

Food Quality & Safety

FARM TO FORK SAFETY

TRANSPARENCY:

**THE MUST-HAVE
INGREDIENT**

**Addressing consumers'
demands to know where
their food came from
and exactly what's in it**

JUST PROVE IT.

Spectroquant® Prove water analytic system

Simplify water analysis
with a new class of
spectrophotometers



Our goal was to build the perfect tool for water analysis. One that unites the simplicity you want with the security you need, and durability you expect. Spectroquant® Prove water analytic system delivers all these and more. Its intuitive controls, and our popular Spectroquant® test kits make analysis smoother than ever.

Spectroquant® Prove water analytic system.
It just makes your work flow.



just-prove-it.com



OUR WEBINARS SATISFY YOUR APPETITE TO LEARN.



A host of audio and video webinars are available on demand at www.foodqualityandsafety.com/webcast/

TAKE YOUR PICK!

Winner Announcement Coming Soon

2017 Annual Food Quality & Safety Award

Find out who had all the right ingredients to be named this year's Food Quality & Safety Award winner. Watch this space and learn more at foodqualityandsafety.com/award.

This prestigious award honors the dedication and achievement of an organization that has made significant improvements in its safety and quality assurance program with a positive impact on business needs.



Contents

APRIL/MAY 2017 • VOLUME 24 NUMBER 2 • www.foodqualityandsafety.com

20

COVER STORY

TRANSPARENCY:

THE MUST-HAVE INGREDIENT

Addressing consumers' demands to know where their food came from and exactly what's in it

BY JESSE STANIFORTH

Special Report

24

Phytochemicals' Role in Animal Wellness

Natural plant-based feed additives can improve animal nutrition, and consumers' perceptions

BY SONNY PUSEY AND KEVIN ADAMS

Safety & Sanitation

27

Dressed to Impress... And to Prevent Contamination

Tips on finding a uniform provider capable of delivering hygienically clean work garments

BY TIMOTHY COSGRAVE

Food Quality & Safety (ISSN 1092-7514) is published 6 times a year in Feb/Mar, Apr/May, Jun/July, Aug/Sept, Oct/Nov, Dec/Jan by Wiley Subscription Services, Inc., a Wiley Company, 111 River St., Hoboken, NJ 07030-5774. Periodical postage paid at Hoboken, NJ, and additional mailing offices.

Print subscriptions are free for qualified recipients. Annual paid subscriptions are available to all others for \$183.

For subscription questions in the U.S., call 844-862-9286. For outside the U.S., call 856-255-5537.

Food Quality & Safety is a proud member of: United Fresh Produce Association
APEX, Folio Ozzie, and ASBPE award winner for editorial and graphics excellence.

POSTMASTER: Returns and address changes to *Food Quality & Safety* magazine, PO Box 986, Levittown PA 19055-0986



page 38

Safety & Sanitation cont.

29 IS YOUR SANITATION PROGRAM STARTING ON THE RIGHT FOOT?

A footwear cleaning and sanitation program can help stop pathogens from entering into your facility

BY APRIL ZEMAN-LOWE

Quality

32 DON'T GET CAUGHT UP IN SEAFOOD FRAUD

In a sector fraught with mislabeling practices, retailers must be diligent in verifying their seafood's supply chain journey

BY CHRISTOPHER HOEMEKE

In The Lab

35 CHEMICAL CONTAMINATION: YOU'RE NOT SUPPOSED TO BE HERE!

Connecting food contamination and food safety with the application of chromatography

BY DAVID KENNEDY, PHD

38 MONITORING PESTICIDES IN OUR FOOD

Using chromatography techniques that detect residual pesticides in order to meet global regulatory requirements

BY FENG QIN

Manufacturing & Distribution

41 PUTTING 'PRESSURE' ON FOOD PACKAGING

High Pressure Processing harnesses the power of water pressure in food preservation

BY MARK FLECK

43 RESPONSIBLE PACKAGING

The role of packaging in extending shelf life to ultimately increase food safety and reduce waste

BY KARL DEILY

Food Service & Retail



45 RETAIL OPTIMIZATION DRIVES BENEFITS BEYOND TRANSPORTATION

Having a retail strategy in place that improves and consolidates food shipments helps all parties involved, including suppliers

BY TIM BASS

Columns

Washington Report

12 TRUMP, TRADE, AND FOOD

Industry seeks clarity amid evolving international trade agreements and domestic policies

BY TED AGRES

Innovative Tech

14 BENCH WORK BREAKTHROUGHS

Cutting-edge tests, tools, and technologies continue to advance food laboratory analysis

BY LINDA L. LEAKE, MS

FSMA Update

17 SMALL- TO MID-SIZED COMPANIES ARE UP NEXT FOR FSMA COMPLIANCE

Getting a start on designing, implementing, and maintaining a Food Safety Plan that conforms to FSMA

BY JEFFREY T. BARACH, PHD

Evolution of Food Laws

18 THE AGE OF PREVENTION

Rundown of what you need to know about FSMA's rules to keep the modern food supply safe

BY LIBBY THOMA

Departments

8 FROM THE EDITOR

10 NEWS & NOTES

48 NEW PRODUCTS

49 ADVERTISER INDEX

49 EVENTS

50 SCIENTIFIC FINDINGS



facebook.com/FoodQualityandSafety



@FQSmag





PURE GENIUS

REVOLUTIONIZING FOOD SAFETY

A PURE NECESSITY FOR FOOD PROCESSING AND FOOD SAFETY!

Our family of products is based on our patented **Silver Dihydrogen Citrate** molecule. SDC has revolutionized food safety because it is one of the most powerful antimicrobials offering low-toxicity and user friendly solutions. Our products quickly eliminate dangerous pathogens in food processing and preparation facilities.

- PURE® Hard Surface: EPA registered food contact surface sanitizer and disinfectant—Superior efficacy with 24 hour residual protection
- **NEW!** PURE Control®: FDA & USDA Approved processing aid for poultry and produce
- PURE® Multi-Purpose and PURE® Hi-Foam Cleaners: Environmentally friendly concentrated cleaners

PURE Control was developed as an antimicrobial processing aid for direct application to poultry carcasses, parts and organs, fruits and vegetables to reduce pathogen populations. Our environmentally friendly formula maximizes microbial control and is highly effective against Salmonella, Listeria, E. coli and many other microorganisms. PURE Control offers superior efficacy with neutral to positive effect on yield, making it the ideal solution for your poultry and produce processing needs.

**FOR CONSULTATION AND EVALUATION, CALL
619.596.8600 OR EMAIL SALES@PUREBIO.COM**



*Preventing the smallest things from
damaging your biggest asset...your brand!*



From The Editor

Set to take place on April 22, the March for Science consists of a series of rallies and marches held in Washington, D.C. and across the world to help bring recognition to the scientific community and encourage evidence-based policies. This international movement is intended to draw global attention to the critical importance of scientific achievements that impact every aspect of our lives—including food.



In the March 2017 issue of *Food Technology*, John Coupland, PhD, CFS, president of IFT, writes, “The need to use science effectively to solve problems is especially pressing in issues surrounding food. In the past, we would look to traditional methods of salting and drying to preserve our food; now scientific study has led to controlled atmospheres and other innovative technologies to widen our options. We continue to look to science to solve the problems—both large and small—we face today in our food system.”

However, many in the scientific community are concerned that innovative research will come to a screeching halt as new policies in the U.S. are threatening to restrict funding. Proposed budget cuts to research investments and to science agencies like the National Institutes of Health and Environmental Protection Agency have led to many scientists joining the March for Science to bring attention to proposed policies that are ignoring scientific evidence.

Food Quality & Safety’s own publisher, Wiley, is supporting the March for Science and other activities that amplify the pro-research voices of its partners and reinforce the company’s own continued support for science and scholarship. To help the scientific community, Wiley encourages researchers to engage and motivate the public through “scientific communication,” going beyond published articles, to increase the public’s value on science and highlight the need to invest in science.

“We see the results of research in the science of food at the IFT annual event each year as well as in our local supermarkets, and we should support the people and funding that allow the best science to happen,” notes Dr. Coupland.

The March for Science points out that the movement isn’t a rally against a particular political party. “Anti-science agendas and policies have been advanced by politicians on both sides of the aisle, and they harm everyone—without exception,” according to its Mission webpage. “Science should neither serve special interests nor be rejected based on personal convictions. At its core, science is a tool for seeking answers. It can and should influence policy and guide our long-term decision-making.”

Marian Zboraj
Editor

PUBLISHER Lisa Dionne-Lento, ldionne@wiley.com

SENIOR ACCOUNT MANAGER Ken Potuznik, kpotuzni@wiley.com

EDITOR Marian Zboraj, mzbora@wiley.com

DESIGN Maria Ender, mender@wiley.com

PRODUCTION Claudia Vogel, cvogel@wiley.com

Jörg Stenger, jstenger@wiley.com

Elli Palzer, palzer@wiley.com

Advertising Director

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

Sales Office

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

Editorial Office

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

Editorial Advisory Panel

Betsy Booren, PhD
Chief Scientist
American Meat Institute Foundation

Gerry Broski
Sr. Marketing Director, Food Safety
Neogen Corp.

Christine Chaisson, PhD
Director
The Lifeline Group

Virginia Deibel, PhD
Director, Microbiological Consulting
Covance Laboratories

Philip H. Elliott, PhD
Food Safety, Global Quality Assurance
W.K. Kellogg Institute

Steven Gendel
Vice President, Div. of Food Allergens
IEH Laboratories & Consulting Group

Tim Jackson
Director, Food Safety U.S. and Canada.
Nestle

Jennifer McEntire, PhD
Vice President, Food Safety and Technology
United Fresh Produce Association

Mary Ann Platt
President
CNS/RQA, Inc.

Mike Robach
Vice President, Corporate Food Safety,
Quality, & Regulatory
Cargill

Bob Swientek
Editor-in-Chief, Food Technology
magazine
Institute of Food Technologists

Purnendu Vasavada, PhD
PCV & Associates and Professor of
Food Science
University of Wisconsin

Patricia A. Wester
President
PA Wester Consulting

Craig Wilson
Vice President, Food Safety
& Quality Assurance
Costco Wholesale

Steven Wilson
Chief Quality Officer
USDC Seafood Inspection Program

Printed in the United States by Dartmouth Printing, Hanover, NH.

Copyright 2017 Wiley Periodicals, Inc., a Wiley Company. All rights reserved. No part of this publication may be reproduced in any form or by any means, except as permitted under Sections 107 or 108 of the 1976 United States Copyright Act, without either the prior written permission of the publisher, or authorization through the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923; (978) 750-8400; fax (978) 750-4470.

All materials published, including but not limited to original research, clinical notes, editorials, reviews, reports, letters, and book reviews represent the opinions and views of the authors and do not reflect any official policy or medical opinion of the institutions with which the authors are affiliated or of the publisher unless this is clearly specified. Materials published herein are intended to further general scientific research, understanding, and discussion only and are not intended and should not be relied upon as recommending or promoting a specific method, diagnosis or treatment by physicians for any particular patient.

While the editors and publisher believe that the specifications and usage of equipment and devices as set forth herein are in accord with current recommendations and practice at the time of publication, they accept no legal responsibility for any errors or omissions, and make no warranty, express or implied, with respect to material contained herein. Publication of an advertisement or other discussions of products in this publication should not be construed as an endorsement of the products or the manufacturers’ claims. Readers are encouraged to contact the manufacturers with any questions about the features or limitations of the products mentioned.



PUT **TRUST** ON THE **TABLE**

**Your leadership can reduce the
risk of foodborne pathogens.**
We can help.

Diamond V's natural technologies promote safer animal protein production. Our research-proven products help you:

- Meet new food safety standards**
- Lower your risk of food recalls**
- Advance public health**
- Protect your brand**

 **Diamond V**[®]
The Trusted Experts In Nutrition & Health[®]

NEWS & NOTES

FreshFacts on Retail Report

Continued growth in fresh produce spend, highlighted by increased organic as well as innovative value-added products are covered in the United Fresh Produce Association's 2016 Year in Review edition of the "[FreshFacts on Retail](#)" report. This report examines overall retail trends in produce for the past year, as well as provides insights into performance and consumer data for fresh produce. The report also features a spotlight on the impact of e-commerce and home delivery, which has potential to revolutionize the grocery shopping experience.



© NDS3000 - FOTOLIA.COM



2016 Food Safety Survey

FDA's "[Food Safety Survey](#)," a periodic national telephone survey of adults, is intended to help FDA and USDA make informed regulatory, education, and other decisions by providing a better understanding of consumer knowledge, attitudes, and practices related to food safety. Some key findings: Consumers are more concerned about raw chicken and raw beef being contaminated than raw vegetables; most consumers wash chicken before cooking them; 65% had not heard of mechanically tenderized beef; and awareness is high for *Salmonella* (93%) and *E. coli* (89%), and is low for *Campylobacter* (16%).

© AKULAMATIUA - FOTOLIA.COM

ABC Ordered to Face Defamation Trial Over 'Pink Slime'

According to [Reuters](#), a South Dakota state judge has ordered ABC Broadcasting to face a potential \$5.7 billion defamation lawsuit claiming it damaged BeefProducts Inc. by referring in a series of reports to a meat product it sold as "pink slime." Judge Cheryl Gering of the Union County Circuit Court in Elk Point dismissed claims against anchor Diane Sawyer, but said ABC, a unit of Walt Disney Co., and reporter Jim Avila must defend against such claims. The judge said Sawyer was different in part because "her actions as anchor, which limits her involvement in doing research," were not sufficient to establish defamation. BPI's lawyer, J. Erik Connolly, said his client looks forward to proving how ABC "engaged in a disinformation campaign against a company that produces safe and nutritious beef, leading to billions of dollars in damages and hundreds of lost jobs." Jury trial is scheduled for June 5.



Food Retail and Service Guidelines

GS1 US releases a new guideline called the [GS1 US Guidance for Sharing Product Attributes via GDSN in Retail Grocery](#) for users of the Global Data Synchronization Network, an interoperable network that allows brands to share product data with their customers and trading partners. The guideline offers tips for sharing product details and descriptions to help trading partners keep pace with the growing consumer and industry demand for achieving complete and accurate product information.

In addition, GS1 US publishes [Implementation Guideline for Case-Level Traceability Using GS1 Standards](#), which offers step-by-step guidance for the track and trace of food products as they move through the supply chain. The guideline focuses on the implementation of case-level traceability processes leveraging GS1-128 barcodes and capturing important traceability information, such as product and location data, production dates, and batch/lot numbers. By collecting and maintaining this information, trading partners can support visibility of the product's movement through the distribution channel, and minimize the impact of product withdrawals by removing affected product faster.

Business Briefs

Emulsifier provider **Palsgaard** acquires the majority of the shares of Brazilian food ingredients company **Candon Aditivos para Alimentos**.

The Canadian government makes \$1.1 million investment in **Mazza Innovation** to expand its plant extract production facility in Delta, British Columbia, to help meet demand for phytonutrients.

Shimadzu Scientific Instruments and **MIDI** form a strategic partnership to develop and market automated chromatographic solutions for agri-biotech, dietary supplement, food science, and other industries.

Hygiena completes its acquisition of DuPont's food safety diagnostics business. Hygiena will now sell the former **DuPont Diagnostics** products under the Hygiena brand through its entity, **Qualicon Diagnostics LLC**.

Aptean, provider of enterprise software solutions, partners with Canadian value-added reseller, **Vokeso**, to broaden Aptean's presence in Quebec and eastern Canada.

Nelson Jameson has expanded its business development capabilities by establishing a sales office in downtown Chicago.

© IBETIANA - FOTOLIA.COM

REGISTER BY 4/14
& SAVE!



Solutions *for* TODAY
Planning *for* TOMORROW®

HOT TOPICS IN FOOD SAFETY

A Keynote Conversation

A dynamic panel of speakers from industry and government will address the most important issues facing food safety professionals including the implementation of the Food Safety Modernization Act, Litigation, International Implications of the FSMA Rules, and Corporate Commitment.



Kathy Gombas
formerly FDA



Craig Wilson
Costco Wholesale Corporation



Dave Gombas
formerly United Fresh Produce

MODERATOR



Dane Bernard
Managing Director,
Bold Bear Food Safety



Jeffrey Steger
US Department of Justice



Shawn Stevens
Food Industry Counsel, LLC

MAY 8-11
2017

Rosemont, IL

Donald E. Stephens Convention Center

www.FoodSafetySummit.com

#FOODSAFETYSUMMIT

GOLD SPONSOR



SILVER SPONSOR



BRONZE SPONSOR



MEDIA PARTNERS



Food Safety News

Washington Report



Trump, Trade, and Food

Industry seeks clarity amid evolving international trade agreements and domestic policies | BY TED AGRES

Food industry experts and policymakers are having difficulty determining the implications of President Donald Trump's pronouncements regarding foreign trade, including the possibility of imposing tariffs on imports from Mexico, renegotiating the North American Free Trade Agreement (NAFTA), withdrawing from the Trans-Pacific Partnership (TPP), and ignoring rulings made by World Trade Organization.

Adding to the uncertainty, many key presidential advisers and senior agency officials—all with roles to play in shaping food policy—have yet to be confirmed by the Senate. Among them are Scott Gottlieb, MD, a former deputy FDA commissioner, nominated to head that agency, and Robert Lighthizer, a Maryland attorney, nominated to be U.S. trade representative. Sonny Perdue, nominated to head USDA, has undergone hearings in the Senate but, as of publication deadline, had not yet been confirmed. Issues involving food imports, exports, and safety

will likely be impacted by these and other officials.

Questions also surround emerging domestic policies, including a temporary freeze on new and pending federal regulations until reviewed and approved by the Trump administration; the identification of at least two prior regulations to be eliminated for every new regulation issued; the proposed downsizing of the federal government and slashing of non-defense, discretionary budgets, possibly affecting spending for food safety.

In a preliminary [budget submission](#) for Fiscal 2018, the Trump administration is seeking \$179 billion for USDA, a \$4.7-billion or 21 percent reduction from 2017's funding level. USDA's Food Safety and Inspection Service (FSIS) would remain fully funded, however. (By law, slaughter and processing facilities cannot operate unless FSIS inspectors are present.) But some external research grants could be trimmed, and the budget "focuses" in-house research funding within the Agri-

cultural Research Service to the "highest priority agriculture and food issues," such as farm productivity, and "addressing food safety and nutrition priorities."

Funding within FDA for the Food Safety Modernization Act (FSMA) and food safety is not specifically addressed in the budget, although funding for the Department of Health and Human Services, FDA's parent agency, would be cut by \$15.1 billion, or 179 percent over the current year. Fiscal 2018 begins Oct. 1, 2017. The White House plans to submit a traditional full budget in mid-May.

Trump has been explicit about his disdain for government regulations which, he says, have impeded business growth and U.S. productivity, and his desire to repeal or trim back rules that are costly or burdensome. Thus far, however, the Trump administration has not indicated how it views FSMA, whose extensive rules and regulations are in the process of being implemented by industry. Most industry experts doubt that the administration would seek to dismantle FSMA, given that its major provisions have already been issued as final rules and that the law was passed with strong bipartisan congressional and industry support.

The White House, however, has not explicitly addressed its overall philosophy regarding food safety. This has left many people sifting for clues. For example, does Trump's well-known preference for burgers and steaks cooked [well-done](#) mean that he truly appreciates the importance of proper food preparation and handling to prevent the spread of foodborne illnesses?

Perhaps more significantly, what, if anything, should be made over the Trump campaign's online posting—and prompt removal—last September of a [fact sheet](#) that highlighted "specific regulations to be eliminated," including what it called the "FDA Food Police"? The fact sheet claimed the FDA Food Police "dictate how the federal government expects farmers to produce fruits and vegetables" and that federal regulations "greatly increased in-

spections of food ‘facilities’ and levies new taxes to pay for this inspection overkill.” Following publicity, the fact sheet was quickly removed and replaced with one that did not mention the FDA.

Food and Trade

At the heart of many concerns is how the U.S. food industry may be impacted by major changes to international trade agreements. Trump, both as candidate and president, has made foreign trade a cornerstone of his agenda to strengthen the U.S. economy by promising to make such agreements “freer and fairer for all Americans.” The Trump administration’s [trade policy agenda](#), issued March 1, 2017 by the Office of the United States Trade Representative (USTR), promises “a fundamental change in direction of U.S. trade policy” by focusing on bilateral instead of multilateral negotiations and renegotiating and revising agreements “when our goals are not being met.”

Shortly after assuming office, Trump signed an [executive order](#) withdrawing the U.S. from TPP, a trade agreement between Australia, Brunei, Canada, Chile, Japan, Malaysia, Mexico, New Zealand, Peru, Singapore, and Vietnam that had been seven years in the making under the Obama administration.

While noting that Congress was unlikely to ratify TPP in any case, the United Fresh Produce Association urged the Trump administration to “move past anti-trade rhetoric” and begin building consensus for key portions of TPP that would have benefited U.S. growers. These include rules that prevent countries from imposing protectionist measures in the form of sanitary and phytosanitary barriers. Without these, “countries can simply choose to block imports without scientific justification,” said Tom Stenzel, president and CEO, United Fresh.

Most U.S. food-industry related worries, however, surround Trump’s repeated calls to renegotiate NAFTA and impose tariffs of 10 to 20 percent on imports from Mexico and possibly other countries, with revenues to be used, in part, to build a wall on the southern U.S. border. When it went into effect in 1994, NAFTA removed most remaining trade barriers and tariffs from U.S., Mexico, and Canada. The pact has long been controversial due to concerns

of job losses, declining wages, and companies shifting manufacturing to Mexico. Indeed, Trump called NAFTA “the worst trade deal in the history of the country.”

While continuing to bristle over the concept of a border wall, Mexican officials agree that NAFTA needs updating. “NAFTA is a 23-year-old agreement. We need to bring it up to modernity,” said Mexico’s Economy Minister Ildefonso Guajardo at a meeting hosted by the Detroit Economic Club in March. He disagreed with Trump that NAFTA has led to a “massive” trade imbalance, noting that Mexico’s exports to the U.S. in 2016 totaled \$294 billion compared to \$231 billion in U.S. exports to Mexico.

According to [USTR](#), Mexico was the second-largest supplier of imported agricultural products to the U.S. in 2015 (the most recent year available), with goods totaling \$21 billion. Any border tax or tariff would be imposed on U.S. importers, adding to the cost of products as they cross the border, which would lead to reduced company profits or higher consumer prices.

With much at stake, more than 130 U.S. food and agricultural organizations have urged Trump to not abandon NAFTA but to upgrade and modernize it, thereby preserving and expanding its gains. In a Jan. 23, 2017 [letter](#) to the president, the groups, organized as the U.S. Food and Agricultural Dialogue for Trade, noted that NAFTA has been a “windfall” for U.S. farmers, ranchers, and food processors, with agricultural exports to Canada and Mexico more than quadrupling in value, from \$8.9 billion in 1993 to \$38.6 billion in 2015.

“With the productivity of U.S. agriculture growing faster than domestic demand, the U.S. food and agriculture industry...relies heavily on export markets to sustain prices and revenues,” said the letter, whose signatories included such trade and industry groups as the American Soybean Association, the Fresh Produce Association of the Americas, the U.S. Dairy Export Council, and Western Growers, as well as food processing companies, including Archer Daniels Midland, Cargill, and Tyson Foods.

Regulatory, Hiring Freezes

While FSMA itself is unlikely to be affected by the administration’s temporary freeze on new and pending regulations or the two-for-one rule, some FSMA-related is-

ssues might be. They include pending FDA rules for food lab accreditation standards, the posting of recall notices, and traceability regulations for high-risk foods. Other potentially affected actions include a USDA final rule on adding new requirements to the National Organic Program for livestock handling and avian living conditions, and an FDA proposed rule to remove GRAS affirmation for partially hydrogenated oils, according to an [analysis](#) by the Covington & Burling law firm. Finally, FDA guidance documents related to the Nutrition Facts Label final rule could also be delayed.

The Trump administration’s freeze on filling vacant federal government positions, announced in January, was having a negative effect on USDA’s FSIS. According to a Jan. 18, 2017 internal message sent to FSIS staffers, the staffing freeze would delay tests of pathology samples submitted to the FSIS lab system for analysis. “AMR-01 and rush cases will be given priority status,” the memo stated, “however, turnaround times and expected to be delayed by at least 24 hours on these samples.” Resolving the matter would depend on staffing of key positions, it added.

But administration staffing at the most senior levels is also causing some concern. Sonny Perdue, Trump’s choice to lead the USDA, was governor of Georgia during the 2008/2009 Peanut Corp. of America [Salmonella outbreak](#), which killed nine people and sickened at least 714 others across 46 states. Two years earlier, under Perdue, Georgia had slashed its food safety budget by 29 percent. The FDA had delegated inspection responsibility to the state, and state officials later said that shortfalls in manpower and funding had hindered their ability to adequately inspect the company.

In March, Trump nominated Dr. Gottlieb to head the FDA. A former deputy FDA commissioner for medical and scientific affairs (2005-2007), Dr. Gottlieb’s experience has been mainly with pharmaceutical discovery, development, and drug approval policies, including design of and requirements for human clinical trials. The extent to which he might be directly involved in the agency’s food portfolio remains unclear, although some previous FDA commissioners had largely delegated food responsibilities to their deputies. ■

Agres is an award-winning freelance writer based in Laurel, Md. Reach him at tedagres@yahoo.com.

Innovative Tech



bioMérieux's GENE-UP real-time PCR solution for pathogen detection allows for a high level of specificity.

Bench Work Breakthroughs

Cutting-edge tests, tools, and technologies continue to advance food laboratory analyses

BY LINDA L. LEAKE, MS

If you're a laboratory professional who thinks a programmable coffee maker is the greatest thing since sliced bread, you're in for a pleasant surprise. Not only can you wake up to fresh brewed java at your prescribed time, you can now arrive at your workplace and find freshly made culture media ready and waiting to be used, thanks to the recent development of a new programmable media preparator.

Say hello to the Masterclave 20 Automated Media Preparator, introduced by bioMérieux, Inc., Hazelwood, Mo., in November 2016.

"With its automatic water-filling and autostart features, the Masterclave 20 has the ability to prepare fresh agar or broth that is ready when lab operations begin," says J. Stan Bailey, PhD, director of scientific affairs for bioMérieux Industry.

Another recent bioMérieux offering, introduced in 2016, is GENE-UP, a proprietary real-time three-step polymerase chain reaction (PCR) pathogen detection system, which the company touts is fast, simple, accurate, and requires minimal training.

Dr. Bailey explains that GENE-UP's first step, sample preparation and enrichment, includes a standardized protocol

and workflow with single enrichment and incubation time between 8 and 24 hours. Step two consists of a simplified, generic 5-minute mechanical lysis.

The third step, amplification and detection, features the same PCR run for all parameters. "This allows for accurate results within one hour, a higher level of specificity than other molecular methods, and real-time PCR analysis coupled with endpoint melt peak analysis," Dr. Bailey says.

BCN Research Laboratories, Inc., Rockford, Tenn., a commercial laboratory that serves the food industry, has been using GENE-UP since July 2016.

"We typically run about 100 GENE-UP samples every day," says Amy Pass, BCN's senior lab technician. "Since we started using this technology, we have experienced a 25 percent increase in our sample load, but the amount of time our employees spend running the tests has stayed the same."

Another benefit of GENE-UP, Pass mentions, is that it provides a definite positive or negative result. "So there is no subjective decision looking at the lateral flow strip to see one line or two," she says.

Colony Tests and Counter

Results in five seconds or less are one of the charms of Charm Sciences, Inc.'s, Lawrence, Mass., new Peel Plate Colony Counter, which became commercially available in February 2017.

The instrument is designed to analyze a variety of Charm's Peel Plate microbial tests, according to Robert Salter, MS, the firm's vice president of regulatory affairs. The tests are prepared media in a shallow dish with an adhesive top. "They are aseptic ready-to-use tests that are simply rehydrated with the food or food dilution, and incubated at times and temperatures appropriate to the microbes being detected," Salter explains.

Currently there are Peel Plate tests for aerobic bacteria (Peel Plate AC, introduced in August 2015), coliform bacteria (Peel Plate CC, introduced in 2016), Enterobacteriaceae (Peel Plate EB, introduced in 2017), yeast and mold (Peel Plate YM, introduced in 2016), heterotrophic bacteria in water (Peel Plate HET, introduced in January 2016), and coliforms/*E. coli* (Peel Plate EC, introduced in August 2015) for use in dairy products, ground meats, other foods, contact surfaces, and water.

The new Colony Counter reads all of these Peel Plates, Salter says.

The Peel Plate EC test holds Performance Test Method Status 061501 with the AOAC Research Institute for total coliform in dairy products tested at 32 degrees Celsius and for *E. coli* and coliform detection in water, surface rinses, environmental sponges, and foods such as ground meats, eggs, chocolate, and dry dog food tested at 35 degrees Celsius.

Based on additional multi-laboratory reference method comparative data, the Peel Plate EC test and the Peel Plate AC test were voted in the 2015 National Conference on Interstate Milk Shipments for inclusion into the Pasteurized Milk Ordinance governing U.S. milk testing requirements.

"Many of our customers are using Peel Plate tests to verify their sanitation and hygiene practices and to monitor and improve food product shelf life," Salter notes.

Molecular Detection Chemistries

Roka Bioscience, Inc., Warren, N.J., offers differentiated molecular chemistries for pathogen detection. One such cutting-edge chemistry is target capture, Roka's proprietary sample preparation method that is integrated into the company's testing instrument called the Atlas System.

Target capture uses highly specific nucleic acid hybridization to purify and concentrate only the target RNA of interest, according to W. Evan Chaney, PhD, Roka's director of customer applications and microbiology. "Roka's target capture technology is the only fully integrated nucleic acid based sample preparation technology in the industry," he says.

The diversity of sample matrices in food related analyses results in very unique diagnostic application challenges, Dr. Chaney points out. "Our target capture technology helps to address these challenges by providing an ideal sample for downstream amplification and detection by molecular chemistries called transcription-mediated amplification (TMA) and hybridization protection assay (HPA)," he relates.

"TMA is still novel within the food industry and many food safety professionals are not aware of the differences between it and incumbent testing methods, like PCR," Dr. Chaney says.

Post TMA, all Roka assays detect any amplified product utilizing HPA, which Dr. Chaney describes as a highly specific chemiluminescent reaction from which the intensity is measured by the Atlas instrument.

Roka's technology is utilized in many industry segments, including commercial laboratories, poultry, ready-to-eat meats, produce, dairy, confectionary, ingredients, cereals, multi-component

foods, snack foods, and as a tool in pre-harvest food safety.

TMA is used by Marshfield Food Safety, LLC (MFS), Marshfield, Wis., a firm that provides customized, onsite process control laboratory services for U.S. food processing operations.

"We have been using TMA for qualitative, semi-quantitative, and limits testing for *Salmonella* for four years," says Roy Radcliff, PhD, chief executive officer, MFS.

(Continued on p. 16)

Complete Inspection Complete Protection

We offer product inspection solutions to **ensure regulatory compliance with FSMA** that will also boost your profits and protect your brand.



SAFELINE
Metal Detection & X-ray Inspection



SAFELINE
Metal Detection & X-ray Inspection



HI-SPEED
Checkweighing



CI-VISION
Vision Inspection



Visit us at the Food
Safety Summit

Booth 204

May 8 - 11, 2017
Rosemont, IL

► www.mt.com/pi

METTLER TOLEDO

(Continued from p. 15)

“We started using TMA for identifying *Listeria* species in early 2016, and we have been using it for *L. monocytogenes* since August 2016.

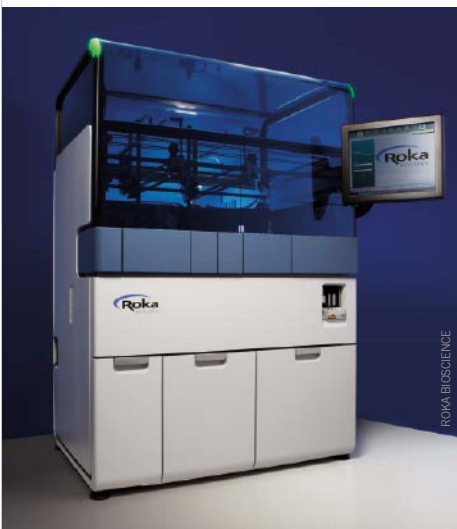
“Roka’s Atlas System integrates well with our LIMS,” Dr. Radcliff continues. “The automatic importation of results into our laboratory information management system and tracking of TMA kit lot numbers simplifies the workflow and traceability, which makes them easily auditable.”

MALDI-TOF

As general manager of Mérieux Nutri-Sciences, Wendy McMahon, MS, CFS, oversees the company’s Silliker Food Science Center (SFSC) contract research laboratory, Crete, Ill.

McMahon believes matrix-assisted laser desorption ionization–time of flight (MALDI-TOF) mass spectroscopy (MS) is an important tool for bacterial and fungal identification in food laboratories today. “It’s really used for determining unknown organisms, mostly spoilage and contaminations, with mold being a good example,” she points out.

Available commercially for less than 10 years, MALDI is a three-step soft ionization technique that allows the analysis of biopolymers such as DNA, proteins, peptides, and sugars, and also large organic molecules. The TOF is the type of mass spectrometer most widely used with MALDI, primarily because of its large mass range.



Roka Bioscience’s fully automated Atlas System enhances the accuracy, speed, and efficiency of testing through detection of molecular pathogens.

Under McMahon’s leadership, the SFSC is launching the use of MALDI-TOF in the lab during the spring of 2017. “We expect hundreds of ID requests per month due to its quick time to result,” she predicts.

The SFSC is using bioMérieux’s VITEK MS to run its MALDI-TOF tests. “We made that decision based on the database,” McMahon relates. “Specifically, bioMérieux’s database has been established with an average of greater than 14 isolates per species and an average of 26 spectra per species, making it very specific. If an organism is not a part of the database (unidentifiable), then 16S ribosomal RNA (rRNA) gene sequencing can be used for identification.

“Microbiologists appreciate the quick turnaround time MALDI-TOF offers, less than 30 minutes once the isolate is ready, while requiring very little hands on time from a technician,” McMahon continues. “In contrast, the gold standard of 16S rRNA gene sequencing for bacterial identification takes a day of operations and a significant amount of hands on time.

“MALDI-TOF is becoming more widely used throughout the food industry due to the quick results and ease of use,” resumes McMahon. “MALDI-TOF’s use in food will increasingly provide companies with faster results when investigating spoiled product, mold contaminations, or out of specification raw ingredient or finished product.”

Details to Work Out

There are details to work out in the increasingly more sophisticated world of food laboratory technology, especially with regard to the pathogen testing and detection end of things, says Lee-Ann Jaykus, PhD, the William Neal Reynolds Distinguished Professor in the Department of Food, Bioprocessing, and Nutrition Sciences at North Carolina State University, Raleigh, and also the scientific director of the USDA-NIFA Food Virology Collaborative.

“In recent years, several assays have been designed to meet the need of providing testing results in near real-time (same day), but by and large, they still require some cultural enrichment for pathogen detection, even though enrichment may be abbreviated,” Dr. Jaykus relates.

To get true real-time pathogen detection will require methods that are completely culture-independent, she says. “Such pathogen detection will also re-



CHARM SCIENCES

Charm Sciences’ Peel Plate Colony Counter features results in five seconds or less.

quire pre-analytical sample processing methods, also called ‘sample prep,’ to concentrate the organisms from the sample matrix, and remove matrix-associated inhibitory compounds,” she elaborates. “While some novel sample prep technologies have been launched in the past several years, no silver bullet has been found yet.”

Many groups, be they academic, industry, or government, are actively developing biosensor technologies, Dr. Jaykus points out. “Many of these technologies are novel and ‘sexy’ but still do not have the low detection limits necessary for pathogen detection in foods,” she says. “In addition, the sample matrix can be a significant impediment to analytical sensitivity. Another reason for sample prep, and a personal caution, is that without one (sample prep) we cannot have success in the other (biosensors).”

Dr. Jaykus believes that as detection become less dependent upon culture and more dependent upon nucleic acid sequence, the issue of bacterial cell or virus viability becomes more important. “Just because we can detect DNA does not mean that the organism is alive,” she notes. “This issue is of importance in making decisions about prevention and control in food safety, as well as management of recalls and outbreaks. It has not yet been resolved.” ■

Leake, doing business as Food Safety Ink, is a food safety consultant, auditor, and award-winning journalist based in Wilmington, N.C. Reach her at LLeake@aol.com.

For bonus content, go to April/May 2017 issue on FoodQualityandSafety.com and click on “Food Laboratory Breakthroughs.”

FSMA Update

Small- to Mid-Sized Companies Are Up Next for FSMA Compliance

Getting a start on designing, implementing, and maintaining a Food Safety Plan that conforms to FSMA

BY JEFFREY T. BARACH, PHD



The Food Safety Modernization Act (FSMA) is a multi-component set of regulations. Most large companies have had internal resources and a past history with Hazard Analysis and Critical Control Point (HACCP) programs to make the leap to FSMA without too much difficulty. However, small- to mid-sized companies are finding themselves challenged with modernizing their Food Safety Systems. Several factors are causing distress, including limited resources of people, time, and finances; transitioning the operations of each production line from current Good Manufacturing Practices (cGMPs) to FSMA preventive controls; the additional record-keeping and paperwork burdens; and of course, the looming upcoming deadline of compliance by Fall of 2017.

At this point, small- to mid-sized companies need to take a deep breath and move forward at a good pace by developing a plan to implement their FSMA program on a step-by-step basis. Some companies may even seek the assistance of outside consultants. The following suggestions for small- to mid-sized food companies can help plan and manage the task at hand.

- Establish if you must comply. If you are a Registered Food Facility with the FDA selling food in the U.S., you most likely must follow FSMA rules.
- Get support and a resource commitment from management. Find a Food Safety Champion in the organization to get the ball rolling. Reinforce the im-

portance of a food safety culture within the company.

- Make an implementation plan considering the existing Food Safety System. If you only have cGMPs in place, look toward HACCP principles and HACCP plans to help transition into FSMA. If you have a HACCP plan, your job will be easier since you can build on HACCP to develop a Food Safety Plan.
- Identify an internal or external preventive controls qualified individual (PCQI) who will oversee the development of the Food Safety Plan. This may include a staff person taking a course to become a PCQI from an organization, like the Food Safety Preventive Controls Alliance.
- Begin development of the Food Safety Plan with the PCQI. This includes analysis for biological, chemical, and physical hazards and assigning preventive controls (e.g. process controls, food allergen controls, sanitation controls, and supplier controls) to those hazards likely to cause illness or injury.
- Develop and establish ways to monitor these controls and establish corrective action procedures to follow if the controls fall outside of limits.
- Scientifically validate process controls and verify the Food Safety Plan is working and the plan is designed properly by auditing the controls (verify that the plan effectively controls the hazards).
- Establish and update recordkeeping procedures to ensure accurate records

and documents for use by the organization and/or by inspectors.

- Provide training on the Food Safety System for management and for line workers who have responsibility to manage the preventive controls.

Take a Step Back

The implementation of FSMA rules for food companies is a perfect opportunity to step back and look at the current equipment, the products being produced, and operations to see if hazards can be eliminated so that fewer controls need be applied. For example, consider changes to a filling machine that is used for multiple products, some products with allergens and some without allergens. If the current design allows pockets of product to accumulate, potentially causing a cross-contact hazard of allergen containing product, the hazard may be eliminated by upgrading to a filler that incorporates sanitary design features that can prevent cross-contact situations. As another example, many raw ingredients

(Continued on p. 47)

For Further Reading

For more information, Dr. Barach recently authored a plain-language guidebook that assists small- to mid-sized food companies with the task of complying with FSMA human food rules. "FSMA and Food Safety Systems: A Guide to Understanding and Implementing the Rules" is available at <http://ow.ly/Quxq3o7GQfr>.

Evolution of Food Laws

The Age of Prevention

Rundown of what you need to know about FSMA's rules to keep the future food supply safe | BY LIBBY THOMA



unique provisions, including water supply and plumbing, plant operations, and holding and distribution of human food by-products for use as animal food. The regulations also contain very similar requirements to the PCs for Human Food final rule, including the requirements for the development of a food safety plan that contains: 1) a comprehensive hazard analysis of the products and processes, 2) establishment of PCs, 3) monitoring procedures for PCs, 4) verification and validation activities for established PCs, and 5) a recall plan.

Accredited Third-Party Certification

The Accredited Third-Party Certification rule defines requirements for the development of a voluntary program for the accreditation of third-party certification bodies to conduct regulatory food safety audits and issue certifications of foreign facilities. The accredited certification body's auditor will act on behalf of the FDA as a regulatory authority when performing unannounced audits of the eligible foreign supplier/importer. If the supplier's food safety programs are acceptable, the supplier will be issued a certificate of compliance that may qualify it to be eligible for the Voluntary Qualified Importer Program, which allows importers expedited review and entry of products into the U.S. The rule also describes the requirements for recognized accredited certification bodies to perform these audits as well as the agency's ability to directly accredit third-party certification bodies if none have been recognized within two years of implementing this program. The body of regulation is found in CFR Parts 1, 11, and 16.

Foreign Supplier Verification

The Foreign Supplier Verification Programs (FSVP) rule is quite revolutionary and puts a great deal more responsibility on importers to "verify that their foreign suppliers are producing food in a manner that provides the same level of public health protection as the preventive controls or produce safety

Editor's Note: This third and final article in a series reviewing the evolution of food law highlights the most important aspects of six rules of FSMA.

Understanding the below six rules will help you better incorporate the Food Safety Modernization Act (FSMA) into your food safety program. Here's what you need to know.

Preventive Controls for Food for Animals

The Preventive Controls for Food for Animals final rule has staggered dates of compliance for both the current Good Manufacturing Practices (cGMPs) and the preventive controls (PCs) rule, beginning

Sept. 18, 2017 with full implementation by Sept. 17, 2019. Larger entities falling under this body of legislation were required to comply with the new cGMPs in September 2016 and will be held to the PCs rule beginning Sept. 18, 2017. The due date for full compliance by all entities is Sept. 17, 2019. There are several definitions of exempted businesses, but the details concerning these exemptions are beyond the scope of this article, so please refer to the regulations for more information on this topic. The PCs for Food for Animals rule (published in 21 CFR 507 Subpart B) establishes [baseline cGMP standards for producing safe food](#) for a broad range of animals.

The cGMPs for food for animals are very similar to those for human foods, with a few

regulations, as appropriate, and to ensure that the supplier's food is not adulterated and is not misbranded with respect to allergen labeling."An FSVP is required for each food brought into the U.S. and the respective supplier of that food. Importers must conduct a comprehensive hazard analysis of each raw material and a risk assessment of the respective foreign supplier. Based on performance and risk of the imported food, a list of approved suppliers, supplier verification, and corrective action activities must be documented. The program's written procedures must include a provision for receiving product from unapproved vendors on a temporary basis. Foreign supplier verification activities may include annual onsite audits of the supplier's facility, sampling and testing of product, or reliance on another entity to perform verification activities, as long as the importer is familiar with the relevant documentation. Annual onsite audits are "generally required when there is reasonable probability of exposure to an identified hazard that may result in a serious adverse health consequence or death to humans or animals (called a SAHCODHA hazard)."

Corrective actions are needed when a foreign supplier has not provided the same level control as required under the produce safety and PC regulations, or produces adulterated or misbranded food with respect to allergen labeling. Corrective actions depend on the nature of the issue but may include discontinuing use of the supplier until satisfactory actions have taken place to rectify the problem.

Produce Safety (and Environmental Impact)

The Produce Safety (PS) rule, also known as the Standards for the Growing, Harvesting, Packing, and Holding of Produce for Human Consumption, is found in 21 CFR Part 112. The intent of the PS rule is to "establish science-based minimum standards for the safe growing, harvesting, packing, and holding of produce, meaning fruits and vegetables grown for human consumption." The definition of "farm" is the same as defined in the [Preventive Controls for Human Food rule](#) and is used to determine entities that are exempted from the PS rule. The specifics concerning exemptions and staggered compliance dates are beyond the scope of this article, so please

refer to the regulations for more information on these topics. The rule identifies and seeks to control five primary methods of potential contamination: 1) agricultural water, 2) biological soil amendments, 3) domesticated and wild animals, 4) worker training and health and hygiene, and 5) equipment, tools, and buildings. There are also specific provisions defined for the growing, harvesting, packing, packaging, and holding of sprouts, which are particularly vulnerable to microbial contamination due to the nutrient-rich conditions under which they are grown.

In order to address the PS rule's overall impact on the environment, human health, and socioeconomic effects, the FDA released the Final Environmental Impact Statement. The agency believes public health will benefit due to the decrease in the number of illnesses tied to produce contamination. On the flip side, the FDA acknowledges that the regulation may cause a farmer to use ground water instead of surface water which may contribute to existing groundwater shortages, and that Native American farmers may be affected disproportionately by increases in operating costs as a result of the rule since their income average is 30 percent less than that of other farmers.

Sanitary Transportation of Human and Animal Food

On June 6, 2016, the Sanitary Transportation of Human and Animal Food rule was finalized. This body of regulation is found in 21 CFR Parts 1 and 11. The rule builds on safeguards established in the Sanitary Food Transportation Act of 2005 and sets "requirements for shippers, loaders, carriers by motor or rail vehicle, and receivers involved in transporting human and animal food to use sanitary practices to ensure the safety of that food." The rule includes requirements for: 1) vehicles and transportation equipment to include proper design and maintenance, 2) transportation operations to protect food from contamination, 3) training of carrier personnel in sanitary transportation practices, and 4) records that include written procedures, agreements, and required training. The rule pertains only to food destined for distribution and consumption in the U.S. Please refer to the [final rule](#) for specifics on transporters or shippers who are exempted or waived

from the regulations, including those governed by the Pasteurized Milk Ordinance, food establishments governed under the Retail Food Program, and exporters who transport food through the U.S. but do not distribute it in the U.S.

Intentional Adulteration

The Mitigation Strategies to Protect Food Against Intentional Adulteration rule of FSMA was effective July 26, 2016 and is published in 21 CFR Parts 11 and 121. The regulation requires registered domestic and foreign food facilities "to address hazards that may be introduced with the intention to cause wide scale public health harm."The key phrase is "wide scale" as this rule is intended to prevent acts of adulteration, including acts of terrorism, which may greatly impact the U.S. population by causing a significant number of illnesses, death, or economic disruption of the food supply. This rule does not apply to acts that are motivated by strictly economic reasons, as these are covered in the PCs for Human and Animal Food rules.

The rule mandates facilities adopt a process approach, similar to Hazard Analysis and Critical Control Points, or HACCP, when creating the required food defense plan. A vulnerability assessment must be conducted to identify weaknesses and actionable process steps. Mitigation strategies are developed for each actionable process step to minimize and prevent identified vulnerabilities. Mitigation strategies must include procedures for monitoring, corrective actions when strategies are not properly implemented, and verification activities to ensure monitoring is conducted as required and is effective. Employees must be appropriately trained and records of the monitoring, corrective actions, and verification activities must be maintained. At a minimum, the food defense plan must be reanalyzed every three years.

From rules governing beer in 1700 B.C. to the seven foundational rules of FSMA enacted in 2011, government and commerce have worked together to create food safety regulations and best practices for protecting human health. ■

Thoma, a food safety and quality professional with nearly 20 years of experience in food manufacturing and food safety auditing, has worked for NSF International for four years as both a GFSI certified auditor and as a technical specialist in the Supply Chain Food Safety group. Reach her at lthoma@nsf.org.



TRANSPARENCY:

THE MUST-HAVE INGREDIENT

Addressing consumers' demands to know where their food came from and exactly what's in it

BY JESSE STANIFORTH

© DEBIL THORIS-FOODIA.COM

Transparency: It's obviously important, but for companies recognizing the need to make it a part of their brand, the best way to proceed is—ironically—not that clear. Customers want transparency, and manufacturers want to deliver it. But figuring out how to make processes transparent, how to build consumer trust, and how to make sure your customers retain their confidence in your organization in an atmosphere of polarized discussion is a complicated set of decisions to make.

“Transparency is no longer a ‘nice to have’ quality for food companies—it really is mandatory in the eyes of the consumer,” explains Katy Jones, chief marketing officer for FoodlogIQ. “Building a culture of transparency focused on safety and quality is critical for food companies.”

Putting it in even starker terms, Prof. Ravi Jadeja, food safety specialist at Oklahoma State University's Robert M. Kerr Food & Agricultural Products Center, frames transparency as a consumer right.

“Consumers are entitled to accurate information about their food,” he says. “They should be empowered with as much information as possible related to food safety, quality, origin, and sustainability, so that they can make informed decisions related to their food.”

Adopting transparency creates new customers while making old customers happy, notes Reid Paquin, industry solutions director, food and beverage, at GE Digital. “The data shows that product transparency impacts purchasing decisions,” he says, “and those brands that take advantage can increase their market share. Companies that believe food transparency is not a top consumer priority are putting themselves at risk.”

The Challenge of Change

Companies who are arriving late to the transparency game have perfectly good reasons for being behind: When an aspect of manufacturing that has never previously been a priority suddenly comes to the fore, the shift in focus demands an enormous investment in change.

Charlie Arnot, CEO of the Center for Food Integrity (CFI), is happy to see manufacturers turning toward transparency, but he notes that sending out the internal memo announcing the decision to become more transparent is only the first of a long series of actions, each increasing in complexity.

Arnot explains, “The procurement department gets that memo and they say, ‘We’re going to start sharing a lot more information about where we get this product. But do we know how those vendors get their products? How far back do we have to go?’ Someone in corporate social responsibility will say, ‘This is a great

move and we applaud it, but have we established what we’re going to talk about and what our values are?’ The first thing you have to focus on is getting internal alignment and making sure you’ve got buy-in from the entire organization. Then put together a process that allows you to say, ‘Here are our values. Here’s our

The CFI advises manufacturers to strive for websites that will not challenge consumers, leading them to become frustrated and give up.

commitment to transparency. Here’s the information we’re going to be willing to share.”

Jones agrees, noting that transparency is ultimately about communication, and it needs to reflect supplier onboarding and effective internal communication in order to work properly when made plain to consumers.

“Open and transparent communication with your suppliers is a must for addressing these issues,” she notes. “After all, you can’t offer consumers the information they crave about your product and processes if you aren’t getting that information from your suppliers and brokers. And you cannot expect a supplier to fulfill your requirements around safety and brand promise if you aren’t open about your expectations. It’s a two-way relationship that can make a huge difference in your business.”

Yet even gathering the information that the company will now make transparent can be a challenge because if transparency has never previously been a goal, the information may well be stored in a manner that will be laborious to bring into the light.

“A lot of companies still use manual or paper-based processes,” Paquin says, “especially when it comes to traceability. These systems are simply not accurate enough and cannot provide the visibility that is needed to provide the transparency consumers want. Traditionally, the ROI to replace these systems with automation has not been the strongest. Manufacturers would make investments for other initiatives, say a system to improve productivity first.”

Traceability

For some in the industry, the linear “one up and one back” approach to supply chain transparency has sufficed thus far, says

(Continued on p. 22)

(Continued from p. 21)

Jones, but that's unfortunately outdated in the present climate. Knowing only the information one step back and one step forward in the supply chain is no longer enough.

"To give consumers the transparency they want," Jones underlines, "it is imperative that a company implement whole chain traceability, rather than relying solely on the movement of product within its own four walls."

Adopting that level of transparency will cost capital, but Jones stresses companies need to understand that it's also an investment that pays a healthy dividend.

"Transparency in food marketing can be driven by the data that is assembled when implementing a traceability program," Jones explains. "Traceability provides visibility into the data about your products and how they move across your supply chain. Imagine being able to tweet with real-time data about the food you produce. It can be an incredible marketing advantage in the food industry. Traceability can enhance compliance with federal and state food safety regulations, and significantly reduce the time it takes to resolve a food recall or withdrawal, which helps tremendously with establishing and maintaining consumer trust."

A study Paquin conducted within the last few years recently showed that 45 percent of respondents had a formal traceability solution in place, he explains, but it also revealed that having a system in place alone was not enough to guarantee market share. Track and trace technology, with a two-way information flow from trace-back to trace-forward, made a deciding difference.

"From a practicality standpoint, traceability is really about what you can track within your system," Paquin says. "Leaders in the industry were more likely than their peers to be able to track and trace their products from any stage in the value chain. This includes details on suppliers used, operators who worked on the product (or an ingredient that was mixed into the product), equipment used in the manufacturing process, distribution, and even

SmartLabel Goes Beyond the Label

The SmartLabel technology initiative enables consumers to have instantaneous access to detailed product information about thousands of products, including food, beverage, pet care, household, and personal care products. This transparency initiative, created by manufacturers and retailers, allows consumers to get additional details about products by scanning a barcode, using SmartLabel sponsored-apps, or searching www.smartlabel.org.

At the touch of finger, consumers can have all the information they want to know about the food products they are purchasing. For example, nutritional information, ingredients, allergens, third-party certifications, social compliance programs, usage instructions, advisories and safe handling instructions, and company/brand background, along with other pertinent insights about the product.

The information through SmartLabel is available whether a consumer is in the store, at home, or work, or using a smartphone, tablet, or desktop computer.—*FQ&S*



The SmartLabel Sponsored by Mondelēz International app enables consumers to scan a product's QR code or UPC code and access detailed information, including ingredients, nutrition facts, allergens, and more.

any customer complaints. Without an integrated system, a manufacturer will not be able to provide the transparency that consumers demand today."

Jones, too, cautions against doing transparency by halves, or by trying to claim transparency without actually putting in the work it demands.

"Where food companies go wrong is when they attempt to market 'farm to fork' in an inauthentic way," she says. "Consumers are getting smarter about these marketing programs and want more data-driven marketing. They want real-time information backed by real data."

What Consumers Think and Know

A significant challenge manufacturers face, says Arnot, is becoming the source consumers turn to for information about their food. In a climate of alarm over "fake news," debates over the merits and harms of GMOs, and other deeply debated topics, Arnot notes that "People trust information from their peers before they trust information from experts. If that's the case, how do we begin to engage with those peers in a more effective way? It's very challenging."

Having surveyed widely on the subject, Arnot reports that over the past seven years, the number of consumers who believe they have all the information they need to make decisions about their food has been steadily increasing. The problem is that the information that makes consumers feel informed may not be true.

"People feel empowered by the ability to access information," Arnot says. "The challenge for the food industry is that it might not be *accurate* information, and it might not be coming from the *food system*. That's one of the places where as a food system we need to figure out where we can improve. We have to be *in the places consumers go* to find information."

Arnot singles out Campbell's and Hershey for their recent successes in making information available through SmartLabels and QR codes (a system also endorsed by Jones, whose FoodLogiQ sells software that generates such codes). This is effective in giving consumers one-stop information.

Also recently launched is the SmartLabel Sponsored by Mondelēz International app that makes in-store access to detailed product information on Mondelēz's snacks possible from smartphones. More than 1,100 products across its U.S. snack product

portfolio—biscuits crackers, cookies, chocolate, gum, and candy—are searchable through the new app as well as online at www.smartlabel.org.

For more complex information, however, consumers will likely contact the manufacturer. At that point, Arnot underlines, it is integral for companies to be ready to respond as quickly as possible.

“If someone decides they’re interested enough to send an inquiry to the Contact-Us button on your website, the expectation is that they’re going to get a response within eight hours,” he says. “If you don’t make that happen, then you begin to be perceived as less responsive, and that equates to less transparent. We know consumers are looking for ‘The information that’s relevant to me, when I want it, from the source that I want it from, at the time that I want it.’ That’s part of what creates the challenge for companies today.”

If companies can encourage consumers to trust them, that means consumers will be more likely to get information from them directly, rather than going through blogs and social media discussion groups...

Arnot also encourages developing company websites that are simple, clear, and user-friendly. The CFI advises manufacturers to strive for websites that will not challenge consumers, leading them to become frustrated and give up. When the CFI has had third-parties evaluate company websites, he stresses, invariably, manufacturers believe they are far more transparent than they actually are.

“Companies would say, ‘It’s there! You really just have to know exactly where to find it! You just have to go six clicks in on this particular tab and stand on your left foot on Friday, and it’s there!’” Arnot laughs. “Really, the three-click rule applies, where anything should be available to you within about three clicks. That makes sure you’ve got your website organized in such a way so that people who are interested in your ingredients, where your products come from, your sources, your people, and impact on the environment can find whatever they’re looking for quickly and with a minimum of obstacles.”

Trust

Arnot reflects that during the battle over genetically modified organisms, the idea of “GMOs” became a shorthand for consumers to express distrust in industrialized food systems. For that reason, he and the CFI want to see manufacturers cultivating trust among their customers: If companies can encourage consumers to trust them, that means consumers will be more likely to get information from them directly, rather than going through blogs and social media discussion groups where the information shared may be less accurate and more shaped by ideology. However, in order to promote trust among consumers, manufacturers need to build practices consumers can have faith in.

“The primary driver of trust is the perception of shared values—that’s three to five times more important in building trust than providing factual information,” Arnot explains. “It’s about helping people understand: What are the values of your organization? What do you stand for? What do you believe in? Are those values consumers can align with? And how do you actually demonstrate those values in your organization? Above all, consumers want to know most about a company’s practices. Because the practices are what you do every day, they really are your values in action. They want to know what you do, why you do it, and your values. That level of transparency gives consumers a greater sense of confidence they can trust.”

For Jones, an important component of building consumer trust is showing transparency as a part of all levels of an organization.

“It’s critical to build a consensus for transparency from the top down,” she says. “For example, an executive can be transparent when addressing recall issues with the public on social media or the company blog.”

Trust can also be built with support from outside your company, reminds Prof. Jadeja, who noted that products bearing third-party verification seals are perceived as higher-quality products, particularly by consumers in European countries.

“There are several Global Food Safety Initiative-benchmarked food safety and quality schemes that allow food processors to use their logos on food packaging (for example, SQF Quality Shield) if processors meet the stringent food safety and quality requirement established by the schemes,” says Prof. Jadeja.

The two areas that consumers value third-party verification most highly, says Arnot, are in the attestations of the treatment of animals and in food safety. “There’s a higher value of third-party verification there than any of the other areas we tested. When it comes to food safety and animal care, that’s where consumers really look for third-party verification and use that as a barometer of whether this is a company they can trust. Once again, you can’t do transparency without trust.”

Trusting Consumers

The last part of the trust equation, Arnot says, is to trust customers to understand your business and its intentions. Shifting to a more transparent way of functioning is a long process with a steep learning curve. But, he says, if you’re frank with your client base about what you’re doing and why, they will understand. Let them know that what you’re undertaking will be ongoing and as a result you may not get it right every time, but regardless of whether you make mistakes, you’re nonetheless genuinely committed to the task of transparency—and let your customers know that you’re willing to talk with them directly about it if they have any questions.

“People will give you the benefit of the doubt if you help them understand that it’s a process, it’s not something where you turn a switch and today you’re transparent even if yesterday you weren’t,” he says. “You have to get buy-in from the organization, you have to establish your values, talk about what you’re going to communicate, and then make sure your consumers understand that you’re on a journey with them, and if they’d like more information, they should let you know.” ■

Staniforth is a Montreal-based freelance journalist. Reach him at jbstaniforth@gmail.com.

Special Report



Plant-based ingredients, such as essential oils, herbs, and spices, in animal feed can strengthen animals' immune systems.

Phytogenics' Role in Animal Wellness

Natural plant-based feed additives can improve animal nutrition, and consumers' perceptions

BY SONNY PUSEY AND KEVIN ADAMS

Garlic, cinnamon, thyme, and oregano, a list of ingredients commonly found on a kitchen spice rack, are increasingly prevalent in the diet of chickens, turkeys, pigs, and cattle. These powerful plant-based ingredients—called phytogenic feed additives—have a growing presence in animal nutrition programs in the U.S.

It's part of a paradigm shift in feeding animals that is being driven, in large part, by consumer demand. Today's consumers want clean labels and food produced with transparency.

Observations in the grocery aisle and mainstream media channels show the food industry is responding. Choices for natural, no antibiotics ever, sustainable, and humanely raised protein products pervade the meat case. Restaurant chains, grocery retailers, and consumer brands continue

to announce intentions to eliminate antibiotic use in their supply chains.

To bolster their experience and reputation in natural or organic brands, it's a recognized trend for major food companies to acquire specialty, small food companies, like the recent Gold'n Plump chicken acquisition by Pilgrim's Pride Corp. Companies are motivated to grow their portfolios and offer choices—often with increased margins—to consumers.

Meanwhile, meat and poultry producers are pressed to find solutions that support animal health and productivity without the use of antibiotics.

Trending Globally: Herbs, Spices, and Plant Extracts

Herbs, spices, other plants, and their extracts, like essential oils, have been used for human health and veterinary appli-

cations throughout history. It's not a new concept in modern animal nutrition either. The term phytogenics was coined three decades ago by Delacon, an Austrian company that saw a need for natural plant-based solutions to keep animals healthy and performing.

No longer a niche, the phytogenics market has grown in global importance. Domestic and international regulations restrict the use of medically important antibiotics, or those important for treating human disease, in livestock production. Phytogenic feed additives are predominant in the European Union, which effectively banned the use of antibiotic growth promoters in livestock production in 2006.

Forecasts show the phytogenics market segment will grow 2.5 percent globally by 2022, an estimated worth of \$774 million, as [reported by Global Market Insights, Inc.](#) Various phytogenic providers have their sights set on the U.S. as one of the most attractive markets.

In the U.S., phytogenics have been a beneficial component of conventional animal production systems for the last 17 years. Consumer-driven market demands, coupled with new antibiotic rules in the U.S. that eliminate subtherapeutic use of medically important antibiotics for growth promotion, have producers revamping their feeding strategies and testing antibiotic-free production systems. As meat and poultry producers consider their options, more are turning to phytogenics as natural performance enhancers.

The Power of Nature

Developing phytogenic feed additives consists of selecting active substances found in nature and harnessing their modes of action for a specific impact in animal nutrition. The makeup of phytogenics ranges from familiar ingredients to exotic sources like quillaja (soapbark tree). It's a process that requires significant scientific knowledge and research. Drawing upon 100 different natural substances, ingredients are precisely combined and formulated to create phytogenic solutions to animal feeding challenges. For example, sensory substances from thyme and rosemary offer antioxidant properties, help improve nutrient absorption, and stimulate appetite. Bitter substances from dandelion, garlic, and hops help increase secretion of

digestive juices. Tannins from berries and peppers help reduce ammonia emissions.

Using natural ingredients is more than a preference; studies show plant-based additives make a difference. Natural plant extracts are scientifically shown to have an advantage in animal nutrition compared to synthetic, or chemically produced, nature-identical substances. Relying on all agents within a plant, natural extracts exhibit greater synergy among different active substances, which have not been reduced to the effects of a single lead substance.

The plant-derived active substance is very potent, illustrating the wonderful power of nature. In an animal feed formula, phytogenics only take up a small part—about 200 parts per million—of the total ration.

Like any ingredient, sourcing and quality must be carefully controlled to achieve product consistency. For instance, Delacon's quality management processes include full traceability of raw materials and ingredient standardization. The plant-based ingredients are processed with microencapsulation technologies to protect active substances from processing and storage conditions, ensuring efficacy.

Benefits from Farm to Fork

Phytogetic feed additives offer a host of promising benefits to animals, producers, the environment, and consumers.

On the farm, phytogenics provide broad-spectrum efficacy, optimizing animal performance through nutrition in many ways. For example, feeding phytogenics helps the gut flora to flourish and supports a healthy gut microbiome. This contributes to reduced intestinal inflammation and strengthens the animal's immune system so it can overcome stress and challenging periods, like weaning or hot weather.

Phytogetic feed additives help livestock producers do more with less. Feeding phytogenics promotes improved digestion and utilization of nutrients, so animals get more energy from their feed and perform better. Using nutrition strategies to maintain animal health, animals are more productive and can better reach their genetic potentials.

The effects of phytogenics compound to help livestock producers act sustainably



Sourcing raw materials and quality control are key to creating a consistent phytogetic product.



Identifying natural active substances for best animal performance.

and minimize the carbon footprint of animal production. Through improved feed efficiency and microbial interventions, feeding phytogenics to poultry and pigs has been shown to reduce ammonia emissions by up to 50 percent. While in ruminants, such as cattle, feeding phytogenics can mitigate methane emissions by up to 20 percent.

At the same time, phytogenics provides food safety, leaving no harmful residues in the end protein product to build a feed-to-food chain consumers can trust.

Survey Reveals High Acceptance Among Millennial Foodies

An increasingly transparent food system means meat and poultry producers need solutions that not only work but also resonate positively with consumers. To test consumer perceptions of phytogenics (defined as essential oils, herbs, and spices) used in meat and poultry production, Delacon commissioned a [research survey](#) conducted by Millennium Research in December 2016.

The survey targeted millennials, aged 24-34, of which 44 percent identify as foodies. Millennial consumers' preferences tend to influence older generations and their growing economic significance urges food companies and marketers to develop products that appeal to this generation.

While consumers have no prior awareness of phytogetic feed additives, the survey revealed a tremendous opportunity to connect with influential millennial foodies with a story about animal wellness, including how natural, plant-based ingredients, such as garlic, cinnamon, and thyme, are fed to chickens, pigs, and other animals.

Nine out of 10 (87 percent) millennial foodies say meat and poultry produced with phytogenics would make a positive impact on their brand choice. And, nearly two-thirds (63 percent) of millennial foodies look at labels closely, suggesting an opportunity for food brands to differentiate themselves with the story of phytogenics.

Millennials—now more than a quarter of the U.S. population—embrace food experiences and make buying decisions that align with their values. Asked to select the attributes most important to them when choosing a specific brand of poultry or meat, millennial foodies elected “raised with good animal welfare practices,” “raised without antibiotics ever,” and “raised in ways that reduce environmental impact,” even before “certified organic” or “locally raised.”

The survey response underscores millennials' interest in knowing how their food is grown and raised, and the importance of providing them with information. The benefits of feeding phytogenics to animals—including promoting animal gut health, reducing greenhouse gas emissions, and supporting antibiotic-free production—make a compelling narrative.

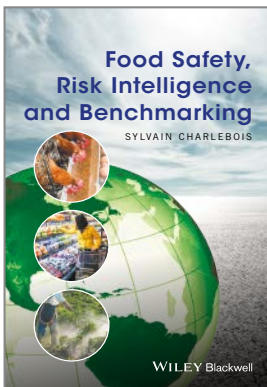
Food is a form of social currency and millennials make buying decisions that provide them with satisfaction or a feeling of superiority. Nearly two-thirds (62 percent) of millennial foodies say knowing that animals were fed completely natural phytogenics would make them feel great about their food choices. More than half (55 percent) say they would choose meat and poultry raised with phytogenics to reflect their concern about the environment, animal welfare, and natural ingredients.

The survey aimed to measure whether millennial foodies' preference for meat and poultry raised with phytogenics would influence their purchase decision. If given the opportunity, six out of 10 (59 percent) millennial foodies “would choose meat and poultry raised with phytogenics.”

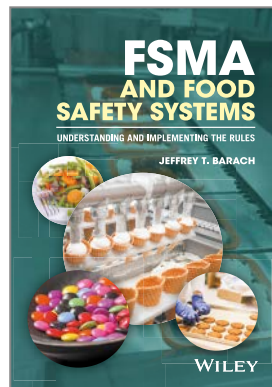
(Continued on p. 47)

Wiley Food Technology

Use code
VBN70
to enjoy **20% off**
at **wiley.com**



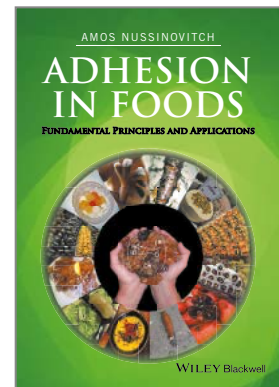
Food Safety, Risk Intelligence and Benchmarking



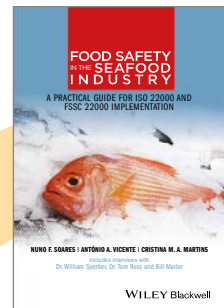
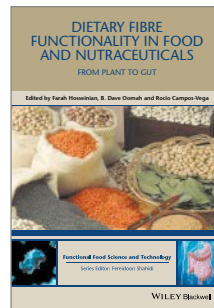
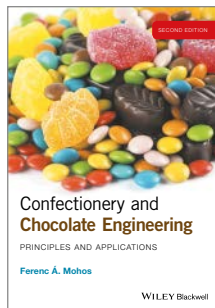
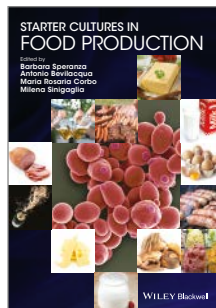
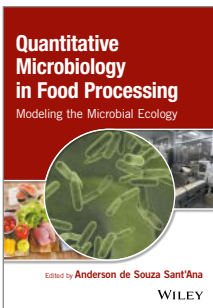
FSMA and Food Safety Systems: Understanding and Implementing the Rules



Managing Packaging Design for Sustainable Development: A Compass for Strategic Directions



Adhesion in Foods: Fundamental Principles and Applications



 www.wiley.com

WILEY

17-275607

Safety & Sanitation

PERSONAL HYGIENE



Dressed to Impress... And to Prevent Contamination

Tips on finding a uniform provider capable of delivering hygienically clean work garments

BY TIMOTHY COSGRAVE

Ultimately, an effective food service uniform provider should offer a hygienic laundering program that helps reduce microbial contamination threats in four key laundry processing stages, including:

1. HACCP/GFSI-specific wash cycle;
2. Dryer/moisture removal cycle;
3. Steam tunnel finishing/garment pressing; and
4. Poly-wrapping (for an added preventive measure to help protect cleaned garments from exposure to environmental contaminants after processing, throughout the delivery process, and prior to being worn).

For example, UniFirst Corp. has a program specifically for the food industry called UniFirst UniSafe Service. This service includes a portal-to-portal process designed to minimize cross-contamination risks, with independent testing showing results of greater than 99.99999 percent reduction in microbial contamination associated with uniforms and other food worker garments. These types of processes begin at customer facilities and extend throughout all garment handling, laundering, and finishing procedures to regularly deliver hygienically clean garments.

Training and Product Protection Processing

HACCP/GFSI-specific training for personnel involved in the processing of food-related customer garments is another important consideration. These specialized education programs should call for individual training of all point-of-contact personnel so that everyone involved fully understands food safety concepts, handling, and compliance. These types of specialized training programs can prove extremely useful, especially when developed in conjunction with a certified HACCP instructor. Such programs show a commitment on the provider's part to making a positive difference in delivering the results customers need.

(Continued on p. 28)

When food is your business, the safety of your product is vital to long-term success, and careful control of all processes in the facility is critical to achieving regulatory compliance. That's where your Hazard Analysis and Critical Control Points (HACCP) and Global Food Safety Initiative (GFSI) plans come in.

To ensure food safety, food-related businesses must adopt a HACCP/GFSI mentality in virtually every aspect of their program—right down to the uniforms that outfit their food industry workers.

To help prevent contamination within food manufacturing, processing, distribution, and retail operations, and to aid general safety of food products, businesses in the food industry must pay careful attention to how work garments worn by food industry employees are designed, maintained, processed (hygienically cleaned), and managed so they are not a potential source of food contamination. Careful controls are vital to minimizing cross-contamination risks and achieving regulatory compliance.

If your food-related business does not have a specialized food service uniform program provider that is HACCP/GFSI-conscious and can aid in your compliance goals, you could be exposing the business to significant risks. That's because product safety is non-negotiable in food-related industries.

A specialized food service uniform program can help ensure food safety and minimize cross-contamination risks, while removing bacterial contaminants that can colonize on employees' workwear.

When selecting a uniform provider, businesses should make sure the supplier is HACCP/GFSI-conscious in the following areas.

Hygienic Laundering

Food service uniform laundering programs should be based on principles set forth in HACCP and GFSI application guidelines, and address safety risks involved with the process. All garments ideally should be sorted, hygienically cleaned, dried, finished, and poly-wrapped while addressing CCPs.

(Continued from p. 27)

Furthermore, as an added measure of security, seek out a food service uniform laundering program that has been verified through scientific testing by an independent laboratory, showing that its services are designed to be effective for killing pathogens found on food industry uniforms and known to cause foodborne illnesses.

Uniform program providers should adhere to the following product protection processing (PPP) steps.

Delivery of clean garments. Hygienically clean garments (poly-wrapped, if desired) should be delivered to a designated area at customer sites.

Pickup of soiled garments. Soiled garments need to be sorted, placed in plastic bags, and put on route truck in segregated containers/bins.

Return to uniform provider's laundry processing facility. Soiled garments are to be kept segregated during transport.

Unloading soiled garments. Garments need to be accurately sorted and those identified as "food-related" kept segregated.

Washing and drying. Identified "food-related" soiled garments should be hygienically laundered with a specified HACCP/GFSI wash process and cleaning formula. After the wash cycle, items get loaded into dryers for moisture removal and garment conditioning.

Inspection and garment finishing. All hygienically clean garments should undergo multi-point quality inspections; garments

passing inspection should go through a high-temperature steam tunnel or garment pressing; garments failing inspection need to be routed for mending or replacements and go through the complete PPP again.

Loading the route vehicle for delivery. Trucks should be loaded for delivery with appropriate segregation and protection between soiled and hygienically clean garments.

Final delivery of hygienically clean garments. Finished garments (with optional poly-wrapping) are to be properly segregated and transported from the plant to the designated site at the customer location for final delivery.

Laundering Process Certification

When evaluating which food service uniform program works best for your business, another important consideration is food service laundering certification. Look for providers that have been awarded hygienic laundering certifications for their processes specific to the food industry.

There are a few organizations that provide these types of certifications.

For example, TRSA Hygienically Clean Food Safety certification status for cleaning and servicing of work apparel for food-related industries lets the world know that your uniform service provider is doing its part to help ensure food safety for consumers. TRSA is an international organization, representing textile industry companies, with expertise to determine appropriate hygienic laundering solutions for food manufacturing and food processing facilities and workplaces.

NSF International and others have also launched similar certification programs for commercial laundering operations to verify their design effectiveness in providing hygienic laundering solutions.

Using a hygienically clean certified laundry can reassure customers that you are committed to product safety, and can further establish your credibility as it relates to a focus on quality and concern for consumers. More and more, businesses in food-related industries are looking for such third-party validation from credible organizations.

Specialized Food Clothing Designs

Uniform designs for food-related industries are not just for show. This is another area for consideration, as uniform design also helps address critical safety functions. Be sure to choose a food industry uniform provider that offer garments with HACCP/GFSI-conscious designs and features.

When choosing food processor coats and food service uniforms for employees, business customers and the public can benefit from certain safety design features. Below are a few examples.

- No pockets above the waist that could potentially trap hazardous bacteria; or could potentially store items that may fall into the food or packaging.
- No buttons on the garment that could also potentially fall into the food or packaging; snaps are preferred in food industries.
- Durable materials, such as industrial-grade fabrics, can resist contamination and help prevent erosion.

(Continued on p. 47)



**Request a
FREE
Hand Hygiene
Flyer today!**

*Clean hands are the first line of
defense against product contamination.*

NELSON JAMESON
INC.

1-800-826-8302
www.nelsonjameson.com

Icons for social media: WordPress, Facebook, Twitter, YouTube, LinkedIn, Google+.

Is Your Sanitation Program Starting on the Right Foot?

A footwear cleaning and sanitation program can help stop pathogens from entering into your facility

BY APRIL ZEMAN-LOWE

Cross-contamination can occur at any point in the food production process, making it imperative for processing facilities to be proactive in preventing pathogens from entering and spreading throughout the facility. Often overlooked, cross-contamination from footwear can come from inside or outside the plant, increasing the need for facilities to implement a proper footwear cleaning and sanitization program. Whether a plant has a dedicated footwear program or not, footwear should be cleaned and sanitized before entering critical areas for maximum pathogen reduction.

Background

Successful footwear cleaning and sanitization programs are customized to a facility's specific needs. When deciding on a footwear cleaning and sanitizing program, there are many things to consider such as: How many production employees work in the facility? Is there a dedicated footwear program with a properly selected tread pattern? What is the soil load? Is the facility wet or dry?

Depending on the size and type of facility, processors can choose from various boot washers and scrubbers, foot baths, and footwear sanitizing units to use with cleaning and sanitizing chemicals for maximum pathogen reduction on footwear.

All employees, from management to line workers, will need to be educated that footwear is another vehicle for cross-contamination and, if not properly cleaned and sanitized, footwear can spread pathogens commonly responsible for food product recalls, such as *Listeria Monocytogenes* and *Salmonella* Enteritidis. According to the [FDA recall list](#), in 2017 alone, *Salmonella* and *Listeria* have been the cause for at least 26 recalls, affecting food industry segments across the board, including dairy, produce, seasoning and ingredient, confectionary, snack, and pet food. It is not often simple to determine the exact moment or source when cross-contamination occurs in a facility. However, food plants can take proper measures to help reduce risks of cross-contamination from footwear by implementing programs throughout the entire facility and training employees on how to properly perform each step. The following actions can function as a checklist for starting or improving your current program.

Pre-Planning/Project Scoping ✓

Footwear cleaning and sanitizing equipment is a significant investment with great benefits when executed correctly. As such, the following factors should be evaluated: purchasing dedicated footwear, using cur-

rent employee footwear, selecting proper tread patterns on footwear (open treads are more easily cleaned and sanitized), sufficient space for sanitary storage of dedicated footwear, dressing room design, traffic flow, access to emergency exits, and how the footwear systems will flow in conjunction with hand washing/sanitizing and gloving.

Building a Team ✓

When planning or improving a footwear program, both management and production employees from the following departments should be involved so that all factors can be discussed during the pre-planning phase: quality assurance, food safety, sanitation, Food Safety Modernization Act (FSMA) coordinators, safety, and maintenance. Many companies offer trial equipment so that units can be evaluated on-site prior to purchase. This can be extremely helpful in building an effective program.

During trial periods, test protocols can be set up with environmental monitoring using control and test groups with different footwear, tread patterns, and sanitizers. Both physical and microbial hazards should be identified. Procedures developed during the testing phase help a facility collect and evaluate the information needed to validate if, when properly implemented, the system will effectively control the identified hazards.

Footwear Cleaning Process Flow ✓

Similar to an effective hand hygiene program, footwear should be cleaned prior to sanitization to remove any dirt or debris on the bottom or sides of the footwear. In the [Guidance for Industry: Prevention of Salmonella Enteritidis in Shell Eggs During Production, Storage, and Transportation](#), the FDA states that footwear must be cleaned and all organic matter should be removed prior to sanitization. Sanitization is not effective if footwear is not first cleaned. To set up an effective process flow, check electrical, air, and water availability. Consider when and where footwear cleaning will occur; prior

(Continued on p. 30)

(Continued from p. 29)

to, after, and/or during the shift. Facilities can use boot washers or boot scrubbers, depending if the facility or area is wet or dry. Wet units combine a cleaning chemical and water into a solution that is applied to footwear. Dry units can be run in facilities not wanting to increase moisture. When selecting a cleaner/scrubber, physical space and throughput (number of employees processed per minute) should be considered. Additionally, it is extremely important to select a unit with design features such as sanitary welds, stainless enclosures, and no paint. It is essential that the unit will not become a pathogen harborage site in and of itself. To prevent this, choose units with an open sanitary design that will not trap particles and debris; have solid tubing without hollow parts; and are easy to wash down, clean, and inspect.

Footwear Sanitization Process Flow ✓

Once footwear is cleaned, food production workers can move on to a footwear sanitizing system for maximum pathogen reduction. Foot baths are commonly seen, but over the last few years the industry has been introduced to alternatives that provide a fresh spray of sanitizer to each employee, providing consistent, measurable results. Individual sanitizing units help address common issues production employees experience with foot baths, including constant maintenance, monitoring of sanitizer, lost efficacy, and inconsistent results. Footwear sanitizing units use compressed air to deliver the sanitizer, often alcohol-based, to the bottom of the footwear soles. This atomized spray guarantees a fresh application

of sanitizer for each employee while minimizing chemical waste. It is an ideal solution for dry processing facilities.

Selecting a Sanitizer ✓

When choosing a surface sanitizer for footwear sanitization, facilities should again consider their specific needs. Dry facilities often benefit from D2-rated, alcohol-based formulated surface sanitizers, which are ready-to-use, highly evaporative, do not require a rinse, and are EPA registered. These formulas are ideal for water-sensitive equipment and low-moisture environments, making for a useful product in all areas of the facility. Products commonly used in wet footwear sanitizing environments are quat and chlorine-based formulas. For an additional layer of protection, adding a mat with floor treatment powder next to the footwear sanitizing station provides a sure-footed surface when exiting. Using a floor treatment with surfactants will help ensure the powder penetrates all cracks, crevices, and porous areas of the footwear.

Training ✓

Once a footwear cleaning and sanitization program is implemented, make sure best practices are understood and available for production workers. The [FSMA Final Rule for Preventative Controls for Human Food guidelines](#) have updated the current Good Manufacturing Practices, making it mandatory for employees who manufacture, process, pack, or hold food to be properly qualified and trained to perform their assigned duties. Employees should be properly trained and footwear cleaning and sanitizing units need to be conveniently placed to ensure employees use them before entering critical control points. In addition, make instructional posters and user manuals readily available when employees need to refer to them.

SSOPs ✓

When selecting units and after the purchase, the units should have a sanitation standard operating procedure (SSOP) set up outlining daily, weekly, and monthly maintenance so that footwear equipment receives the care and attention as would any other piece of equipment in the plant. In the SSOP, develop pre-op, operational, and corrective action procedures. Setting up an SSOP outline in advance will result in less downtime. Make sure to also allocate staff time and resources for cleaning and sanitizing of the units.

Verification ✓

How are the systems working? What are the results from micro testing? What can be improved in the process flow to ensure that the goal of maximum pathogen reduction with consistent results is occurring? Essentially, is the program operating according to plan?

By practicing proper footwear cleaning and sanitizing measures, food processors can help reduce cross-contamination. Whether a facility is large or small, there is a footwear cleaning and sanitization program that will suit each facility's needs. Understanding the steps and process of maintaining clean footwear in a facility will help keep the U.S. food supply safe and reduce risks of costly and dangerous plant contaminations and recalls. ■

Zeman-Lowe is national account manager for Best Sanitizers, Inc. Reach her at azeman@bestsanitizers.com.


FQ1704

Isolate samples

according to the colored closure

WHIRL-PAK® Color Tape

Whirl-Pak® bags with tape colors of white, blue, yellow, and red,
for 4-oz. (118 ml), 18-oz. (532 ml), 24-oz. (710 ml), and 55-oz. (1,627 ml) bags



Provides an instant visual indicator to differentiate samples!

Nasco

Contact us for a FREE Catalog!
1.800.558.9595
In Canada call: 1.800.668.0600
whirl-pak.com • info@eNasco.com

Do you know what's walking into your plant?

Whether you have a dedicated footwear program or not, cross-contamination from footwear can easily find its way into your facility. Stop pathogens in their tracks with Best Sanitizers' line of Alpet® chemicals, BSX Boot Scrubbers, and HACCP SmartStep™ and HACCP Defender™ Footwear Sanitizing Units.



BSX200
Manual Boot
Scrubber



BSX800
Walk Through Boot
Scrubber



BSX1000
High Capacity Walk Through
Boot Scrubber



HACCP SmartStep™
Footwear Sanitizing
System



HACCP Defender™
Walk Through Footwear
Sanitizing Station

To learn more, call Best Sanitizers at 888-225-3267 or visit bestsanitizers.com/nextstep3

Quality

AUTHENTICITY



Don't Get Caught Up in Seafood Fraud

In a sector fraught with mislabeling practices, retailers must be diligent in verifying their seafood's supply chain journey

BY CHRISTOPHER HOEMEKE

The prevalence of mislabeled seafood has grown to such a level that it threatens to impact the integrity of the entire market for seafood. Victims of seafood fraud not only include consumers, but also food retailers that are trusting a supply chain that is fraught with misleading labeling practices.

A 2015 Oceana study revealed the mislabeling of one of the America's favorite fish—salmon. Oceana collected 82 salmon samples from restaurants and grocery stores and found that 43 percent were mislabeled. DNA testing confirmed that most of the mislabeling consisted of farmed Atlantic salmon being sold as wild-caught product. Further, in September 2016 Oceana tested 25,000 samples of seafood caught around the globe, and said an average of one out of five samples was

mislabeled. The organization reviewed more than 200 published studies from 55 countries, with all but one finding seafood fraud. Fraud was found in *every sector* of the supply chain.

While seafood fraud is a global issue, for the U.S. it is particularly unsettling as more than 90 percent of the country's consumed seafood is imported from other countries around the world...and from countries lacking stringent aquaculture laws.

Retailers and consumers deserve to know the facts about their seafood's supply chain journey, including what kind of fish it is, how and where it was caught and processed (i.e. is it from legal fishing waters, a sustainable fishery, produced without any forced labor or child labor?), and most importantly, trust the information is accurate. Food retailers and restaurateurs

refusing to acknowledge seafood fraud risk damage to their corporate reputation, integrity, and balance sheet. So what's being done about it?

Traceability

A lot can happen during the journey from a fisherman's boat to the shelf to the dinner table. Many food retailers and restaurants are investing in traceability strategies to gain better insight into a seafood product's itinerary for the following four reasons.

1. Quality. Knowing the seafood's journey and how it has been caught or handled along the way will tell food retailers a lot about its quality.

2. Trust. Each species has a specific taste, recognition, and value in the market. Traceable products track who handles and treats the product at each step of the supply chain—if the seafood is traceable, food retailers can feel confident that they are getting the right species they paid for.

3. Health. Traceability alleviates health concerns allowing food retailers to recall bad product and hold suppliers and processors accountable; provide accurate freshness dates; and identify whether or not acceptable chemical additives were used to preserve the product.

4. Sustainability. Consumers are growing more concerned by over-fishing, bio-diversity reduction, ocean pollution, and bad social practices in the seafood industry. Traceability allows food retailers and restaurants to ensure their fish are coming from a sustainable and reputable source.

A number of supply chain traceability programs have been developed to ensure the integrity of seafood supply chains. For example, the Obama Administration announced on Dec. 8, 2016 that it had implemented a program to help prevent illegal fishing and seafood fraud. The final rule, scheduled to go into effect on Jan. 1 of 2018, directs the National Oceanic and Atmospheric Administration (NOAA) to install a Seafood Import Monitoring Program that will track about 25 percent of imported seafood from fishing boat to U.S. borders. The rule seeks to decrease the incidence of seafood fraud by requiring product reporting at the time of importation to the U.S. government and complying with a report verification process.

As cited per the [Federal Register](#), pursuant to the Magnuson-Stevens Fishery Conservation and Management Act, the final rule establishes permitting, reporting, and recordkeeping procedures relating to the importation of [certain fish and fish products](#) identified as being at particular risk of illegal, unreported, and unregulated fishing or seafood fraud.

Collection of catch and landing documentation for certain fish and fish products will be accomplished through the government-wide International Trade Data System. The rule requires data to be reported on the harvest of fish and fish products. In addition, this rule requires retention of additional supply chain data by the importer of record and extends an existing National Marine Fisheries Service requirement to obtain an annually renewable International Fisheries Trade Permit to the fish and fish products regulated under this rule. The information to be reported and retained, as applicable, under this rule will help authorities verify that the fish or fish products were lawfully acquired by providing information to trace each import shipment back to the initial harvest event(s).

However, the rule is facing heavy challenges and adversity to its purpose as a few of the fishing industry's biggest players including the National Fisheries Institute have sued the NOAA and Department of Commerce for placing what they say is an onerous and expensive burden on importers who already follow the rules.

In 2000, the Marine Stewardship Council (MSC) also developed a sustainable fishery standard and "Chain of Custody" traceability with certification that is applicable to the full supply chain from a MSC-certified fishery to final sale. In 2012, the Aquaculture Stewardship Council (ASC) developed a responsible aquaculture standard with the same traceability standard of MSC. Every company in the supply chain handling or selling a MSC- or ASC-certified product must have a valid Chain of Custody certificate. This means seafood sold with the MSC or ASC label can be traced back to the ocean or the aquaculture farm, giving buyers confidence in its origin and means of production.

Companies certified against the MSC-ASC Chain of Custody Standard are audited regularly to ensure that they

meet five traceability requirements: 1) seafood products can only be purchased from MSC-certified suppliers and from MSC-certified fisheries or ASC-certified farms; 2) MSC-certified seafood products must be identifiable; 3) MSC-certified seafood products must be segregated from non-MSC-certified seafood at each step of the supply chain; 4) MSC-certified seafood product volumes must be recorded; and 5) the MSC-certified organization must have a

document management system. Each processor, storage, trader, and importer in the world who wants to use MSC or ASC label must be audited by accredited third-party certification body.

In addition, a new digital tracing technology called blockchain is on the rise and being tested in the seafood industry. Originally used to track the digital currency Bitcoin, blockchain is a digital ledger in

(Continued on p. 34)

BIO-RAD FOOD SAFETY

WE'RE WITH YOU AT EVERY STEP



Have confidence in our products and people

At Bio-Rad, we believe that success comes with trust and partnership — and we are invested in your success. We know that you settle for nothing but the highest quality in food safety. With solid, personable, and dependable teams, we've provided over 60 years of world-class expertise in microbiology. Our state-of-the-art products provide precise and integrated solutions, which along with our unparalleled worldwide service, set us apart.

See how we can help you.

Visit bio-rad.com/info/food-quality

BIO-RAD

(Continued from p. 33)

which transactions are recorded chronologically and publicly. New information cannot be removed or changed after it has been recorded. Blockchain aims to replace the severely outdated process of tracking seafood through tags and paper records by digitally tracking seafood across the supply chain.

The new blockchain approach allows fishermen to record their harvest (i.e. date, type of species, quantity, fishing area, fishing gear, name of vessel) and register their catch on the blockchain system. The data is then sent to the fish processor. When the fish are processed, packed, and stored, the processor records data to the blockchain system and forwards on to the next client in the chain until it reaches its final destination. The information on the origin and supply chain journey of the seafood can then be accessed and verified on smartphones used by retail buyers, restaurateurs, and consumers.

Label Verification Training

There is no universal seafood labeling system for grocery stores so buying fish products often requires a little diligence to ensure it is what it is. However, the FDA launched an online learning module to help food retailers ensure the proper labeling of seafood products offered for sale in the U.S. marketplace. Proper identification of seafood is important throughout

the seafood supply chain to ensure that appropriate food safety controls are implemented and that consumers are getting the type of seafood they expect and for which they are paying.

The module provides an overview of the federal identity labeling requirements for seafood offered in interstate commerce; a list of the specific laws, regulations, guidance documents, and other materials pertinent to the proper labeling of seafood; a description of the FDA's role in ensuring the proper labeling of seafood; and tips for identifying mislabeled seafood in the wholesale distribution chain or at the point of retail.



Third-Party Verification

Third-party verification experts provide food retailers with a number of benefits. Among them is their impartiality to data allowing for trusted, ethical reporting. They can also offer counsel on the correct setup of tracing product authenticity (including MSC, ASC, and blockchain), further reducing any need for unnecessary expen-

so they can protect their product and brand reputation,” says Jeff Chilton, vice president of professional services for Alchemy.

In addition, the global authenticity competence center of EUROFINS group and USP have signed a collaboration agreement. Leveraging the scientific strengths of both organizations, Eurofins and USP will combine expertise to assist the food sector with specific tools for combating food fraud. The agreement includes several areas of cooperation, including exploration of new analytical testing methods, training and consulting to help the food sector assess the vulnerability of supply chains, and other services based on global analytical and food fraud data to inform industry of emerging issues.—*FQ&S*

Blockchain for Dummies

Blockchain technology has everyone in the food industry talking about how it can improve traceability. Big food retailer Wal-Mart started testing the use of blockchain in Fall 2016 to help monitor its food and identify and remove recalled products. If you're new to this emerging technology, then “Blockchain for Dummies” is an ideal starting place. The book allows professionals to gain a better understanding of what blockchain is, how it can improve the integrity of their data, and how it can enhance their data security. “Blockchain for Dummies” will be released in May 2017 and available at <http://ow.ly/woA5309RzNI>.—*FQ&S*

ditures due to fraud or labeling mistakes. Finally, they have access to state-of-the-art equipment and technology that can synthesize and analyze data to identify trends and opportunities for supply chain improvements, remedies, and corrections.

For example, in 2015 one of the world's largest tuna trading companies in Asia employed a third-party provider to verify the traceability of its tuna supply before it was shipped to a cannery facility. The verification program focused on ensuring there was no use of fish aggregating devices (FAD), a man-made object commonly used to attract tuna, in the supply chain. The certifier examined 30 large fishing vessels in Pacific Ocean, transshipment to 20 carrier vessels, and discharge to a Bangkok port. After the assessment was complete, a FAD-free traceability standard was set into place and today the supply chain remains consistently monitored to ensure compliance is maintained. Tuna suppliers who meet the FAD-free standard requirements receive a certificate of recognition to verify their compliance in Asia and to other international customers that require it.

In conclusion, consumer trust demands that the seafood they buy is what it says it is. Until a unified global tracking process is in place to tackle fraud, food retailers must ask the hard questions about where their seafood comes from and employ a traceable or verified system so to ensure what you “sea” is what you get. ■

Hoemeke is vice president of agriculture and foods at Bureau Veritas North America. Reach him at christopher.hoemeke@us.bureauveritas.com.

Collaborations to Combat Food Fraud

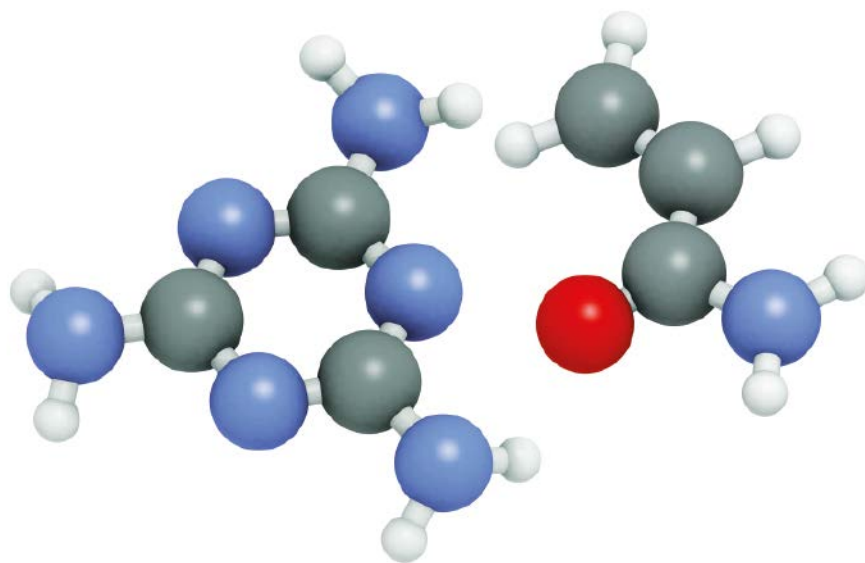
Alchemy Systems and the U.S. Pharmacopeial Convention (USP) are collaborating to enable food companies around the world and of all sizes to quickly assess supply chain risk and build robust systems to minimize food fraud.

Food safety program provider Alchemy will combine its Food Fraud Risk Assessment and Mitigation Services with USP's Food Fraud Database—a comprehensive source of information on food fraud risk for thousands of ingredients. The database can be used to identify which ingredients have a known history of adulterations. It includes incident reports, inference reports, surveillance records, and analytical methods.

“The Alchemy-USP collaboration will enable companies to prioritize fraud risks down to the ingredient level

In The Lab

CHEMICAL CONTAMINANTS



4. How did it get in the food?
5. What is the specific danger or health risk?
6. How can potential contamination be prevented?

The chemical contamination of food is usually (but not always) quite subtle. It is often manifested as trace level exposure to toxic chemicals over long periods of time (i.e., chronic exposure). Potential health effects may not be realized until many years later, perhaps in the form of carcinogenicity, teratogenicity, and/or metabolic disturbances. And, unlike microbial contamination that can be reversed by such techniques as heating, the chemical contamination of food is generally not reversible. Chemical contamination can only be “cured” by prevention, and prevention is impossible without deep, scientific knowledge about the chemical system associated with the potential for contamination. If you can’t identify, detect, and measure the potential chemical contaminant, you can’t prevent it from happening. You are relying on luck, not science.

Science-Based Prevention

The above concept illustrates why the Food Safety Modernization Act (FSMA) represents such a revolutionary advance in the area of making food safe from chemical contamination. FSMA is wholly anticipatory, not reactionary. You are not allowed to wait decades for a subtle carcinogenic effect to manifest itself before taking action; you must reasonably anticipate the threat of contamination and take proactive measures to prevent it. In other words, you must answer the number 6 question, mentioned previously. However, you can’t begin to answer this question without reliably answering questions number 1 and 2. For effective prevention, you need to use analytical testing methods that are both qualitatively and quantitatively reliable. The FDA consistently uses the term “scientifically-valid” to describe this basic requirement. Therefore, if prevention is the heart and soul of FSMA then scientifically-valid food testing methods are the means to effective prevention. However, the term “scientifically-valid method” is not a static definition, but a fluid concept.

(Continued on p. 36)

Chemical Contamination: You’re Not Supposed to be Here!

Connecting food contamination and food safety with the application of chromatography | BY DAVID KENNEDY, PHD

When you hear the words “food contamination” your mind makes an immediate connection to unpleasant words such as: illness, disease, unsafe, etc. However, it’s very unlikely that the word “chromatography” comes to mind. One dictionary definition of “contamination” has it as “the action of making something impure by polluting or poisoning.” In other words, the “pure” becomes “impure” by the introduction of something bad that isn’t supposed to be there. Narrowing the definition to the subject of “food contamination,” one definition describes it as “the presence in food of harmful chemicals or microorganisms

which can cause consumer illness.” Again, something bad has been introduced that shouldn’t be there, which is making the wholesome unwholesome. Food contamination is often divided into two categories: chemical and microbiological. This article will deal only with the chemical contamination of food.

Chemical Contamination

It is impossible to deal seriously with the subject of the chemical contamination of food without drilling down on some questions, such as the following.

1. What is the potential contaminant?
2. How much is there?
3. Where did it come from?

(Continued from p. 35)

Food Testing Method Modernization Movement

As technology has advanced, the ability to identify, detect, and measure chemical substances in environmental samples (such as food) has increased exponentially. Arguably, the advance of analytical testing capabilities in the past two decades has exceeded the advance of the prior 100 years. Consequently, food testing methods that may have been the pinnacle of scientific-validity when they were developed 20 years ago may now be quite dated in terms of analytical capability. This is manifested in the inability of many older test methods to adequately differentiate and quantify specific chemical species. The risk of chemical contamination as increased, particularly in light of the globalization of food supplies that has complicated the tracking of ingredient origins.

This is probably best illustrated by the unfortunate incident of 2007-2008 where ingredients used in the manufacture of pet food and infant formula were intentionally contaminated (i.e., adulterated)

The melamine tragedy brought rapid realization of the vulnerability of many older food testing methods for preventing chemical contamination, whether accidental or intentional.

with melamine to fraudulently increase the measured protein content. The scheme initially succeeded because the prescribed test used to measure the protein content (the 100+ year-old Kjeldahl test for total organic nitrogen) can't distinguish between the nitrogen content of protein and melamine. The Kjeldahl test lacks the ability to speciate specific organic nitrogen compounds and is not fit for the purpose of measuring the protein content of food, at least in the face of a chemical contamination threat from melamine. A sophisticated

high performance liquid chromatography (HPLC) test for melamine was subsequently developed, which put an end to that particular contamination threat.

The melamine tragedy brought rapid realization of the vulnerability of many older food testing methods for preventing chemical contamination, whether accidental or intentional. This vulnerability arises from an inherent lack of specificity of older food testing methods—the inability to accurately speciate individual toxic chemical species in a complex food matrix. This inability is particularly stark when one compares the technology underlying the older methods to the much greater capabilities of modern analytical technology. This has led to a broad-based, method modernization effort on the part of government agencies (FDA, NIOSH, EFSA, etc.) and standard setting institutions (AOAC, USP, etc.) to be able to measure, and therefore prevent, the chemical contamination of food. Modern chromatography has played a major role in this food method modernization movement and preventing food contamination.

Impact of Modern Chromatography

In the introduction to this article, I stated that the term “chromatography” probably isn't the first thing that comes to mind when considering the subject of food contamination. But, perhaps it should be; at least in the case of chemical contamination. Modern chromatography has an unsurpassed ability to isolate, differentiate, and identify diverse potential contaminants in food. There are many diverse opportunities for food to become chemically contaminated. One needs only to consider the great number of toxic compounds in commerce and the many potential exposure routes from farm to table. The potential for contamination is so diverse, it is impossible to generalize the power of chromatography to prevent food contamination. Instead, I will present a series of thumbnail sketches that illustrate the breadth and depth of recent chromatographic method developments.

The images at left and right are examples taken from the recently published [Phenomenex Food Testing Applications Guide](#) that contains over 150 liquid chromatography (LC), gas chromatography (GC) and solid phase extraction (SPE) applications.

Image 1

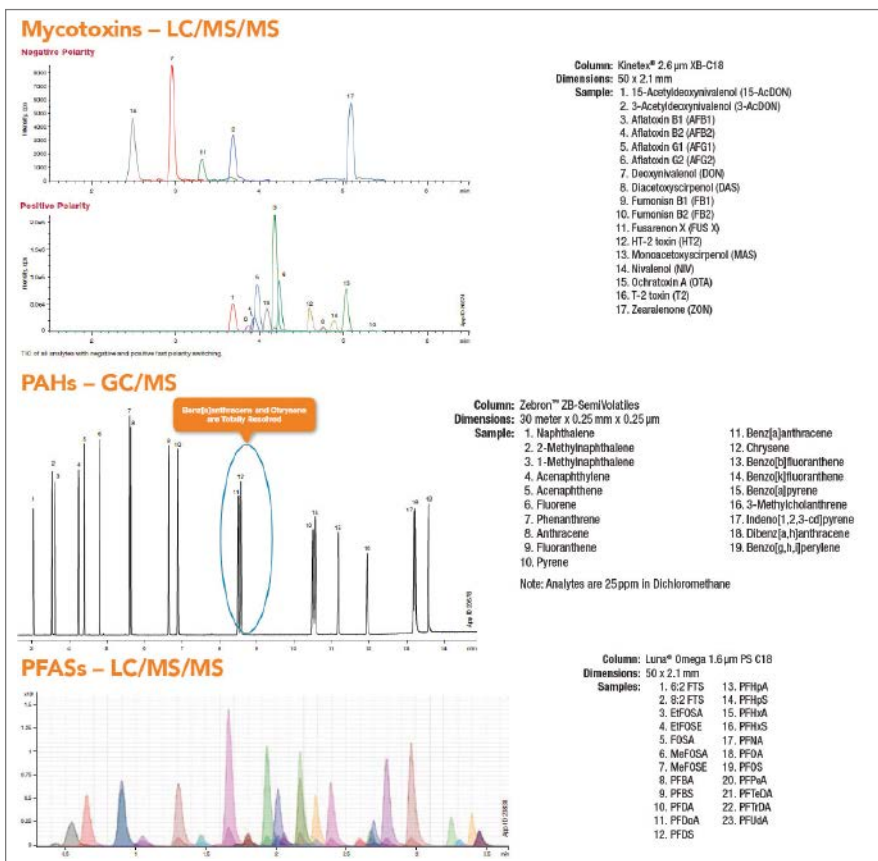


Image 2

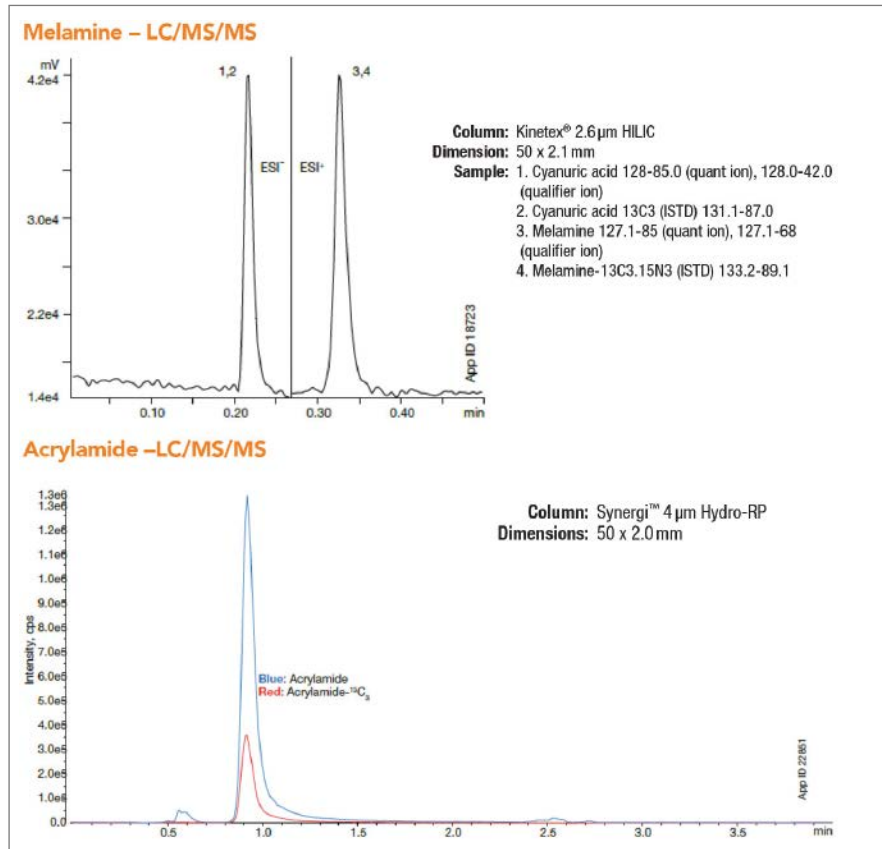
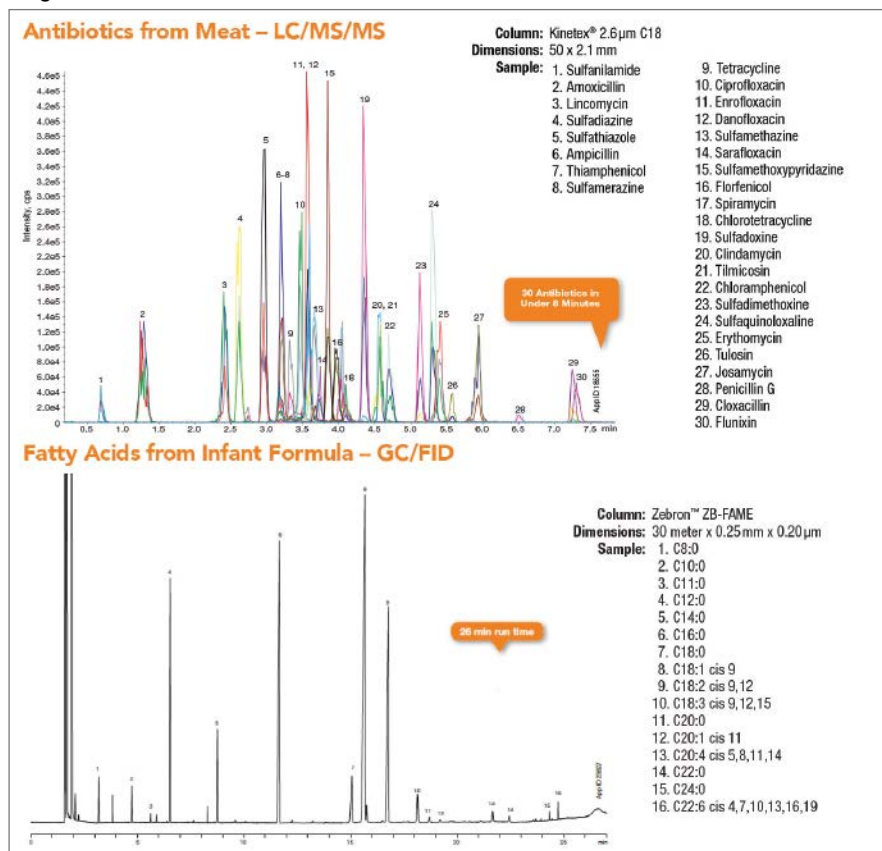


Image 3



Chemical Contamination Scenarios

Image 1, page 36:

Mycotoxins from cereal based goods by SPE and LC/MS/MS. Produced by certain molds that can grow on grains, mycotoxins are a class of compounds that are highly toxic and carcinogenic.

Polycyclic aromatic hydrocarbons (**PAHs**) in water by GC/MS. PAHs are a class of carcinogenic compounds that arise from the inefficient combustion of petroleum-based products and can contaminate the environment and foods.

Twenty-three per-polyfluorinated alkyl substances (**PFAS**) by UHPLC/MS/MS. PFAS compounds have been widely used in food packaging; they are able to leach into food at trace levels, and since they are extremely bioaccumulative, they can build up in the fat tissue of the consumer.

Image 2, top left:

Melamine and cyanuric acid in milk and baby formula products by SPE, LC/MS, and GC/MS. This relates directly to the melamine contamination/adulteration crisis of 2007-8.

Acrylamide from coffee by SLE and LC/MS/MS. Acrylamide can be found in certain starch-containing foods that have been exposed to heat. It is classified as a carcinogen so its presence in food, even at low concentrations, is a concern.

Image 3, bottom left:

Antibiotics in meat by LC/MS/MS. Another source of contamination is the introduction of antibiotics and other veterinary products used in livestock production.

Fatty acids in powdered infant formula by GC/FID. The analysis of fats in food was considered a “nutritional” analysis, but with the FDA’s 2016 ban of unhealthy trans fat from processed food, the presence of trans fat would now be considered “contamination.”

Conclusion

The rapidly evolving science of chromatography has enabled powerful, sophisticated, and effective food testing methods. These methods have strengthened the ability to prevent contamination. The practice of chromatography is certain to continue its advancement, thereby insuring future improvements in food safety. ■

Dr. Kennedy, business development manager at Phenomenex, has focused on food safety and environmental monitoring during his over 45-year career. Reach him at Davidk@phenomenex.com.

Monitoring Pesticides in Our Food

Using chromatography techniques that detect residual pesticides in order to meet global regulatory requirements

BY FENG QIN



Next time you walk up and down the aisles of your favorite supermarket, think about this—on average [35 percent to 40 percent of all food and fiber crops grown around the world are lost to pests and disease every year](#). As food safety and risk management professionals, we can all readily appreciate the importance of pesticides in preventing potential food shortages or worse. In fact, pest control dates back to the first person to swat a bug. More methodical methods soon followed. The Sumerians used a sulfur compound to drive off insects. The [Egyptians had over 800 recipes for pesticides](#), while the Chinese used arsenic and mercury compounds to control plant diseases and fend off pests.

The Ubiquity of Pesticides

Though often misunderstood to refer only to insecticides, the term pesticide also applies to herbicides, fungicides, and various other substances used to control pests. Today, more than 5.5 billion pounds of [these chemicals are applied to seasonal crops](#) around the world each year. The U.S. agricultural industry alone uses over half a billion pounds of pesticides a year to treat just 21 selected crops, including corn, soybeans, and wheat. According to [USDA](#), about 76 percent of those pesticides are herbicides, 17 percent are soil fumigants,

desiccants, and plant growth regulators, while insecticides account for the remaining 7 percent.

With all of those chemicals ending up on global crops, it should come as no surprise to learn that trace amounts of those chemicals end up in the food supply. Remember your mom always telling you to wash that fruit or vegetable before eating it? Turns out she was right. Residual pesticides are found in 52 percent of fruits and over 30 percent of vegetables. But even mom's advice does not often help, since washing foods does not always remove all of the chemicals. Beyond those that cling to the skin of fruits, vegetables, and grains, [some are actually absorbed into the food itself](#). Despite all of the preventive measures in place, consumers are still eating pesticides on a daily basis.

Even more disturbing is the potential accumulative effects of longtime exposure to these chemicals. The possible implications of exposure to multiple pesticides on food are also of growing concern. It is not uncommon, for instance, to treat crops several times with different pesticides depending upon treatment needs, including insects, rodents, fungi, and soil enhancers. [One recent study](#) linked multiple myeloma to certain agricultural exposures, including pesticides, in men throughout North America. Another recent ruling in California will soon require a cancer warning to

appear on glyphosate, the world's most popular weed killing pesticide.

Preventive Measures Abound

In most countries pesticides are highly regulated and designed to dissipate by harvest time, leaving behind only trace amounts of compounds that are measured in the parts per million and billion (ppm and ppb) levels. Government regulators note that those levels are [below the legal tolerance limits](#) set by food safety agencies from around the developed world, and are thus safe for human consumption. In every instance, these tolerance levels already factor in an added safety margin that considers their potential impact on children, who consume more food by body weight, as well as people with higher sensitivities.

In order to verify these tolerance standards, farmers, food manufacturers, processors, packagers, and some larger grocery chains now conduct their own testing to make sure every ingredient is within the established tolerance limit. In states like California, which has the strictest standards for pesticide use, testers are mandated by law to fully describe or reference the preparation process and methodologies used as well as provide validation data and all analytical reports upon request.

Testing Methodologies

What do most testing laboratories use to detect, identify, and quantify pesticides in food? While there are multiple methods to measure pesticides at environmentally relevant concentrations, the industry gold standard is chromatography. Both gas chromatography/mass spectrometry (GC/MS) and liquid chromatography/mass spectrometry (LC/MS) meet the analytical requirements to detect pesticides in food, especially in fruits and vegetables.

GC/MS. This is a highly sensitive and universal detecting system that most people encounter at airports, where it is used to detect substances in luggage or on passengers. Able to detect trace elements down to ppm and ppb, which appear as chromatographic peaks on a chromatogram, GC/MS is frequently used to detect a wide variety of analytes within a single sample matrix, such as pesticide residues in food. GC/MS can also be used to [help](#)

(Continued on p. 40)

HUMAN HEALTH

ENVIRONMENTAL HEALTH

Copyright © 2016 PerkinElmer, Inc. 400952_01. All rights reserved. PerkinElmer® is a registered trademark of PerkinElmer, Inc. All other trademarks are the property of their respective owners.



WHOSE PESTICIDE ANALYZER
GIVES YOU
15% MORE TIME?

SIMPLE: PERKINELMER.

Given our global food supply, increased risks from pesticide residues, and growing regulatory requirements, your lab's pesticide analysis workload gets larger and more complex all the time. But with our QSight™ Pesticide Analyzer, you can meet the challenge. Based on the QSight triple quadrupole mass spectrometer and Altus® UPLC®, it requires no shut-down for cleaning, which means 15% more uptime, or up to 35 more days per year for sample analysis. All while providing the most efficient high-sensitivity solution on the market.

The QSight Pesticide Analyzer: What will you do with all that time?

Learn more at www.perkinelmer.com/pesticides


PerkinElmer
For the Better

(Continued from p. 38)

[identify unknown pesticide elements](#) by comparing their relative retention time data to that of a standard, such as chlorpyrifos that is typically used as the standard for common chlorinated hydrocarbon and organophosphate pesticides.

LC/TOF-MS. A newer, more sensitive, and faster technology for pesticide analysis is liquid chromatography/time-of-flight mass spectroscopy, or LC/TOF-MS. Basically, the system determines an ion's mass-to-charge ratio by measuring the time it takes for an ion to reach a detector that is set at a predetermined distance. That time measures the ion's velocity and is used to determine its weight, or mass-to-charge ratio, which in turn helps to identify the specific ion. Since LC/TOF-MS collects full spectrum information on samples, the mass spectrometer can examine the data for non-targeted (or unknowns) as well as targeted information that is stored in a spectra database. Using a standard sample preparation procedure such as QuEChERS (Quick, Easy, Cheap, Effective, Rugged,

and Safe), a LC/TOF mass spectrometer like the PerkinElmer AxION 2 TOF can provide lab scientists with the ability to rapidly detect hundreds of commonly regulated pesticides in food at or below the regulatory limit of 10 ppb in concentration. These instruments can also automatically highlight those residual amounts of pesticides that are above the regulatory limit. LC/TOF technology is an example of how to detect residual amounts of neonicotinoid [pesticides in honey](#), which are now the most commonly used insecticide class in the world and are currently under investigation as a possible cause for bee colony collapse disorder.

LC/MS/MS. Liquid chromatography coupled to triple quadrupole mass spectrometry (LC/MS/MS), or triple quadrupole system, is becoming the method of choice for the detection of multiple residual pesticides in food, nutraceuticals, and botanicals. LC/MS/MS systems have a unique detection mode called multiple reaction monitoring, which allows the first quadrupole in the system to select the parent ion

mass of the analyte before sending them to collision cell for fragmentation. Following this the second quadrupole is able to select daughter ion from those parent ions and send them to the detector for detection. The unique parent/daughter ions combination provides high specificity, selectivity, and sensitivity. Using systems such as the PerkinElmer Altus UPLC system coupled to a QSight 220 triple-quad mass spectrometer can allow lab scientists to identify and simultaneously quantify the trace residue of multiple pesticides in fruit faster than other GC technologies.

In addition, portable GC systems, such as the 32-pound Torion T-9 GC/MS by PerkinElmer, are available when the lab is needed onsite.

When it comes to flexibility, speed, and accuracy in testing for residual pesticides in food to meet global regulatory requirements there is a wealth of chromatographic options to help make the next family dinner be as pesticide free as possible. ■

Qin is product manager for food solutions at PerkinElmer. Reach him at feng.qin@perkinelmer.com.

TEST. TRUST. MOVE.

Spectroquant® Move Cl₂/O₃/ClO₂/CyA/pH mobile colorimeter

Test

at the click of a button using all parameters for disinfection control with one instrument.

– SIMPLIFY DISINFECTION CONTROL.

Trust

your results with our secure, simplified Analytical Quality Assurance and enhanced documentation.

– SECURE RAPID, RELIABLE RESULTS.

Move

your water analysis anywhere – even to wet or dusty environments – thanks to IP 68 classification.

– MOVE YOUR ANALYSIS ANYWHERE.



MILLIPORE SIGMA

The life science business of Merck KGaA, Darmstadt, Germany operates as MilliporeSigma in the U.S. and Canada.

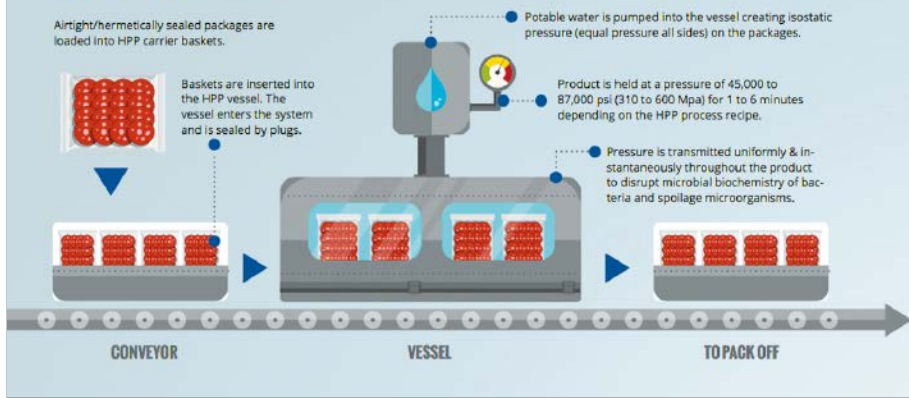
Copyright © 2017 EMD Millipore Corporation. All Rights Reserved. Merck and the Vibrant M are trademarks and Spectroquant is a registered trademark of Merck KGaA, Darmstadt, Germany.

emdmillipore.com/move-disinfection-control

Manufacturing & Distribution

PACKAGING

How HPP Works?



Putting 'Pressure' on Food Packaging

High Pressure Processing harnesses the power of water pressure in food preservation | BY MARK FLECK

Traditional food preservation technologies, like heat pasteurization, have significantly increased the safety of the food supply over the years. Unfortunately, many of these commonly used preservation techniques negatively impact the flavor, texture, nutrients, and color of food products. Additionally, consumers have become familiar with the not-so-fresh flavors of products with chemical preservatives. These concerns combined with the food production industry's latest focus on keeping labels as clean as possible have made High Pressure Processing (HPP) a popular technology in the food production industry.

Having evolved from a novel food preservation concept to a go-to method called for by food manufacturers and their retail partners, many companies are finding themselves under pressure to learn more about how to best use the pressure of water. The following is a primer on what HPP is and can do, and the best practices companies can adhere to when making the transition to the HPP.

The 411 on HPP

Unlike heat pasteurization, which often negatively impacts food vitamins and nutrients when addressing bacteria, HPP's cold pasteurization offers the opportunity to enhance food safety, while at the same time maintaining the fresh taste, bite, and color of the product in its natural state. HPP interrupts the cellular function of microorganisms by applying enormous pressure to foods for a period of just a few minutes. In most cases, this isostatic (equal from all sides) pressure is applied after the food is packaged, virtually eliminating any chance of recontamination.

Most HPP foods are technically non-sterile, i.e. not shelf-stable, but research studies completed on a wide range of food products and categories confirm that HPP technology effectively inactivates vegetative bacteria like *Listeria monocytogenes*, *Salmonella*, *E. coli* O157:H7, and *Campylobacter* as well as yeasts, molds, and other fungi. It is a log-reduction food preservation technology which, in simplest terms, means that

the higher the process pressure and longer the hold time, the greater the reduction of microorganisms—to a point. HPP is not effective on some enzymes and bacterial spores, including *Clostridium botulinum*. Producers need to tap into other techniques, such as blanching (for vegetables), and possibly adding a very small amount of natural antimicrobials or anti-clostridia ingredients to address those components not affected by HPP.

HPP provides additional value beyond its food safety benefits in the form of significantly increased shelf life. Because HPP inactivates most spoilage organisms, food processors frequently report dramatically increased product shelf life, often by more than twice the results without HPP.

Delivering a high-quality, cleaner-label product with prolonged shelf life can unlock all kinds of value. Some processors use HPP as an opportunity to increase their batch size and reduce the frequency of production runs. Because of the much longer product shelf life, a manufacturer on the East Coast can now tap markets in the Midwest and the West Coast. Others have seen HPP as an opportunity to provide new kinds of offerings or foods in different parts of the store. For example, avocados have traditionally been sold as a perishable item in the produce section and must be sold, donated, or thrown out within a matter of days. [Avomex/Fresherized Foods](#) was able to slice, pit, hermetically seal, and process avocado halves using HPP for a new product in the retail refrigerated sections. With HPP, the avocados last 30 days without turning brown or losing their optimal taste and quality—all done without the use of chemical preservatives.

Four Keys to Implementing HPP

While the benefits of switching from thermal pasteurization to HPP are often well worth the cost, changing processing methods is a major step that ought to be carefully considered before any definitive action is taken. The following four points

(Continued on p. 42)

(Continued from p. 41)

are what food brands should keep in mind as they consider making the switch.

1. Determine your goals. There are many reasons to switch to HPP. Understanding and acknowledging your goals and setting benchmarks for what success looks like are keys to settling on the most beneficial transition possible. Some providers utilize HPP to enhance their food safety program, while others are hoping to create a cleaner-label product and reduce sodium levels. Still others use HPP to reduce food waste/shrink or streamline their operations. Depending on the product, HPP may be able to make some or all of those dreams a reality.

Whether it's expanding market reach through extended product shelf life, increasing your margins, or simply addressing changing consumer demands by converting a product currently distributed frozen to fresh, it's critical to set an emphasis on what you plan to accomplish from the transition. Doing so helps evaluate success and guides future processing decisions.

2. Know your product. It is always important to thoroughly understand your product. HPP is effective on a wide variety of products, but differences among those products or even differences between varying types of the same product can have an effect on process hold time and level of pressure needed with HPP. The following are examples of information you should have about your current product.

- The product pH and water activity—very important with beverages.
- Your target product shelf life compared with your current shelf life.
- Your current packaging—does it provide an air tight/hermetic seal, and is there at least one surface or a combination of surfaces that can accommodate a 15 percent temporary volume change?
- Package barrier properties—does your current package/film have barrier qualities (OTR and MVTR) to maximize the increased shelf life benefit of using HPP?
- Labeling—if there is one, is it water-proof or could it be applied post-HPP?

3. Conduct research and obtain consultation. Once you understand your goals and have defined the characteristics



During HPP, products already sealed in their final packages are introduced into a vessel and subjected to a high level of isostatic pressure.

of your existing or new product, you can begin evaluating whether HPP is the right technology for your application. The next step is conducting research—microbiology challenge studies, product shelf life studies under various conditions, and organoleptic/sensory analysis, i.e. taste and flavor, texture, mouth feel, visual appearance, smell, and more.

If you already have an in-house product development team and micro lab, they can research available HPP technical literature on pathogen validation and shelf life studies. If not, there are knowledgeable resources available to you from universities and third-party companies who provide these services. You may simply need to try processing a few samples to know where to start. There are HPP test vessels available at multiple universities and third-party research organizations.

In addition, the two principal HPP equipment manufacturers (Avure Technologies and Hiperbaric) have many of these capabilities in-house or close working relationships with local labs to perform these analyses for your company. The growing network of HPP outsourcers, like Universal Pasteurization, have facilities located across the U.S. and may be able to assist with getting the evaluation process started.

4. Choose whether to insource or outsource your processing. Numerous companies have invested in in-house HPP systems as a long-term, go-to-market business strategy. One of the questions you and your team will want to answer is whether you have the space and product volume to justify an HPP equipment purchase. The seven-figure capital expenditure, space and facility requirements, the implementation time, and ongoing staffing to operate and maintain the HPP process are key

considerations to keep in mind. The weight of the larger HPP systems typically require special foundations to support the equipment load.

Understand that HPP is a batch-process and doesn't lend itself well to traditional food processing lines. Manufacturers often create a staging area pre-HPP to provide product queues. Post-HPP, the product package will typically pass through an air knife to remove the moisture remaining from the HPP process. One may need to consider the additional floor space for any pack-off requirements, e.g. ink jetting, kitting, sleeving, overwrapping, boxing, and palletizing.

Many companies wishing to take advantage of the benefits of HPP don't have the volume or resources to justify the investment and upkeep for purchasing and maintaining their HPP operation in-house. Even some of the larger companies who have sizable product volumes don't want to invest their time and capital in bringing HPP in-house. They may have only a few products at each of their production facilities that would benefit from HPP. If so, the setup and upkeep costs of purchasing and operating an HPP machine may overwhelm the financial benefits from implementing the process in-house.

Fortunately, today there is a network of HPP outsourcers who fulfill this step in the production process for companies both large and small. Outsourcers own and operate HPP machines on behalf of clients. Leveraging these service providers can be a much more economical way for smaller producers to use HPP for their products. Additionally, many of these HPP outsourcers offer pack-off, cold storage, and logistic services. Outsourcers also support companies who have their own HPP vessels. They will assist in processing overflow during peak times of production or as a backstop if the manufacturer's HPP system is temporarily out-of-service for maintenance.

Is HPP right for you? Certainly the answer and the nuances are highly variable, but HPP is a fast-growing food preservation technology offering benefits across a broad product spectrum. ■

Fleck is a consultant and HPP specialist with Universal Pasteurization, an HPP outsourcing service provider for food and beverage producers. Reach him at mfleck@ucsne.com.



Responsible Packaging

The role of packaging in extending shelf life to ultimately increase food safety and reduce waste | BY KARL DEILY

The issue of food waste is very real. Approximately one-third of food produced for human consumption is wasted globally and, in the U.S., nearly 95 percent of that food ends up in landfills or combustion facilities, according to the [EPA](#).

While there is no single remedy to solving the problem of food waste, there are several steps that food processors and retailers can take to immediately improve operational efficiency and sustainability and reduce food waste.

In a recent report by the [Food and Agriculture Organization \(FAO\) of the United Nations](#), the organization identified areas along the food supply chain where food waste occurs. The FAO report highlighted, for example, how improved technologies can help prevent food waste during the harvesting and processing phases of food production. It's also known that advanced packaging technologies play an important role in ensuring the freshness and extending the shelf life of food, enabling retailers to better satisfy consumer demands and minimize food waste from farm to fork.

Innovation is nothing new to the packaging industry though. In fact, the Cryovac

brand has its roots in solving a shelf-life challenge, albeit a much larger one: how to better preserve meat for French soldiers at the onset of World War II. The French inventor, Henry DePoix, pioneered vacuum packaging technology to better protect and preserve fresh meat, forever changing the way food is packaged.

Some 75 years later, while the challenges and technologies have certainly changed, the goal is the same: develop smart, sustainable packaging to extend shelf life, increase food safety and ultimately decrease food waste.

With a growing global population, the need to meet increased demand and address environmental concerns has never been more important.

A Global Food System

By 2050, it is estimated that the global population will grow an additional 33 percent to nearly 10 billion people, according to [FAO estimates](#).

As a result, food demand is expected to nearly double and retailers will need to source more products globally. Not surprisingly, food may need to be transported further than ever before to reach

its final destination. Product shelf life—and the packaging that ensures it—must be considered within this larger context.

As well as extending the shelf life of products, there will be a growing need for food packaging that allows for safe and efficient transport to connect areas of food supply with those of greatest need, such as new urban areas. Helping processors increase transportation efficiency means fewer loads, reducing the environmental impact of transportation, as well as increasing access to safe, nutritious food.

Changing Consumer Habits

In developing countries, food loss often happens during post-harvest and processing, while industrialized countries face a similar level of food loss at the retail and consumer levels. Yet all countries are impacted by changing consumer habits and lifestyles, like rapid urbanization, expansion of supermarket chains, and dietary preferences.

Two big changes in consumer preference are impacting markets around the world: 1) the rise in global demand for proteins and 2) the emergence of new chan-

Effective packaging, like vacuum skin innovations, can reduce shrink and increase shelf life...

nels for food distribution, associated with the increase in e-commerce. For retailers and food processors, the changes in consumer habits present several challenges.

Firstly, proteins like meat, chicken, and fish are among the costliest items for retailers to stock and sell. And, unlike canned foods or dry goods, which often can be donated to food banks, protein products are often thrown out when their shelf life expires due to food safety concerns.

[USDA](#) reports that in the U.S. alone, approximately 2.7 billion pounds of meat, poultry, and fish valued at \$8.8 billion, or about 5 percent of all such inventory, are thrown out by retailers each year.

Effective packaging, like vacuum skin innovations, can reduce shrink and

(Continued on p. 44)

(Continued from p. 43)

increase shelf life—sometimes nearly doubling it. This helps retailers tackle the problems of food loss and waste and ultimately improve their bottom lines.

Secondly, the rising demand for smaller portions due to shrinking household sizes and the need to protect food during e-commerce delivery increases the need for innovative packaging solutions to portion and protect food. For example, as shoppers change the way they plan for meals and make more use of meal kits, novel packaging solutions that extend shelf life like barrier bags and modified-atmosphere packaging are needed to deliver the high-quality products consumers demand while ensuring food safety.

Creating a Conversation

While sustainable packaging is not new, companies are increasingly opting for packaging alternatives to meet their sustainability goals and consumer demands.

A [2014 Harris Poll Consumer Food Waste Study](#), commissioned by Sealed Air, showed that consumers are more educated about packaging and its ability to reduce food waste, and have strong opinions about brands that demonstrate a commitment to sustainability. Here are some other interesting findings from the poll:

- 8 in 10 consumers agree that they would think more highly of stores or food brands that help them reduce food waste;
- 57 percent would think more favorably of a store if it used packaging that kept food fresher longer; and
- 43 percent of consumers consider food products that have packaging designed to keep food fresher longer to be environmentally friendly.

It is important for the industry to engage consumers in continued conversation around the role of packaging in extending freshness of food and reducing waste—something that impacts both the environment and consumers’ wallets.

Looking Ahead

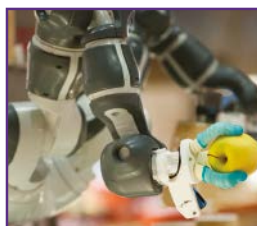
Addressing food waste is a major concern that all stakeholders in the global supply chain must address in the future. The packaging industry has a major role to play. By focusing on solutions to increase product shelf life and increase distribution efficiency, innovative packaging does more than affect the sell-by date consumers might see on their products; it shapes the production-to-purchase process and can support the global goal of reducing food waste.

In addition, there will be a number of resource challenges, from changing climate and weather patterns impacting harvesting programs to a growing population and potential water and food scarcity issues. While it may not be possible to solve each one of these issues overnight, investing in smart, sustainable food packaging is a great place to start. ■

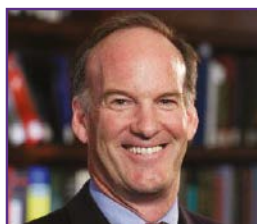
Deily joined Sealed Air in 1981, starting his career with Cryovac in R&D. Named President of Food Care in November 2011, Deily leads the Food Care Division that creates packaging and hygiene solutions. Reach him at karl.deily@sealedair.com.

Register today!
www.FreshTEC.show

Follow us on Twitter for the latest updates
@FreshTECshow
#FreshTEC



Building on a deep footprint in the fresh-cut processing sector, the **United FreshTEC Expo** is designed to highlight the most cutting-edge technologies for the fresh produce industry. Find breakthrough innovations in mechanical harvesting and robotics, warehouse automation and packaging solutions, data analytics and more featured in the FreshTEC Expo.



Bruce Taylor
CEO, Taylor Farms

The **FreshTEC Conference** will kick-off with a keynote from **Taylor Farms CEO Bruce Taylor**. Designed for operations executives and managers looking to understand how to solve today’s challenges, but also to look beyond at the visionary innovations on the way as we prepare for the future. Dig deep with expert discussions focused on pre- and post-harvest automation, food safety in packing and processing operations, and an intense look at controlled growing environments.



Food Service & Retail

SHELF LIFE



To gain that competitive edge, shippers are focused on retail consolidation programs that optimize food shipments, while at the same time improving customer service to help shippers get ahead. These programs not only enhance the level of control, but also provide a deeper level of visibility, create efficiencies, capture critical business intelligence, decrease costs, reduce mileage, improve speed to market, and decrease over, short, and damage claims.

Key Benefits

Important benefits include better visibility and collaboration across the supply chain, enhanced inventory management, and shorter transit times.

Better visibility and collaboration.

Supply chain performance plays a critical role in controlling costs and improving service. According to a survey by ECR Europe and McKinsey, successful supply chain collaboration on average resulted in a 4.4 percent decrease in out-of-stock instances and a cost reduction of 5.4 percent.

Collaboration can—and should—begin early in the supply chain. Shippers' supply chain providers can provide an analysis of the entire supply chain and break down the invisible barriers that exist between different divisions within a supplier. Often, suppliers find themselves unaware of what others within the business may be doing. They can also become so focused on meeting their immediate goals, they lose sight of the big picture. This type of siloed approach doesn't work to anyone's benefit.

Early planning also helps providers offer a custom solution. For food service companies with multiple distribution facilities, retail consolidation becomes an important piece in the supply chain strategy and a critical method for improving profitability.

Enhanced inventory management.

Inventory control is critical in the retail sector, especially when it comes to food,

(Continued on p. 46)

Retail Optimization Drives Benefits Beyond Transportation

Having a retail strategy in place that improves and consolidates food shipments helps all parties involved, including suppliers

BY TIM BASS

The topic of retail optimization for food businesses is important because retailers have an incredibly high standard for peak supply chain performance. Suppliers that don't provide on-time, accurate deliveries can face costly penalties and other repercussions. Of course, when you're dealing with food, which is often perishable and may need to be shipped at a certain temperature, there are added layers of complexity since you risk the product going bad.

A Timely Issue

The food business is getting a new wave of attention as it takes on new forms, includ-

ing online grocery shopping and delivery of food orders to consumers' doorsteps. With increasing interest in services like this, ensuring the quality of the food has become more complex than ever.

To help address the evolving challenges in the industry, compliance programs are now the norm within today's retail supply chain. They're designed to give the retailers a competitive edge, outline appointment times, and set delivery standards along with penalties for not meeting the terms. The theme with retailer compliance programs is the same: non-compliance results in hefty costs and the risk of lost business.

(Continued from p. 45)

given the need to closely monitor and adhere to expiration dates and shelf life limitations. Perishables that have gone bad lead to a great deal of waste, and the supply chain complexity behind these items can be tricky to manage. In addition to being costly in terms of lost sales and discarded product, food recalls can be severely damaging to brand reputation and customer loyalty.

Inventory control is critical in the retail sector, especially when it comes to food, given the need to closely monitor and adhere to expiration dates and shelf life limitations.

Retailers try to keep their inventories low and prefer just-in-time deliveries from vendors. At the same time, they want to make sure the product they need is going to be available. This becomes a real balancing act when seasonal demand for certain food items increases or decreases, such as during the summer months when certain



products like bottled water are more popular, for example, or during the winter holidays, when a different group of seasonal items are more in demand.

As part of a retail optimization program, supply chain service providers can help retailers and suppliers manage inventory by analyzing data and making proactive inventory and transportation decisions.

Shorter transit times. The growth of the omni-channel sector—including in the grocery business—means customers expect things at the click of a button. Case in point: A recent report from [Internet Retailer](#) details the online grocery boom, noting that the sector is expected to grow by 157 percent to \$42.1 billion this year alone, according to Morgan Stanley.

Continual analysis of transit time data along with proactive communication can help suppliers plan and execute an effective transportation strategy as the omni-channel food retail market continues to grow. For example, by combining partial loads into fully utilized truckloads, suppliers can achieve shorter, more predictable transit times. With proper pre-planning, loads can be consolidated, which typically allows more direct transportation routes. This, in turn, reduces the risk of damage and errors.

Network Optimization

A comprehensive network optimization effort can drive major reductions in landed costs while maintaining—and in some cases, even improving—transit times. Considerations include production, warehousing, and inventory needs, in addition to transportation. Warehouse location, growth projections, and potential new markets should all be closely considered and included in forward planning to ensure that today's working solution does not become tomorrow's roadblock to scalability.

The decision to work with a single national warehouse provider or multiple regional warehouse providers is driven largely by two things: 1) cost and 2) the consideration of utilizing a single or multiple warehouse management system(s). This analysis complements a mode optimization effort, allowing shippers to control costs and enhance service through the optimum blend of intermodal, truckload, and less-than-load services.

In Summary

A good retail consolidation program allows the entire supply network to comply with retailers' requirements while also increasing visibility, reliability, and quality of product. Overall, this creates value for the shipper and end-customers through improved service. Everyone wins.

Given the benefits, there's a clear case for implementing a retail optimization strategy when it comes to ensuring quality and safety of food, given the logistic complexities involved with managing perishables. ■

Bass, director of sales at AFN Logistics, has held several positions at AFN, giving him broad experience across operations, carrier relations, and developing supply chain solutions. Reach him at tbass@afnww.com.

FOLLOW ME!
ADD FOOD TO YOUR FEED!

Food
Quality
& Safety

@FQSMAG

Small- to Mid-Sized Companies...

(Continued from p. 17)

can contain physical hazards like stones or small metal fragments. Placing foreign object removal measures upstream as part of cGMPs may eliminate the necessity of a preventive control downstream to remove an incorporated object or discard a product that contain foreign objects. The idea here is to simplify the Food Safety Plan by considering design modifications that could

assist in managing and mitigating any potential hazards before they become a significant hazard that must be controlled as part of the plan.

For small- to mid-sized companies, the conversion to modern Food Safety Systems may be a formidable task and the clock is ticking. The effort, however, can bring advantages and benefits that go beyond the duty to comply with FSMA. These in-

clude a reduction in consumer complaints, higher quality products, less possibilities of a recall, a better position to litigate if a problem should occur, proof of compliance to the FDA, and a business advantage if a customer requires an updated Food Safety Plan. ■

Dr. Barach, principal for Barach Enterprises LLC, is a lecturer, training professional, consultant, and educator in food safety systems, food sanitation, HACCP, and FSMA. Reach him at Jeff.barach@cox.net.

Phylogenics' Role...

(Continued from p. 25)

Several label claims for a brand of chicken or pork were shown to be influential for this segment. Ranking most influential was “fed a special diet that improves overall wellness and strengthens immune system.” Though, “fed a diet of natural ingredients that actually reduces greenhouse gas emissions by animals” and “leaves no harmful residues” also were influential.

A Natural Choice

Consumers want to know how their food is grown and raised. They want options in their grocery store or local restaurants that align with their values.

While natural, no antibiotics ever, sustainable, and humanely raised protein products prevail, animal nutrition will continue to adapt and offer those choices to the market. Phytogetic feed additives are a natural option to successfully raise animals that meet consumer-driven market

demands and their benefits are proven to connect with audiences from farm to fork.

Millennials' interest in animal well-being and the environment beckons producers and food companies to tell an authentic story with a deep level of transparency. It's simple enough to talk about ingredients found on a common kitchen spice rack. ■

Pusey and Adams are Delacon animal nutrition specialists who customize phytogetic solutions for poultry and livestock producer customers in North America. Reach them at pusey@delacon.com and kevin.adams@delacon.com.

Dressed to Impress...

(Continued from p. 28)

- Long sleeves to cover arms and long pants to cover legs to prevent hairs or other skin contaminants. Elastic cuffs add another level of protection as well.
- Color coding of garments to distinguish workers wearing uniforms in food processing areas, those who handle raw and/or cooked food, from other workers to help avoid cross-contamination of harmful bacteria.

Working with a uniform service provider that can regularly maintain uniforms can help assure that hygienically clean uniforms are readily available on a daily basis. The provider should also regularly inspect all garments for any compromises in quality that could expose the company to contamination risks.

Simply put, the importance of having a specialized uniform service provider that is knowledgeable about HACCP/GFSI and

the safety needs of food-related industries cannot be overstated. Minimizing cross-contamination risks and complying with food safety regulations are musts in order for food businesses to be successful—and the right uniform service provider and employee workwear designs can really make a difference. ■

Cosgrave is the environmental health and safety director for UniFirst Corp. Reach him at Timothy_Cosgrave@unifirst.com.



When you want to sink your teeth into the real meat of a food quality and safety topic, turn to the whitepaper and video resources available at www.foodqualityandsafety.com.

WHITEPAPERS & VIDEOS OFFER THE SAUCY DETAILS YOU'RE LOOKING FOR.

Get a taste today. Visit:
www.foodqualityandsafety.com/category/whitepapers

Brought to you by Food Quality & Safety magazine and our partners. This free content is offered as part of our mission to advise quality and safety decision makers in food manufacturing, food service/retail, and regulatory and research institutions on strategic and tactical approaches required in a rapidly changing food market by examining current products, technologies, and philosophies.

NEW PRODUCTS



Autotitrator

The automatic potentiometric titrator HI901C serves as a benchtop meter for direct sample measurements. HI901C can titrate for a variety of applications, including acids and bases. In addition to titration mode, the autotitrator also operates as a fully functional pH, redox, and ion selective electrode meter. A dynamic dosing algorithm keeps titrations timely and accurate. The 40,000-step piston driven pump is capable of dosing extremely small volumes of reagent. The unit also features equivalence endpoint detection. **Hanna Instruments, 800-426-6287, www.hannainst.com.**



FTIR Microscope

The Nicolet iN5 FTIR microscope is designed for laboratory technicians to identify particulate or unknown microscopic materials, including contaminants and defects in food. With minimal user training, it features an optical setup that allows users to simultaneously examine a sample and collect chemical information. A large field of view is intended to make it easier to locate and target contaminants, and it has the spatial resolution required for accurate chemical analysis. The microscope uses Thermo Scientific OMNIC software so users can match samples in real time. **Thermo Fisher Scientific, 800-955-6288, www.thermofisher.com.**

Solutions for Allergen and Germ Contamination

According to the company, KIMTECH Precision Cleaning Cloths + Allergen Control are 100% allergen free and are designed and tested to remove up to 100% of food allergens from surfaces. KIMTECH Precision Cleaning Cloths' AllerXpel Technology



combines high absorbency with high abrasiveness to remove allergens from stainless steel surfaces. The cloth absorbs four times its weight in liquid, removing water from surfaces when cleaning and reducing down time.

In addition, the new Continuum System is a safety culture program designed to foster improved hand hygiene and cleaning

practices. Beginning with an onsite assessment of the food processing facility, Kimberly-Clark Professional's proprietary approach exposes the weakest links in safety related to hygiene and cleaning and recommends solutions to positively influence workers and their physical environment. **Kimberly-Clark Professional, 800-241-3146, www.kcprofessional.com.**



GC Columns

A new trio of Zebron GC columns are developed for the analysis of fatty acid methyl esters (FAME) in food. Identification and measurement of these compounds in food products, such as cheese, peanut butter, infant formula, cooking oils, and oil-based nutritional supplements, is increasingly important in meeting labeling requirements and testing for product adulteration. The Zebron ZB-FAME offers selectivity targeting a 37-compound mix in a column that's shorter than traditional solutions, reducing run times to about 11 minutes. The Zebron ZB-88 is a GC alternative to other 88-phase columns for the separation of cis/trans isomers. This column is suited for the analysis of olive and hydrogenated oils. And the Zebron ZB-23 can be a cost-effective alternative to existing 23-phase columns for the separation of cis/trans isomers in products including omega-3 and fish oils. **Phenomenex Inc., 310-212-0555, www.phenomenex.com.**

In Other News

Packers Sanitation Services expands its offering of contract services to include its Value-Added Services Program that assists meat, poultry, and food processors with a variety of non-production jobs.

3M Food Safety's Molecular Detection Assays for *Listeria*, *Listeria monocytogenes*, and *Salmonella* have been certified by NF VALIDATION from AFNOR Certification.

Heresite Protective Coatings' new P413 phenolic coating gains approval for NSF/ANSI 51: Food Equipment Materials, which establishes minimum public health and sanitation requirements.

Neogen's new Reveal Q+ MAX tests for deoxynivalenol, fumonisin, zearalenone, and T-2/HT-2 toxin use a water-based common extraction.

CAT Squared releases its Direct Store Delivery app to provide route accounting, inventory control, mobile point-of-sale, and delivery functionality by integrating into a company's ERP, CRM, and WMS systems.

Loftware Spectrum 3.0 is a browser-based solution designed to meet complex, high volume customer and regulatory labeling requirements across global enterprises.

Gael Enlighten, an enterprise safety management and incident reporting software, will now be known as **Ideagen Coruson**.

Advertiser Directory

ADVERTISER	PAGE	ADVERTISER	PAGE
Best Sanitizers	31	NASCO	30
Bio-Rad	33	Nelson-Jameson	28
Food Safety Summit	11	Neogen	52
Diamond V. Mills	9	PerkinElmer	39
IAFP	51	Pure Biosciences	7
Mettler-Toledo	15	United Fresh	44
Millipore Sigma	2, 40	Wiley	26

Events

APRIL

26

Dairy Plant Food Safety Workshop

Portland, Ore.

Visit <http://www.usdairy.com/events>.

MAY

8

FSMA Part 117: Preventive Controls for Human Food—Dietary Supplements

Chicago

Email ascanlin@easconsultinggroup.com or call 571-447-5500.

8-11

Food Safety Summit

Rosemont, Ill.

Visit <http://www.foodsafetysummit.com/>.

15-18

Advanced HACCP and Implementing SQF 8.0 Systems Compliance Seminar

Logan, Utah

Visit www.easconsultinggroup.com, call 571-447-5508, or email ascanlin@easconsultinggroup.com.

22-23

Whole Genome Sequencing for the Food Industry: Current Advances, Obstacles and Solutions

Burr Ridge, Ill.

Email htomlin2@iit.edu or call 708-563-1576.

22-24

Food Sure

Amsterdam, Netherlands

Visit <http://www.foodsureeurope.com/booknow/>.

23-24

Supplier Food Safety Management Workshop

Rosemont, Ill.

Visit <http://www.usdairy.com/events>.

23-25

Food Microbiology Short Course

University Park, Penn.

Visit <http://agsci.psu.edu/foodmicro> or call 877-778-2937.

JUNE

6-7

Dairy Plant Food Safety Workshop

Baraboo, Wis.

Visit <http://www.usdairy.com/events>.

13-15

United Fresh

Chicago

Visit <http://www.unitedfreshshow.org/>.

13-15

Dairy Processing 101

Seattle, Wash.

Visit www.easconsultinggroup.com, call 571-447-5508, or email ascanlin@easconsultinggroup.com.

20-22

The 51st Annual Microwave Power Symposium

Miami

Visit <http://impi.org/symposium-short-courses/>.

25-28

IFT17

Las Vegas

Visit <https://www.iftevent.org/>.

JULY

9-12

IAFP Annual Meeting

Tampa, Fla.

Visit <https://www.foodprotection.org/annualmeeting/>.

10-13

Advanced HACCP and Implementing SQF 8.0 Systems Compliance Seminar

Rancho Cucamonga, Calif.

Visit www.easconsultinggroup.com, call 571-447-5508, or email ascanlin@easconsultinggroup.com.

SEPTEMBER

24-27

AOAC Annual Meeting and Expo

Atlanta, Ga.

Visit <http://ow.ly/2Mj530adGr2>.

OCTOBER

3-4

Dairy Plant Food Safety Workshop

Dallas, Texas

Visit www.plma.com.

NOVEMBER

12-14

PLMA's Private Label Trade Show

Chicago

Visit <http://www.usdairy.com/events>.

SCIENTIFIC FINDINGS

For access to complete journal articles mentioned below, go to the April/May 2017 issue at www.FoodQualityandSafety.com or type the article headline in search box.



ARTICLE: Antimicrobials from Mushrooms for Assuring Food Safety

The interest in natural antimicrobials has increased due to consumer preferences for foods that are free of chemical preservatives while still microbiologically safe. One of the best sources is certain mushrooms (fungi) because many of them not only have nutraceutical functions but also possess antimicrobial properties. This article reviews the available information on mushroom antimicrobials for food safety control. It includes available resources, extraction procedures, antimicrobial activities, and the status of their applications to food safety. The review indicates that there are potential benefits to be gained from mushroom antimicrobials in food production, processing, and preservation as a biosolution to meet the demands for food quality and safety. **Comprehensive Reviews in Food Science and Food Safety, Volume 16, Issue 2, March 2017, Pages 316–329.**

ARTICLE: Effect of Extensive Feeding Systems on Growth Rate, Carcass Traits, and Meat Quality of Finishing Lambs

This review aims to summarize the relevant published information about the effects of extensive feeding systems on the carcass and meat quality characteristics of lambs. Lambs finished in a feedlot or with supplementation under extensive systems exhibit faster growth rates, achieve target weights quicker, and produce heavier carcass weights when compared to grazing lambs. However, the literature also shows that finishing lambs on high-quality pasture can produce satisfactory growth rates without compromising carcass and meat quality. Requests for products perceived as “healthy” and that are produced where animal welfare is optimal under systems that don’t impact negatively on the environment

has heightened the interest in lamb production under extensive systems. Lambs raised on pasture can meet many of these specifications. **Comprehensive Reviews in Food Science and Food Safety, Volume 16, Issue 1, January 2017, Pages 23–38.**



ARTICLE: Qualitative Detection of Fungal Contamination in Paprika Powder

Dried red pepper is one of the most commonly used spices in many parts of the world. In this study, molecular biology methods were applied for detection of contamination in nine samples of paprika powder. Internal transcribed spacer (ITS) regions were selected for sequencing as they have a high variability between species and organisms and therefore are appropriate for



taxonomic identification. The sequence analysis of ITS regions were identified by high sequence similarity with the ITS regions of many microscopic fungi, especially representatives of the class *Ascomycota* and other yeast species. Microbiological data indicating the overall quality of samples are discussed. **Journal of Food Safety, Volume 37, Issue 1, February 2017, e12296.**

ARTICLE: Effect of Different Salt and Fat Levels on the Physicochemical Properties and Sensory Quality of Black Pudding

Black pudding, also known as blood sausages or blood pudding, is a kind of meat product made by blood. This article discusses how low sodium and reduced fat in black pudding products are achievable. Twenty-five black pudding formulations with varying fat contents of 2.5%, 5%, 10%, 15%, and 20% (w/w) and sodium contents of 0.2%, 0.4%, 0.6%, 0.8%, and 1.0% (w/w) were used. Sensory acceptance and ranking descriptive analyses as well as compositional and physicochemical analyses were conducted. Samples high in sodium scored higher in juiciness, toughness, saltiness, fatness, and spiciness. These samples were the most accepted, whereas samples containing 0.2% sodium were the least accepted. Black pudding samples containing 0.6% sodium and 10% fat displayed a positive correlation to liking of flavor and overall acceptability. **Food Science & Nutrition, Volume 5, Issue 2, March 2017, Pages 273–284.**



© JOACHIM - FOTOLIA.COM

© JESSIMINE - FOTOLIA.COM

© PETER HERMES FURIAN - FOTOLIA.COM

© BLUEHORSE.PL - FOTOLIA.COM

IAFP2017
ANNUAL MEETING
Tampa, Florida
July 9 - 12, 2017



IAFP 2017



Ideas! Challenges! Solutions!

More than 3,400 food safety professionals will discuss these and more in their quest to keep the world's food supply safe.

www.foodprotection.org

Connect on the Coast
JOIN US FOR IAFP 2017

The Leading Food Safety Conference



International Association for
Food Protection

6200 Aurora Avenue, Suite 200W
Des Moines, Iowa 50322-2864, USA
+1 800.369.6337 +1 515.276.3344
Fax +1 515.276.8655




Environmental Monitoring

Neogen's industry-leading diagnostic tests provide the building blocks for great environmental monitoring programs. Utilizing allergen, ATP and pathogen detection systems you can build a world-class environmental monitoring program with Neogen, a world-leading diagnostic company.

- Pathogen Detection – easy-to-use, rapid diagnostics using Reveal® or ANSR®
- Allergen Tests – tools for validation and verification for the environment using Reveal 3-D and Veratox®
- ATP Testing – sanitation verification that provides real-time results using AccuPoint® Advanced

Learn more today at foodsafety.neogen.com/en/environmental



Neogen's AccuPoint® Advanced ATP system consistently yielded the highest percent recoveries and the most consistent readings as tested by NSF International

Best Practices for Effectively Implementing an ATP Sanitation Verification Program

NEOGEN NSF

Download our free Best Practices for Effectively Implementing an ATP Hygiene Monitoring Program handbook!



800-234-5333 (USA/Canada) • 517-372-9200
foodsafety@neogen.com • foodsafety.neogen.com

