

# Food Quality & Safety

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Data sharing and machine learning are transforming food safety—starting in the field

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# From The Editor

## It's Fall Y'all!

**T**he year is flying by! Halloween is at hand, with the holidays right behind it. It's the season that truly celebrates the food industry and all that it can provide consumers.

Regardless of where you are in the world, it's likely there is at least one day dedicated to the recognition of the bounty of the harvest and the blessing of a diverse, plentiful food supply.

For the food safety industry, fall is a chance to shift the focus from the daily battle to protect public health, and simply marvel at the amount of food successfully produced every day that is safe, nutritious, and easily available. So, to all our readers, a hearty "job well done!" Take the time to acknowledge the successes and accomplishments achieved in food safety, something I've been keenly aware of as we at *Food Quality & Safety* conclude celebrating our 30th anniversary serving this industry. Before you know it, a new year will begin, and the focus will shift back to addressing new challenges and opportunities to improve public health.

I would be remiss if I failed to mention the loss of Jimmy Buffet, who lost his battle with a rare form of skin cancer on September 1, 2023. It's a loss felt by his faithful followers, the Parrotheads, along with music lovers everywhere, but also by many in the food industry. Jimmy's marketing skills made the Margaritaville brand one of the great success stories in the food sector. From the song to its founding location in Key West, and finally into a national restaurant chain treasure, Buffet captured the essence of the Florida Keys and the tropical lifestyle in his music and his restaurants. Although not a native Floridian, he embraced the tropical ethos and described it with such unique style in his music that he's been adopted into the Florida native family, something few achieve in a state full of retirees and tourists. Where else could "the lost shaker of salt" become such an iconic representation of both a restaurant chain and a lifestyle option?

I'll close with this simple thank you to Jimmy Buffet, and to his loyal followers everywhere, "Fins up Parrotheads, it's 5 o'clock somewhere."

**Patricia A. Wester**  
Executive Industry Editor



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# NEWS & NOTES



## FDA Names Jim Jones First Deputy Commissioner for Human Foods

BY KEITH LORIA

In August, James “Jim” Jones was named FDA’s first-ever deputy commissioner of the Human Foods Program, effective September 24, 2023. In this role, Jones reports directly to Robert M. Califf, MD, FDA commissioner, and exercises decision-making authority over the program’s entities.

As part of the newly created position, Jones is charged with setting and advancing priorities for a proposed unified Human Foods Program, which could include food safety, chemical safety, and innovative food products that will bolster the resilience of U.S. food. He will also lead efforts on nutrition to help reduce diet-related diseases and improve health equity.

Jones has more than three decades of experience in the U.S. Environmental Protection Agency (EPA), stakeholder community, and private industry dealing with challenges related to chemical safety and environmental sustainability. His work has primarily focused on diminishing the impact of chemicals and pollution on the U.S. food supply. While at EPA, Jones was instrumental in the 2016 overhaul of the Toxic Substances Control Act, the first update of that statute in more than four decades. He also was responsible for deci-

sion making related to regulation of pesticides and commercial chemicals.

Jones was also a member of the Reagan-Udall Foundation’s independent panel of experts that submitted an evaluation of FDA’s Human Foods Program in December 2022, so he’s chiefly aware of FDA’s challenges and opportunities as the agency aims to unify the program.

“I had the pleasure of serving on the expert panel that provided operational recommendations for the FDA’s food-related activities, and I now look forward to helping the agency realize its vision for the proposed Human Foods Program, including carrying out important nutrition initiatives to improve the health of our country,” Jones said in a prepared statement. “As a former pesticide regulator, I have a deep understanding of the unique needs of government programs involved in upholding safety of the U.S. food supply, as well as the important role that the agriculture community and state partners play in this paradigm.”

Mike Taylor, former FDA deputy commissioner for foods and veterinary medicine and a board member emeritus of STOP Foodborne Illness, says Jones is the perfect choice for this critical role. “Commissioner Califf’s important organizational changes in FDA’s Human Food Program and full empowerment of the deputy commissioner make needed, unifying change possible, in the public health interest of America’s consumers and in the interest of the food system on which we all rely,” Taylor tells *Food Quality & Safety*. “Jim brings the vision and collaborative leadership style needed to make that change happen.” ■

## REDUCE Act Aims to Cut Down on Single-Use Plastic Products

BY KEITH LORIA

Several lawmakers have proposed legislation that would establish an excise tax on virgin plastics used to make single-use products. Known as the Rewarding Efforts to Decrease Unrecycled Contaminants in Ecosystems (REDUCE) Act, the proposed

tax would begin at 10 cents per pound of virgin plastic in 2024, increasing to 15 cents per pound in 2025 and up to 20 cents in 2026.

The bill is sponsored by Senators Sheldon Whitehouse (D-RI), Ron Wyden (D-OR), Chris Van Hollen (D-MD), and Robert Menendez (D-NJ), in addition to 26 members of the House of Representatives.



Food and beverage companies use plastics produced through packaging used for products, food and beverage containers, and food service products (such as polystyrene foam containers) and, if passed, the legislation would have a large impact on these organizations.

Food and beverage manufacturers would need to replace plastic with solutions that can be recycled and are more environmentally friendly, and likely come with a higher price tag. The tax is intended to incentivize a switch to these alternative materials.

One part of the proposal would direct revenue from the virgin plastic fee into a fund that would promote plastic waste reduction and recycling activities, such as improving recycling infrastructure, carrying out marine debris reduction, detection, monitoring, and cleanup activities. ■

## FDA Releases Recommendations for Sprout Production

FDA has released two guidance documents that outline recommendations for how sprout operations need to comply with the Produce Safety Rule.

The first is a guidance (2023 Final Guidance) that updates and finalizes some sections of the January 2017 Draft Guidance entitled “Compliance with and

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Recommendations for Implementation of the Standards for the Growing, Harvesting, Packing, and Holding of Produce for Human Consumption for Sprout Operations.” These sections include:

- Cleaning and sanitizing;
- Agricultural water in sprout operations;
- Seeds for sprouting;
- Environmental monitoring; and
- Recordkeeping.

The second guidance (2023 Draft Guidance) re-issues certain sections of the January 2017 Draft Guidance and issues one new section for sprout operations as revised draft guidance. The following updated and new sections in the revised draft guidance are now available for comment:

- Equipment, tools, and buildings;
- Sampling and testing of spent sprout irrigation water (or in-process sprouts); and
- Personnel qualifications, training, and hygienic practices.

The revised draft guidance is available for comment, and FDA has said it is particularly interested in receiving information about testing of spent sprout irrigation water or in-process sprouts that sprout operations are currently conducting for non-O157:H7 pathogenic *E. coli*, including test kit names. Comments can be submitted at [regulations.gov](https://www.regulations.gov). ■

### CDC UnCOVERS New Strain of *E. coli*

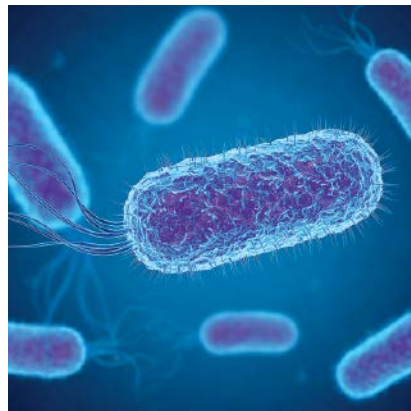
BY KEITH LORIA

The Centers for Disease Control and Prevention (CDC) has uncovered a new strain of *E. coli* that has been responsible for multiple outbreaks of foodborne illness over recent years, including some related to romaine lettuce and other leafy greens.

The REPEXH02 strain is believed to have first come to light at the end of 2015, with the agency noting that it was responsible for dozens of hospitalizations and many cases of hemolytic uremic syndrome (HUS), a serious issue that can often impede blood clotting in infected people and cause kidney failure.

A study by CDC researchers utilized whole genome sequencing to examine the DNA of a strain and track the bacteria that cause foodborne illness, which allowed them to determine whether outbreaks were caused by the same strain, and the link involved with others. The new strain consists of two clades with different geographic distributions, one of which has notable genomic features.

*E. coli* O157:H7 is estimated to cause 63,000 domestically acquired foodborne illnesses and 20 deaths in the United States each year, according to the CDC. The agency found that 58% of recent *E. coli*-related illnesses were attributed to vegetable row crops, with the majority coming from leafy greens. In 2019, a large outbreak related to romaine lettuce from California’s Salinas Valley caused 167 cases and hospitalized 85 people from 27 states. In 2020, 40 infections occurred in 19 states, 20 people were hospitalized and four developed HUS.



The newly identified strain has a toxin type associated with more severe disease in those infected, according to the CDC. Still, additional study is needed to understand factors that contribute to the bacteria’s emergence and persistence in specific environments, the study authors note. ■

### FDA Updates Infant Formula Compliance Program

FDA has released an updated infant formula compliance program for FDA investigators, laboratory analysts, and compliance officers. The program is designed to outline the agency’s approach for inspections, sample collection, sample analysis, and compliance as part of its

effort to strengthen the safety, resiliency, and oversight of the formula industry.

In September 2022, FDA released its internal evaluation of the infant formula response, which recommended that the agency review and update its compliance program to ensure it reflected the latest science on *Cronobacter*.

The agency says the updated program builds on lessons learned over the last several years to expand on its approaches for inspections, sampling, laboratory analysis, and imported formula products. For example, updates include instructions for annual environmental sampling of *Cronobacter* and *Salmonella* at powdered infant formula facilities. The compliance program provides instruction for FDA notification should a sample test positive for either pathogen.

The compliance program also includes instructions for how product or environmental positives identified during records reviews should be immediately escalated to the appropriate subject matter expert within the Human Foods Program.

Additional background on the risks associated with *Salmonella* and *Cronobacter* in formula products, and the conditions that could lead to environmental contamination within the manufacturing facilities, is included in the updated compliance program. In addition, it further elaborates on new, related requirements included in the Food and Drug Omnibus Reform Act of 2022.

All updates related to the oversight of infant formula can be found at [fda.gov](https://www.fda.gov). ■

### New Bill Would Require USDA to Buy More Fresh Produce from U.S. Growers

BY KEITH LORIA

A new bill, known as the Fresh Produce Procurement Reform Act, aims to allow local and regional supply chains the opportunity to distribute U.S.-grown fresh produce to those in need. The bill was introduced by U.S. Representatives Rosa DeLauro (D-CT-03) and David G. Valadao (R-CA-22), along with Sen. Sherrod Brown (D-OH).

If passed, the legislation would require USDA to collaborate with growers, distributors, and food hubs to offer fresh, U.S.-grown fruits and vegetables to community organizations, including youth organizations, schools, tribal governments, and local food pantries. It would also prioritize





socially disadvantaged farmers and entities, regional food inequities, and local and regional food systems.

The Fresh Produce Procurement Act would also provide greater opportunities for a variety of high-quality produce sourced, packed, and distributed from new growers and distributors, such as women-owned, and socially disadvantaged members of the agriculture community. “This bill not only helps our neighbors in need, but it also helps our domestic agriculture sector by ensuring the produce they grow is being put to good use,” said Rep. Valadao.

The sponsors of the bill note that USDA’s current food procurement model makes it challenging for highly perishable fresh fruits and vegetables to be promptly procured and delivered to the community and, as of now, food options are limited to five fresh produce varieties. They expect the legislation to strengthen access to a wide variety of U.S.-grown fresh fruits and vegetables to recipients in need by including at least seven types of U.S.-grown fresh fruits in vegetables to vulnerable communities. ■

### HHS Recommends Reclassifying Cannabis as a Schedule III Substance

BY KEITH LORIA

The U.S. Department of Health and Human Services (HHS) has recommended that the Drug Enforcement Agency (DEA) reclassify cannabis from Schedule I of the Controlled Substances Act to a Schedule III substance, according to *Bloomberg*, which obtained a document sent to Anne Milgram, head of the DEA, from an official at HHS.

Currently, cannabis is classified as a Schedule I controlled substance, which designates it as a drug with no currently accepted medical use and that carries a high potential for abuse. Therefore, the manufacture, sale, or possession of cannabis is

federally illegal, even for personal medical purposes. A Schedule III substance is an FDA-approved drug that offers moderate-to-low potential for physical and psychological dependence and that is legal with a prescription.

Aaron Smith, executive director of the National Cannabis Industry Association (NCIA), says that moving cannabis from Schedule I to Schedule III would mean that the federal government is acknowledging the medical efficacy and relative safety of cannabis for the first time since President Nixon declared the war on drugs in 1971.

However, he added, a rescheduling would still not resolve the fact that federal law is in conflict with the vast majority of state laws that allow some form of legal cannabis to be sold through state-licensed facilities, including the current 23 states that have legalized cannabis for nonmedical purposes. “The only way to fully harmonize state and federal laws is to remove cannabis from the federal Controlled Substances Act and regulate cannabis in a manner similar to alcohol, and [the NCIA] consider[s] the move to reschedule as a step toward that goal,” Smith tells *Food Quality & Safety*.

A move to Schedule III would open the door for cannabis-derived pharmaceutical products to more easily come to market by



undergoing FDA’s new drug approval process; however, says Smith, “the cannabis industry as we know it is not positioned to navigate that process nor are most cannabis consumers likely to shift from whole plant cannabis products to a pharmaceutical alternative; therefore, the impact [of a reclassification] on the cannabis edible and beverage space would likely be limited, as these businesses that are currently violating federal law with a Schedule I drug will be doing so with a Schedule III drug after rescheduling.”

Currently, it’s unknown whether FDA would begin to take enforcement actions against the industry once it is placed in a Schedule III classification. Smith considers this an unlikely outcome, given the enormous public support for the legal industry. “One big positive impact of rescheduling is that state-legal cannabis businesses would be able to take business deductions on their federal taxes, as Tax Code Section 280E would no longer apply,” Smith adds. “This is unquestionably a big step forward for the industry and for supporters of cannabis reform. Rescheduling would not bring cannabis policy into the modern age, but it does move us in that direction.” ■

### California Passes Law Banning Certain Additives in Food



In early October, California passed a first-of-its-kind bill banning red dye No. 3., potassium bromate, brominated vegetable oil, and propyl paraben from foods and beverages.

These four chemicals have previously been banned in 27 nations in the European Union. A fifth food additive, titanium dioxide, was previously included in the original bill; however, it was dropped because it didn’t have bipartisan support.

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# Washington Report



## The EATS Act

A group of lawmakers are pushing to include the controversial Ending Agricultural Trade Suppression Act into the 2023 Farm Bill; others say it could upset state autonomy

BY KEITH LORIA

In response to the U.S. Supreme Court's May 2023 decision in *National Pork Producers Council v. Ross* to uphold California's farmed animal confinement law, Proposition 12, Senator Roger Marshall (R-KS) and Representative Ashley Hinson (R-IA) introduced the Ending Agricultural Trade Suppression (EATS) Act. If enacted, this legislation would federally overrule California's law that, in part, prohibits the sale of pork from pigs confined to gestational crates, and similar state and local health, safety, and animal welfare laws.

The EATS Act is the most recent incarnation of legislation initiated by former Representative Steve King (R-IA) to counter state animal protection laws, which was unsuccessful in being included in both the 2014 and 2018 U.S. Farm Bills. New efforts, however, are underway to include the EATS Act in the

next Farm Bill, which is expected to be finalized by the end of 2023.

In its decision, the U.S. Supreme Court acknowledged that California's law highlighted the constitutional power Congress possesses to "regulate commerce ... among the several states," and suggested that Congress could displace the legislation by exercising its commerce power and enact legislation that regulates the interstate trade of pork.

Still, plenty of opposition to the EATS Act exists, with many claiming that the proposed legislation would curtail the ability of state and local governments to regulate the production and sale of agricultural products, potentially nullifying more than a thousand state laws.

In an August 2023 letter to the House Agriculture Committee, 150 lawmakers cautioned that the act would harm America's small farmers, threaten numerous

state laws, and infringe on the fundamental rights of states to establish laws and regulations within their own borders. "The EATS Act goes beyond overturning Proposition 12 to threaten many other state laws," the letter stated. "The bill is particularly draconian in that it aims to negate state and local laws even if there is no federal standard to take their place, creating an overnight regulatory vacuum. In doing so, [it] would drastically broaden the scope of federal preemption and impede the ability of voters and elected officials to enact laws that address local concerns."

### State Sovereignty

A July 2023 report by the Brooks McCormick Jr. Animal Law & Policy Program at Harvard Law School in Cambridge, Mass., analyzed the legislation and presented potential widespread consequences if the EATS Act passes. The report called the proposed legislation "unconstitutional" and said it would threaten states' rights, consumer safety, and farmer livelihood.

Kelley McGill, a regulatory policy fellow at the program and author of the report, says the act raises potential constitutional questions related to the 10th and 11th Amendments in addition to state sovereignty. "Enactment of the EATS Act likely would spawn litigation that could tie up the legislation in courts for years to come," she says. "This litigation would create years of regulatory uncertainty for food and agriculture industry participants, regulators, and consumers. Without regulatory certainty, it will be difficult for the industry to accurately conduct the forecasting necessary to make business decisions and move forward with plans."

When it comes to states' rights, McGill says that the EATS Act would upset the long-standing, constitutional balance of power between the 50 states and the federal government. "It would shift agricultural oversight power away from the states and to the federal gov-

ernment,” she says. “Federal agencies, such as USDA and FDA, would need to fill regulatory voids created by the EATS Act, and the federal judiciary would have to review a likely onslaught of challenges brought against and under the legislation.”

What’s more, her report says the act could prohibit the enforcement of numerous state and local regulations related to food safety, food quality, and product labeling, exposing consumers to new risks. “The EATS Act also could affect certain state and local regulations on pesticides and fertilizers as well as future restrictions on the use of antibiotics or growth hormones, soil or irrigation quality requirements, PFAS contamination thresholds, manure management practices, and limitations on genetic engineering and other technological processes,” McGill adds.

The livelihoods of farmers would also be affected, she says. “The EATS Act could prohibit certain state and local regulations governing pests and diseases, removing critical tools that help protect farmers and their crops and livestock from the spread of invasive pests and disease,” McGill says. “The prohibition of these regulations by the EATS Act could jeopardize entire sectors of the agricultural economy and threaten the livelihoods of local producers. The EATS Act also would devalue significant infrastructure investments made by certain farmers in order to comply with state laws.”

### The Cost of Compliance

Shawn Stevens, a food industry attorney with the Food Industry Counsel and a member of the *Food Quality & Safety* Editorial Advisory Board, says that certain states, such as California, have essentially come close to reaping havoc on the food industry on a national level by creating their own sets of rules that apply to various food commodities, and he believes this isn’t good for business or for the consumer. “If we harken back to Upton Sinclair, who wrote *The Jungle* in the early part of the last century, what he described was a mishmash of rules and regulations—and in some cases, no regulations—applicable to the slaughter and processing of beef,” Stevens says. “Because of this, every state was doing their own thing, and it made it difficult, if

not impossible, to efficiently produce and sell food products throughout the U.S.”

In response, Congress passed the Federal Meat Inspection Act (FMIA) in 1906, which set a single set of standards applicable to slaughter and processing facilities throughout the country, for all meat and poultry. “The idea was to create a uniform set of standards so everyone was operating on the same level and the consumer knew what he or she was getting,” Stevens says. “It enhanced, improved, and supported interstate commerce.”

[The EATS Act] would create years of regulatory uncertainty for food and agriculture industry participants, regulators, and consumers. Without regulatory certainty, it will be difficult for the industry to accurately conduct the forecasting necessary to make business decisions and move forward with plans.

—KELLEY MCGILL

There’s also a clause in FMIA that prohibits states from creating any additional or different rules than those set forth in the act. “The EATS Act, in essence, is mirroring the preemption clause in FMIA, but extending that clause to agricultural products, through the raising of cattle or other animals intended for slaughter,” Stevens says. “I think it’s a great idea, and I don’t see why anyone would oppose this, unless you’re a senator from California. Therefore, this is as constitutional as you can get.”

The National Pork Producers Council (NPPC) is one group that supports the EATS Act, citing concerns about the cost of compliance with certain state laws for some pork producers. The group also notes that U.S. pork producers are struggling economically. Since Proposition 12 requires capital investment that many

producers will not have access to and that will lead to further consolidation between producers who have financial resources and those who don’t, fewer family farmers would continue to operate, says the organization.

Scott Hays, NPPC’s president and a pork producer from Missouri, says that a bipartisan, legislative solution to Prop 12 that ensures affordable, healthy pork products remain available to all Americans, including Californians, is fundamentally important for America’s pork producers. “Therefore, NPPC supports a legislative solution that helps us achieve that goal, which gets right at the fabric of our democracy—by not restricting trade between states,” Hays adds. “The implications are far reaching for agriculture and will stretch to other industries if a solution is not reached.”

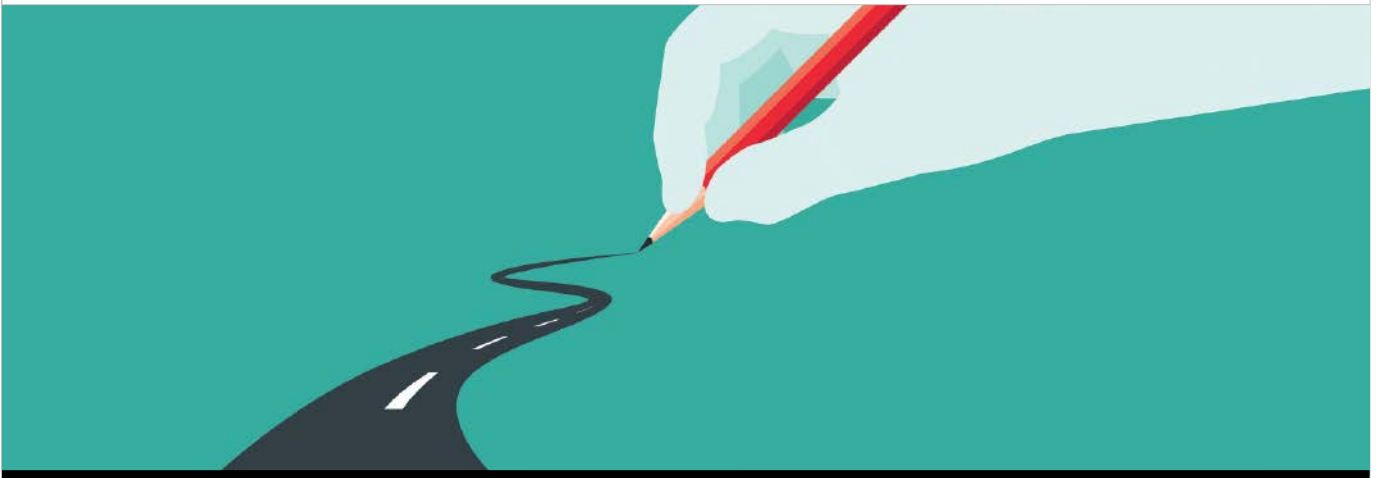
### Potential Impact on the Food Industry

McGill believes that if enacted, the legislation would cause significant disruption and uncertainty for producers and regulators in the food industry. “Many key terms are undefined in the legislation, leaving open the potential scope and effects that it might have,” she says. “State and local governments may stop enforcing a wide swath of their food and agriculture regulations rather than risk being sued under the expansive private right of action created in section 3 of the legislation. State and local governments also may be chilled from enacting new regulations related to food production to avoid costly litigation.”

Stevens disagrees that it would be that disruptive and stresses that it’s an important piece of legislation that must be passed. “If it is approved by congress and signed by the President, nothing will change; it will be the status quo, and everyone will be happy,” he says. “If it’s not passed, it could be seen as an endorsement to California and other states to go and make whatever rules they want and apply them to the raising of livestock, and we can end up in this crazy swirl where the only place you can get affordable beef is at your local corner butcher shop.” ■

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# Career Development



## Training a 21st Century Workforce

We must build a path for the next generation of food safety experts

BY PATRICIA A. WESTER

**T**he courses required for food safety fundamentals are available to everyone involved in food safety. Hazard Analysis and Critical Control Points (HACCP) and Preventive Controls Qualified Individual (PCQI) were developed with federal funds and provide the backbone of food safety knowledge applied industry wide.

It's clear that this is where many go for the basics, but where do the food safety experts who teach these fundamentals come from?

Beyond entry level courses, formal continuing education sources get a little sketchy. Of course, there should be refresher training provided by the employer every year, but that doesn't provide the employee an opportunity to add new subject matter to their knowledge base. Until recently, there weren't any advanced academic options beyond pure chemistry or microbiology.

There are third-party courses in specialized topics that can offer people ways to learn about new topics or gain advanced knowledge, but these courses can be very specific and they're often too expensive to take in significant numbers. Course topics include document controls and electronic signatures, specialty food production courses such as better process controls (canned foods) and environmental monitoring plans (EMPs) for ready-to-eat foods. These courses provide certificates of completion that are recognized by industry and add to a person's list of accomplishments.

Often, it's up to the employee to pay for advanced training out of pocket; this is particularly true for independent contract auditors. But even if expenses are company reimbursed, this is an extremely expensive structure for advanced learning that usually forces companies to limit attendance.

These courses are taught by experts with documented credentials in those fields—instructors who have had additional training and experience that allow them to present the topic and address any questions.

There are other experts out there; Food safety is a broad field with many niche areas to explore. We read about them through articles in trade magazines or see them speaking at meetings. In fact, these meetings are some of the most common means of expanding knowledge base or exploring new areas. But again, this is expensive from a different perspective. There may be one session on a topic of interest in a two- or three-day agenda. Travel costs and meeting fees add to the total cost but those are the only receipts available as proof of attendance. Was the session actually attended, or was the hour spent catching up on work? Or worse, was the hour spent playing games on a phone? There are no individual certificates by topic that could be used to build a portfolio of learning. So, we're left with little evidence someone even attended the available sessions, much less learned anything from the expert speaker's presentation.

Another challenge is determining which speakers are the true experts, and which ones are not. Some were once experts in a given topic but are now out

of date, some were never experts but seem to appear on nearly every conference agenda; there is a mix of everything. Sometimes you can get opposing opinions at the same event, and yesterday's best practices can be today's worst ideas.

### How Other Industries Work

For employees, the same credit is given to those who played computer games by the pool at a meeting as it is to those who sat earnestly listening and taking notes in every session. If there is a career ladder in food safety, exactly how does one climb it under these circumstances? As employers, how do we differentiate among applicants to ensure we select the best and brightest? The fact is, the answer to both questions is the same: We don't. We pick one and hope for the best. As staff, we simply hope we're the ones picked.

This is a perfect example of how not to develop a well-trained work force that sees job advancement in their future. Yet, it's the one that's been in use in the food safety sphere for decades. So, how do we break this cycle?

You might be surprised to hear that this is not how other industries work. Where academic paths are not available, a vocational option is developed that allows personnel to document and track their work knowledge growth. These options are backed by verifiable knowledge retention methods that are tried and true. Credentials that include both good and bad reports show who is truly dedicated to job growth.

All of that and more can be accomplished in food safety. We simply need to decide we want—no, need—a better way of doing things and it can happen. We cannot rely on regulatory agencies to set the bar; that got us started with HACCP and PCQI curriculums, but that bar will be too low for the rapidly changing landscape of food safety. This change must come from within, from industry leaders who demand better-trained staff, not cheaper training that the head of QA can get budgeted.

PCQI rules give us a starting point for this change. A few little-known requirements make it the owner or person in charge's responsibility to ensure staff are qualified and trained for their assigned job tasks.

- **117.310 states:** The owner, operator, or agent in charge of the facility must sign and date the food safety plan upon initial completion and sign and date if any modifications are made to the food safety plan.

- **117.4 states:** The owner, operator, or agent in charge of the facility must ensure that all individuals who manufacture, process, pack, or hold food (subject to subpart C, D, E, F, or G of this part) are qualified to perform their assigned duties and must have the education, training or experience to perform assigned duties and must be trained in the principles of food hygiene and food safety.

If we use the tools provided within FSMA's preventive controls rules, we can justify revising the entire food safety training system. We can show the leaders in corporate food manufacturing that a new approach is in their best interest, because it's no longer the responsibility of a HACCP manager or QA supervisor; now it's up to them.

### A Seismic Shift

FSMA makes clear that corporate accountability was an achievable goal and they included the language in the regulations to make it a reality. Sadly, it failed to get the attention it deserved in the initial launch period, and the pandemic has certainly set things back even further. Few even realize it's there. My guess is that training funding would explode if CEOs realized the lack of it will fall squarely in their lap if a food safety failure occurs. If it were me, it would be the first thing I would present during budgeting.

One way or another, the food industry needs to shift its approach to employee training and knowledge building. We need to define the skills necessary to develop a well-rounded food safety professional. More than anything, we need to attract new talent and keep them by creating a solid career path that rewards the extra time and effort they've invested in this career choice.

At a time when student loan forgiveness is a frequent news topic, launching a well-paying career that does not require a four-year degree should be an easy task. Why aren't we doing that? Certainly, the food industry is reluctant to change,

We simply need to decide that we want—no, need—a better way of doing things. We cannot rely on regulatory agencies to set the bar ... this change must come from within, from industry leaders who demand better-trained staff.

much less change quickly. But this idea has been percolating for a few years now; it's no longer new.

Some legislative accomplishments have made new job development attractive. "Green" jobs are the coming thing and, to me, there's nothing greener than food production. People have been eating since the dawn of time and a lot of methods haven't changed much since then. Now is the time to take something as old as making food and make it new again.

This is already being done in new product development. Plant-based proteins are already on the market. Vegan beef is out there. People's tastes are changing. There must be a way to align both objectives and finally bring food safety training into the 21st century. There is no institutional memory to rely on when producing new foods such as plant-based proteins, no years of experience to define job duties.

More importantly, we are short-handed now and will be for the foreseeable future unless we take a new look at an old problem and develop new solutions. We must attract new, younger, and more enthusiastic staff and show them a path to advancement, not just to more work. We need better, targeted training that's traceable to defined curriculums. Job advancement based on meeting goals and objectives will provide that option. Demonstrating knowledge and understanding of food safety principles to address emerging concerns will give employers options to grow their food safety teams. That's where the next generation of experts will come from. ■

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# GUEST EDITORIAL

## What's For (or in) Dinner?

The booming meal kit industry needs stricter regulatory oversight

BY TYLER WILLIAMS



The meal kit industry continues to grow rapidly, with a market size projected to reach \$17.8 billion in 2023, compared with \$13.50 billion in 2022, according to a report from The Business Research Company. But this relatively new sector of the food industry faces some additional growing pains.

For example, FSIS reported last year that ground beef products in HelloFresh meal kits may have been associated with reported illnesses related to *E. coli* infection. Additionally, the plant-based meal delivery service Daily Harvest voluntarily recalled its French Lentil and Leek Crumbles product after dozens of people who ate the product became sick. *The Wall Street Journal* reported that several had to undergo gallbladder surgery after eating the product.

The flurry of alarming news raised concerns about the regulatory environment surrounding meal kit delivery services. The biggest issue? The lack of targeted regulatory oversight. For now, the places where meal kit delivery and food safety intersect represent a sort of wild west of food production and distribution.

A positive development happened in December 2022, however, when a trio of federal agencies—USDA, FDA, and the Centers for Disease Control and Prevention (CDC)—issued a 49-page guide for how to ensure food safety in the third-party delivery (TPD) industry. The guidelines are not regulations, and companies do not have to abide by the suggestions, but they represent a good first step.

Either way, the industry's lack of specific oversight does not mean that

the products completely escape safety inspections. When food products of any kind are manufactured and packaged, they follow normal federal regulations and oversight. So, that vacuum-sealed bag of chicken thighs or the pouch of rice for a kung pao chicken meal does withstand USDA and FDA scrutiny, but once it's packaged up into a box for shipping, it's a different story.

### Navigating the "Last Mile"

The main problem with meal kit food safety revolves around everything that happens once a kit leaves a company's facility and heads to a person's home—what FDA dubs the "last mile."

With traditional food channels, such as grocery stores, the link between the manufacturing facility and the refrigerated shelves of the supermarket remains intact. The trucks are refrigerated if items require refrigeration. Inspectors scrutinize the trucks for signs of rodents or insects, and for holes in the truck that allow unwanted creatures and substances to enter. When the trucks reach their destinations, workers unload the boxes and direct them to their proper places, including freezers and refrigerators. All of this undergoes recordkeeping and regulatory oversight.

But with most meal kit deliveries, oversight vanishes once the products get packed into boxes. From there, companies use services such as UPS, the U.S. Postal Service, DHL, Amazon Prime, and other delivery outfits to ship boxes to customers. What else are the trucks carrying, other than the meal kits? Potentially hazardous substances, such as containers of

Drano and dishwashing detergents, aerosol cans, nail polish remover, pesticides? It might all be packed helter skelter in a delivery truck. Once the products reach their destinations, often front porches and apartment lobbies, they sit until their owners whisk them away to their kitchens and ovens. This entire leg of the journey lacks FDA or USDA oversight.

The meal kit facility itself can stand as a source of concern. A wilderness of potentially unregulated control points there could affect food safety. For example, workers at a meal kit company could use unsanitary tables to repackage food they have received from suppliers, such as meat processors.

Still, I think the larger issue hinges on delivery. The COVID-19 pandemic disrupted mail service, for example. Supply chain issues combined with labor shortages and increased reliance on home deliveries snarled delivery times. With many meal kits, packages are supposed to arrive within two to three days, and the cooling device they contain will be dry ice. But what happens if it takes five to seven days to get the package out? In a regulated environment, this would be rare, but in the world of meal kit delivery, it can be anyone's guess.

The topic has been batted around in food safety circles for several years, especially regarding food delivery in general. Uber Eats and DoorDash have become prominent channels for food delivery, but the drivers have no training in food safety. Large companies that engage with food delivery, such as national pizza chains, often train their drivers in food safety and incorporate

The main problem with meal kit food safety revolves around everything that happens once a kit leaves a company's facility and heads to a person's home—what FDA dubs the “last mile.”

protocols and procedures surrounding packaging and temperature control that help protect food. But with TPD services, this training is absent. The same applies to meal kits. When it comes to the delivery part of the equation, training in food safety doesn't happen.

### Safeguarding Meal Kits Without Regulations

So far, the consequences of this lack of regulation have not been especially traumatic on a grand scale, but all it takes is one big food safety fail to change everything. I do believe FDA will eventually

get more involved. Perhaps they will release more than just suggested guidelines, but right now, it's such a petite sector of the food industry that it doesn't dwell in the bullseye of the radar.

Until the meal kit industry submits to stiff oversight, I think these companies must continue to improve. One thing they can do is perform a risk assessment to determine what could be at risk. What if the package arrives one day late, or the ice doesn't last as long as anticipated? What if the temperature outside is especially blazing? That's where working with experts in food safety makes a difference—they understand the key variables and can help reduce risk as much as possible.

While consumers shouldn't assume that meal kits delivered to their doorstep are safe upon arrival, the consumer does have the critical responsibility of cooking the food to its proper temperature. The risk for *E. coli*, for example, diminishes dramatically when food is cooked properly. Some people like to eat burgers and hear the cow moo. It's never a safe idea, but overly rare burgers can be especially

risky with meal kit delivery. Consumers don't know how long a package has been in transit, what kind of truck was used, and how long the package sat outside the house. Given all of these factors, it's vital for consumers to always follow directions closely for how to cook meal kit food.

The meal kit market is a new one, and I welcome it. These companies offer consumers access to new and thrilling dishes each week, compelling them to work on their cooking skills, improve their diets, and more. Although I will always champion this market, as with any new industry, regulations lag far behind, and safety is not as strong as it is in established sectors. I encourage the companies involved to ratchet up their attention to food safety, and closely review the new federal guidelines for meal kit safety.

As the industry matures, I also encourage FDA to pay increasing attention to this exciting new category within the food and beverage industry. ■

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# Harnessing the Power of AI

Data sharing and machine learning are transforming food safety—starting in the growing fields

BY ANDREA TOLU



The year 2023 has been to artificial intelligence (AI) what 1993 was to the internet: the year it became available to the masses. While the public debate on the impact of AI on society has just started, one of its most fascinating aspects is its potential to generate elaborate predictions based on an analysis of immense volumes of data.

For the past few years, researchers and regulators have been trying to apply this ability to food safety. FDA has made data analytics a part of its New Era of Smarter Food Safety Blueprint, an initiative the agency launched in 2020 that seeks to reduce the number of foodborne illnesses by leveraging technology to create a safer, more digital, and more easily traceable food system.

### Data Sharing in the Field

Food safety organizations have also joined the AI movement. One online platform developed by the Western Growers Association, a trade organization comprising more than 2,200 farmers, aims to allow users to share food safety data. This network, called GreenLink, started in 2021 in partnership with Creme Global, an Ireland-based data analytics company, and six participating members and has grown tremendously, reaching 140 growers and 6 million data points. “Our goal is to capture and analyze field food safety data so that each operation can view it individually and compare it with an aggregated data of other operations,” says De Ann Davis, PhD, senior vice president of science for the Western Growers Association.

The GreenLink platform plans to use both descriptive and predictive models for analysis. “For example, if a water test comes back high in *E. coli*, we would like to be able to use descriptive analytics to explain what’s likely causing that, and predictive analytics to understand [whether] that value is expected to be high in that period of the year,” says Dr. Davis. The use of predictive analytics, however, hasn’t been implemented; GreenLink’s datasets are not yet consistent enough to start making predictions. “That doesn’t mean that in six months we won’t be able to do that, though,” she adds.

This insufficient level of consistency has to do with the freedom that the project

**While the produce industry is well controlled, we’re still seeing outbreaks. Yet, no single company is going to observe enough contamination events to understand truly what’s driving that risk. People are starting to realize that sharing data across companies may be the way to find answers to those questions.**

—MATT STASIEWICZ, PHD

leaves to participants to decide what data to share—for example, field location, water or pathogen testing results, or bird activity. Such flexibility is meant to encourage members to share information that is normally treated as confidential.

The challenge of collecting non-public data is an aspect of AI in which the human factor is very much present. When sensitive company data is essential for developing AI tools, sharing it is not a spontaneous act done for the sake of the algorithm; rather, it’s a business decision taken to gauge risk versus reward.

Dr. Davis says this is a chicken-and-egg problem: “People want to know what you’re going to deliver before they go all the way in with the data, but you can’t deliver anything if they don’t provide data first. So, it’s also a matter of balancing the value they’re getting out with the amount of data they’re putting in.”

### Why the Produce Industry Is Ripe for AI

Indeed, growers may be receptive to the idea of sharing data. Matt Stasiewicz, PhD, an associate professor of applied food safety at the University of Illinois Urbana-Champaign, says, “While the produce industry is well controlled, we’re still seeing outbreaks. Yet, no single company is going to observe enough contamination events to understand truly what’s driving that risk. People are starting to realize that sharing data across companies may be the way to find answers to those questions.”

Dr. Stasiewicz is one of his university’s site leads for the AI Institute for Food Systems (AIFS), a consortium formed by six universities and USDA. One of the group’s aims is to create an AI-powered database based on information gathered from public research projects, with a spe-

cific focus on microbiological testing data from growing fields: “Just knowing that a test was positive or negative is not really predictive,” says Dr. Stasiewicz. “It’s much more useful to find out what else about that sample could help predict the result, such as how the sample was taken, its size, the assay method, or the size of the field. That can be combined with publicly available data such as weather patterns, the presence of migratory birds, or a specific wind pattern that may be blowing dust in from somewhere else.”

### Federated Learning

Getting growers and researchers to share data can be a challenge, a challenge Dr. Stasiewicz is certainly familiar with. “Nobody is going to share with me, as an academic, a bunch of data,” he says. “Even if it’s not clear what the risk is, if you can’t define a benefit, it’s not worth doing it. If we want to show a path to share food safety information in a non-competitive and non-risky way, we need to find a way to provide more value than the standard root cause analysis.”

One way to lower the perceived risk of sharing data is to remove personally identifying information: “We don’t necessarily need a firm name, a facility location, and a sample date. What we need is the relationships: knowing, for example, that two samples came from the same facility,” says Dr. Stasiewicz.

Another method would be not to require data sharing in the first place. This approach is called federated learning. Bas van der Velden, PhD, head of data science at Wageningen Food Safety Research (WFSR), a research organization based in Utrecht, Netherlands, says, “In the traditional model, you collect data in a

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centralized place and use it to train the algorithm. In federated learning, it's the algorithm that goes to the data stations—which can be a computer, a smartphone, or a server—but, instead of coming back with the data, it just takes the optimized model back. The data never leaves its original location.”

Through this model, WFSR and additional partner companies and research institutions are contributing to an EU-funded project called Extreme Food Risk Analytics (EFRA). The organization's goal is to develop AI-powered food risk prevention tools using what it calls “extreme data mining.”

Dr. van der Velden explains that the next phase of the project will be to take this model into a real food production environment by working with a large European poultry producer as a use case. “We plan to apply the federated learning approach to train the AI tool with all sorts of internal and external data. A possible use case could be an early warning system that tells you there's a pattern indicative of microbiological hazard in the short or long term,” he says.

Another crucial aspect of food safety that WFSR is working on, and one that machine learning normally lacks, is a concept

called “explainability,” adds Dr. van der Velden. “If you simply say to a farmer not to harvest or not to irrigate today because the algorithm says so, you likely won't have a successful adaptation. Explainable AI tells why a certain action matters in a language that is tailored to each user, whether it's policymakers, farmers, researchers, or average citizens,” he adds.

### Connecting Information

One type of AI that makes massive use of public information is a model developed by Agroknow, a data and analytics company based in Athens, Greece. The company uses AI technology to collect public food safety data, such as product recalls, border rejections, or facility inspections, and combine it with the internal information of food companies. “Part of our work is to discover announcements hidden in the websites of public authorities around the world and translate them into English,” says Nikos Manouselis, CEO of Agroknow. “When the municipality of Athens inspects a food facility in the region and discovers an issue, they announce it in Greek on their website. Similarly, the FDA publishes its most important announcements in one or two pages, but there are also other pages that nobody looks at.”

## Microbiome Data and Genome Sequencing

Not all AI projects for food safety are looking to collect data from open environments such as agricultural fields. The Sequencing Alliance for Food Environments (SAFE) Programme, a now-concluded project conducted by University College Dublin, Creme Global, and six food companies, used microbiome data from food processing plants to predict contaminations. “The process consisted of collecting environmental samples over time and analyzing them using DNA and advanced genomic techniques to build up historic records on how the microbial ecosystems evolved,” says William O'Sullivan, head of data science at Creme Global. “We then used AI models to recognize whether the microbiome may lead to the growth of pathogens or spoilage microorganisms.”

One key indicator used to predict future contaminations is the level of diversity in the microbiome: “In a small ecosystem like a food plant, a lot of these microbes tend to compete with one another. If one of them manages to win out over the rest, it can contribute to forming an environment that harbors other kinds of pathogens,” says O'Sullivan.

Regarding the issue of sharing data to train the algorithms, O'Sullivan has a somewhat nuanced view. “In our experience, whilst data sharing between industry and academia may remain challenging for some time to come, we have readily established that industry is willing to share data with legal entities, as long as the data is treated as confidential,” he says.

The use of genome sequencing as the main data set for an AI-based algorithm is also the focus of research by Xiangyu Deng, PhD, an associate professor of food science and technology at the Center for Food Safety at the University of Georgia in Athens. In this case, the goal is not to predict future contaminations, but to identify their source. Dr. Deng's focus is on *Salmonella*. “More than 98% of foodborne cases of *Salmonella* in the U.S. are caused by the 100 most common serotypes. Some of them are closely associated with specific



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animals. For example, *S. Kentucky* to poultry, and *S. Dublin* to cattle. But others, like *S. Typhimurium*, one of the most common in the U.S., can be found in poultry, cattle, or pigs.”

Identifying the animal source of a foodborne zoonotic disease is a crucial part of outbreak investigations but also a difficult one. To help speed it up, Dr. Deng collects genomic sequencing information from *Salmonella* isolates with known animal sources and uses a machine learning model to determine the most likely animal sources of new cases based on a set of genetic features.

His team is expanding the tool to include less-considered serotypes: “Most foodborne illness cases are considered sporadic, so they're not investigated. This model will allow us to make some educated guesses for sporadic cases and identify roots of contamination that would have otherwise remained undetected.”

To train the algorithm, he uses FDA's GenomeTrakr, which also collects data from FDA's Center for Veterinary Medicine and USDA's Food Safety and Inspection Service. Data from meat production environments, however, is still unavailable. “For major serotypes, we believe we have enough genomic data to allow our model to make accurate predictions. The model will improve as more training data become available,” says Dr. Deng.—AT



Once all of this public data is mined, Agroknow uses AI to connect pieces of information that, though seemingly unrelated, likely refer to the same event: “There may be a news article about five people who got sick from *Salmonella* after consuming a chicken product in Crete, and a public announcement about a recall of the same product, area, and days, where the serotype is specified. The algorithm would match them and provide a complete description of the event, assigning a reliability score,” says Manouselis.

**We plan to apply the federated learning approach to train the AI tool with all sorts of internal and external data. A possible use case could be an early warning system that tells you there’s a pattern indicative of microbiological hazard in the short or long term.**

—BAS VAN DER VELDEN, PHD

The most interesting and impactful use of this model, however, is to anticipate trends to better allocate testing and auditing resources, which is especially important for large food companies with extensive supply chains. “When we were in the middle of the ethylene oxide crisis, everyone was testing much more. At some point, our forecasting models showed that the risk was decreasing. For our clients, that was a signal that they could start testing less for ethylene oxide treatment and redirect resources to other areas.”

Right now, the accuracy score of Agroknow’s typical forecasting model ranges between 80% and 95%. But for Manouselis, even a lower level could be useful: “We’re not going to keep it locked up until it reaches 100%. We prefer to put it in the hands of our clients and let them decide if it is useful or not; very often they tell us that even 40% would be enough for them to make better decisions.”

Manouselis cautions that an important part of making AI tools useful and accessible is to demystify them: “AI is not black magic; it’s a scientific model,” he says. “You train it with data, it gives back results; you validate these results and improve the model with more data. It’s a constant cycle.” ■

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When all this data is analyzed and harmonized with the use of AI, it gives food companies an accurate idea of the current risks in the supply chain. When their internal data, such as results of inspections, audits, and lab tests, is added, the picture is complete.

Manouselis says that this information can be used to assess the risk related to ingredients or suppliers almost in real time. “If there’s a spike in contaminations of ethylene oxide in sesame seeds and it’s one of my ingredients, I will know I have to test more. If one of my suppliers or other suppliers in the same area were involved in food safety or food fraud incidents, I will source from a different region.”



# Safety & Sanitation



## Establishing Employee Guidelines for Food Processors

How supervisory staff can ensure a safe, educated workforce

BY RICHARD F. STIER

One of the most overlooked assets for many food processors is their workforce. There is a great deal of focus on food safety and quality, food safety culture, and prerequisite programs, but when it gets down to brass tacks, the line workers

and their performance are what ensures that the plant operates as it should.

The role of production, sanitation, quality, and warehousing supervisors is to manage the operation and ensure that the company's quality, safety, and sanitation programs are developed,

documented, implemented, and—most importantly—properly maintained. It's up to individual workers to conduct their jobs properly to ensure that programs are maintained. The key to maintaining the food quality and safety system is, as mentioned, developing and documenting programs, and then making sure that workers are properly educated so that they understand not only what is expected of them, but the rationale behind these expectations.

The Preventive Controls for Human Food rule found in title 21 of FDA's CFR parts 117.10 and 117.37 emphasizes the need for programs such as disease control, handwashing, proper garments, and basic cleanliness, and is focused on people and equipment. CFR 117.37

addresses sanitary facilities and controls. How and why these are essential should be addressed as part of employee education. The goal is to minimize the potential for cross-contamination and cross-contact on the processing floor, in the warehouse, and on receiving docks to ensure that the foods produced are safe and wholesome.

The word “education” is used in this instance because it implies that a company’s programs focus not only on how to complete something and what is expected, but also why the programs are in place.

Education or training should occur within three levels:

1. Orientation for new employees (this two-part program encompasses employee guidelines and job training);
2. Refresher sessions for all employees (this should occur annually); and
3. Emergency sessions in response to problems.

These programs must be developed, documented, and implemented by qualified individuals, preferably a Preventive Controls Qualified Individual (PCQI), in facilities regulated by FDA. Training may, however, be conducted by people under the supervision of a PCQI.

### Orientation

All new employees must not only learn how to perform the job for which they were hired, but must also be educated on what is expected from a food hygiene, safety, and sanitation perspective. There are four areas that an orientation should address above and beyond learning how to conduct the task for which employees were hired. These are:

1. Issues related to prevention of contamination or adulteration;
2. Rules pertaining to clothing and garments;
3. Employee hygiene and disease control and; and
4. Eating, drinking, and smoking.

How the orientation is conducted varies among companies. Some operations may present the information in a Powerpoint presentation led by a staff member, others may show a video, and some may simply give the new employee a docu-

ment to review. An interactive program with visuals is the best option. When employees see, hear, and do, there is a greater chance that the message will register with the audience. It’s a good idea to provide each new employee with a document, such as an employee handbook that describes all expectations. They should sign the document acknowledging that they have both received and understood the company’s rules. Some operations even include language in their documents such as, “I understand the rules for employees of this plant and promise to abide by them as long as I am employed by the company. I also understand that failure to follow these rules may be grounds for dismissal.”

### Employee Guidelines

Let’s look at what might be included in a food processor’s employee guidelines. Here are some points that a processor might establish to minimize the potential for product contamination or adulteration:

1. Process area doors are to be kept closed at all times during production. Do not use anything to prop open the doors.
2. All ingredients are to be stored in closed containers at all times to prevent contamination. After opening a container, reseal the bag or transfer the remaining product to a clean, resealable container and label it with the date that it was opened using indelible marker or a permanent tag. These materials shall be stored on pallets or shelves. No materials shall be stored on the floor at any time.
3. Allergens and sensitizing ingredients must be stored in designated areas only and kept away from non-allergens. Designated utensils must be used when using these materials.
4. All ingredient containers must be clearly marked as to their identity to prevent misuse. If a container is not labeled, set it aside and contact management.
5. All equipment lubricants, cleaning chemicals, sanitizers, and similar items must be stored away from ingredients and packaging materials in designated storage

areas to prevent possible cross contamination.

6. Do not place any objects, such as pencils, pens, or cigarettes, behind your ear at any time.
7. Any product or packaging materials that fall onto the floor must be discarded.

When employees see, hear, and do, there is a greater chance that the message will register with the audience.

8. Keep waste bins covered at all times.
9. Do not place food or drinks on packaging materials, ingredients, or finished goods. Food is allowed in designated areas only.
10. Personal stereos are not allowed in the production area because they cannot be sanitized after being handled.
11. All utensils, such as knives, spoons, and scoops, must be cleaned and sanitized and stored in designated areas when not in use.
12. Production floor staff must clean, sanitize, and store all processing equipment and utensils at the end of the work day according to documented procedures.
13. Cell phones are not allowed on the production floor or the warehouse and must remain in the employee’s vehicle or locker.
14. Situations that may create food safety or quality concerns must be reported to a supervisor immediately.

When conducting the orientation, the company should not only explain how to adhere to these protocols but also why they have been established and the ramifications of failing to properly follow them.

### Attire

A second area that must be addressed in the orientation is clothing and

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garments. Most food processors provide their line workers with clothing and safety shoes. The clothing should be comfortable (breathable fabrics) and must not pose a risk for product contamination. Guidelines for proper attire include:

1. No jewelry, including rings, brooches, watches, pins, earrings, necklaces, or visible piercings, shall be worn in the production area. The only exceptions are a plain gold wedding band, which must be covered with a glove, and medical alert bracelets. The bracelet should be covered by a long-sleeve garment with elastic wrist bands.
2. All employees and visitors must wear hair nets when working in or entering the production or warehouse areas. Hairnets must cover hair and ears.
3. All bearded employees and guests must wear snoods when working in or entering the production area. Mustaches must be fully covered.
4. No articles whatsoever, such as pens, pencils, or thermometers, may be held in uniform pockets.
5. No hairpins, combs, or barrettes may be worn by employees working in the production area.
6. Employees working in the production area may not wear false eyelashes, false fingernails, or fingernail polish.
7. All employees must wear the disposable gloves that are provided when handling product or ingredients directly. Gloves must be

- discarded at the end of a shift or if they become soiled or damaged.
8. Production floor employees must put on a clean uniform each day. At the end of the day, the dirty uniform must be placed in the laundry hamper.
  9. Employees must wear hearing protection in designated areas (e.g., processing and boiler rooms). Proper hearing protection is defined as ear muff-type hearing protectors or metal-detectable ear plugs.

### Hygiene

Then there is employee hygiene and disease control. During the COVID-19 pandemic, food plant workers had to be masked. This is no longer required, but the pandemic showed that masks can be successfully used in food processing facilities. Additionally:

1. All employees are required to thoroughly wash their hands before starting work, after using the restroom, after touching any potentially insanitary equipment or utensils, and after any break. Following washing, employees must use hand sanitizer.
2. Any employee with any signs of illness (sneezing, coughing, runny nose, or fever) shall not be allowed to work in the production area. Contact your supervisor and report your condition prior to reporting to work.
3. Any employee with open and/or infected wounds or cuts on their

hands or face shall not work in the production area. Wounds on hands must be fully covered with a glove if the employee is to work in the production area.

Employee health issues are more stringent in other parts of the world. There are countries that mandate a wide range of testing for any person wishing to work in a food plant. Tests may include but need not be limited to blood tests, tuberculosis tests, stool samples, and chest X-rays. This degree of testing is not allowed in the United States.

All these issues should be addressed at length during the orientation for the new employee. Yearly refresher sessions should address those issues that management deems to be higher risk, such as handwashing, and/or those that have observed to be deficient in some way. The deficiencies might have been picked up during internal audits or through third-party audits.

Further, it's ultimately the responsibility of management to ensure that employees are not only properly educated but also properly motivated to do what is needed to protect public health and the company's good name. ■

**Editor's note:** Be sure to check the most up-to-date regulations for all requirements.

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# Effective Communication in Food Safety Training

Best practices to reach your employees

BY RICK FARRELL

Approximately 600 million people globally fall victim to food poisoning annually; of those, 420,000 succumb to foodborne illnesses, according to the World Health Organization. Improper handling during food production and the packaging process can introduce bacteria, parasites, and viruses that cause foodborne diseases. Those in the food industry should learn and practice mandatory safety precautions to reduce food contamination and poisoning. Food safety is a set of practices for aiding in the safe processing, handling, packaging, and distribution of food products.

Whether you have a multi-billion-dollar food production industry, a roadside kiosk, or a mini-bakery, you should invest in employee food safety training. Food safety training is available in in-person, real-time, and online training sessions. Real-time food safety training

presents a one-on-one virtual connection between the trainer and the trainee.

A food safety training session facilitated through real-time communication lets the trainer offer a real-time presentation of the live activities from the trainer's end. The sessions involve using session initiation protocol (SIP) and real-time transport protocol (RTP) to create and sustain communication between the involved parties.

## The Importance of Effective Communication

Effective communication fosters a seamless connection between trainers and trainees during complex and long food safety training sessions. Real-time communications systems establish uninterrupted food safety training without message alteration or confusion. In this rewarding learning atmosphere, each party feels satisfied and engaged. There

are many reasons to get everyone in your company trained to handle food safely, including:

- Improving the handling and maintenance of machines;
- Increasing sanitization and cleanliness of components;
- Reducing food packaging leaks;
- Reducing food contamination and poisoning issues;
- Improving the quality and health of food products delivered to clients; and
- Boosting brand image and reputation.

The average human has a relatively low attention span of 8.25 seconds, and effective communication is the key to extending these short spans. Boring safety training sessions could reduce a learner's attention span so trainers need to communicate effectively to get trainees fully engaged and boost their attention spans.

There are no boredom issues during training sessions in which the speaker and audience communicate effectively. Trainees will ask the right questions, and the trainer will answer them correctly, facilitating efficient learning.

Training sessions in which resourceful communication is the center of

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everything foster problem solving, active listening, nonverbal communication, confidence, and questioning.

### Top Benefits of Communication During Food Safety Training

Sometimes, employees may not properly respond to food safety-related hazards. Training informs workers and boosts their confidence levels so they can raise alarms when they detect potential hazards. Properly trained employees understand the basic protocols to handle food during packaging and distribution to reduce the potential for leakage and contamination.

Communication is an indispensable tool in food safety training and determines the learning curves of each involved party. Food handler training increases knowledge and equips learners to address future food safety issues more easily. Learners can only grasp food safety protocols and management systems when the training programs are communicated effectively.



When a food safety trainer passes information effectively to the target audience without leaving holes, they help them better understand the key points of interest while preparing them to practice what they learn in the future.

Training programs with clear and easy-to-understand training materials enable workers to properly comprehend lifelong and new safety practices. Proficient communication can help learners understand and complete their training

courses much faster while increasing the success rates of the training programs.

Food industries should adopt training programs that use clear and feasible videos and photos, infographics formatting, and all-inclusive training materials. Message recipients feel more at ease when training messages are presented knowledgeably and confidently.

### Best Practices

To reduce misunderstandings, real-time food safety training supports key facets of communication, such as facial expressions, eye contact, and body language. As a trainer offering real-time food safety training programs, it integrates engagement, logistics, scope, etiquette, and facilitation. Training focused on these fundamental aspects helps with troubleshooting issues, implementing safety strategies, and gives insights on planning.

#### Proper scope and preplanning:

Although virtual training sessions cannot replace in-person interactions, proper preplanning and strategizing help you create the best scopes to optimize and track the training sessions. Know the topics to address, the length of the session, the availability of training materials, and the credibility of the lecturers. Create an interactive real-time online training session by allowing participants to ask questions and give suggestions when necessary. Longer sessions will get participants bored. Limit the programs to about three hours with 10-minute breaks to reduce screen fatigue.

**Practice etiquette.** The host's etiquette is one thing that can break or make a training program a success. The host has to set clear session rules and press accountability penalties to limit misconduct. Everyone in attendance must avoid distractions and behaviors that could affect other learners' attention spans and listening abilities. Effective communication requires sticking to the main agenda and not wandering outside the session-specific topics. Timing should be a priority, ensuring timed sessions for the welcome, guest speaker instruction, breaks, and wrap up.

**Engagement.** Virtual food safety training programs offer a seamless engagement, interaction, and knowledge acquisition platform. But since there is

Learners can only grasp food safety protocols and management systems when the training programs are communicated effectively.

no in-person connection, attendees can get bored and lose focus. Calling those in attendance by name fosters smooth interaction while keeping everyone alert. Using "raise hand" unmute and chat features to answer open-ended questions can boost engagement. The use of virtual tools such as surveys, polls, and whiteboards reduces screen fatigue and boosts knowledge retention while increasing engagement.

### Real-Time Communication During Food Safety Training

Real-time food safety training hosts and facilitators can use two basic ways to present their programs. The best method depends on the availability of resources and everyone's location.

#### In-person training sessions:

These sessions offer opportunities for face-to-face interaction, which can provide greater understanding and clarity than virtual methods. The heart-to-heart, human-level interaction offers a hands-on learning experience. These sessions are more collaborative, as multiple learners can attend classes simultaneously. The person-to-person connection between learners and lecturers makes learning fun and more interactive.

#### Interactive online training modules.

These modules offer a greater range of programs, cost-effective sessions, and the opportunity to connect and interact with people from around the world. These programs are streamed in real-time from the host/facilitator's computer to the learners' device. Although cost-effective, they don't offer the same person-to-person connections as in-person training sessions. ■

Farrell is president of PlantTours.





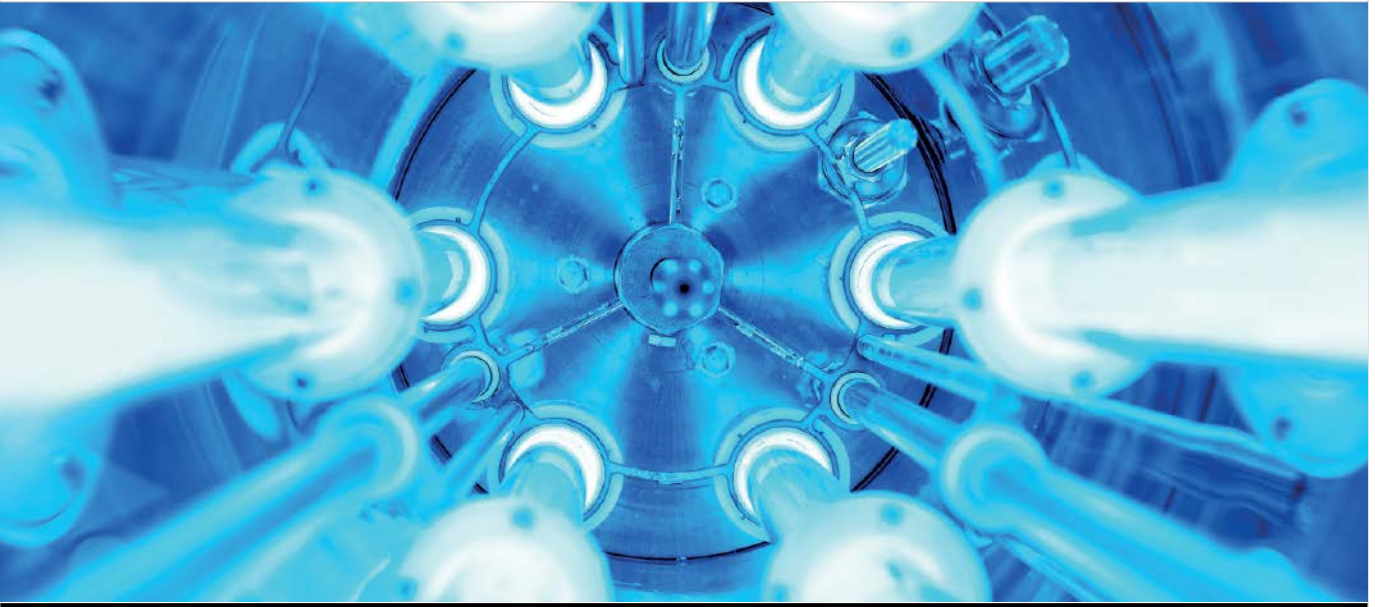
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# The Power of Light

UV technology can help eradicate deadly pathogens in food

BY **KEN KERSHNER**

In her eye-opening documentary “Poisoned,” filmmaker Stephanie Soechtig shines a light on the extent of contamination in the American food industry. Everyday grocery items from lettuce to chicken breasts, and even cookie dough, are sometimes tainted by dangerous levels of bacteria.

This isn’t surprising, necessarily. Romaine lettuce is frequently contaminated by *E. coli* O157 carried in irrigation water. *Salmonella* and *Campylobacter*, which often contaminate chicken, are prevalent in the fecal matter on chicken farms. And the cookie dough? Raw flour can carry harmful bacteria such as *E. coli*, which remain alive even after low-temperature baking. Raw or undercooked eggs can also introduce *Salmonella* into the dough, posing a risk to people who like a bite of raw dough while baking or who don’t bake their cookies long enough.

These contamination vectors are hard to eliminate. That’s why, in the U.S. alone, a staggering 48 million people a year fall victim to foodborne illnesses. It’s also why we need innovative solutions to address pathogenic contamination. One

such solution is ultraviolet (UV) technology. By harnessing the power of UV light, which is capable of killing harmful bacteria and pathogens in food items of all types, the food industry can reduce the prevalence and severity of food-related illnesses.

## A Safe and Versatile Solution

UV technology offers a promising and pragmatic solution because it can significantly enhance food safety with minimal adverse effects on the environment or on the quality of foods.

One vital step toward improving food safety is treating irrigation water, a common source of contamination on farms. Among the disinfection methods available, UV technology is an ideal choice. Unlike chlorine, which can negatively impact plant health and the environment, UV technology provides a powerful yet safe means of eliminating pathogens from the water. By effectively neutralizing harmful microorganisms, UV treatment can ensure that irrigation water is made clean for agricultural use.

UV technology can also be used to curb the spread of pathogens in food

processing plants, where it can be used as a surface disinfectant for conveyor belts. This is where a lot of cross-contamination happens and it only takes one tainted batch to spoil the rest due to the surface-to-surface transfer of pathogens.

Let’s consider a scenario in which a worker cuts up a chicken tainted with *Salmonella*; a single contaminated bird can contaminate an entire production line. Implementing UV surface disinfection measures would act as a robust barrier against that contamination.

The same disinfection measures could apply in fruit and vegetable processing. For instance, the outer surface of a cantaloupe is porous with a webbed texture that provides numerous crevices where bacteria can hide and thrive. Addressing this contamination is a challenge because these fruits might be irrigated with tainted water. In this case, incorporating an additional disinfection step that includes UV light makes good sense.

UV technology can even be used to disinfect food packaging. By ensuring that packaging material is free from harmful microorganisms, UV disinfection offers another layer of protection that enhances the safety and quality of the food product throughout its journey—from the point of production to the consumer’s doorstep.

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# WILEY



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# Quality



## Burning Reality

How wildfires and their smoke can impact agricultural production for years—and even decades—after a major burn

BY JESSE STANIFORTH

**E**astern Oregon isn't known as an agricultural capital, but the area contains plenty of wheat farms and farmers looking to keep their crops and families supported while producing export-quality wheat. It may not be the verdant west of the state, across the Cascade Mountains, but eastern Oregon has farmers who are just as serious about their work as anywhere else.

In 2018, an especially aggressive wildfire season hit eastern Oregon, beginning in midsummer. "It burned up a lot of range lands in areas that were in crop production, primarily dryland wheat," says Jacob E. Powell, a professor of crop and soil science in the college of agricultural sciences at Oregon State University in Corvallis. "They had one really bad fire that was 80,000 acres, and then they

had some additional fires; about 120,000 acres burned in the region." He adds that much of that was dryland planted in wheat that was fully matured, and farmers were preparing to start harvesting when these wildfires occurred.

Even for a smaller farming region such as eastern Oregon, the fires started a cascade of consequences. The 2018 fires, Powell says, resulted in "a lot less wheat being shipped down the river." This had a chain of secondary effects. He says that grain elevators in his area of Oregon saw a 50% to 60% reduction in the number of wheat bushels they received following the fires. "Obviously the producers lost income," he adds. "A lot of them had crop insurance, which helped cover that. But suddenly there was less work for the local wheat co-op, and all the people who are involved with getting the grain into the

elevators. Then there's the transportation chain of people—in my area, a lot of it is trucked to local elevators, and then it's put on the Columbia River and barged to Portland. From there, it's sent primarily to exporters overseas. So [the fire damage] had major implications for everybody involved in that whole supply chain. Suddenly there was less work for them to do."

The wave of wildfires across the western United States has been impossible to ignore for several years, and scholars have warned that even as the annual fires may burn through and limit their own potential fuel, climate-driven factors may still create circumstances favorable to major fires in the future.

Beyond the inarguable human tragedy of these fires, there is a second crisis these events bring—that of the farmers, and the damage done to their farms. Eastern Oregon was far from the epicenter of recent wildfires. Carlos F. Gaitan Ospina is CEO of San Francisco's Benchmark Labs, which uses AI technology to predict and prepare for severe weather events, among other disasters. He calls California's wildfires "catastrophic for the agricultural sector and

the West Coast. [And] while California's Central Valley has seen limited impact, vineyards, specialty crops, and grazing lands from the Sierras to San Diego have been severely impacted."

The potential damage from wildfires varies widely, say Gus Plamann and Joy Youwakim, agronomists at Biome Makers, a Sacramento, Calif.-based agricultural technology company. "Wildfires can inflict indirect damage to crops and the environment and direct destruction to structures and maintenance expenditures," Plamann and Youwakim wrote in an email to *Food Quality & Safety*. "The long-term consequences of these damages can vary depending on the severity of the fire and the resilience of the impacted crops and ecosystems. For example, areas of high-severity fire can impact water quality and soil erosion."

Smoke from wildfires is a significantly damaging factor for a variety of reasons: It deposits potentially toxic ash into crops, it can block the sun to prevent healthy growing, and—perhaps most expensively—smoke can pollute or otherwise damage crops grown for their flavor.

### The Smoke Factor

Wildfires can damage crops the most direct way—by burning them up, or by reshaping the soil of the region. Another troubling factor about wildfires, however, is how smoke and pollutants can easily travel hundreds of miles from their sources.

Smoke from wildfires is a significantly damaging factor for a variety of reasons: It deposits potentially toxic ash into crops, it can block the sun to prevent healthy growing, and—perhaps, most expensively—smoke can pollute or otherwise damage crops grown for their flavor. This problem is most acute for

wine-grape and cannabis growers, say Plamann and Youwakim, because those two products are sold for the complexity and subtlety of their taste profiles. Cannabis is also an especially difficult crop to protect from smoke because its resin is very sticky, making it a magnet for airborne ash and particulate.

Smoke is also a problem for hops growers, some of which Powell encounters in eastern Oregon. "The damage to flavor seems potentially extremely expensive if you get a whole crop of hops that suddenly no longer tastes like hops, but tastes like smoke," he says. "Nobody is going to want to buy or brew with that." And the worst factor for smoke, Powell says, is how far it travels, how easily it moves, and how completely unpredictable its outcomes are. "You're going to have a fire several hundred miles away—within a 200-mile radius, basically—and it can still mess up your harvest."

Mike Thornton, PhD, is a professor of plant sciences at the University of Idaho in Boise, where he has researched the effects of wildfire smoke on potato crops. He says that smoke's effects on plants are very complex. "It is really hard to separate out what the smoke itself is doing to crop productivity due to the fact that the growing seasons where we have the highest smoke exposure tend to be very dry and hot," he says. "Those are the conditions that promote forest and range fires. We know from previous research that high temperatures are not good for the productivity of some, but not all, crop plants. Potatoes are one of the crops very sensitive to high temperatures."

Different crops are hit by wildfires in different ways. Some are burned to the ground. Powell says that in his region, there were major concerns about soil and water erosion because, in wheat field after a fire, there is nothing left. "It's a moonscape," he adds. In this case, Powell says farmers had to plant an emergency covering crop to maintain soil moisture throughout the winter; however, this is a separate concern from farmers facing smoke or pollution damage.

Gaitan Ospina also stresses the fact that the impact of fire varies from crop to crop. "The time from seed to harvest for lettuce or strawberries is very different

than for almonds or grapes, so for many farmers, if they go back to the same crop that they had before being affected by a wildfire, it could take five, 10, or more years to go back to the pre-wildfire conditions and income."

### What Can Farmers Do?

In all cases, there are very few actions farmers can take to protect their crops from wildfires. Powell is aware of a number of products that offer a barrier film growers can spray onto their crops to protect them from smoke damage, but it's expensive and needs to be applied early in the fire.

Beyond that, most attempts to mitigate damage are simply efforts to avoid fires. "One step agricultural producers are taking is implementing targeted grazing to reduce invasive weeds, which may exacerbate fire length and intensity during a wildfire," say Plamann and Youwakim. "Historically, indigenous communities, like the Karuk Tribe in Northern California, have used controlled burning as a land management tool to reduce the risk of wildfires in the future. Controlled burning can reduce fuel accumulation and promote the growth of new vegetation, often native to the region. Also, the recovery of soil organic matter is essential for soil quality restoration after a wildfire."

Unfortunately, this has placed the need to protect against fires at odds with popular farming practices. Between 2000 and 2010, says Dr. Powell, prior to the uptick in wildfires, farmers had started to switch to a no-till approach in which they would leave crop residue in the ground to help increase yields. No-till farming was a boon for crop yields, but it also left fields full of wildfire fuel. "No-till farming is doing wonders for the soil and the bottom line for most farmers," Powell says. "But unfortunately with these fires now, the fire burns through a field that was in crop and then hits the field that was fallow—and basically has an effective fuel."

These are problems no farmer can afford to leave unresolved, says Jessica Todd, Sioux-City, ND-based underwriting manager for Agribusiness Risk Underwriters. With each fire, it becomes harder and harder for farmers to insure their farms and crops. "What's

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happening in the insurance market is that most of these farmers are insured with standard market insurance companies,” Todd says. “They’re insured for really minimal premiums and deductible structures, so it’s something in their business plan that’s affordable. [But] it’s happening right now that some of these [major national insurance] carriers are getting out of agriculture—or getting out of areas that have a potential for a wildfire exposure because of the risk, and because they’ve taken so many losses in the last few years.”

Many farmers are discovering the companies that used to insure their crops and farms simply don’t offer that coverage anymore, and they are now stuck going from company to company trying to figure out who will still insure such high-risk properties. While Agribusiness Risk Underwriters handles insurance for high-risk business and locations, Todd stresses that the price for these products has increased significantly, as much as multiple times what farmers were previously paying. Those who can get that kind of insurance are the lucky ones. The rest won’t be able to find insurance at all.

Gaitan Ospina says that after recouping damages from wildfires, facing the rising cost of insurance is a major challenge for farmers. “In many areas, premiums have jumped [fivefold] in the last few years.”

“There are definitely farmers who aren’t going to be able to find coverage,”

The time from seed to harvest for lettuce or strawberries is very different than for almonds or grapes, so for many farmers, if they go back to the same crop that they had before being affected by a wildfire, it could take five, 10, or more years to go back to the pre-wildfire conditions and income.

—CARLOS F. GAITAN OSPINA

Todd says. “Even when you look into the excess and surplus [insurance], underwriting companies like us still have to see if it’s a suitable risk—if they have a fire prevention or a fire mitigation plan in place, if they’re keeping proper distance of brush from the buildings, if they have water trucks on site. We still have to look at all of that and actually underwrite the account. And there are times where, just because they’ve had so much wildfire history in that particular area, there isn’t anything that can be done to make it a suitable risk.”

In California, for example, farmers have the California FAIR Plan, a last-resort option created in 1968 to provide

insurance to those who cannot find coverage anywhere else; however, Todd notes that the coverage is basic and limited to specific perils—so one can specifically buy wildfire insurance, or flood insurance, but not an expanded package of insurance for the full property. FAIR insurance itself was intended to offer temporary stopgap solutions; it is the opposite of the stable and dependable insurance plans farmers have relied upon so far.

The problem of uninsurable properties is one of many created by the emergence of the modern wildfire threat. For many, that means that the priority remains preventing and fighting the fires themselves. Powell has seen producers building strategic fuel-breaks into their landscapes to prevent fires from traveling, while also investing in firefighting equipment. “They don’t necessarily have huge fire trucks, but they at least have a 100-gallon tank on their truck with a pump that they know how to use,” he says. “If a small fire starts, they can at least put it out fairly quickly.”

Little tools like this work better in conjunction with others: Powell is enthusiastic about programs in Oregon and Idaho called Rangeland Fire Protection Associations (RFPAs), which help train farmers to fight fires. “They go through an abbreviated firefighting training, like professional wildland firefighters go through. They get the same radios that the local Oregon department of forestry uses, and so they’re able to communicate better with other firefighting agencies. It also allows them to purchase surplus fire equipment at a reduced rate.”

Powell notes that the logo of Rangeland Fire Prevention in Oregon includes the motto “Neighbors Helping Neighbors Fight Fires,” and he thinks this unified approach helps farming communities defend themselves far more effectively than if each farmer had to protect their farm alone. “If your neighbors are trained up to help you,” he says, “it can go a long way. When there’s a wildfire burning on your property, your neighbors are going to be the first ones there to help you, well before anybody else arrives.” ■

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# Testing



## How Augmented Diagnostics Can Impact Food Safety

Leverage “small data” in microbial testing to help anticipate risk

BY JULIEN DEFFERRARD

For many years, the concept of “big data” has been framed as a key to help resolve various challenges and drive improvements across many business segments. The potential of big data, however, can sometimes get lost when applied to food safety. With minimal food safety “positive” testing results from which to mine data and glean insights into potential environmental or product contamination, the food industry must evolve to take the “small data” that is gathered from incidents and augment it with expertise in microbiology and food safety to solve complex challenges. This will unlock actionable insights for smarter, more dynamic risk assessment in food safety and quality control.

This approach, called “augmented diagnostics,” is rigorously grounded in science and delivers data reporting and

test results, as well as in-depth insights to help food industry leaders make better decisions that will drive efficiency while also improving public health.

For augmented diagnostics to succeed in solving food safety and quality challenges, an organization must be willing to invest in two key areas: advanced tools to gather enhanced data, information, and expertise in data science, and microbiology and food processing to analyze the data and provide recommendations for the best path forward.

With so many options for diagnostic testing solutions available in the market, finding the right partner that indexes highly against both of these areas can seem deceptively straightforward. In a sea of options, it’s important to understand not just what types of technology are available, but also finding the right tool to address the specific goals or

challenges an organization is trying to solve, while ensuring the expertise of the selected lab partner fits both current and future needs.

### Leverage the Right Data

Traditionally, microbiology testing in food has been reactive; results and data captured from a point in time are returned one to three days following sample collection. Organizations have tried to move to a proactive model for risk anticipation, seeking to apply big data methodology to food safety problems. As discussed above, big data requires significant inputs, and the finite “positive case” data in food safety is a hurdle for effective application of this method; however, this is just one limitation of employing a big data approach when it comes to food safety.

In addition to requiring an abundance of data for successful implementation, this approach is most successful when employed in structured and static environments. The challenge in food safety is that a food processing facility is not a simple, static environment. Processes are complex, with a lot of moving parts, and there are a high number of ever-changing variables that can affect food safety and quality, such as environmental issues, compromised raw materials, or contamination in the process. Big data algorithms will only return broad stroke results to answer large-scale questions. There is no substitute for subject matter expertise and a diagnostic partner to ensure insights are tailored for each specific circumstance. Simply put, there is no big, off-the-shelf solution to ensure food safety and quality.

### Unlock New Insights

While data can be collected across food processing—from raw materials to end-user consumption—positive testing results are the most important anchor points that drive actionable insights. Now,

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more than ever, molecular diagnostic tools—both new and familiar tools being applied to food safety—are giving organizations the ability to truly focus on specific areas and understand their specific “small data” for the first time. Two examples of molecular diagnostic tools that are currently leveraged for organizations to focus on this small data include whole genome sequencing (WGS) and metagenomics.



**WGS:** Well known across the diagnostic testing industry, WGS is gaining traction as more organizations leverage this tool to provide more in-depth information about specific contaminations. One barrier to wider adoption of this technology in the food safety sector is the in-depth data that the application returns, which can cause hesitancy due to the fact that data is potentially discoverable and may lead to unattended consequences for the organization.

While this is an understandable concern, it's encouraging to see an increasing number of organizations adopt WGS as they find that the benefits for their company far outweigh the risks. The more in-depth data an organization has, the better it can understand the situation and implement solutions to address current issues, as well as those that may emerge upstream in the production process, to maximize ROI. For WGS application to be successful, an organization should work with an experienced partner that can go beyond supplying merely a sequence of data reporting for an in-house team to try and decipher; you'll want a partner that delivers in-depth insights into the data and suggests actions to enhance your quality programs.

**Metagenomics:** This is another powerful tool that can unlock the mysteries lying within an organization's small data. The application of metagenomics returns enhanced analysis of what a food product's actual microbiome is, which allows an organization to isolate and target relevant spoilage organisms to then implement enhanced screening processes across production, which can better control risk. One significant barrier to applying metagenomics is the idea that too much data can result in limited application opportunities or in cumbersome process overhauls. Think of metagenomics as not necessarily a focus on a wider set of data but rather as a focus on the right data that can enhance your organization's decision-making capabilities.

In both cases, data gathered from molecular tools, when paired with existing internal and external data, results in the opportunity to connect the dots across an organization to better anticipate potential risk.

### Leverage Data Science

Many times, those responsible for decision making do not have a microbiology background. This is fine, as responsibilities for senior leaders in food safety and quality extend far beyond diagnostic testing, but what we find is that sometimes our customers are intimidated by data approaches. The best way to raise confidence in data analysis capabilities is to invest in infrastructure that supports data science. This can be achieved by carving out room for dedicated data scientists within an organization or by outsourcing to a diagnostics partner. Whichever direction you choose, it's imperative to work with your team at the onset to set your organization up for success. Two ways to do this are by properly framing the question you're working on and through partnership and alliance.

**Framing the question:** Data is useless if it doesn't answer your most pertinent questions. Think of Google, which provides a gateway into an infinite amount of knowledge; however, the only way you get to access the knowledge that you seek is to ask Google the question you are most interested in finding the answer to. This is why combining expertise in microbiology and food processes with data science is so important; a team

that possesses these three skillsets is able to perform the work to frame the right question and to ensure that the data gathered provides a meaningful answer.

Data gathered from molecular tools, when paired with existing internal and external data, results in the opportunity to connect the dots across an organization to better anticipate potential risk.

**Partnership and alignment:** Organizations must be transparent with their in-house and external diagnostic partners about their strengths as well as their gaps so that they can identify the right solutions to better anticipate risks. In turn, diagnostic partners must be transparent about the decision criteria that the recommended tools are built on. The notion that no two organizations are the same extends into the diagnostic testing category as well: No two testing stories are the same. The key to a thriving augmented diagnostics approach to food safety relies on full collaboration between stakeholders to leverage the wider industry insights and unique considerations, ensuring success for the organization. There is no off-the-shelf solution to augmented diagnostics.

The food safety industry as a whole is collectively leaning forward when it comes to the best ways to leverage augmented diagnostics to fuel discovery and further understanding. As we look beyond simple, point-in-time data testing, an investment in data augmentation to tell a more compelling story of your organization's risk offers benefits for both consumers through the advancement of public health, and the organization via more bottom line efficiencies. Diagnostic testing partners should drive value by unlocking new information and providing actionable insights to empower food safety and quality leaders to make more informed decisions. ■

**Defferrard** is associate director, augmented diagnostics, Americas, at bioMérieux and has a degree in biological engineering and a master's in microbiology and food safety. Reach him at [julien.defferrard@biomerieux.com](mailto:julien.defferrard@biomerieux.com).





# Testing In Alternative Proteins

How to develop safe and compliant products—and detect food fraud

BY LORNA DE LEOZ, PHD

In recent years, concerns about the sustainability of certain farming methods, especially those involved in meat production, have caused some topics in food manufacturing to rise up the political agenda. This has triggered a range of research projects, including the development of plant-derived and lab-grown meat alternatives, that have the potential to help deliver sustainable, secure, and reliable sources of protein for human consumption. As a result, the global market for alternative proteins is projected to reach \$36.6 billion by 2029, according to a 2023 report published by Meticulous Research (available at [meticulousresearch.com](https://www.meticulousresearch.com)). To maximize this potential, alternative protein producers will need to rigorously test their products to provide proof of their integrity.

## The Need for Testing

Novel products of all types can face various challenges, including food safety issues. For alternative proteins, for example, the demand in some markets has soared while supply has fallen

short, which has led to food fraud in some cases. This is potentially dangerous, as wheat or soya, which are allergens, can be used as substitutes for more expensive plant-based proteins. Other types of common food fraud include concealment, counterfeiting, and mislabeling. All have the potential to weaken customer acceptance, which could constrain market growth and hamper the development of sustainable food sources.

Chris Elliott, PhD, a professor in the School of Biological Sciences and founder of the Institute for Global Food Security at Queens University in Belfast, Northern Ireland, says that testing isn't just needed to spot deliberate substitution. "There could be a lot of things that shouldn't be there, things that have been added by accident. Therefore, we need to be testing to look at the overall integrity of the global food supply chain," he says.

"Safety scientists like me need access to reliable analytical methods to confirm our work to the regulators," adds Ben Smith, PhD, director of the Future

Ready Food Safety Hub at the Nanyang Technological University in Singapore. "Also, all things have their thresholds for effect, and we need to understand whether these materials could be problematic. Most of them are endogenous (found in the body), but there is still a need for testing."

## Building Acceptance

Devin Peterson, PhD, distinguished professor of food, agricultural, and environmental sciences and director of the Flavor Research and Education Center at The Ohio State University in Columbus, believes there must be a fundamental understanding of what's required to meet consumer expectations; it's not all about safety and compliance. "We often think about consumers in terms of how much they like something, but behaviors towards food go beyond simple 'liking.' We also need to consider what people want, which can drive motivation," he says. "A whole new set of ingredients are involved when looking at plant-based products, which need to be explained."

He adds that plant proteins can generate aroma and flavor compounds, which all need to be understood. This is especially important, as taste remains a key barrier to the widespread uptake of alternative proteins. In recent years, food manufacturers have significantly improved the taste, texture, and affordability of meat alternatives, but many consumers believe there is still a distinguishable deficit.

Some people are increasingly concerned about veterinary drugs, hormones, and other potential contaminants in meat-based products, however, so they may be more inclined to purchase alternative protein-based options. Proving this, and ensuring a good eating experience, are key to unlocking the alternative meat sector's growth.

## The Future of Food Safety for Alternative Proteins

Testing for contaminants in food products isn't easy, says Dr. Elliott. "It is quite complicated, because the people who conduct the fraud are generally

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pretty smart, and they know the testing methods people use, so they try to find ways to get around them.”

Dr. Smith sees a clear need for more sophisticated test methods. “We’ve tried to break things down into individual materials and look at things from a component perspective. Many of the tests and systems we have in place aren’t designed to test complex materials,” he says.

“I think there are a lot of opportunities for many types of new technologies,” he adds. “One of the important things we must realize, particularly in this innovation space, is that not one technology necessarily outbids another. There are pluses and minuses for different types of reasons.”

Targeted analysis for food authenticity testing is often used for detecting substitution, dilution, and mislabeling; however, quantifying compounds in food matrices requires sensitive, reliable, and repeatable analytical approaches.

### Ensuring Quality and Safety

The testing of alternative proteins has two clear goals: to enhance product quality during development and to ensure consumer safety during production. Each plays a central role in the commercialization and eventual acceptance of alternative protein-based foods, and both need to be carefully regulated. “In the past, we’ve typically seen regulation lagging behind innovation; however, we’re seeing rapid innovation in the cultivated meat sector, with methodologies changing monthly,” says Dr. Smith. “Labs are doing a lot of different things to bring a product to market, but from a regulatory perspective, that’s always a challenge because we want to know what’s being put on the table.”

### The Right Balance

Balancing innovation with integrity in the alternative protein space is key. While advancements in this field hold immense potential, it is crucial to prior-

itize food safety, authenticity, customer acceptance, and nutrition to build a sustainable and trustworthy food system. As the world navigates the complexities of the future of food, embracing innovation with a keen eye on integrity will pave the way for a healthier and more sustainable future for generations to come.

Also, faced with an increased demand for—and heightened regulatory scrutiny of—alternative protein-based foods, labs need trusted analytical methods to help them further improve their products’ quality, consistency, palatability, safety, and nutritional value. ■

**Dr. De Leoz** is global food segment director at Agilent Technologies and has nearly 20 years of experience in the food industry as a bench chemist, graduate researcher, and mass spectrometry specialist. Reach her at [lorna.deleoz@agilent.com](mailto:lorna.deleoz@agilent.com).

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Food  
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# Food Service & Retail



## Efficiency Upgrade

Food service equipment that offers operational flexibility and multiple solutions for performance can give your business a competitive edge

BY DOUG GEORGE

**T**he food service industry continues to evolve as it keeps up with constantly changing regulations and frequent updates to new technologies and innovations. Every aspect of food service relies on speed and efficiency for smooth operation and food service managers and operators need equipment that offers operational flexibility and multiple solutions to help managers and staff do more with less.

While the food service industry dealt with several challenges in 2022 and 2023, including pandemic recovery, labor shortages, supply chain issues, and soaring inflation, managers and operators are expected to focus on advancing operations over the next year, specifically in the area of food service equipment.

With this outlook in mind, operators have adopted many consumer-facing technologies that offer a competitive edge; hot and cold sheetpan merchandisers and increased capabilities offered by touchscreen controls to better manage equipment performance are just some of the innovative, flexible equipment offerings that can lead to savings and increased efficiency for food service managers and operators.

### Hot and Cold Convertible Merchandisers

Traditionally speaking, food service managers and operators have usually had one piece of equipment to keep food cold and one to keep food hot. Now, hot and cold convertible merchandisers have become versatile pieces of food

service equipment, thanks to their thermal flexibility, which allows both hot and cold foods to be served at the same time. This not only saves time and labor but also frees up valuable serving space. These merchandisers can be used to display and merchandise a wide range of food and beverage products, from pre-packaged sandwiches and salads to drinks and desserts.

The main advantage of hot and cold convertible merchandisers is their ability to switch between heating and cooling modes, making them ideal for use in a variety of different food service settings. In a cold mode, the merchandiser can be used to keep perishable products such as salads, sandwiches, and drinks chilled and fresh. In a hot mode, the merchandiser can be used to keep hot food items such as soups, stews, and baked goods warm and ready for service.

Hot and cold convertible merchandisers work extremely well in institutional settings such as schools, hospitals, and corporate cafeterias, where operators need to serve a variety of different food items to large groups of people. These merchandisers can be used to display a range of food and beverage products in a single location, allowing customers to easily make their selections while also ensuring that the products remain at the proper temperature.

In addition to their versatility, hot and cold convertible merchandisers offer other benefits for food service operators. For example, they can help operators reduce waste by keeping products fresh for longer periods of time, as well as improve the overall presentation of products by keeping them at the proper temperature and humidity levels.

Overall, hot and cold convertible merchandisers are a valuable tool for food service operators, especially in institutional settings, as they offer a versatile and efficient way to display and merchandise food and beverage products while also keeping them fresh and ready for service.

### Touchscreen Control Technology

In food service today, it's all about making everything large, colorful, easy to use, and easy to program. In response to these goals, touchscreen controls

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have become increasingly popular and can be found in a variety of food service equipment—from commercial ovens and fryers to beverage dispensers and refrigeration units.

A common advantage of this display technology is the ability to simplify and streamline the cooking and preparation process, as operators can easily select and adjust cooking temperatures, cooking times, and other settings with just a few taps of their fingers, reducing the need for manual adjustments and minimizing the risk for errors.

Additionally, touchscreen controls can also improve the accuracy and consistency of food preparation. With precise temperature and time settings, operators can ensure food is cooked to the desired level every time, resulting in a better quality product and a more satisfied guest. The accuracy and consistency provided also help provide real-time feedback and monitoring for temperature,

humidity, and other factors that impact cooking or refrigeration equipment.

Ultimately, touchscreen controls can provide valuable information and analytics to operators, including usage data and maintenance alerts that can be adjusted as needed and that prevent potential issues before they become problems. This information can help operators optimize their equipment usage, reduce downtime, and save money on maintenance costs in the long run.

### The Future of Food Service

As the food service industry becomes increasingly competitive, operators are under more pressure than ever to maximize their efficiency and productivity. This requires them to be able to quickly and easily adjust their equipment and processes to meet changing demand, without sacrificing quality or safety.

With the ever-changing landscape of regulations and safety requirements, food service operators must adapt

quickly and stay compliant to avoid penalties or fines. Flexible equipment allows operators to navigate changing regulations by enabling them to easily modify equipment settings to meet new standards. For example, reducing the time and energy needed to hold food at the appropriate temperature minimizes utility use, thus reducing environmental impact while helping meet evolving menu requirements.

Flexible equipment is becoming increasingly important in the food service industry today and is driven by changing preferences, shifting regulations and safety requirements, and an increased demand for efficiency and productivity. By investing in flexible equipment and technology, food service operators can stay ahead of the curve, quickly adapt to changing circumstances, and capitalize on new opportunities as they arise. ■

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**George** is senior vice president of project management for the institutional segment at Duke Manufacturing.

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# NEW PRODUCTS



## X-Ray Product Inspection System

The new X12 X-ray from Mettler Toledo is an inspection system designed for small- to medium-sized packaged foods. Detecting hard-to-find physical contaminants such as glass, stone, and bone, this system features a front opening design to provide for easy access for cleaning and maintenance. Beyond foreign material detection and removal, the X12 can perform a variety of product integrity checks. **Mettler Toledo, [mt.com/pi](http://mt.com/pi)**

## HDPE Acid Digestion Fume Hood

The new UniFlow HDPE Acid Digestion Fume Hood is engineered specifically for extremely corrosive operations involving dissolution procedures for element analysis. The food features a chemical-resistant construction with a welded one-piece HDPE interior fume chamber including hood walls, ceiling, work surface, and rear drain trough. The exterior is constructed of composite resin and is chemical resistant. Available in 48", 60", 72", and 96" models, this series of fume hoods can be supplied with or without a built-in wash down system and rear drain trough. Fume hoods include a counterbalanced vertical sliding clear viewing sash in either polycarbonate, where hydrofluoric acid is being used or tempered glass for other applications, vapor proof LED light fixture, pre-wired switch, and remote-control water fixture with built-in spray nozzles if wash down is required. **HEMCO, [hemcocorp.com/pvcad](http://hemcocorp.com/pvcad)**



## Containment Tank

Frontline International, has released the outdoor double wall containment tanks, which can be used to store used cooking oil outside until it can be collected by a recycler. The double wall tanks, available in 160-gallon and 315-gallon capacities, have secondary containment (bundling) built-in with 115% secondary containment. This construction has a heavy-gauge stainless steel exterior and is insulated to withstand extreme temperatures. These tanks come with electronic locking mechanisms to discourage theft and can only be opened remotely by the operator or to an authorized recycler. The tanks are compatible with pump station and mobile caddy options. Employees never have to come in contact with oil. **Frontline International, [frontlineii.com](http://frontlineii.com)**



## Dish Machine

Auto-Chlor has released the A6 EnergySaver Dish Machine, which offers dual-mode sanitizing and a high-speed 45-second wash cycle, cleaning and sanitizing up to 72 racks per hour. Because of its water-efficient technology, the A6 dishwasher uses as little as 0.69 gallons of water per wash cycle. The machine is available in 208 or 204 volt and single- or three-phase power options. It features integrated controls and pumps, cutting the need to mount chemical feeders on the wall while ensuring the proper detergent and chemical disposal amount. The physical design includes three doors, making it work for both in-line and corner positioning. An integrated food scrap accumulator speeds up pre-wash employee rinse time and prevents clogged drains. When using the A6 as a low-temp machine, a chemical sanitation bath is needed in addition to the regular detergent wash cycle, but using the machine at a lower temperature reduces the water heating energy by 35% and the washing energy by more than half. **Auto-Chlor, [auto-chlor.com/a6](http://auto-chlor.com/a6)**



### Transfer System

R.A Jones has launched the Intelligent Flexible Transfer System (IFTS), an automated and customizable transfer system that provides CPG companies with a solution for simple or complex automation challenges. The system draws upon a library of fixed automation, various robot types and sizes, and standard or custom tooling to optimize a solution to meet production needs and improve efficiency within the packaging line. The system integrates a four-axis robotic pick and place and, depending on sizing, product can span across two magnetic shuttles. By rotating and collating products so more can fit in the carton, the system can help cut down on overall carton volume by 10% to 20% and create a more sustainable packaging option. Another feature of the transfer system is the shuttles' ability to detect the presence of a product; if no product is placed on the shuttle, the machine automatically responds to substitute another shuttle in its place in some scenarios. The system offers a smaller footprint and is scalable, so units can be grouped in a line or in different configurations to incorporate larger robots or solve different problems, such as packaging heavier products. **R.A Jones, rajones.com**

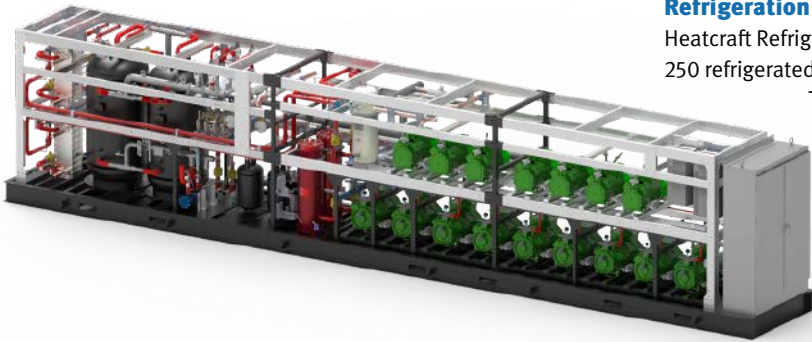
### Optical Sorter

Key Technology has introduced Compass food optical sorters. The product helps processors automate and improve quality management of their food products. The system can sort processed, frozen, and pre-processed vegetables and fruits, nuts, leafy greens, potato chips, confections, and other food products and can identify and separate plastic, glass, paper, and other organic and inorganic foreign material from the line. It can also sort specific product defects. The sorter is offered in a configurable range of system types and sizes and can be installed in line at the start of the process to sort incoming product, after critical transformational processes on the line, or at the end of the food processing. **Key Technology, key.net**



### Refrigeration System

Heatcraft Refrigeration Products now offers expanded capacity, up to 250 refrigerated tons, for the eCO<sub>2</sub>Boost Transcritical Booster System. The system, which can be customized for an array of applications CO<sub>2</sub> refrigerant. Compared with traditional hydrofluorocarbon systems, the typical CO<sub>2</sub> system is expected to cause 98% less global warming impact and an energy cost that is 6% to 10% lower. **Heatcraft, heatcraftprd.com**



### Capacitance Level Switch

The Optiswitch 6500 capacitance level switch from Krohne provides a minimally invasive solution for point level detection of liquids, liquid-liquid interfaces, and solids. One feature of the switch is its variety of available hygienic process connections. Unaffected by foam, condensate, or build-up, the product can be set to detect foam or even changes in media characteristics of the same liquid. The product is also resistant to CIP and SIP agents. The switch can be installed in any position and is fully compliant with FDA and EC1935/2004, in addition to being EHEDG and 3A certified. Typical applications range from small tanks in hygienic applications to tanks with tough, pasty, or strongly adhesive media. The product can also provide block prevention, overflow protection, dry-run, and pump protection in tanks. A range of detections, from interface detection to high and low-level detection to detection of foam, are all achievable with this hygienic switch. **Krohne, us.krone.com**



## News & Notes *(Continued from p. 9)*

### USDA Focuses on Anticompetitive Acts in Food and Agriculture

BY KEITH LORIA

A joint venture between USDA and bipartisan attorneys general in 31 states and the District of Columbia have agreed to a framework that would improve competition and protect consumers in food and agricultural markets in areas such as grocery, meat and poultry processing, and agriculture. The partnership will assist state attorneys general in tackling anticompetitive market structures in agriculture and related industries that are raising prices and limiting choices for consumers and producers, USDA said in a statement.

The initiative is designed to enhance the capacity of state attorneys general to conduct on-the-ground assessments of competition and consumer issues, improve coordination between federal and

state agriculture and competition authorities, and bring about more independent research programs, all in the hopes of establishing fairer and more competitive markets and improved supply chains.



USDA will create an oversight committee to establish the project governance and

transparency standards for the partnership, as well as a project selection advisory committee that is tasked with reviewing project requests and recommending approval. One focus for the agency will be to seek out anticompetitive market structures and practices, price gouging and other anti-consumer practices in food and agriculture industries.

“In joining this collaborative effort, we are increasing our capacity to investigate and tackle anti-consumer behavior that drives up food prices, limits options, and disrupts a key supply chain,” Anthony G. Brown, Maryland’s attorney general, tells *Food Quality & Safety*.

Additionally, USDA stated that it would finalize new rules under the Packers and Stockyards Act, a century-old anti-trust law meant to protect farmers from anticompetitive conduct, before the end of the year. ■

## The Power of Light *(Continued from p. 26)*

### Address Contamination at Its Source

Effective management of harmful pathogens requires a dual approach centered around disinfection and source-level regulations. The ultimate goal is to prevent pathogens from coming into contact with

food products at the outset; however, the current regulatory framework is somewhat limited. In the farm environment, for example, regulations primarily rely on periodic testing by growers to identify the presence of pathogens such as E. coli in their water supply. These tests are conducted on an infrequent basis, often monthly or quarterly. For instance, Food Safety Modernization Act regulations in the U.S. rely on periodic, infrequent micro tests of the source water.

To enhance the safety of food products, a shift toward more proactive and real-time monitoring mechanisms is needed, as opposed to the conventional practice of collecting grab samples intermittently. UV treatment is a promising solution, offering valuable insight into water-quality variations. Through internet-connected sensors, UV technology can monitor and treat the water, actively identifying fluctuations in water quality and ensuring a swift response to any potential contaminants.

Indeed, by installing UV, growers can ensure greater regulatory compliance and higher quality food. It wouldn’t be a

surprise to see large food producers offer a premium to growers who take these actions, just as dairy producers often pay a premium to farmers who consistently deliver milk with a lower microbial count.

UV technology addresses contamination concerns at the source, namely at farms and production facilities, and offers a powerful tool to intercept pathogens before they have a chance to spread through the supply chain. This approach significantly reduces the likelihood of cross-contamination and subsequent foodborne outbreaks.

One key advantage of UV technology is its potential to limit reliance on reactive measures downstream, such as product recalls and treatment of foodborne illnesses. Instead of dealing with the consequences of contamination after the fact, the integration of UV technology focuses on preventing the issue at its source. This protects public health and bolsters consumer confidence in the food they purchase, leading to stronger brand loyalty and a more resilient food industry. ■

**Kershner** is global commercial director at Nuvonic.



# SCIENTIFIC FINDINGS

For access to the complete journal articles mentioned below, go to “Food Science Research” in the October/November 2023 issue at [foodqualityandsafety.com](http://foodqualityandsafety.com), or type the headline of the requested article into the website’s search box.



## Designing Ultraprocessed Plant-Based Foods

Numerous examples of next-generation plant-based foods, such as meat, seafood, egg, and dairy analogs, are commercially available. These products are usually designed to have physicochemical properties, sensory attributes, and functional behaviors that match those of the animal-sourced products they are designed to replace. However, there has been concern about the potential negative impacts of these foods on human nutrition and health. In particular, many of these products have been criticized for being ultraprocessed foods that contain numerous ingredients and that are manufactured using harsh processing operations. In this article, the concept of ultraprocessed foods is introduced

and its relevance to describe the properties of next-generation plant-based foods is discussed. Most commercial plant-based meat, seafood, egg, and dairy analogs currently available do fall into this category, and so can be classified as ultraprocessed plant-based (UPB) foods. The nutrient content, digestibility, bioavailability, and gut microbiome effects of UPB foods are compared to those of animal-based foods, and the potential consequences of any differences on human health are discussed. The authors argue that UPB foods can be designed to have good nutritional profiles and beneficial health effects. ***Comprehensive Reviews in Food Science and Food Safety*. 2023;22:3531-3559.**

## Salmonella and E. coli Contamination on Steel Surfaces

Cross-contamination in the poultry slaughtering process can lead to the spread of zoonotic bacteria such as *Salmonella enterica*. Equipment surfaces may facilitate contamination of carcasses due to bacterial adherence and transfer. In this study, the attachment, proliferation, and detachment of *Salmonella* Enteritidis and *E. coli* were comparatively investigated on uncoated and silica-coated stainless-steel surfaces. The conditions occurring in the slaughtering workflow were imitated on labo-

ratory scale, for example, spilling contaminated liquid onto equipment surfaces, pressing or sliding carcasses against surfaces during the slaughtering procedure, and cleaning contaminated stainless-steel surfaces with water or detergent. Growth on stainless-steel surfaces was measured for eight hours. The applied silica coating led to a partly higher repelling effect without impact on proliferation for the target organisms on stainless steel. ***Journal of Food Safety*. 2023;43:e13075.**



## Sunflower Seed Roasting Temperature

To facilitate the typical flavor of sunflower oil, seed roasting is widely applied. In this study, the effects of seed-roasting degree on the quality attributes of sunflower oil were assessed, particularly tocopherols, sterols, total phenolics, fatty acids, and triglycerides composition as essential compounds for the nutritional value of the sunflower oil. Roasting seeds at a high temperature can significantly raise oxidative stability by 1.5 to 1.8 times, the content of carotenoids by 2.0 to

5.5 times, chlorophyll by 7.5 to 17.0 times, as well as increase the browning index by 4.0 to 10.0 times and deepen the color of the sunflower oil. However, the fatty acid and triglyceride profiles of sunflower oils have little change under distinct seed-roasting degrees. The authors recommended that seed roasts at 160°C to 180°C for about 20 min to ameliorate the oxidative stability and quality. ***Journal of Food Science*. August 17, 2023. doi: 10.1111/1750-3841.16735.**





### Wild Fish Food Safety

Harvesting marine food fish to meet the global demand has become a challenge due to a reduction of fishery areas and food safety hazards associated with increased pre-harvest and post-harvest contaminations. The causes of low fish availability and contaminations were reviewed following the published literature from 2000 to 2023. Marine fish yields are stressed due to the spread of contaminants triggered by rising sea temperatures, transportation of microorganisms by marine vessels, anthropogenic activities leading to increased toxic microorganisms, and the entry of toxic chemicals and antibiotic residues into seawater via rivers or directly. Processing adds pyrogenic chemicals

to foods, and the hazardous materials may accumulate in the fish beyond the tolerance limits permitted for human foods. While the research and control measures focus on minimizing the hazards due to pathogenic microorganisms and chemicals in market fish, there is less discussion on the unhealthy changes occurring in the oceans affecting the quantity and quality of fish, and the origins of microbial and chemical contaminations. This review examines the factors affecting availability of wild fish and increased contaminations. ***Comprehensive Reviews in Food Science and Food Safety*. Published September 21, 2023. doi: 10.1111/1541-4337.13239.**

### Consumer Acceptability of No-Added Sugar Products

Stevia is an emerging natural high-intensity sweetener. There are negative perceptions of zero-calorie sweeteners, but studies that provide knowledge of these sweeteners improve their perception. This study evaluated consumer acceptability of a zero-sugar bakery product under blind and informed conditions along with physicochemical analysis of the products. Rebaudioside A (Reb A) and the new types of stevia (Rebs D and M) with sugar as a control were used to formulate pound cakes. Panelists evaluated the overall hedonic impressions (aroma, texture, flavor, and aftertaste) and intensity (sweetness and bitterness) of the cakes under blind and

informed conditions with an enforced two-week break between evaluations. Overall, stevia cakes showed an increase in flavor and texture liking during an information session when compared with the blind session, but only Reb A showed a significant difference. The increase in liking scores indicated that information positively affected consumer perception of the stevia-sweetened cakes attributes. The authors conclude that stevia can be used in a practical baking application and product-related information impacts consumer acceptability. ***Journal of Food Science*. September 26, 2023: doi: 10.1111/1750-3841.16773.**



### Improving Peach Quality

Peaches are a highly significant economic fruit renowned for its juicy flesh, delectable taste, and pleasant aroma, all of which have made it a consumer favorite. Improving fruit quality often involves enhancing its aroma, as it is widely acknowledged that the aroma of a fruit plays a crucial role. However, the formation of aroma volatiles is dynamic and varies with fruit development and ripening and is closely linked to genetic background, cultivation management, and post-harvest treatment. With the advancement in molecular biology

and multi-omics techniques, researchers have gained fresh insights into the molecular functions of peach genes, which holds significant implications for enhancing fruit flavor and advancing modern breeding programs. This review summarizes the most-recent findings pertaining to aroma volatile compounds, sheds light on the underlying regulatory mechanisms, and dissects the primary fields of peach fruit aroma research. ***International Journal of Food Science and Technology*. 2023;58:4965-4979.**

### Organic Food Packaging and Consumer Preference

Organic food enjoys widespread popularity; however, there are numerous factors influencing consumer purchasing decisions. Among these factors, packaging stands as a significantly salient determinant. While numerous studies have examined various aspects of organic food packaging, such as design, materials, and size, the impact of packaging transparency has received relatively less attention. This research explored the influence of transparency in organic food packaging on consumer purchase intentions. The findings from

two experiments illustrate that transparency in organic food packaging significantly impacts consumers' purchase intentions. Specifically, organic food with transparent packaging (versus opaque) increases purchase intentions, with green perceived value playing an intermediary role. These findings may offer practical implications for companies in terms of designing packaging transparency and other aspects of organic food packaging. ***International Journal of Food Science and Technology*. October 5, 2023. doi: 10.1111/ijfs.16765.**



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San Diego, Calif.

[pittcon.org](http://pittcon.org)

### MARCH 2024

12-16

#### National Products Expo West

Anaheim, Calif.

[expowest.com](http://expowest.com)

21-22

#### Future Food-Tech

San Francisco, Calif.

[futurefoodtechsf.com](http://futurefoodtechsf.com)

26-27

#### American Food Sure Summit

Atlanta, Ga.

[americanfoodsure.com](http://americanfoodsure.com)

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#### GFSI Conference

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#### Congrence

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[thewesternfoodsafetyconference.com](http://thewesternfoodsafetyconference.com)

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6-9

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[iaea.org](http://iaea.org)

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### JULY 2024

14-17

#### IFT First Annual Event and Expo

Chicago, Ill.

[iftevent.org](http://iftevent.org)

14-17

#### International Association for Food Protection

Long Beach, Calif.

[foodprotection.org](http://foodprotection.org)

### Have an Upcoming Event to Promote?

If you have an upcoming industry event that you would like considered for inclusion in our online and print listings, go to [foodqualityandsafety.com/events](http://foodqualityandsafety.com/events) for info or contact Vanessa Winde at [vwinde@wiley.com](mailto:vwinde@wiley.com).



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