground. Pigeon droppings are highly acidic which can cause damage to building exteriors, and their droppings, feathers, and nesting ma-

terials can contaminate food products.

Canada geese are not typically a problem inside food facilities, but can cause significant nuisance problems outside of facilities. This previously migratory species now often overwinters in the U.S. wherever food is abundant. They nest at the edges of bodies of water, such as ponds or swamps, and around buildings near bodies of water. When large flocks of geese overrun an area, their large and numerous droppings quickly become a foul nuisance.

### Prevention of Birds In and Around Facilities

Before embarking on any bird management plan, it is necessary to determine if there are any laws pertaining to the situation. Federal law protects all birds with the exception of the common pigeon, and some local laws might block certain methods of bird management. Be sure to check federal, state, and local laws and ordinances to see if they affect the bird species causing issues and consult with a pest control professional experienced in bird control. Working together, you can ensure you remain in compliance with these regulations.

The first step in preventing bird problems in a food facility is utilizing a pest control professional to conduct a thorough inspection of the building in order to determine if there are signs of birds, what species might be causing problems, and if there are any points of access birds could use to enter the building. The pest profes-



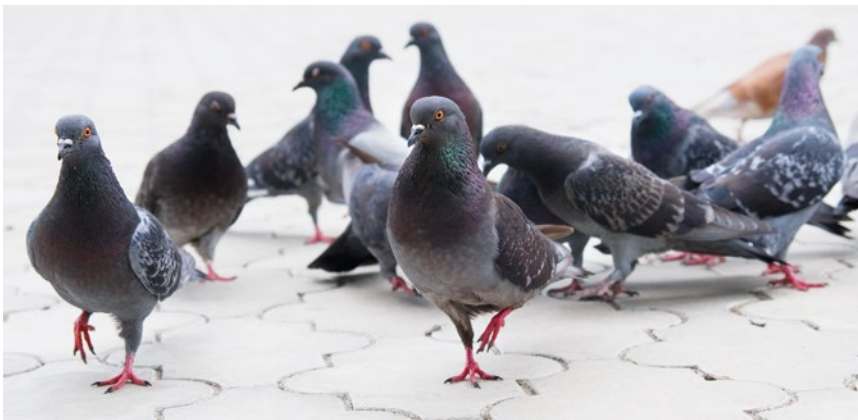
sional will closely inspect both the inside and outside of the structure with flashlights and mirrors to determine if changes should be made to better exclude birds. During this initial inspection process, it is crucial to have open communication between the service provider, the property owner, and building employees.

Because pest professionals only see a small window of activity, staff members who are present throughout the day are an invaluable resource for gaining intel on when and where pest birds are causing problems. The facility manager or owner must also be highly involved in the inspection and monitoring of pests so it is clear what vulnerabilities may be present in or around the structure, and what must be accomplished to eliminate them. Additionally, it should be noted that employees frequently contribute to the entry of pest birds into buildings and warehouses when exterior doors or windows are left open. Having a protocol in place that everyone is aware of and follows goes a long way in preventing birds and other pests from entering the structure.

That being said, birds are incredibly resourceful creatures and can enter buildings in a variety of ways. Any openings to the building, such as lofts, vents, or eaves must be blocked with wood, metal, glass, masonry, or plastic netting. Warehouse doorways used frequently throughout the day are common access points for birds. Installing clear plastic strips that touch the ground at the opening have proven effective at excluding birds, as these are seen by many bird species as impassable barriers.

Sealing the exterior of a structure and eliminating food or water sources in the immediate vicinity of the building are the best ways to prevent infestations. These types of methods, which focus on eliminating factors that could lead to pest problems before they take root, are part of an inte-

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grated pest management plan, also known as IPM. Frequently, these simple fixes are enough to manage pest birds.

### Tactile, Auditory, and Visual Repellents

Equally important to excluding birds from entering the facility is eliminating roosting areas on top of or near the building. If possible, eliminate ledges or create a 45-degree slope on which birds will not be able to roost or nest. If this is not an option, there are three main types of repellents designed to affect a bird's senses: tactile, auditory, and visual.

Tactile repellents make an area inaccessible or uncomfortable for birds to touch. Anti-roosting devices such as porcupine wire, which consists of rustproof spikes or needles, stainless steel wire coils, or toothed repellent strips are cost-effective options that may be installed to prevent birds from being able to land on ledges and windowsills. It is crucial that the material covers the entire length of the ledge, and any debris that could protect birds from the spiked effect must be removed on a regular basis. Electrical wiring is another option, which delivers a non-lethal shock when birds land. However for large areas, this may not be as economical a tactic as other aforementioned methods.

There are also chemical tactile repellents available to prevent roosting, which

come in the forms of gels, pastes, sprays, and more. The textures of these repellents can vary widely, but they typically produce an uncomfortable sensation on birds' feet when they land. These chemical repellents lose effectiveness over time, so reapplication may be necessary as often as every few months, depending on the variety. From an economic standpoint, chemical repellents are best suited for use in small areas.

Auditory repellents are sonic devices that emit intermittent noises that are frightening to birds. These devices use sudden, loud, or alarming noises such as screeching sounds, piercing alarms, and horns to scare birds away. Others use bird distress calls, which are especially effective for species that migrate in flocks and communicate threats to each other. These types of devices usually do not have a permanent effect on birds that are adapted to urban life, such as sparrows and pigeons, but can prove effective against large flocks of starlings and geese. Sonic devices should be installed as soon as birds begin roosting in an area because the longer a flock is established, the more difficult it is to drive the birds away with scare tactics. Noises should be employed in early morning before birds leave roosting areas and again at dusk when they return. Auditory devices, however, are not practical for urban or residential areas and may be regulated by local ordinances.

Similar to sonic devices, visual repellents are installed with the purpose of scaring birds away from an area, though some birds may quickly become acclimated to them, rendering the visuals ineffective. Lasers are one of the most effective visual repellents, and create intense red laser spots, which scare roosting or loafing birds and disperse flocks. Other visual repellents include flashing lights, fake owls, hawks, dogs or other threatening predators, and shiny flags. Like noise repellents, visual repellents are less effective on entrenched bird populations.

### The Bottom Line

Proper bird control can take a lot of trial and error, as the effectiveness of each method varies depending on a facility's location, its structural design, and the



**Salmonella bacteria can be found in pigeons, sparrows, and starlings, all of which commonly invade food production and storage facilities.**

species of pest bird causing problems. Working closely and communicating openly with a pest control professional, and properly and promptly following their recommendations, will expedite the process of determining which bird management tactics are the best fit for a facility. Once an effective, efficient, and maintainable bird control system is in place, however, the many risks of food contamination associated with birds will be eliminated. ■

**Dr. Fredericks** is chief entomologist and vice president of technical and regulatory affairs for the National Pest Management Association. Reach him at [jfredericks@pestworld.org](mailto:jfredericks@pestworld.org).



## Zeroing In On Stored Product Insects

Any business that handles cereals, grains, or dried food is at risk from stored product pests damaging and contaminating products | BY PARI PACHAMUTHU, PHD, BCE

The potential impact on business from a food pest infestation can be wide-ranging, resulting in lost revenue, lost customers, claims for loss and penalties, and even prosecution if non-compliance of applicable laws is involved. Worse yet, pest infestation can easily lead to loss of trust from customers and consumers, undermining your organization's hard-earned reputation.

There are numerous pests that prefer to make their homes inside storage containers, grain silos, and warehouses, costing businesses millions in lost revenue each year. They contaminate raw materials and finished products in various ways, including through feces, webs, and cast skins, causing costly damage and process disruption and delays. Stored product insects (SPIs) (beetles, moths, weevils, and mites) can infest foods such as flour, rice, dried fruit, nuts, barley, and more.

### Consequences of Pest Infestations

In order to gain insight into the challenges and issues pest infestation can present in

food manufacturing and other industries, Rentokil commissioned independent research agency Opinion Matters and the Centre for Economic and Business Research (CEBR). This research found that in 2014 alone, disruptions caused by pest infestations resulted in \$9.6 billion in operating costs in the countries surveyed. Moreover, 84 percent of U.S. businesses reported a net impact on revenue due to pest infestation across a five-year period. Statistics like these demonstrate the serious impact pest infestations can have on businesses of all kinds.

However, the potential impact was not limited to financial loss alone, particularly for food-related businesses. The CEBR research found that food manufacturers and processors reported pest-related costs associated with contamination of raw materials leading to replacement costs (28 percent) and an erosion of staff morale (30 percent). If the pest problem is not discovered in finished goods until arrival at the customer's location, negative impacts such as penalties, lost revenue, and reputation

will be at their highest. Even before that point, if pests are discovered during production, there can be a loss of productivity due to machine downtime, which can lead to missed fulfillment dates, potential contract losses, and financial penalties. The CEBR research cited that 41 percent of non-public facing core-food firms experienced business disruption from infestations that lasted the same amount of time as the infestation itself.

### Best Practices

Common signs of SPIs include:

- Live or dead insects in stored products, larvae, pupae, or silken webbing on food storage bins on shelves;
- Larvae or webbing on the outside of packets or bags;
- Larvae, pupae, or silken webbing in food harborages in cracks and crevices around shelves or on machinery, in food spillages, or on beams or windowsills; and
- Indications of the pests in insect traps or rodent stations.

Denying access to your premises is the first line of defense against stored food pests. This means inspecting incoming products, high standards of hygiene, and sanitation need to be maintained at all times throughout the year particularly in the warmer months when the temperature can expedite the development of SPI infestations.

Recommended prevention includes the following practices.

**Temperature control.** Stored product beetles and moths development time can be affected by temperature. Temperature above 89.6 degrees Fahrenheit or below 77 degrees Fahrenheit will slow population growth. Egg and pupa are less affected by relative humidity than larval stage. Development time for egg and pupa is affected by relative humidity as low as 8 to 12 percent.

**High hygiene standards.** Keeping a facility clean is essential to pest prevention. All excess food materials from spillages should be promptly cleaned as well as dust accumulation on facility surfaces, machinery, equipment, storage locations, and transport vehicles. All stock and food materials should be stored off the floor and

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away from the walls to facilitate cleaning and inspections. Add these areas to your Master Sanitation Schedule.

**Appropriate packaging for raw materials and finished goods.** Sufficiently robust and airtight packaging will help prevent infestation in food manufacturing facilities, during transportation, and at customer locations.

**Tight fitting insect screens and screen doors.** The insect screens should receive regular inspection and maintenance to ensure proper protection.

**Waste management.** It is important to have a policy in place that all waste should be placed in sealed bags. Waste containers should be thoroughly cleaned before every delivery and kept closed except when waste is being added. External drains, sumps, and pits should also be cleaned regularly as these areas offer potential harborage for pests.

**Inspection of incoming raw materials.** Stored insect pest infestations in a facility can be confined to a small area such as a bag or pallet of raw material. If undetected, the infestation can disperse rapidly throughout the premises. For this reason, it's essential to be vigilant in inspection and monitoring. Incoming stock should be inspected for any evidence of live pest activity away from the main storage area. If found the shipment should be rejected immediately and returned to the supplier.

### Benefits of a Proactive Approach

The application of practical and scientific experience to provide a tailored solution for a particular environment is the first step in proactively minimizing the risk of pest infestation and protecting a food manufacturing business from SPIs. The best approach considers all available preventative and curative options. While pesticides are an important and necessary part of a proactive approach, the goal of an SPI control program is to reduce the amount of pesticides used, which is a better method all the way around for a food manufacturing facility.

A proactive plan can involve a number of techniques, including the following.



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**Pheromone program.** Stored product insects can be monitored using the appropriate lures. When captured species reach specified count levels in the traps, specialized treatment procedures should be initiated.

**Light traps.** Commercial traps with UV light will occasionally trap SPIs. Activity can be recorded to monitor and ensure early detection of any pests.

**Dusting.** Certain dusts can be employed with pesticides to control moisture, inhibiting pest harborage.

**Precision spraying.** Targeted spot crack and crevice treatments can be useful to eradicate localized SPIs in a structural environment. Success is dependent on adequate access and cleaning of loose or impacted residues and the use of approved materials that prevent product contamination.

**ULV program.** An ultra low volume, or ULV, program can be used to knock down the adult population and find potential harborage/breeding sites.

**High Temperature.** In some situations where a fumigant cannot be used, infested fresh commodities such as nuts, dried fruits, and grains can be heat treated using trailers, sea containers, or heat pods. All stages of insects are eradicated by heating the material for most products one to four hours at 120 degree Fahrenheit.

**Grain protectants.** Prevention and control of stored product insects must be considered from harvest to storage and processing. Grain protectants involve the application of insecticidal dusts and sprays directly to grain while in storage in silos on farms or at mills or during transportation. Because most grains are used for human consumption,

there are strict guidelines that control the use of grain protectants. Proper application is based on the natural decay of the pesticide residues to low levels during the storage or transportation of the grain so that it can later be processed into edible foods.

**Exterior protection.** Where exterior infestations have been identified, it may be necessary to apply an approved insecticide treatment to pest activity sites outside buildings and storage facilities. These treatments can reduce the risk of SPI infestation.

### Management and Recordkeeping

The negative consequences of pest infestation is exacerbated for food manufacturing and processing operations because they are typically subject to stringent audits by customers, corporate head offices, as well as independent industry auditing bodies. When auditing is required, up-to-date and easily accessible records are essential in demonstrating that pest control is managed effectively. This is one reason many businesses subject to auditing requirements choose to partner with a professional pest control supplier who can devote full attention to managing and documenting a proactive plan to control pests and provide online reporting tools, freeing the organization to focus on its core activities.

As the CEBR research results demonstrate, pest control is always a concern for food producers. It's a task that requires knowledge and expertise to comply with national and local regulations and the requirements of third-party auditors. Additionally, maintaining the cleanliness and safety of food products is vital to brand reputation, which makes ensuring a meticulously kept facility of critical importance. An investment in a proactive SPI management plan is the first step toward ensuring the safety and quality of food products being delivered to consumers. ■

**Dr. Pachamuthu** is technical services manager for Rentokil Pest Control North America—J.C. Ehrlich Pest Control, Western Exterminator, and Presto-X Pest Control are part of Rentokil companies in North America. Reach him at [ppachamuthu@west-ext.com](mailto:ppachamuthu@west-ext.com).



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# Looking for a Pest Management Partner?

Key factors to look for when selecting a pest professional who can implement risk-based preventive strategies | BY ZIA SIDDIQI, PHD, BCE



of a larger network, you may also consider talking with other managers about their pest management providers and their results.

### ***Insist on an inspection before you sign.***

Once you have a list of providers to check out, it's time to see how they treat your facility—don't choose a provider sight unseen. Your partnership with a potential pest management provider should start with a full inspection and assessment of your facility.

Remember, IPM programs are customizable to specific facilities. A thorough inspection will help the potential provider determine what type of services you need in yours.

***Get the details in writing.*** FSMA requires food processing facilities to develop and execute written risk-based preventive food safety plans that detail likely hazards, corrective actions, and results. With this in mind, your pest management professional should thoroughly document any service visits and corrective actions.

You want a provider who not only documents his or her every move but also uses the documented information to determine pest trends and aid in decisions about how to best manage pest activity going forward. These records should be kept onsite for any surprise audits.

***Speaking of audits...*** Because pest management can account for so much of your total audit score, there's a lot riding on the success of your pest management program. In addition to documentation, your pest management professional should work with you to ensure all documents are in proper order and audit ready at any time.

Look for a pest management provider that can help you get prepared for the third-party auditor, based on the food safety standards with which your facility is required to comply, and even provide onsite support the day of your audit.

***Keep your staff in mind, too.*** Even the greatest pest management plans can struggle in facilities that don't have buy-in from

*(Continued on p. 32)*

**W**hy is pest control a necessity in food processing facilities?

You can start with your audit scores and reputation. Third-party audits are a serious matter for food processing facilities. Just one low score can cause your customers to lose trust in your business—and if those customers pull their support, you could see a major impact on your bottom line.

Taking the Food Safety Modernization Act (FSMA) into account, food processing facilities have every reason to strengthen their pest control program and documentation efforts to not only follow and implement a risk-based prevention program to protect their product and consumer base, but also be audit-ready at any time. Success on your third-party audit hinges on documentation, and the pest management portion can make all the difference in your score—it accounts for up to 20 percent.

Then there are the pests themselves.

Cockroaches and ants can pick up and transfer harmful bacteria. Flies can spread disease-causing organisms everywhere they land—and they land frequently, leaving their traces in an abundance of places.

Then there are rodents, which can also cause serious health problems. According to the CDC, rats and mice are known to spread bacteria like *Salmonella* and *E. coli*, as well as more than 35 diseases worldwide, such as hantavirus.

From its impact on audit scores to its role in abating health concerns and to brand protection, pest control should be a priority for any food processing facility. An ongoing, comprehensive, and well-documented integrated pest management (IPM) program, which focuses on risk-based preventive strategies like sanitation and facility maintenance to help prevent pest activity, is ideal for food processing facilities.

### **Picking the Right Partner**

With all this in mind, it's important to find the right, licensed pest management professional who will partner with you and your staff to implement a customized IPM program for your facility and help keep pest problems away. But the key word here is “partnership.”

When starting your search for a pest management partner, be sure to ask about IPM. IPM is the preferred pest management practice of NSF International's food safety audits and helps meet and exceed the requirements of industry auditors. One-size-fits-all pest management solutions are simply not effective, so look for a provider who can tailor an IPM program specifically to your facility and your needs.

The following guidelines can help you search for a pest management partner that stands out from the crowd.

***Start your search with your peers.*** If you're looking for pest management recommendations, begin by talking to your industry colleagues. If your facility is part

(Continued from p. 31)



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the staff. Your staff plays an important role in reporting pest sightings and keeping your facility clean.

With this in mind, make sure to ask about resources a pest management provider can offer your staff. Many providers offer staff training and educational resources like tip sheets and checklists—often at no extra cost.

**Establish thresholds.** Even with a proactive, responsive pest management partner, creating a pest-free environment can be difficult but achievable. To get to this goal, thresholds should be set. Thresholds dictate how much pest activity—and what types of pests—are acceptable before corrective actions need to be taken.

Thresholds are best set by working with your pest control professional because there are several factors that come into play.

For instance, if you're in an older facility or located in an environment that is more conducive to pest activity, such as areas that are near water, heavily wooded or warm, your pest management provider may want to counter these challenges with exclusion recommendations that can include extensive building maintenance and repairs.

If you're in a newer building and don't currently battle any present pest issues, it may be perfectly reasonable to move forward with a "one pest is one too many" threshold. You can continue partnering with your provider to adjust your IPM pro-

## Keeping Pests Out of Loading Dock

BY MARY BLASER

If loading dock openings are not sealed properly, they can leave facilities vulnerable to infiltration of insects, water, dust, dirt, and other contaminants. Here are some steps on how to get a complete seal to protect against these potential hazards.

**1. Look for light.** When a trailer is in place and the dock door is opened, examine the perimeter around the trailer and dock leveler and look for areas where you can see light. If there's daylight, there's a gap to be filled. Different gaps will need to be sealed by different products. Understanding what kinds of gaps exist will lead to more informed decisions on properly sealing them.

**2. Examine different sealing options.** Not all seals and shelters work for every situation at the loading dock. Foam compression style dock seals generally offer a greater deal of energy efficiency, but can suffer significant wear-and-tear due to constant friction. Additionally, foam and other material can protrude inside of the trailer when compressed, interfering with forklift loading. In contrast, perimeter-sealing dock shelters offer full access loading since they seal along the side of trailer, but unless the right model is selected, sealing efficiency tends to be significantly lower than that of a compression style seal.

**3. Remember the fourth side.** While it's critical to seal gaps at the top and along the sides of the dock opening using a dock seal or shelter, don't forget the "fourth side"—the bottom. Gaps typically exist below and around the dock leveler and bumpers, and present stubborn challenges for seal-

ing out contaminants. Installing an under-leveler pit seal provides a barrier against dirt and rodents, in addition to reducing energy loss. Inside the facility, lip corner seals, filler pads, and other components help fill tough-to-seal gaps where the dock enclosure, leveler, and bumpers all meet.

**4. Consider vertical-storing levelers.** Vertical levelers differ from pit-style levelers in that they allow the loading dock door to close directly onto pit floor, minimizing outside air and pest infiltration. This configuration also allows trailer doors to be opened inside the facility, which further enhances environmental and product control inside the loading dock area.

Using a system of products including the right dock seal or shelter, an under-leveler seal, and a vertical leveler, a complete seal can be achieved to help keep pests outside. A reputable loading dock equipment provider who is trained to provide expert environmental control analysis can recommend the most effective system of product solutions.

**Blaser** is director of marketing and business development at Rite-Hite Environmental Enclosures Corp. Reach her at 888-841-4283.

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gram over time to ensure that your pest management program stays effective.

Even with a sound IPM plan, however, if you are currently battling pests—whether they are cockroaches, ants, flies, or rodents—it will take time to reach your threshold goals. Work with your pest management provider to create a timeline for steady and reasonable improvement.

Once you choose a pest management provider, lean on constant communication and hammer out the roles of everyone in-

involved. Set benchmarks for your pest management program and establish specific times throughout the year to evaluate the program's success and areas of improvement with your provider.

Keep all of this in mind, and you can help build a solid, long-lasting partnership with your next pest control provider. ■

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# Quality

SHELF LIFE



ing on packaging, they are exposed more or less to the cold air of the freezing chamber. Without glazing, the oxygen of the air will react with the fats (turning them rancid) and drying and dehydration of the product will not be prevented (which may lead to freezer burn). In addition, glazing is a physical barrier that protects the product from damage during production, packaging, transport, and retail.

Without glazing, the oxygen of the air will react with the fats (turning them rancid) and drying and dehydration of the product will not be prevented (which may lead to freezer burn).

## Why Just Glaze It? Bring Glazing to the 21st Century

The use of glazing in the frozen seafood industry should be updated to bring new benefits to products and consumers

BY NUNO F. SOARES

Seafood products are made from a important natural resource with a steadily growing consumption over the last several decades. According to a 2014 Food and Agriculture Organization [report](#), the supply of fish food increased in the last five decades at an average annual rate of 3.2 percent, even outpacing population growth worldwide (1.6 percent). Since the 1990s this growth has been supported mainly by aquaculture production, which had a 6.2 percent annual growth rate between 2000 and 2012. Another recent trend has been the increas-

ing demand for processed products, particularly frozen seafood products. In 2012, frozen seafood products accounted for 54 percent of the total processed fish for human consumption and for 29 percent of the total seafood market for edible purposes.

According to the [Code of Practice for Fish and Fishery Products](#), glazing is the application of a protective layer of ice formed at the surface of a frozen product by spraying it with, or dipping it into, clean seawater, potable water, or potable water with approved additives, as appropriate. When frozen fish are to be stored, depend-

The most common method of glazing is dipping, where frozen seafood products are immersed in a tank filled with cold water for a period of time, creating an ice coat that completely surrounds the product. Glazing carried out by spraying uses the proper equipment to spray glazing solution over the product. Although dipping is a relatively simple and cheaper method, with more production capacity than spraying, it is more difficult to control the amount and uniformity of glaze. The amount of glaze formed is dependent on factors such as product and glazing solution temperature; size, shape, and surface area of the product; and glazing time.

Glazing solution is commonly used at a temperature close to the freezing point. The amount of glazing added to the product should be considered wisely by manufacturers in order to effectively guarantee the protection of the product without being perceived by consumers as a method of deceiving and/or improving manufacturers' profits.

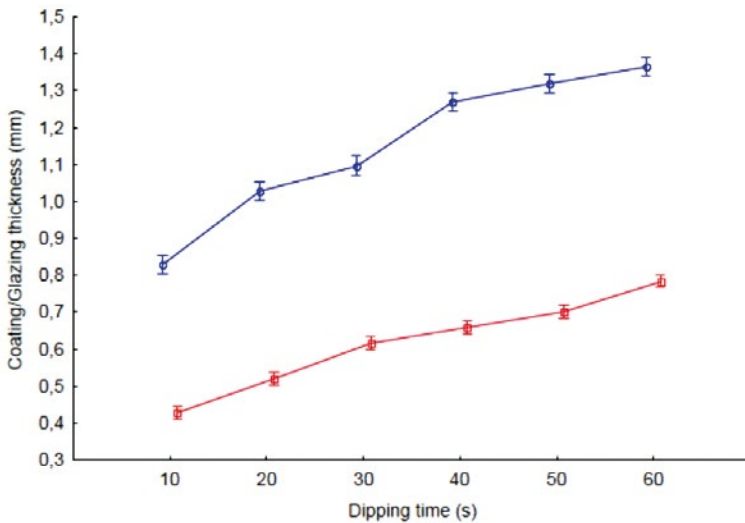
### Glaze Lost During Storage

Until now glaze has been viewed as a substance with the main function of acting as a barrier to protect the product surface from exposure to the (cold) environment.

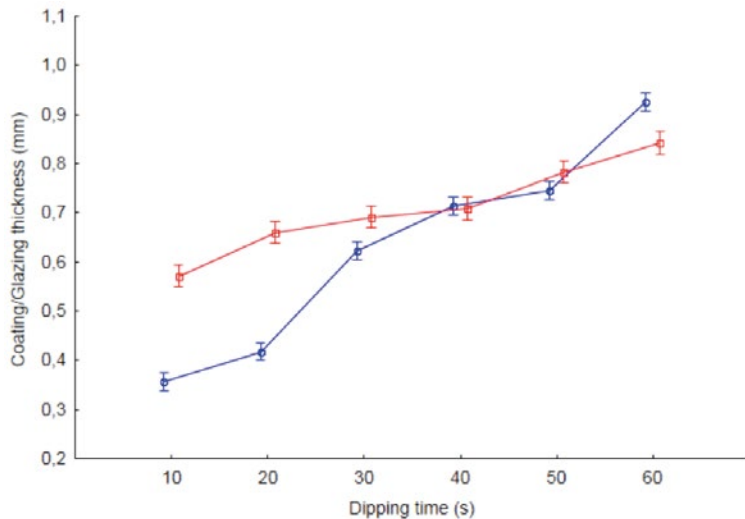
*(Continued on p. 34)*

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**Chart 1:** Coating/glazing thickness variation along dipping time for salmon at -25° C/-13° F glazed with water at 2.5° C/36.5° F (□) and coated with chitosan at 2.5° C/36.5° F (○). Each point represents the mean ± standard deviation of 15 replications.



**Chart 2:** Coating/glazing thickness variation along dipping time for salmon at -25° C/-13° F glazed with water at 0.5° C/32.9° F (□) and salmon at -15° C/5° F coated with chitosan at 8° C/46.4° F (○). Each point represents the mean ± standard deviation of 15 replications.



With that in mind, the amount of glaze should be defined according to the time it takes for it to be reduced during storage until the product’s surface is exposed to cold temperatures. However, that is not the case since there is no information available regarding the amount of glaze needed to guarantee that. To address this goal a paradigm of the frozen seafood industry must be broken, but first let’s discuss how industry currently measures glazing.

It is common to read expressions like over glazing or excessive glazing. Unless

a threshold is defined between client and manufacturer, these terms only reflect a subjective judgment since there is no threshold defined for the amount of glaze that is necessary to protect the product. On the other hand, when organizations intentionally mislabel the product weight in the pursuit of financial profit, it should be addressed as fraudulent behavior and not as excessive glazing.

Industry measures and presents the amount of glazing as the percentage from the glazed product that is actually glazing

water. Although this value can be important when defining the product price, it may be deceiving regarding the ability to protect the product during frozen storage. If glazing works as a barrier to separate the frozen fish from the cold air, the critical parameter should be its thickness. In opposition to the percentage of glazing, this value is independent of the kind of product (or its size and shape) and will clearly indicate the capacity of glazing to protect any product according to a set of storage conditions (e.g. storage temperature, temperature fluctuations, and storage period).

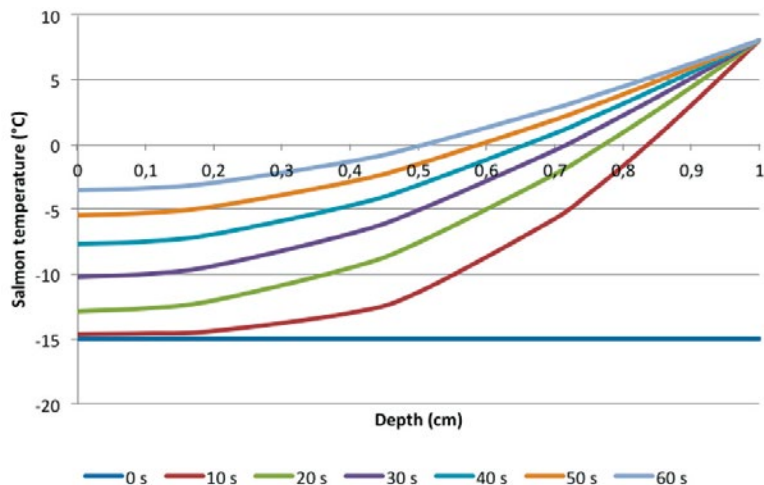
Contrary to what many may think, glazing loss is slow especially at low temperatures and when temperature fluctuations are avoided. When salmon was stored during 37 weeks in an industrial freezing chamber at  $-21.4 \pm 1.6$  degrees Celsius ( $-6.5 \pm 2.9$  degrees Fahrenheit), only 71 percent of it glazing was lost at the end of the [experiment](#). But when the product was stored at  $-5.0 \pm 0.6$  degrees Celsius ( $23.0 \pm 1.1$  degrees Fahrenheit), a similar percentage of glazing was lost (6.9 percent) just after seven weeks. At the end of the [research](#) period (14 weeks), it reached a loss as high as 17.1 percent. When a chitosan coating (0.5 percent weight/volume, or w/v) was used to protect the product, the improvement at the end of the experiments was noteworthy, reducing the amount of loss to about half of the obtained with water glazing.

Although glazing may not be uniformly distributed on the product (especially in corners it can be thinner), it is possible to assume that with such low glazing thickness losses after 37 weeks at usual storage temperatures, the product should be safe from exposure to cold air during the typical shelf life period (52 to 104 weeks). As mentioned before, the only way to guarantee that the product is protected is to think in terms of thickness and not in percentage of glazing. To better study this problem it is necessary to understand the correlation between glazing percentage and its thickness and how the variables of glazing application affect its initial value.

### Glazing Thickness and Variables

It is empirical and of common sense that the amount of glaze that is formed when a frozen fish product is immersed in a cold solution is dependent on the temperatures

Chart 3: Temperature profile showing the temperature variation from the center (depth = 0) to the surface (depth = 1) of a sample of salmon initially at -15° C/5° F when applying a chitosan coating at 8° C/46.4° F. Each curve corresponds to a different dipping time.



of the product and of the solution, the immersion time, and the product itself. More challenging are answers to questions like: How each variable impacts the amount of glaze? What are the limits to glazing uptake? How glazing uptake translates into glazing thickness?

These issues started to be addressed in [recent research](#). When salmon at -25 degrees Celsius (-13 degrees Fahrenheit) was dipped in water at 0.5 degrees Celsius (32.9 degrees Fahrenheit) during 10, 20, 30, 40, 50, and 60 seconds, the coating thickness obtained increased between 0.57 millimeters (mm) for 10 second dipping and 0.84 mm for 60 second dipping. Raising the temperature of the salmon in 10 degrees Celsius (18 degrees Fahrenheit) resulted in an average reduction of the glazing thickness of 27 percent. Likewise, when water temperature was raised by 2.0 degrees Celsius (3.6 degrees Fahrenheit), the thickness was also reduced, but only by 13.6 percent (on average). This last experiment clearly showed that the reduction was greater for 10 second and 20 second dipping times, where on average the reduction was 23.1 percent; the longer dipping times (30 to 60 seconds) had only 8.8 percent average reduction.

The use of a 1.5 percent w/v chitosan solution to glaze frozen salmon resulted in a much thicker protective coat than when only water was used. For example, when the same conditions of product temperature (-25 degrees Celsius/-13 degrees Fahrenheit) and solution temperature (2.5

degrees Celsius/36.5 degrees Fahrenheit) were used, the thickness of water glazing (0.78 mm) at the end of the experiment (i.e. after 60 second dipping time) was thinner than the one obtained with chitosan solution only after 10 second dipping time (0.83 mm). As seen in Chart 1 (p. 34), the thickness of the chitosan solution glazing after 60 seconds was 1.37 mm, 73 percent higher than the one obtained with water.

Another important result was obtained by the comparison between the thickness of the glazing when salmon at -25 degrees Celsius (-13 degrees Fahrenheit) was dipped in water at 0.5 degrees Celsius (32.9 degrees Fahrenheit) with salmon at -15 degrees Celsius (5 degrees Fahrenheit) dipped in chitosan solution at 8 degrees Celsius (46.4 degrees Fahrenheit) as shown in Chart 2 (p. 34).

Chart 2 clearly shows that after a 40 second dipping time the results obtained with the chitosan solution are equal or better than the ones obtained with traditional water glazing. This is quite relevant since, even if only thinking in glazing as a

barrier to prevent the contact of the product with cold air (which, as seen below, is not the case for chitosan glazing), the same thickness can be obtained in a much less demanding energy setup (higher glazing solution and product temperature), leading to direct energy savings or even making the use of some equipment unnecessary.

The results obtained also confirmed that after a period of time (depending on the setup) the thickness of glazing stops increasing and even decreases. This phenomenon was clear when glazing water was maintained at 2.5 degrees Celsius (36.5 degrees Fahrenheit). After a 40 second dipping time, the thickness stopped increasing when salmon at -25 degrees Celsius (-13 degrees Fahrenheit) and -20 degrees Celsius (-4 degrees Fahrenheit) was used and started reducing for salmon temperature of -15 degrees Celsius (5 degrees Fahrenheit). In the case of glazing with chitosan solution, this phenomenon was not observed in the conditions defined for the experiments even when 60 seconds of dipping time was applied.

### Temperature Profile and Safe Dipping Time Concept

The glazing thickness can be explained by the conduction of heat from the solution to the frozen fish, leading to a decrease in the temperature of the solution (changing phase) and a corresponding increase on that of the product. The impact of raised temperature in the product is often neglected but it is directly dependent on the product, dipping time, and product/glazing solution temperature. Immediately after immersion, a temperature profile will be established inside the product, with a higher temperature close to the surface and lowering as it moves to the center of the product. These temperatures can be

*(Continued on p. 36)*

Table 1: TVC for frozen salmon glazed with water and chitosan solution after 181 days storage with or without thawing.

Coating	Time (Days)	Samples Without Thawing (CFU/g)	Samples After Thawing (CFU/g)
Control	0	2.73X10 <sup>3</sup>	4.20X10 <sup>3</sup>
Control	181	2.97X10 <sup>3</sup>	4.12X10 <sup>4</sup>
Water	181	3.65X10 <sup>4</sup>	3.40X10 <sup>4</sup>
Chitosan 1.5%	181	<10	<10

(Continued from p. 35)

predicted by the use of the second law of Fourier. Chart 3 (p. 35) presents the temperature profile when salmon at -15 degrees Celsius (5 degrees Fahrenheit) is dipped in chitosan solution at 8 degrees Celsius (46.4 degrees Fahrenheit), clearly indicating that after 50 and 60 seconds the product is in all its volume above or very close to -5 degrees Celsius (23 degrees Fahrenheit). This is particularly relevant since *Vibrio spp.* is a common microorganism in seafood [reported](#) to grow above this temperature.

Depending on the conditions of each facility and the time that it would take the product to return below -18 degrees Celsius (-0.4 degrees Fahrenheit) in all points, and taking in consideration the cumulative effect of future temperature oscillations until the product reaches the final consumer, I believe that organizations should address this issue and propose the adoption of the Safe Dipping Time (SDT) concept. SDT should be defined by each organization according to its operational conditions (e.g. temperature of product and glazing solution, production room temperature, time to product return to frozen storage and its temperature) and will represent the maximum time that a product can be dipped without the temperature raise constituting a hazard.

### Antimicrobial Activity of Chitosan Solution

Freezing is a commonly used method for long term preservation since it is well known for the capacity for inhibiting microbial growth and slowing down enzymatic activity. The [Fish and Fishery Products Hazards and Controls Guidance—Fourth Edition](#) presents in its Appendix 4 a list of common pathogens in the fish industry and temperatures that enable growth and toxin formation. According to the guide, the two pathogens that are able to grow at the lowest temperatures are *Yersinia enterocolitica* and *Listeria monocytogenes* at -1.3 degrees Celsius (29.7 degrees Fahrenheit) and -0.4 degrees Celsius (31.3 degrees Fahrenheit), respectively. These temperatures are much higher than the -18 degrees Celsius (-0.4 degrees Fahrenheit) recommended for storage of frozen fish and therefore, during frozen storage, temperature is the main factor to inhibit microbiological growth. In fact, in an [experiment](#) where salmon was glazed with water or chitosan solution (0.5 percent w/v) and stored at -5 degrees Celsius (23 degrees Fahrenheit), the total viable count (TVC) did not show any trend during the 14 week experiment and fluctuated between  $5.0 \times 10^2$  and  $1.0 \times 10^4$  colony-forming units/gram for both glazing solutions tested.

Nevertheless, as soon as the temperature rises, as is the case when fish is

thawed at home before cooking, microorganisms can grow again, start spoiling the product, or even produce toxins depending on the time/temperature of exposure. The use of water glazing will not in any way affect microbial growth but the use of a 1.5 percent (w/v) chitosan solution has been proven to reduce the TVC in salmon stored at -22 degrees Celsius (-7.6 degrees Fahrenheit) during 181 days. In this [experiment](#), two different TVC evaluations were performed. Both were based on BS EN ISO 4833:2003 but one was done immediately after storage and the other after the product was kept in a refrigerator at 5.9 degrees Celsius (42.6 degrees Fahrenheit) during 24 hours, simulating conditions of home thawing. Table 1 (p. 35) presents TVC results for both experiments.

The results clearly show that using a chitosan solution to glaze the product can actively reduce the microbial contamination of the product and even help ensure that it is safe during a 24-hour thawing process.

### Final Considerations

Glazing has been used too long as simply a mechanical barrier. At a time where safety, added-value products, and product differentiation are so important for consumers, and therefore for the fish industry, organizations should revise the use of glazing and bring new benefits to products and consumers.

Reducing the amount of glazing to the thickness necessary to guarantee the protection from cold air and introducing substances that can guarantee a safer product (not only during storage time but also at consumers' homes) are paradigm changes that can shape the industry in the forthcoming years and increase consumers' confidence regarding frozen fish. ■

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## History of Glazing

The first [U.S. patent](#) describing a process to artificially freeze and preserve fish was published in 1861. In his patent, Enoch Piper claims the invention of a new and improved method of preserving fish that includes a 24-hour freezing process and suggests glazing the fish, by a dip in cold water, forming a coat of about 1/8 of an inch in thickness. After being glazed, the frozen fish is transferred to an insulated chamber and cooled with a freezing mixture within vertical metallic tubes to keep the fish frozen until used.

In 1902, [D. W. Davis patented](#) a process of freezing in a rectangular pan covered with a lid and packed in an ice-and-salt mixture for freezing. In his patent, Davis describes that before placing in cold storage, the frozen cakes are to be immersed and held submerged for several minutes in a body of water, which absolutely must be at a temperature of 32 degrees Fahrenheit.

Later, in 1926, the Appendix VIII to the [report of the U. S. Commissioner of Fisheries](#) mentions that fish must be frozen in metal pans and then warmed slightly by spraying or immersing in cold water to loosen them. The report states that glazing tanks are commonly made from wooden or concrete, provided with a movable wooden platform suspended by ropes to a windlass by which it was moved up and down the tank.

Today, the glazing of frozen fish has undergone significant technological improvements, especially in terms of the equipment used (and the materials of which they are made). However, regarding the type and function of the glazing solution used, the industry is currently still stuck in the 19th century.—N.S.

# In The Lab

MOISTURE CONTENT



## Complete Moisture Analysis for Wheat

Though moisture content has purpose as a standard of identity, water activity can be more effective in evaluating moisture in grain and flour to provide a consistently stable product

BY BRADY CARTER, PHD

During the summer of 2015, [Alltech tested the North American wheat crop](#) and found an average of 3.2 mycotoxins per sample. Mold and the mycotoxin it produces represent a serious economic threat to wheat growers and flour producers. Molds are spread throughout the crop as grain mixes in storage. Often, pockets of high moisture develop, allowing mold to grow. Moisture continues to be an issue as grain is tempered, processed into flour, and stored.

Moisture content is monitored at various points in this process. However, susceptibility to mold and microbial growth is better correlated to water activity than to moisture content because fungi cannot grow (and mycotoxin cannot be produced) in grain and flour below a 0.70 water activ-

ity. Moisture content is not directly related to mold and microbial growth rates, and the currently suggested moisture content levels for flour and farina correspond with water activity levels right at the cutoff point for mold growth. Any uncertainty in the moisture content measurement can allow contamination of the product.

Water activity is a measure of microbial susceptibility accepted by the USDA and a key component in many hazard analysis and critical control point plans. To prevent mold and microbial contamination, it behooves the flour industry to consider including a water activity specification to ensure microbial safety.

### How Does Contamination Occur?

According to *Cereal Foods World's* study "[The Case for Water Activity as a Speci-](#)

[fication for Wheat Tempering and Flour Production](#)," it appears that through trial and error, those who have set current recommended moisture levels for grains and flour have fortunately, if unknowingly, pinpointed the right water activity level to maximize stability. However, as current moisture content specs result in water activities very close to the microbial growth

Any uncertainty in the moisture content measurement can allow contamination of the product.

limit, problems can result from even small uncertainties in the moisture content measurement.

In fact, because flour is hygroscopic, it can easily take on moisture that pushes its water activity above the microbial growth limit. If flour or farina is exposed to high humidity (more than 70 percent), its water activity will quickly become unacceptable. Soft flour will reach unsafe water activity levels the fastest, but all products will have reached unacceptable water activities and moisture levels in only 24 hours. (This change in water activity and moisture content only applies to product exposed to ambient conditions. Moisture movement through a mass of bulk stored product once the surface has come to equilibrium and the subsequent changes in water activity and moisture content are not part of this discussion.)

### Using the Right Measurement for Every Step

**Weighing.** Wheat products, both flour and grain, are sold on a weight basis. When you buy grain you don't want to pay for water. Thus, there are restrictions about what moisture contents are allowed, and these restrictions have become a useful standard of identity for grain and flour to make sure that purchasers are buying what they expect. Moisture content is commonly required for any flour specification sheet, with 13.5 percent ideal for soft wheat and 14 percent ideal for hard wheat.

(Continued on p. 38)



(Continued from p. 37)

**Tempering.** Before it is milled, grain must be tempered with moisture to soften the endosperm and toughen the bran, which facilitates grinding of the grain and separation of the bran and germ from white flour. Liquid water is added to raise the moisture level of the grain from 12 percent to 17 percent. The grain then equilibrates for 16 to 24 hours before it is milled. However, standard practices do not include a test to determine if moisture equilibrium has been achieved, but instead depend on pre-set soaking times. The 16 to 24 hour hold time for tempered wheat is typically not long enough for mold to grow. Longer hold times, however, are likely to cause tempered wheat with water activities higher than 0.70 to experience mold growth. Since mold, microbial spoilage, and lower rates of rancidity are better correlated with lower water activities than moisture contents, it would make more sense to focus on optimizing the water activity level and then confirm that the moisture content is acceptable rather than to rely on just a moisture content specification.

**Shelf life.** To have value as an ingredient, flour must maintain its quality during storage. The degradative reactions that could potentially [end its shelf life](#) include microbial spoilage, caking and clumping, nutritional loss, color loss, and rancidity. The two extrinsic influences that will most significantly impact its rate of shelf life loss are [temperature](#) and [moisture](#). Wheat and

## The ideal moisture method would combine high throughput testing with a primary measurement, eliminate variability due to changing ambient conditions, and provide a scientific standard for dry.

flour producers currently use moisture content as an indication of whether their product is going to be in danger of molding. However, water activity is not only a well-established predictor of mold and microbial growth, it is also more closely correlated with caking and clumping, nutritional loss, color loss, and rancidity. [Water activity measurements](#) are more repeatable than moisture content analysis, and can be verified using saturated or un-

Table 1: Moisture content of flour as determined at four different ambient humidities.

Ambient Relative Humidity	Method Which Controls Ambient Conditions	Convection Oven
30	11.79 <sup>a</sup>	11.97 <sup>a</sup>
40	11.79 <sup>a</sup>	11.79 <sup>b</sup>
60	11.81 <sup>a</sup>	11.44 <sup>c</sup>
70	11.80 <sup>a</sup>	11.26 <sup>d</sup>

saturated salt solutions. In addition, water activity helps form the basis for the [FDA's definition of potentially hazardous foods](#). Consequently, including water activity in flour specifications is more critical to ensuring quality and shelf life than moisture content.

### Moisture Content Methods for Wheat and Flour

Moisture content is a measure of the quantity of water in a product reported on either a wet or dry basis. In theory, moisture content determination is simply a comparison of the amount of water in a product to the weight of everything else in the product. In practice, it is an extremely complex process to actually obtain reliable results.

There are many ways to analyze how much water is in a product. The Association of Official Agricultural Chemists, or AOAC, lists 35 different methods for measuring moisture content. These are classified as either direct or indirect measurement methods. Direct moisture content methods either force water out of a sample at elevated temperatures and track the weight change or involve a chemical reaction with water and titration. The most common direct moisture methods include air-oven drying and Karl Fischer titration.

Indirect methods do not remove the water from the sample but instead try to predict the moisture content based on either testing under accelerated heat conditions or by correlating another measured

property to the moisture content. These secondary methods require calibration to a primary or direct method. Examples of indirect measurement methods include halogen or infrared-based moisture balances, near infrared absorption, and dielectric capacitance.

The advantage of direct methods is that they are a primary measurement typically with superior precision, but they are also labor intensive and have long analysis times. Indirect methods are typically much faster than direct methods, but are not primary measurements based on ac-

## New Research to Improve Low-Moisture Foods

In 2015, a team from the University of Nebraska-Lincoln (UNL) received a portion of a \$5 million USDA food safety grant to enhance low-moisture food safety by improving development and implementation of pasteurization technologies. UNL will receive \$943,617 over five years.

According to UNL, low-moisture foods, such as nuts, spices, and peanut butter, have been considered at low risk for foodborne illness because they are consumed in a dry state. While microbial growth isn't possible, the bacteria can survive and stay on the food product for a long time. Foodborne pathogens, such as *Salmonella*, can cause illness even at very low levels.

UNL research will focus on improving and developing technologies that can kill the bacteria while not affecting food quality. Research includes looking at radio frequency and extrusion processing of the low-moisture products to inactivate the bacteria. Traditional heating heats the product from outside to inside, whereas technology using electromagnetic waves, such as radio frequency waves, volumetrically heats the product. With these methods, according to UNL, the impact on food quality is minimal because the food can be more evenly heated throughout the product to inactivate bacteria.

Research findings will be disseminated to local food processors in Nebraska and across the country.

In addition to UNL, principal co-investigators on the project are Michigan State University, Washington State University, Illinois Institute of Technology, and North Carolina State University.—*FQ&S*



cepted standards and consequently suffer in reliability. Due to the absence of a scientific definition of “dry,” all moisture methods lack a standard that would allow the comparison of methods or determination of accuracy. These issues can cause problems when determining shelf life because current wheat moisture content specs are so close to the mold-growth limit.

Loss-on-drying methods are also affected by the ambient conditions under which samples are analyzed. It is difficult to obtain reproducible results with all [loss-on-drying methods](#), including both the moisture balance and convection oven, because relative humidity in the lab environment affects the moisture content measurement. See Table 1 on page 38.

The ideal moisture method would combine high throughput testing with a primary measurement, eliminate variability due to changing ambient conditions, and provide a scientific standard for dry. Table 1 shows how much more accurate [moisture content](#) measurement can be when using this type of method.

### Which Water Activity Specs Should Be Used?

**Mold.** A suggested water activity specification for flour and farina would be 0.62-0.68  $a_w$ . As indicated in “[The Case for Water Activity as a Specification for Wheat Tempering and Flour Production](#)” study, this water activity range corresponds with ideal moisture levels for hard and soft flour. In addition, this water activity range

would prevent mold growth and minimize the rate of rancidity.

**Tempering.** Based on the connection between the water activity of whole grain and current tempering moisture levels, it would be feasible to temper to a constant water activity rather than to a moisture level. This water activity level would achieve tempering conditions similar to those currently being used, but with more consistency since water activity is more precise than moisture content and can be easily monitored with instrumentation to determine when tempering is complete.

Finally, grain could be tempered to 75 percent relative humidity using saturated sodium chloride and vapor equilibration techniques. Grain would achieve a uniform water activity of 0.75 without the issues caused by adding liquid water. The equilibration time should be similar to current tempering hold times, so mold growth would not have time to begin. Finally, having a consistent starting water activity for tempered wheat will consistently result in flour or farina water activities less than 0.70  $a_w$ , preventing mold growth and reducing the rate of rancidity.

### Combining Moisture Content and Water Activity

The flour industry has used moisture content levels to control flour and farina quality for many years. Although this procedure has avoided major disasters, it unknowingly placed the specification close to dangerous limits. The addition of a water activity specification would check this possible problem by clearly identifying where the flour or farina is with respect to the growth limits, all with a test that takes less than five minutes.

Further, use of water activity will improve other processes like tempering, where grain can be brought to appropriate relative humidity values that will not only allow excellent processing qualities, but avoid mold growth and other issues. In practice, wheat producers should temper their grain to a specific water activity, then after it has been milled, re-assess the water activity of the flour to make sure it will be safe. A moisture content measurement should then be taken so growers can sell their flour on a weight basis. ■

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# Manufacturing & Distribution

PLANT DESIGN



◀ Flooring needs to combine a variety of properties in order to be effective, including drainage, coving, and slip resistance, as well being able to withstand impacts, thermal shock, and chemicals.

the majority of contaminants to end up on the floor at some point and hazardous microbes can enter under the shoes of employees or on the wheels of equipment.

The importance of maintaining a hygienic floor finish was exemplified recently, as an unclean floor played a key role in the disastrous *Listeria* outbreak at the cantaloupe producers [Jensen Farms](#), which led to 33 fatalities, 142 hospitalized victims, the end of the business, and a criminal record for the farm owners.

## Hygienic Flooring Properties

To minimize these threats, it is essential that the floor is seamless and impervious, as otherwise the germs will build up within any hard to clean gaps or cracks in the floor's surface. Once this has started to happen, harmful microbes can spread to other parts of the facility, infiltrating the equipment, spoiling produce, and potentially becoming the start of a food-borne illness.

Coving will be required at the edge of the floor to create a seamless transition between it and the wall. Without this, substances can get trapped in the space between the two surfaces, where it can become a contamination threat over time. Coving also significantly aids the wash-down process by containing the water and making it easy for the site's cleaners to wash around the sides and corners of the room.

Excess water poses another problem to food facilities as if it starts to pool and stagnate, it can become a prime site for unsanitary microbes and substances to colonize. Floors therefore need to be pitched to a fall with stainless steel drainage incorporated into the finish to ensure that any liquids can easily flow out of the working environment.

While it is important for the floor to be easy-to-clean, this criterion may be at odds

## The Value of Food Safe Flooring

Failing to choose the right floor system can have a long list of unwanted consequences, especially as a cracked, porous, or failing finish can become a prime site for unsanitary bacteria buildup | BY DAVE MCNEECE

**S**afeguarding the hygienic integrity of produce within today's large-scale food and beverage facilities is becoming an ever more complex task—as plants get bigger, demand becomes more intense, and clients expectations increase.

Yet as these manufacturing and logistical challenges are evolving, so too are the cleanliness and quality standards that businesses are required to meet to ensure that contaminants, unwanted microbes, and harmful bacteria don't creep into the food chain.

Not only is minimizing contamination incidents a priority for earning the trust of

retailers and consumers, but governments are also expecting both domestic and foreign businesses to conform to the same high standard in order to protect against foodborne illness outbreaks.

For food that has traveled across vast distances, this means closely scrutinizing the conditions at every point of the food-stuffs journey, including where it is grown, manufactured, processed, packaged, stored, transported, and sold.

Unwanted bacteria, mold, fungi, dust, and grime can potentially enter at a variety of stages and from a variety of sources, however few areas of any facility will be as at risk as the floor area. Gravity will cause



with another crucial consideration—slip resistance. Food and beverage facilities are often wet places in which to work, meaning that an anti-slip finish is vital to keep staff and visitors safe. However, a roughly textured surface can impede the effectiveness of the cleaning regime; therefore a compromise may need to be made when heavy slip resistance and ease of cleaning are both of critical importance.

Incorporating antibacterial additives into the floor is a good way to further minimize the risk from contaminants. Different flooring materials will deliver the bactericidal property in different ways, from chemically treated surfaces to incorporating a natural agent within the finish. The efficacy and longevity of the bacteria killing property will vary depending on the option chosen. The [ISO 22196](#) test method is the accepted food industry standard to ascertain the antibacterial effectiveness of plastics and other non-porous surfaces.

While often unconsidered, the floor's color can be a useful asset to cut down on contamination and to make a facility safer. Bright signage can be used to create walkways that highlight the safest routes around the site while different zones can be given floors in contrasting colors to avoid cross-contamination. This type of color zoning can be beneficial in locations

where, for example, raw and cooked meats are in close proximity to each other and the site operator wants to highlight the crucial difference between the two areas.

### The Challenges of Food and Beverage Flooring

The floor will need to retain all the above properties for an extended period of time, as if any one of these elements is compromised then so too is the site's sanitary integrity! And in the food industry there are a multitude of unavoidable factors that can easily degrade an insufficiently robust floor finish.

A wide variety of food products will inevitably spill onto the floor and could include fats, hot oils, blood, sugar, and natural food acids. These can cause substantial damage to surfaces that don't have a high level of chemical resistance. Uncoated concrete for example will be corroded and quickly become porous in such an environment. These substances can even infiltrate concrete, resulting in microbial growth that is exceptionally difficult to eradicate once it has begun.

In addition, rigorous cleaning and maintenance processes including steam cleaning, pressure washing, hot water washdowns, and the use of aggressive cleaning agents can all place a significant

amount of stress on the floor. If the floor is not coated, or the coating is not up to the task at hand, then these factors could eat into the surface, leaving it susceptible to bacterial penetration.

The amount and type of physical stress that goes into the floor will also need to be carefully considered, as heavy equipment and potential impacts from dropped tools can easily chip a weak surface. Areas likely to undergo heavy foot traffic or where wheeled equipment and forklift trucks are going to be moving across the floor need to ensure that the finish won't crack when put under this level of strain.

Traffic loadings can be especially damaging, for example just a hand pallet truck when fully loaded could weigh over 2,000 pounds. When repeatedly moved, this will put a lot of pressure through the small wheels and into the floor, especially over areas where it is being pulled in a tight turning circle.

The floor's impact resistance should be tailored to your environment, the higher the likelihood of a severe impact, the thicker the floor coating should be to protect the critical bond layer where the coating meets the concrete. The compressive strength of the floor system can be used to determine the suitability of the floor to the task at hand. Going back to the hand pallet

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Floors will face frequent and often intensive cleaning so they need to aid the cleaning regime to ensure that it is a quick and effective process.

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truck scenario, a compressive strength of at least 40 to 50 newtons/square millimeters would be required.

### Polymer Flooring Benefits

Many large-scale food industry facilities are utilizing polymer solutions to ensure that the floor finish provides the required properties, and that it will be able to maintain them for an extended period of time.

Polymer flooring systems are available in a wide range of formulations and can be specified to meet the different needs of the various working areas within a food and beverage facility, such as thickness, chemical resistance, slip resistance, color, and thermal shock resistance. Despite the variety of solutions, polymer floors share many common properties that make them highly applicable to the food industry, including being seamless, impervious, and robust.

Cementitious urethane floors are one of the best types of polymer flooring for production areas and for locations where the floor will be put under intense strain. This capability stems from its thick buildup and high cross-linked density, which means that it is able to effectively resist heavy impacts, corrosive chemicals, sudden extreme temperature changes, and other deteriorating factors.

A 1/4 to 3/8 inch thick cementitious urethane floor finish is particularly advantageous in areas prone to heavy impacts, as not only will it have a good chance of dissipating any impacts, but should a chip ever occur, then it would not progress down to the substrate.

This type of flooring also has excellent temperature resistance and a thermal coefficient of expansion similar to concrete, which means that it will move at the same rate as the underlying substrate during periods of thermal cycling. These properties make it especially advisable for cold stores, blast freezers, furnaces, and the space underneath hot ovens due to the inevitable long periods of exposure to extreme temperatures.

Antimicrobial additives can be incorporated within the polymer matrix of a cementitious urethane system in order to offer an advanced surface protection against harmful bacteria, mold, and yeasts. The Flowfresh range from Flowcrete Americas,

for example, has a silver-ion based antibacterial agent homogeneously distributed throughout the system's resin matrix. The formulation complements regular floor cleaning and hygiene practices between wash cycles.

Methyl methacrylate (MMA) systems offer food manufacturing facilities certain performance advantages compared to alternative polymer materials. The most notable benefit is that MMA floors can cure at incredibly fast speeds and can be installed at extremely low temperatures—which is particularly advantageous for cold storage room renovations as it avoids having to bring the room up to an ambient temperature to recoat the floor.

MMA systems demonstrate a high level of resistance to a range of acids and alkalis and although they have a unique odor during installation, which can be a concern to facilities operators with produce in the vicinity, the odor is harmless and can be minimized during installation with proper ventilation.

The other main form of polymer floors are epoxies, which are typically trowel or roller applied, two- or three-component systems. Epoxies offer limited resistance to organic acids, which are found in a large quantity of natural foodstuffs. They also have a lower resistance to thermal shock, which makes them more susceptible to cracking and debonding in rigorous food and beverage environments.

Epoxies are a good choice for the non-processing zones of a food manufacturing site, such as the packaging, maintenance, staff break out areas, corridors, lobbies, and office spaces, as they will still provide the necessary properties to keep these parts of the building clean and free from contaminants.

### HACCP International Certification

In North America, the USDA, FDA, and CFIA legally mandate facilities operating in the meat, poultry, and seafood sectors to implement food safety management systems based on Hazard Analysis and Critical Control Point (HACCP) principles and hazard prevention. HACCP management systems help safeguard facilities from such things as spoiled produce and tainted equipment while protecting consumers from outbreaks of foodborne illness.

These guidelines state that a seamless and impervious finish must be maintained at all times, even when the floor is being subjected to a large-scale food processing facility's intense working environment. To comply with HACCP, floors also need to allow for adequate drainage and cleaning.

Building materials that have attained HACCP International Certification have been evaluated to international standards and have been established as providing a set of key safety criteria for potential physical, chemical, and microbiological safety risks by a team of degree qualified food technologists and product assessors. This means that food and beverage producers operating a HACCP based food safety program can specify flooring materials, safe in the knowledge that they will meet the relevant regulatory authority's standards for safe procurement, production, and processing as well as the requirements of the world's leading quality and food safety standards.

HACCP International certification is a globally recognized benchmark of food safety, and as such is an important set of criteria for businesses eager to gain access to lucrative export markets.

### Cost and Consequences

If a facility is going to be involved in processing, packaging, producing, or storing food and beverage produce, then the impact of the site's future activity on the floor needs to be carefully considered to ensure that the everyday operations won't deteriorate the floor finish and lead to an unhygienic, unsafe, and unsightly environment.

Failing to choose the right floor finish can have a long list of unwanted consequences for a food producer. Not only could a cracked, porous, or failing surface become a prime site for unsanitary bacteria buildup, but it can also make the site unsafe for staff and unable to meet government regulations, thereby incurring expensive renovation costs.

Once identified, it is important to discuss the demands that will be placed on the floor with the supplier and contractor to ensure that the specified solution will be able to provide a clean, safe, and effective surface for an extended period of time. ■

**McNeece** is managing director of Flowcrete Americas. Reach him at 936-539-6700.



# Moving From Reactive to Predictive Maintenance

Improving production reliability by identifying issues in factory equipment before a failure occurs

BY ERIC MARTIN, CMRP

**P**redictive maintenance (PdM) is a term—and a practice—you should get to know. With the Food Safety Modernization Act, or FSMA, driving new rules for food manufacturers that emphasize preventive controls, the ability to predict critical manufacturing events in your facility is going to become very important, very soon.

As the FDA shifts its focus from reaction/monitoring to prevention/enforcement, food processors will face a much higher standard for prevention. Production equipment is central to that focus. Reliability, especially the reliability of equipment that is improved through PdM, will be a big part of that challenge.

What is PdM? It's a condition-based approach to machine reliability that identifies, measures, and earmarks factory

equipment requiring maintenance before a failure occurs. PdM schedules repairs according to analysis of a machine's health, instead of a time-based schedule.

PdM identifies issues that can't be detected by output or visual inspection. It uses advanced diagnostic and sensing technologies including ultrasound detectors, thermography, vibration analysis, and oil analysis to identify failures at a premature phase. PdM allows maintenance to take place when it is least disruptive and most cost effective; most of all, the practice ensures that production equipment doesn't fall below prescribed performance, quality, and safety standards.

Every major food manufacturer follows FDA [Good Manufacturing Practices](#) (GMPs) for equipment, processes, and controls. Temperature, cleanliness, and

purity are all important; these factors are measured and documented on a continual basis. PdM, as a preventive discipline, supports GMP rules by identifying problems before they occur. It also helps production and maintenance personnel to address issues proactively.

Yet PdM does more than raise food safety—it makes production more efficient as well. With [lean manufacturing](#) techniques now gaining a strong foothold in food manufacturing, PdM supports such initiatives by enabling overall equipment effectiveness and total effective equipment performance. PdM, in fact, can result in both production increases and long-term savings. Research has shown that as much as 30 percent of all time-based preventive maintenance (PM) tasks can be eliminated through the use of PdM.

## Putting PdM Into Effect

Implementing a PdM program, while not an insignificant task, is in many ways an extension of a more conventional PM effort. If you're already doing some level of PM, you'll find that a combination of PM and PdM often achieves the best results.

The first step in adopting PdM is to review and analyze your current maintenance performance. Data is a huge help

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here. Look at maintenance metrics like downtime, mean time between failures, parts spend, technician cost, and response time. Much of this information will be available from your computerized maintenance management system (CMMS) if your facility uses one. With this data you can determine how much economic benefit even small improvements will be worth to your company.

Next, identify the critical machines—those that, if offline, will slow or even shut down operations. Any asset that will negatively impact production, safety, and/or the environment upon failure can be considered a critical machine. Also give weight to machines that experience frequent failures, as these will likely fall into the “critical” category.

The last step in the planning process is to determine your need for critical spare parts. The goal in critical spares analysis is to maximize efficiency. If a part is readily available from vendors and not essential to equipment function, it obviously does not need to be held in inventory; one that takes weeks or months to obtain, however, may be critical in nature and thus should be kept onsite, in reserve.

### Selecting a PdM Technology

With the above information in hand, it’s possible to select one or more PdM technologies for your facility. Monitoring sensors and diagnostic equipment, as well as trained technicians, represent

a significant investment—so you’ll want to go with your most important technologies first.

As mentioned earlier, the most common PdM monitoring technologies are vibration analysis, infrared thermography, ultrasonic inspection, and oil analysis. In most facilities, one or two of these technologies predominate; for example, machines with fans and high-speed moving parts will benefit from vibration analysis, while electrical equipment requires advanced temperature monitoring. Failure mode and effects analysis is helpful in determining statistical norms and thresholds for machines, subsystems, and components.

**With lean manufacturing techniques now gaining a strong foothold in food manufacturing, PdM supports such initiatives by enabling overall equipment effectiveness and total effective equipment performance.**

Data from PdM activity must be tightly integrated into maintenance work processes. CMMS or other work order system is the appropriate destination to ensure that repair/replace work is done in a timely manner. The most advanced PdM program will be of no value if a machine experiencing imminent failure is not serviced promptly.

Finally, it’s important to track and document results. Comparing program progress against baseline data will demonstrate performance, justify cost, and uncover opportunities for further improvement. (Be sure to share results with senior management as well as maintenance and operations staffs.)

Moving from a reactive maintenance mindset to one that is predictive in nature takes time. It also requires C-level commitment since a culture shift in your processing facility will be needed. You can shorten your learning curve by researching models and practices appropriate to your situation; chances are good that no matter how unique your operation seems, someone has solved similar challenges before. Another alternative is to work with a strategic service partner skilled in PdM—someone with the necessary personnel, best practices, and technology to implement your program in the shortest possible time.

While many food manufacturers are still wrestling with the idea of predictive controls, PdM can take you a long way toward achieving the FDA’s food safety requirements. What’s more, the productivity benefits and cost savings eventually more than make up for the investment in PdM.

As you make these critical decisions, ask yourself what is the cost of inaction. Recalls are expensive—and no amount of production efficiency is worth it if the product can’t be safely consumed. Whether designed internally or strategically sourced, PdM is essential to FDA mandates in particular—and food safety in general. ■

Martin is director of operations, industrial parts services for Advanced Martyn Services, Inc. Reach him at emartin@advancedtech.com.



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# Food Service & Retail

EDUCATION



## Emerging Technologies for Employee Development

Food retail and service companies need to develop a strategy for digital training to keep up with shortening attention spans and the latest communication trends

BY MIKE HOLLAND AND SCOTT LANG

**T**he decades-long trend of eating more meals at restaurants and prepared food from grocery stores continues unabated. Restaurant and grocery store managers work in fast-paced, high-risk environments with significant employee turnover. They have multiple overlapping demands on their time, which makes developing employees a daily challenge. To safeguard food, prevent workplace injuries, and protect thin profit margins, their employees require consistent training and reinforcement.

According to a recent “Mind of the Food Worker” study conducted by the Center for Research and Public Policy (CRPP), food workers prefer digital training methods over traditional instructor led training. The study showed that food workers respond better to more frequent training communication—a need that may be answered through digital technologies. Some of the new approaches to learning include gamification, internal social media networks, digital signage, and augmented reality. Let’s take a look at these emerging technologies and how they are helping overcome some of the unique challenges that retail and food service managers face.

### Improving Retention and Engagement with Gamification

Leading food service and retail companies are turning to gamified learning to improve employee retention and engagement. Gamified learning includes interactive exercises, video-game style simulations, virtual rewards, and other means to chart engagement and friendly competition. The [Association for Psychological Science](#) confirms that competition keeps learners engaged, driving retention and higher test scores.

Food service and retail establishments entice users to perform by offering rewards to “players” who accomplish desired competency. Aside from incentives, rewards may include points, leveling up, and/or achievement badges. To maximize the success of the program, the rewards achieved should be visible to peers by use of leader boards.

Additionally, gamification enables companies to track incidents related to actual operating processes. For example, if targeted learning concepts are related to a safety incident, companies should measure the recordable incident data before and after the games are implemented so they can assess the delta. By looking into these metrics, companies may make sophisticated decisions regarding the impact of training on safety and profitability.

Gamified learning also enables companies to track employee progress. The number of attempts it takes employees to correctly answer questions helps to identify whether the lessons are effective, and uncover learning gaps. Tracking by region or location can show specific locations that may be falling behind in overall performance. One large quick service restaurant chain added gamification to training and drove a 42 percent increase in knowledge retention year over year.

### Leveraging Company-Wide Social Media to Fill Knowledge Gaps

Retail and food service chains are continuously introducing new products, in-store promotions, and updating equipment and procedures. Ensuring that all employees across the company have timely and consistent answers to their operational questions can be a daunting task. Formal training can cover the basics, but

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cannot address all the likely scenarios or knowledge gaps that may arise. This is where private, company-wide, social media networks can help.

According to CRPP's study across all age groups, over 80 percent of food industry employees regularly use public social media like Facebook and LinkedIn. Leading companies are leveraging the power of social media by creating private, secure social media networks for their employees.

These networks enable employees to engage in up-to-the-minute, interactive knowledge forums providing a continuous learning path. Employers can add and answer questions in the forum regarding official processes and procedures. Employees, in turn, are given the ability to share their experiences and expertise.

Social networks build camaraderie, and help develop a sense of belonging and loyalty to the company. One major food company using this approach has seen employee questions grow from 3,000 in the first year to over 15,000 questions the next. That's 18,000 questions that might not have been answered with traditional training or supervisory coaching. Imagine the impact this kind of engagement can have on overall operations and employee effectiveness.

### Digital Signage Provides 24/7 Messaging

A recent study by the [National Center for Biotechnology](#) found that the average attention span for adults is now less than eight seconds. With that in mind, retailers and food service establishments are leveraging digital signage to grab employees' attention using short bursts of information. The digital signs are placed in back of house or in employee breakrooms and run key messages in a continuous loop.

Digital signage can be as simple as a continuous running PowerPoint or using customized graphics and animations. Companies may choose to include more complex information that is driven by real-time data specific to each location's key performance metrics. In order for the program to be successful someone must



“own” the program ensuring it communicates key messages and the content is always up to date.

Additional strategies for digital signage include using both corporate managed messages and local, valued information. Messages may display customer feedback, success with in-store promotions, or peer-to-peer rankings on training and performance. Digital signage is also a great medium for sharing birthdays, other milestones, and recognition of exemplary performance to reinforce a connection between the store and its employees.

One major wholesale retailer implemented digital signage to improve OSHA incident rates. The retailer used scorecards and reporting loops giving employees insight into near misses and safety hazards before they became statistics. Their employees are now half as likely to get injured as they were before implementing this program. They've also achieved significant savings on medical claims, worker's comp premiums, and lost work time.

### Augmented Reality—The Future of Immersive Training

Perhaps the most exciting advancement in the digital training world is augmented reality (AR). AR uses a digital device, such as a tablet, to overlay interactive video content into real-world scenarios. The process happens in real time so the user becomes completely immersed in their learning experience.

Some stores have begun developing customized AR solutions to help them to successfully onboard employees. Using

the device's built-in camera, trainees trigger interactions with specific checkpoints throughout the restaurant, warehouse, or grocery store. These checkpoints launch enhanced computer generated imagery (CGI) so that trainees can interact with their surroundings like they never have before. Part of what trainees see is a real-time camera generated image of the store; the other part is an artificial CGI demonstrating a training concept. The virtual scenes illustrate learning objectives in context, on location, and in the

employee's hands.

AR helps food companies to educate employees on what to do when issues arise by providing a digitally simulated, first-hand experience of how to react. Stores may upload virtual food safety, workplace safety, and customer interactions to aid in coaching employees through desired behaviors. Stores that invest in AR incorporate comprehension testing by working exercises into the employee's experience.

New AR technology debuted at FMI Connect in March of 2015 that has the potential to take AR training to the next level. This virtual reality based training technology was developed by Alchemy Systems' Awareness team, which is working to roll out AR training for a few major retailers this year. The technology is currently in development stages for food service.

### In Summary

Trends show that technology will drive employee performance and engagement through 2016 and beyond. Technology enables food industry establishments to take a data driven approach to closing knowledge gaps and improve employee performance. To keep up with preferred modes of communication, it's time for companies to seriously look at how to develop a strategy for taking training “digital” in the year ahead. ■

**Holland** has over 25 years of experience in developing training, communication, and productivity solutions for the restaurant and retail industry at his company Frameworks (acquired by Alchemy in March 2015). Reach him at michael.holland@alchemy.com. **Lang**, as a product manager for Alchemy, works to develop customized solutions for large retailers ensuring corporate culture fits both the needs of the company and its associates. Reach him at scott.lang@alchemy.com.

# NEW PRODUCTS



## Mass Spectrometer

GCMS-QP2020 high-sensitivity gas chromatograph mass spectrometer features a proprietary multi-function ion source, patented high-speed scan control, and a turbomolecular pump (TMP). These features, along with databases and multiple sample introduction devices, enable custom configurations tailored to fit the needs of food laboratories. TMP's heightened exhaust efficiency can improve performance of the instrument when operated using not only helium and hydrogen but also nitrogen. The pump's differential exhaust system evacuates the ion source and quadrupole separately to help achieve optimal instrument conditions while using any of the carrier gases. Ion source technology can create a stable space for ion creation, prevent contamination due to source interactions, and offer the ability to switch ionization modes without venting the system. Shimadzu Scientific Instruments Inc., 800-477-1227, [www.ssi.shimadzu.com](http://www.ssi.shimadzu.com).

## Washstation Dispenser

The Tork Washstation Dispenser is a hands-free, purpose-built dispenser created to handle the challenges of a food processing environment. It is certified by HACCP International and can help mitigate risks and streamline operational efficiencies. Dispenser is water-resistant and doesn't need to be covered or removed from walls during routine sanitation procedures, including high-pressure spray downs. It's designed to channel water off the housing and away from refills inside. This not only avoids bacteria growth from pooling water, but also reduces waste from refills getting wet during cleanup. SCA, [www.sca.com](http://www.sca.com).

## Hand Sanitizing Wipes

Alcohol-free Soft Care Hand Sanitizing Wipes are ideal for retail environments. Available in a dispensing container, the wipes combine a special cleaning and sanitizing formula with aloe, glycerin, and vitamin E to gently moisturize the skin while sanitizing hands. Users simply wet hands thoroughly and allow them to dry. Used wipes are then disposed of to eliminate cross-contamination. The wipes can also be safely used on surrounding surfaces. Sealed Air Corp.'s Diversey Care, 262-631-4001, [www.diversey.com](http://www.diversey.com).



## CO<sub>2</sub>-Generating Absorbent Pad

Pad-Loc Fresh generates CO<sub>2</sub> inside the package to help create an environment that is unfavorable for microbial growth on fresh and processed meats, poultry, seafood, and other food products. Used as a tool in a modified atmosphere packaging, or MAP, strategy, Pad-Loc Fresh enables fresh and minimally processed packaged food products to maintain visual, textural, and nutritional appeal while also helping to extend the shelf life of fresh food products without the need to add chemical preservatives or stabilizers. Pad-Loc Fresh is FDA-approved. Novipax, 630-686-2735, [novipax.com](http://novipax.com).



## Sorting System

CAPTURA FLOW sorts fresh, frozen, dried, cut, poured, and packed products. The system helps ensure that consumers are protected against a multitude of contaminants and impurities such as glass, wood, cardboard, metals, plastics, stones, and also insects, rodents, etc. Products of incorrect color, shape, or with partial defects also are detected and separated. Individual light and air-blast units make it possible to match the system to the sorting task and simultaneously ensure optimized energy and compressed-air consumption. Sesotec GmbH, 224-208-1900, [www.sesotec.com](http://www.sesotec.com).



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### Auto Wrapper

With the 880 Auto Wrapper, operators simply place the trays on the infeed tray and the machine's insertion mechanism and centering belt correctly position any skewed or angled trays in a fraction of a second. It seals the trays, both in terms of appearance and with mechanical precision to prevent any product spillages or leaks at a later stage.

The device reduces film consumption for food retailers. In addition, the alignment and position of the label can be adjusted—monitored by sensors—with a tap on the touchscreen. Wrapper can also optionally support labeling on the bottom of the tray. Step-by-step instructions on the device's large touchscreen display guide operators through the process to ensure the operator is using the machine safely and correctly. The system's operational footprint is less than 20 sq. ft. **Mettler Toledo, 800-638-8537, [www.mt.com](http://www.mt.com).**



### Temperature Data Logger

The OM-21 cold chain data logger is ideal for monitoring the transportation of food and other temperature sensitive products. It can be included in shipping containers or packages to create a time-based history of the conditions experienced so the user can monitor and safeguard products. The lightweight, waterproof, and flat design can fit inside any package. OM-21 is user-programmable, including sampling interval, start delay, temperature units, alarm range, user name, and more. On completion of data logging, a PDF report is automatically generated containing data summary, graph, and tabular results. **Omega Engineering, Inc., 888-826-6342, [www.omega.com](http://www.omega.com).**

### Reinforced Edge Conveyor Belt

DuraHinge Safety Edge is a flex-style metal conveyor belt fabricated with reinforced edge technology to prevent snagging. The belt has a fully secured edge that allows for tight transfers in the food facility. Each end loop sweeps back around to the adjacent end loop to prevent catching while maintaining enough openness for easy splicing. The belt's outside loop dimensions match industry standards allowing it to be a universal fit for all conveyors. Belt can improve employee safety and food handling sanitation, and is ideal for meat and poultry industries. **Cambridge Engineered Solutions, 800-638-9560, [www.cambridge-es.com](http://www.cambridge-es.com).**



## In Other Product News

**OAL** has received a £60,000 grant from **Eastern Agri-Tech Growth Initiative** to develop an automated food manufacturing processes using robotic "chefs" called **APRIL** to boost production, efficiency, and improve the quality of food produced.

**Dynamic Systems, Inc.** releases **SIMBA 2016**, an update of its **SIMBA Meat & Poultry System**, to include more traceability functionality that allows case-level traceability and through re-boxing and processing.

The **DuPont BAX System X5 PCR Assay** for *L. monocytogenes* gains approval as a method extension of **AOAC-RI Performance Tested Method #070202**. In addition, **AOAC-RI** approves a method extension of **Performance Tested Method #100201** to include the **DuPont BAX System X5 PCR Assay** for *Salmonella*.

**3M Food Safety's** **Petrifilm Rapid Aerobic Count Plate** receives **Official Method of Analysis** status by **AOAC International**. In addition, the **3M Molecular Detection Assay 2—Listeria** has been approved by the **AOAC Performance Tested Methods** program.

**Hygiena** swab test results can now be viewed alongside visual inspection results in **Vigilistics' InspectionPro** application.

**In-Quiz-It Software** releases version 7 of the **U-Trap-It System** with new features to manage pests and environmental issues. New enhancements include the ability to enter freehand text notes when reporting issues and the ability to add photos to notes when applicable.

**Sample6** earns a new patent from U.S. Patent and Trademark Office for its phage-based bacterial detection assay. According to the company, the U.S. Patent No. 13/627,060, entitled "Recombinant Phage and Methods," contributes to **Sample6's** process for phage engineering.

**Asenzya, Inc.** launches a new formulation for **BindEASE**, an all-natural sodium phosphate replacement that can increase yield and maintain the texture and flavor of proteins. The updated formulation includes only four ingredients to minimize impact on product ingredient statements.



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## Events

### FEBRUARY

24

**Food Safety Modernization Workshop Series: Beyond the Basics**  
Washington, D.C.  
Visit <http://www.gmaonline.org/forms/meeting/Microsite/FSMASeries>  
or call 202-637-4806.

29-3

**GFSI Global Food Safety Conference**  
Berlin, Germany  
Visit [www.tcgffoodsafety.com](http://www.tcgffoodsafety.com).

### MARCH

6-10

**Pittcon**  
Atlanta, Ga.  
Visit [www.pittcon.org](http://www.pittcon.org).

7-9

**FSMA Preventative Controls for Human Foods Qualified Individual Certification Workshop**  
Logan, Utah  
Visit [www.cfsrs.com](http://www.cfsrs.com)  
or email [cclark@cfsrs.com](mailto:cclark@cfsrs.com).

9-10

**Advanced HACCP**  
Eagan, Minn.  
Visit <https://www.regonline.com/builder/site/Default.aspx?eventid=1751631>  
or email [foodsafety@ecolab.com](mailto:foodsafety@ecolab.com).

10-11

**HACCP Certification Course**  
Amarillo, Texas  
Email [Training@FSNS.com](mailto:Training@FSNS.com)  
or call 888.525.9788 ext. 239.

14-17

**Better Process Control School**  
Columbus, Ohio  
Visit [foodindustries.osu.edu/services/courses-and-training/BPCS-english](http://foodindustries.osu.edu/services/courses-and-training/BPCS-english)  
or email [dean.840@osu.edu](mailto:dean.840@osu.edu).

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**Microbiology & Food Safety Course**  
Atlanta, Ga.  
Visit [http://www.food-safetynet.com/docs/2016\\_FSNS\\_Complete\\_Course\\_Schedule.pdf](http://www.food-safetynet.com/docs/2016_FSNS_Complete_Course_Schedule.pdf).

29-30

**HTST Pasteurization Workshop**  
Columbus, Ohio  
Visit <http://foodindustries.osu.edu/htst>  
or call 614-292-7004.

### APRIL

14

**Microbiology & Food Safety Course**  
Phoenix, Ariz.  
Visit [http://www.food-safetynet.com/docs/2016\\_FSNS\\_Complete\\_Course\\_Schedule.pdf](http://www.food-safetynet.com/docs/2016_FSNS_Complete_Course_Schedule.pdf).

21-22

**HACCP Certification Course**  
San Antonio, Texas  
Email [Training@FSNS.com](mailto:Training@FSNS.com)  
or call 888.525.9788 ext. 239.

### MAY

4-6

**BRC Global Standard for Food Safety Implementation & Internal Auditor Course**  
Amarillo, Texas  
Email [Training@FSNS.com](mailto:Training@FSNS.com)  
or call 888.525.9788 ext. 239.

10-11

**Dairy Lab for Improved Quality**  
Columbus, Ohio  
Visit <http://foodindustries.osu.edu/labtech>.

Employee "Train-the-Trainer"

**Food Safety Workshop**  
Logan, Utah  
Visit [www.usu.edu/westcent](http://www.usu.edu/westcent)  
or email [kimberly.rasmussen@usu.edu](mailto:kimberly.rasmussen@usu.edu).

10-12

**Food Safety Summit**  
Rosemont, Ill.  
Visit [www.foodsafetysummit.com](http://www.foodsafetysummit.com).

12-13

**Advanced Sanitation Workshop**  
Logan, Utah  
Visit [www.usu.edu/westcent](http://www.usu.edu/westcent)  
or email [kimberly.rasmussen@usu.edu](mailto:kimberly.rasmussen@usu.edu).

17-19

**Food Microbiology Short Course**  
University Park, Penn.  
Visit <http://agsci.psu.edu/foodmicro>  
or call 877-778-2937.

19-20

**Quality Control Workshop (GMP)**  
Logan, Utah  
Visit [www.usu.edu/westcent](http://www.usu.edu/westcent)  
or email [kimberly.rasmussen@usu.edu](mailto:kimberly.rasmussen@usu.edu).

23-24

**Advanced HACCP/HARPC Certification**  
Logan, Utah  
Visit [www.cfsrs.com](http://www.cfsrs.com)  
or email [cclark@cfsrs.com](mailto:cclark@cfsrs.com).

25-26

**SQF 7.2 Implementation & Certification**  
Logan, Utah  
Visit [www.cfsrs.com](http://www.cfsrs.com)  
or email [cclark@cfsrs.com](mailto:cclark@cfsrs.com).

# SCIENTIFIC FINDINGS

For access to complete journal articles mentioned below, go to February/March 2016 issue at [www.foodqualityandsafety.com](http://www.foodqualityandsafety.com) or type in article headline in search box.

## ARTICLE: Physicochemical Assessment of Fresh Chilled Dairy Dessert Supplemented with Wheat Germ



This study investigates the effects of different levels and particle sizes of wheat germ on physicochemical properties of fresh chilled dairy dessert. With increasing wheat germ level, dry matter of the dessert increased while the pH decreased. Particle size had no significant effect on these parameters. Increasing the wheat germ content and particle size enhanced darkness, hardness, cohesiveness, and gumminess

of the desserts while decreasing springiness and water release of the samples. Wheat germ level had greater effects on different quality aspects of the desserts than its particle size. The most acceptable dessert was produced with no more than 5.0% wheat germ with either of the particle sizes used in this study. [International Journal of Food Science & Technology, Volume 51, Issue 1, pages 78–86, January 2016.](#)

## ARTICLE: Processing Strategies to Inactivate Hepatitis A Virus in Food Products—A Critical Review

Foodborne outbreaks caused by hepatitis A virus (HAV) are mainly associated with bivalve mollusks, produce (soft fruits and leafy greens), and ready-to-eat meals. The purpose of this paper is to conduct a structured and systematic review of the published literature on the current state of knowledge regarding the stability of HAV in foods as well as efficacy of food processing strategies and to identify and prioritize research gaps regarding practical mechanisms to reduce HAV contamination of foods. In particular, pro-

cessing and disinfection strategies for the three food categories have been compiled in this review, including common and emerging food technologies. [Comprehensive Reviews in Food Science and Food Safety, Volume 14, Issue 6, pages 771–784, November 2015.](#)



## ARTICLE: Wheat (*Triticum aestivum* L.) Bran in Bread Making—A Critical Review

Wheat bran, a byproduct of the industrial roller milling of wheat, is increasingly added to food products because of its nutritional profile and physiological effects. Epidemiological data and scientific studies have demonstrated the health benefits of consuming bran-rich or whole-grain food products. However, incorporation of wheat bran in cereal-based products negatively affects their production process. The organoleptic quality of the obtained products is also

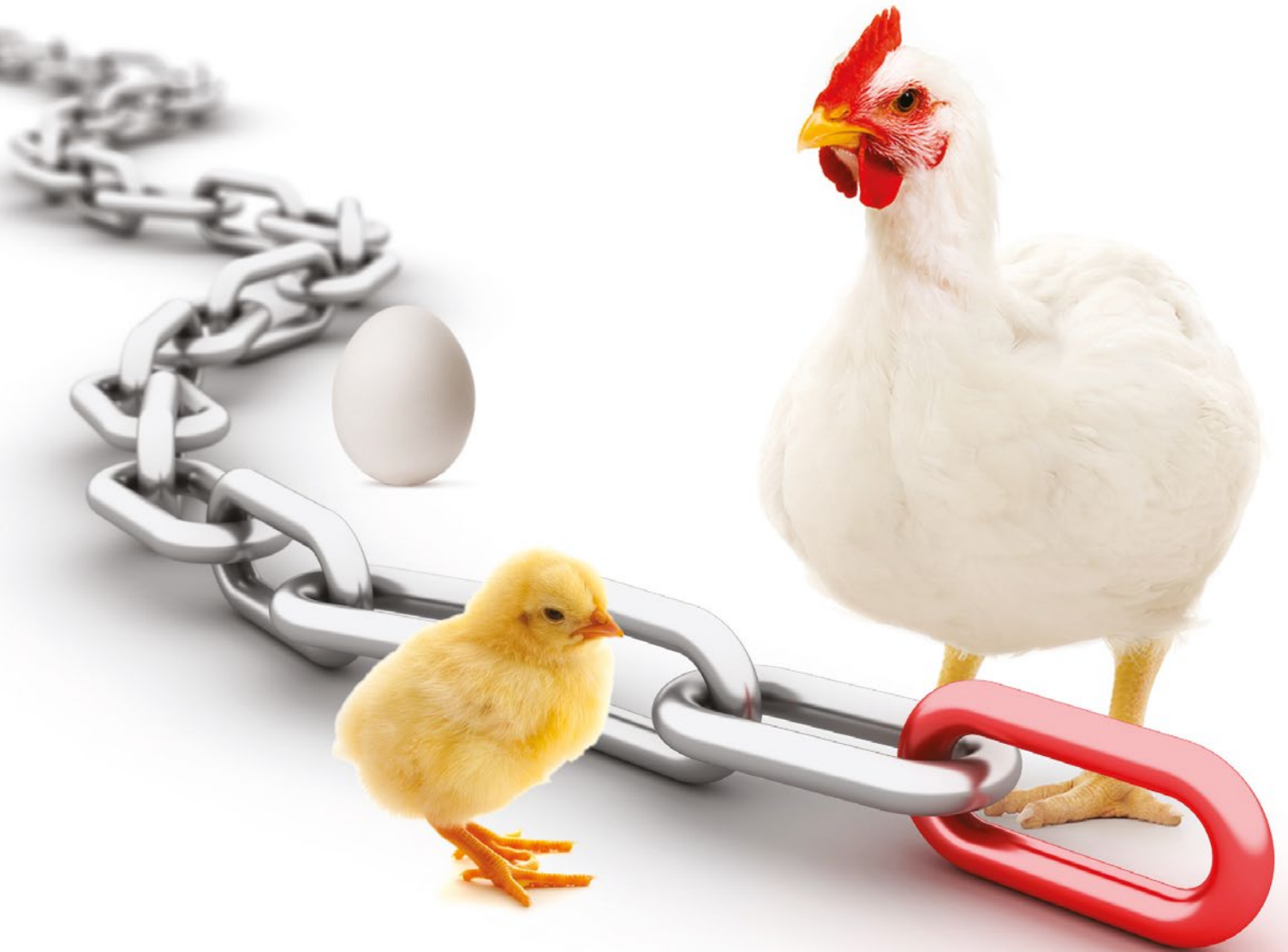
## ARTICLE: Flavor Chemistry of Cocoa and Cocoa Products—An Overview

Cocoa's value and quality are related to unique and complex flavors. Bulk cocoas exhibit strong basic cocoa notes, whereas fine varieties show aromatic, floral, or smoother flavor characteristics. About 600 various compounds (alcohols, carboxylic acids, aldehydes, ketones, esters, and pyrazines) have been identified as odor-active components. The specific cocoa aroma arises from complex biochemical and chemical reactions during the postharvest processing of raw beans, and from many influences of the cocoa genotype, chemical makeup of raw seeds, environmental conditions, farming practices,

processing, and manufacturing stages. Although there has been much research on cocoa flavor components, the relationships between all chemical components that are likely to play a role in cocoa flavor, their sensory properties, and the sources and mechanisms of flavor formation are not fully understood. This paper provides an overview on cocoa flavor from a compositional and a sensory perspective. The nonvolatile and volatile chemical components of cocoa and chocolate flavor, and their sensory properties linked to the main influences in flavor formation, are reviewed. [Comprehensive Reviews in Food Science and Food Safety, Volume 15, Issue 1, pages 73–91, January 2016.](#)



mostly perceived as inferior to that of products based on refined wheat flour. This review summarizes the current knowledge on the impact of wheat bran on bread making, provides an overview of the bran properties possibly involved, and discusses different strategies that have been evaluated to counteract detrimental effects of wheat bran on bread making. [Comprehensive Reviews in Food Science and Food Safety, Volume 15, Issue 1, pages 28–42, January 2016.](#)



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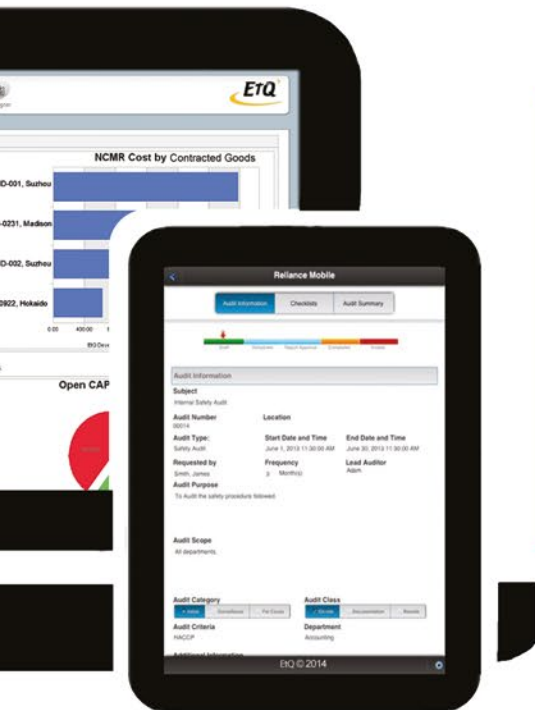
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