IAFP’s A 360° Review for Food Safety Training-Perspectives
From Trainers and Business Owners

Organized by: The Food Safety Education PDG

Moderator: Wenqing Xu, Chair
Shauna Henley, Vice Chair

Sponsored by the IAFP Foundation

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Webinar Housekeeping

• It is important to note that all opinions and statements are those of the individual making the presentation and not necessarily the opinion or view of IAFP.

• All attendees are muted. Questions should be submitted to the presenters during the presentation via the Questions section at the right of the screen. Questions will be answered at the end of the presentations.

• This webinar is being recorded and will be available for access by IAFP members at www.foodprotection.org within one week.
Today’s Moderators

Wenqing Xu, Chair of Food Safety Education PDG
Associate Professor at Louisiana State University.
Wennie’s research and outreach programs focus on consumer related food safety issues.

Shauna Henley, Vice Chair of Food Safety Education PDG
Senior Family & Consumer Sciences Agent and Affiliate Agent in the Department of Nutrition and Food Science, University of Maryland Extension, and the University of Maryland, College Park
Shauna’s work focuses on food safety from farm-to-fork and nutrition education.
Today’s Panelist

Michael Koch, President & Co-Founder
Firefly Farms, Firefly Farms Market

Mike is a local food advocate and award-winning entrepreneur with a distinguished track record of innovation, who has more than three decades of professional and entrepreneurial experience. As one of the co-founders of FireFly Farms—a successful goat cheese business. FireFly Farms’ cheeses have won over 125 national and international awards for excellence in taste, aesthetics and quality. His company was the proud recipient of the United States Chamber of Commerce Dream Big Small Business Award.
Today’s Panelist

Thomas Larsen, Food Safety Training Consultant
State Food Safety

Thomas Larsen works as a food safety training consultant through StateFoodSafety helping high profile brands meet their jurisdictional food safety training and certification requirements while reinforcing their brand and culture. StatefoodSafety has developed unique and proprietary processes that allow for both industry-specific customizations to course materials (grocery, quick service, C-store, etc.) and company-specific customizations (custom avatars, uniforms, branding, backgrounds, props, procedures, etc.) while simultaneously maintaining their network of jurisdictional approvals nation-wide. This technology-driven approach combined with reliable data and knowledgeable client support have allowed Thomas and StateFoodSafety to successfully train and certify some of America’s most beloved brands.
Clint Stevenson
North Carolina State University

Dr. Stevenson leads a research driven food safety education and workforce solutions lab at NC State University. Their multidisciplinary team manages a portfolio of online food safety courses for both industry audiences and college students, collaborate with nonprofits and food companies with their training improvement objectives, and research the effects of instructional design factors on food safety training outcomes.
A 360º Review for Food Safety Training
Perspectives from Trainers & Business Owners

Panelist: Mike Koch, President & Co-Founder
FireFly Farms, FireFly Farms Market

This webinar is being recorded and will be available to IAFP members within one week.
About FireFly Farms

At FireFly Farms, sustainability isn’t a buzzword. It’s a promise. It’s an obsession. It’s economic, ethical, and environmental. Our milk is sourced from family farms in our community. Our dedication to humane and fair practices is non-negotiable. Our solar panels don’t just power us, they empower us. All these things, and more, are why our all-natural cheeses are more than delicious. They’re honest. They’re goodness. They’re truly life changing.
Overview of our Food Safety Journey

• 2000 – EU passes GFSI
• 2002 – FireFly begins commercial manufacture of cheese
• 2011 – US passes FSMA
• 2014 – First mandated HACCP Audit at FireFly
• 2018 – MIPs grant funds product data project at FireFly
• 2019 – Customer requests GFSI compliant audit
• 2020 – FSMA announces Food Traceability Rule
• 2021 – First SQF Audit at FireFly
• 2022 – MIPs grant phase 2 funds food safety internships
What we thought then...

• Food safety is a necessary nuisance
• A (separate) food safety team is a luxury for the large
• Food safety is about oversight and enforcement
• Food safety has nothing to do with food quality
• Food safety concerns end when product leaves the building
What we think now...

• Food safety is a necessary part of who we are
• Everyone who enters the building is part of the food safety team
• Food safety is about continuous monitoring and improvement
• Food safety and food quality are tightly aligned
• We are one link in a food safe chain that starts with farmers and suppliers and ends with retailers
Our Current State

• All staff are part of food safety team
• More than 50% of production staff are PCQI certified
• CCPs have stimulated development of QCPs
• Production workflow and database system capture all safety, quality and traceability data -- paperless and easily retrievable
• SQF practitioners conduct monthly inspections, non-conformities are reviewed by staff. Training occurs as needed.
• Contested non-conformities are reviewed and dispositioned by management.
• Annual supplier audits ensure we are tightly aligned with up-stream partners
• Delivery temp logs and complaint forms ensure we are tightly aligned with downstream partners – our own retail business especially
• Triggers of food safety plan revision are carefully watched
Technology, Data, and Compliance Management

How to develop and use technology to better track food safety training compliance
Technology

“Knowledge put into practical use to solve problems or invent useful tools.”
Identifying Problems

How do I know my company is in compliance?

Does my training positively affect employee behavior?

Does my training reflect and reinforce my company’s brand identity?

How do I track relevant training requirements across jurisdictions?
The Right Tool for the Job

1. Customers
   • Who does this tool serve? What are their current and future needs?

2. Products and Services
   • What tools are we providing to meet their needs and what should we be providing?

3. Metrics
   • What are the milestones, opportunity costs, and time-saved targets?

4. Process
   • Who is doing what, when, and how?

5. Structure and Resources
   • What human and monetary resources are required? (how much does it cost?)
Who is the Customer?

• YOU
• Your company
• Your team
• Your employees
• Your customers
Products and Services

• Currently doing…?
  • Why is this not working?
  • What should be different?

• Should be doing…?
  • How will this be better than what you were doing?
  • Does it solve the main problem?
  • Think Need to haves and Nice to haves
Metrics

• How will I know if this works?
• What does this need to do?
• What does it NOT need to do?
  • BEWARE OF SCOPE CREEP
Scope Creep

“It takes a lot of experience and restraint to limit your information to what is needed”

It’s too easy to get carried away

Create tools for your problems, not the other way around

Not all valuable things have the same degree of value
• Define who does what, how they are going to do it, and when they are going to do it.

• Can this be done in existing tools?
  • If yes, assign someone to figure out how to use those tools
  • If no, determine who will be creating these new tools
  • This may be a third-party vendor

• Does this require extra training to be able to do?
  • Do you have a developer who can build these tools?
  • Does your developer need extra training to be able to do so?
Structure and Resources

• How much will this cost us?
• How many people hours are required to accomplish this?
• Is it worth it? (cost-benefit analysis)
Examples

• How do we track regulations across the country?
Apollo
Examples

- How do we track regulations across the country?
  - Apollo
- How do we keep track of a company’s internal compliance?
## Compliance Manager

The Compliance Manager is a tool designed to help manage and monitor compliance standards for various regions. It provides a dashboard view of the overall compliance score, as well as detailed information on individual locations.

### Dashboard Overview

- **Overall Compliance Score:** 86%
  - **Control Region:** 100%
  - **Central Region:** 86%
  - **Western Region:** 66%

### Location Details

<table>
<thead>
<tr>
<th>ID</th>
<th>Business Name</th>
<th>Address</th>
<th>Group</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>101</td>
<td></td>
<td>4001 Sih Canyon Rd, Portland, OR 97221, USA</td>
<td>Western Region</td>
<td>86%</td>
</tr>
<tr>
<td>102</td>
<td></td>
<td>801 N 58th St, Seattle, WA 98103, USA</td>
<td>Western Region</td>
<td>66%</td>
</tr>
<tr>
<td>103</td>
<td></td>
<td>1 Government Dr, St. Louis, MO 63110, USA</td>
<td>Central Region</td>
<td>100%</td>
</tr>
<tr>
<td>104</td>
<td></td>
<td>2000 E Observatory Rd, Los Angeles, CA 90027, USA</td>
<td>Western Region</td>
<td>100%</td>
</tr>
<tr>
<td>105</td>
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<td>25 Harbor Shore Dr, Boston, MA 02210, USA</td>
<td>Eastern Region</td>
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<tr>
<td>106</td>
<td></td>
<td>20 W 34th St, New York, NY 10118, USA</td>
<td>Eastern Region</td>
<td></td>
</tr>
<tr>
<td>107</td>
<td></td>
<td>2300 Steele St, Denver, CO 80205, USA</td>
<td>Central Region</td>
<td></td>
</tr>
</tbody>
</table>

The dashboard also allows for filtering and viewing compliance updates over time.
Examples

• How do we track regulations across the country?
  • Apollo
• How do we keep track of a company’s internal compliance?
  • Compliance Manager
• How do we support strong brands while maintaining ANSI and jurisdictional approvals?
Quick Custom Courses
Examples

• How do we track regulations across the country?
  • Apollo
• How do we keep track of a company’s internal compliance?
  • Compliance Manager
• How do we support strong brands while maintaining ANSI and jurisdictional approvals?
  • Quick Custom Courses
In Summary

• Know your customer and their needs (what do YOU need?)
• Analyze your current solution and imagine the ideal
• Determine how you will know you are successful
• Figure out who will and can do what
• Calculate the cost (both monetary and temporal)
Thank You!
Food Safety Training, Instructional Design and Costs of Quality

Clint Stevenson, Ph.D.
Associate Professor
Department of Food, Bioprocessing and Nutrition Sciences
NC State University
Objectives

1. Identify the role of food safety training in the costs of quality
2. Identify the association between training interactivity levels and food safety outcomes
Our Program: Research-Driven Food Safety Education Solutions

• Approximately 2,000 participants/year
• 10 online courses (e.g. HACCP, GMPs, Environmental Monitoring, and more)
• Capable of providing custom training solutions (HACCP, GMPs, etc.)
• Self-paced, rolling enrollment, mostly asynchronous learning experiences
• We are a team of subject matter experts, learning designers, developers, customer service specialists, and students
• In addition to managing our portfolio of online food safety courses, we study the effects of instructional design strategies on food safety outcomes

foodsafety.ncsu.edu
We support food and bioprocessing teams in their food quality and food safety operations by offering online active learning experiences and self-paced training.
Costs of Quality – Where Does Food Safety Training Fit?

**Total Cost of Quality**

**Costs of Bad Quality**

- **Internal Failure Costs**
  - Rework, scrap, failure analysis, etc.
  - For example, rework can add $1,000 for one mistake

- **External Failure Costs**
  - Recalls, consumer complaints
  - Average recall costs $10 million*

**Costs of Good Quality**

- **Appraisal Costs**
  - Verification, audits, supplier approval programs
  - For example, audits range $13-24K (including labor, auditor fees, travel, etc.)*

- **Prevention Costs**
  - Training, quality assurance, quality management, process validation
  - Training costs can range from $120-2,500 per employee*


*From Capturing Recall Costs: Measuring and Recovering the Losses (GMA, Covington & Burling LLP, and Ernst & Young, 2011)
## Costs of Food Safety Training Depend

<table>
<thead>
<tr>
<th>Type of Training</th>
<th>Number of Hours to Create 1 Hour of Training</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructor Led – Simple content (e.g. GMPs for new hires)</td>
<td>22:1</td>
</tr>
<tr>
<td>Instructor Led – Average project (e.g. PCQI)</td>
<td>43:1</td>
</tr>
<tr>
<td>Instructor Led – Complex subject matter</td>
<td>82:1</td>
</tr>
<tr>
<td>Level 1 e-Learning (e.g. PowerPoint to e-learning)</td>
<td>from 49:1 to 125:1 (~$10K)</td>
</tr>
<tr>
<td>Level 2 e-Learning (Level 1 e-learning plus scenario based activities)</td>
<td>from 127:1 to 267:1 (~$18K)</td>
</tr>
<tr>
<td>Level 3 e-Learning (highly interactive, simulations, etc.)</td>
<td>from 217:1 to 716:1 (~$50K)</td>
</tr>
</tbody>
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From the Chapman Alliance, How long does it take to create learning? Chapmanalliance.com
EFFECTS OF LEVEL OF INTERACTIVITY ON *LISTERIA* MONITORING PROGRAMS FOR DAIRY PROCESSORS
Hypothesis

A higher:

1. Level of interactivity
2. Learners perceived interactivity
   a. (i.e., small transactional distance)
3. Direct measure of Interactivity
   a. (i.e., screen time)

... will have greater knowledge gains/retention, self-efficacy gains/retention, and change in intentions and behaviors.
Modules in the Environmental Monitoring in the Dairy Industry Course

1. Introduction to Environmental Monitoring
2. Zones
3. Scheduling
4. Organisms
5. Sampling Tools
6. Corrective Actions
7. Trends

Acknowledgements

- Paul Hill, Dean Foods
- Brian Kraus, Wells Enterprises
- Dennis D’Amico, University of Connecticut
- Chad Galer, Tim Stubbs, National Dairy Council
- Stephanie Maggio, Julie Yamamoto, Nathaniel Powers
- Distance Technology and Learning Applications (DELTA)
<table>
<thead>
<tr>
<th>Interactivity</th>
<th>Limited</th>
<th>Moderate</th>
<th>High</th>
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<tr>
<td><strong>Course Narrative</strong></td>
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<td></td>
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</tr>
<tr>
<td>Learning w/ Ginger &amp; Walter</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
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<tr>
<td>Addressing Student by their Name</td>
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<tr>
<td><strong>Standard Learning Activities</strong></td>
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<tr>
<td>Flashcards</td>
<td>✔️</td>
<td>✔️</td>
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<tr>
<td>Standard videos from external resources (ex: FDA video)</td>
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<td><strong>Standard Practice Problems</strong></td>
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<td>✔️</td>
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<td><strong>Complex Practice Problems</strong></td>
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<td><strong>Custom Animations to Enhance Learning &amp; Practice</strong></td>
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<tr>
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<td>✔️</td>
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<td>✔️</td>
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</table>
# Interactivity Rating of Lesson 7

**Lesson 7 Learning Objectives:**
1. Identify appropriate corrective actions
2. Apply root cause analysis
3. Choose appropriate sites for intensified sampling

<table>
<thead>
<tr>
<th>Lesson 7 Count of Interactive Components in Each Version of the Course</th>
<th>Low Interactivity</th>
<th>Moderate Interactivity</th>
<th>High Interactivity</th>
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</thead>
<tbody>
<tr>
<td>Interactions with Virtual Dairy Processors (1pt/interaction)</td>
<td>8</td>
<td>8</td>
<td>8</td>
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<tr>
<td>Addressing Student by Name (1pt/interaction)</td>
<td>3</td>
<td>3</td>
<td>3</td>
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<tr>
<td>Flashcards (1pt/interaction)</td>
<td>9</td>
<td>9</td>
<td>9</td>
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<tr>
<td>Link to External Sites (1pt/interaction)</td>
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<td>9</td>
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<tr>
<td>Video from External Site (1pt/interaction)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Standard Practice Problems (Drag &amp; Drop, Multiple Choice, Fill-in-the-Blank, &amp; Short Answer) (1pt/interaction)</td>
<td>14</td>
<td>8</td>
<td>8</td>
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<tr>
<td>Feedback (Words of Encouragement, Acknowledgement of Correct Answers, Explanation of Incorrect Answers) (1pt/interaction)</td>
<td>7</td>
<td>7</td>
<td>7</td>
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<tr>
<td>Adaptivity (Remedial or Alternative Learning Pathways) (1pt/interaction)</td>
<td>3</td>
<td>3</td>
<td>3</td>
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<tr>
<td>Custom Audio (1pt/interaction)</td>
<td>6</td>
<td>6</td>
<td>6</td>
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<tr>
<td>Scenario-based Practice Problems with 2D Images (2pts/interaction)</td>
<td>0</td>
<td>3x2pts = 6</td>
<td>3x2pts = 6</td>
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<td>0</td>
<td>6x2pts = 12</td>
<td>6x2pts = 12</td>
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<tr>
<td>Interactive 3D Video Simulations (3pts/interaction)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Scenario-based Practice Problem with VR for Added Context (3pts/interaction)</td>
<td>0</td>
<td>0</td>
<td>3x3pts = 9</td>
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</tbody>
</table>

**OVERALL INTERACTIVITY RATING FOR LESSON 7**

<table>
<thead>
<tr>
<th>Low Interactivity</th>
<th>Moderate Interactivity</th>
<th>High Interactivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>59</td>
<td>71</td>
<td>80</td>
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</tbody>
</table>
Lesson-by-Lesson Interactivity Rating

![Bar chart showing interactivity rating for different lessons and treatment groups. The x-axis represents the lessons (1 to 7), and the y-axis represents the interactivity rating (0 to 90) in points. Three treatment groups are indicated: Limited (blue), Moderate (green), and High (orange).]
You are about to enter the Dairy Learning Center. In this virtual experience you will be able to look around the room by clicking the screen and dragging the mouse. Take some time to learn the controls and get situated in the room. You can pause the video at any time, and you can replay the parts at the end of each segment.
Find the scale in Walter & Ginger’s “cheese packaging” area. Notice that it is sitting on a small cart.

**Given what you have learned about zones, what zone would you assign to the handle on the drawer of the cart?**

- Zone 1
- Zone 2
- **Zone 3**
- Zone 4

---

Zone 3 sites are those that are in the production area, but not immediately surrounding a Zone 1 site. Since the top of the scale on the cart is a Zone 1 site, because finished product is weighed here before packaging, and the handle on the cart is directly below the scale, the handle would not be considered a Zone 3 site.

Try again.
Significant Change in Knowledge Score between Pre- and Post-training Time points

- Overall, post-training & 90 days post-training knowledge scores were sig. greater than pre-training
- Low & High treatment groups had sig. increase in knowledge scores after training
Knowledge Gains & Retention Achieved

- Overall ~50% knowledge gains & ~20% knowledge retention
- Low & High treatment groups had similar gains & retention
- Moderate group had lowest gains and almost no retention
Significant Change in Self-Efficacy Score between Pre- and Post-training Time points

- Overall, post-training & 90 days post-training self-efficacy scores were sig. greater than pre-training
- High interactivity treatment groups had sig. increase in self-efficacy gains and retention
Self-Efficacy Gains & Retention Achieved

![Graph showing self-efficacy gains and retention](image.png)
Behavior Change Achieved

Average Self-reported Behavior Score of Study Participants

![Bar graph showing self-reported behavior scores for different treatment group interactivity levels. The graph compares Limited, Moderate, and High interactivity levels. The Limited group has the highest average score, followed by Moderate and then High.](Image)
### Average Lesson Time Negative Correlation with Knowledge Gains

<table>
<thead>
<tr>
<th>Knowledge Gains</th>
<th>Average Lesson Time</th>
<th>Overall TD Score</th>
<th>TD Learner-Content</th>
<th>TD Learner-Feedback</th>
<th>TD Learner-Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge Gains</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Knowledge Retention</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
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</tbody>
</table>
### Learner-Content Interaction Positive Correlation with Knowledge Gains & Retention

<table>
<thead>
<tr>
<th></th>
<th>Average Lesson Time</th>
<th>Overall TD Score</th>
<th>TD Learner-Content</th>
<th>TD Learner-Feedback</th>
<th>TD Learner-Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge Gains</td>
<td>( r = -0.5609 ) ( p = 0.0726 )</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Knowledge Retention</td>
<td>( r = -0.2381 ) ( p = 0.5077 )</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>
## Learner-Content Interaction Positive Correlation with Knowledge Gains & Retention

<table>
<thead>
<tr>
<th></th>
<th>Average Lesson Time</th>
<th>Overall TD Score</th>
<th>TD Learner-Content</th>
<th>TD Learner-Feedback</th>
<th>TD Learner-Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge Gains</td>
<td>$r = -.5609$</td>
<td>$r = .6450$</td>
<td>$r = .7328$</td>
<td>$r = .4660$</td>
<td>$r = .3780$</td>
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<td>$p = .0726$</td>
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<td>$p = .0610$</td>
<td>$p = .2920$</td>
<td>$p = .4031$</td>
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<tr>
<td>Knowledge Retention</td>
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<td>$r = .7408$</td>
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<td>$r = .5067$</td>
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<tr>
<td></td>
<td>$p = .5077$</td>
<td>$p = .1521$</td>
<td>$p = .0932$</td>
<td>$p = .3836$</td>
<td>$p = .5033$</td>
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</table>
Summary

• Managers/supervisors play an important role in implementing food safety training programs
• Well crafted content in food safety training programs is a driver for training effectiveness
• Interactivity for interactivity-sake is costly and not always worth it
Our Food Safety Courses

- Environmental Monitoring in The Dairy Industry
- Online HACCP Training for Blueberry Producers
- Preventive Controls for Dairy Processors
- Food Safety Basics for Artisan Cheesemakers
- Food Safety Basics for Ice Cream Makers
- Good Manufacturing Practices in Food Safety
- Intro to Microbiological Food Safety Hazards
- Norovirus and Food Safety
- Online HACCP Training

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What questions do you have?

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Questions?
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IAFP Upcoming Webinars

April 19  Software Fair Series Part 2 - USDA Integrated Pathogen Modeling Program (IPMP)

April 21  Processing Environment Monitoring in Low Moisture Foods Production: Setting Up a Meaningful Program

April 26  Foundations of Produce Safety in Hydroponic and Aquaponic Operations

May 17   Avoiding Premature Water Activity Testing Results When Meeting Safety Regulations

May 26   Making Your Environmental Monitoring Plan Smarter
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This webinar is being recorded and will be available for access by IAFP members at www.foodprotection.org within one week.

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