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Review

Enhancing food safety culture to reduce rates of foodborne illness

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ABSTRACT

A culture of food safety is built on a set of shared values that operators and their staff follow to produce and provide food in the safest manner. Maintaining a food safety culture means that operators and staff know the risks associated with the products or meals they produce, know why managing the risks is important, and effectively manage those risks in a demonstrable way. In an organization with a good food safety culture, individuals are expected to enact practices that represent the shared value system and point out where others may fail. By using a variety of tools, consequences and incentives, businesses can demonstrate to their staff and customers that they are aware of current food safety issues, that they can learn from others' mistakes, and that food safety is important within the organization. The three case studies presented in this paper demonstrate that creating a culture of food safety requires application of the best science with the best management and communication systems, including compelling, rapid, relevant, reliable and repeated food safety messages using multiple media.

Contents

1. Introduction

Food safety is not simple. Despite numerous food safety information campaigns and educational efforts, along with decades of exploratory microbiology, foodborne illness remains a significant source of human disease (Griffith, 2006; Jacob, Mathiasen, & Powell, 2010). Recent food safety failures have attracted widespread attention resulting in public confusion and mistrust of the food industry and regulators (Hallman, Cuite, & Hooker, 2009; de Jonge, van Trija, van der Lans, Renes, & Frewer, 2008; Onyango et al., 2007). Almost two decades ago, *Escherichia coli* O157:H7 killed four and sickened hundreds who ate hamburgers at the Jack-in-the-Box fast-food chain in the U.S. and propelled microbial food safety to the forefront of the public agenda. However, it remains a challenge to compel food producers, processors, distributors, retailers, food service outlets and home meal preparers to adopt scientifically validated safe food-handling behaviors, especially in the absence of an outbreak.

Current societal values allow some producers to build their business on widespread assumptions that smaller niche market-based locally- or organically-produced foods are inherently safe,

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although considerations for microbiological food safety are not inherent to such production methods. Others in the food industry rely on guidance or oversight by government or auditors to ensure consumers receive safe products. However, many foodborne illness outbreaks have been linked to farms, processors and retailers that went through some form of certification. Also, the U.S. Government Accountability Office noted in a 2008 report that, while inspectors play an active role in overseeing compliance, the burden for food safety lies primarily with food producers.

Frank Yiannas, past-president of the International Association for Food Protection, writes in his book, *Food Safety Culture: Creating a Behavior-based Food Safety Management System*, that an organization's food safety systems need to be integral to its culture. According to Yiannas, achieving food safety success requires:

> "going beyond traditional training, testing, and inspectional approaches to managing risks. It requires a better understanding of organizational culture and the human dimensions of food safety. To improve the food safety performance of a retail or foodservice establishment, an organization with thousands of employees, or a local community, you must change the way people do things. You must change their behavior. In fact, simply put, often times food safety equals behavior." (Yiannas, 2009, p. 1)

The five factors identified by the World Health Organization (2006) as primary contributors to foodborne illnesses—improper cooking procedures; temperature abuse during storage; lack of hygiene and sanitation by food handlers; cross-contamination between raw and fresh ready-to-eat foods; and, acquiring food from unsafe sources—are human behaviors that can be changed through a shift in organizational culture.

Food safety culture is an emerging concept, and the ways and means to best to influence and nurture that culture remain largely unexplored. The question that must be addressed is how to keep the mundane aspects of food safety relevant for all those communities in the farm-to-fork food safety system including farms, food processing facilities, domestic and international distribution channels, retail outlets, restaurants, and domestic kitchens.

2. Food safety in corporate culture

An organization's culture is comprised of the values, shared assumptions and behaviors of employees and managers (Hellriegel & Slocum, 2004). Food safety culture is the way in which an organization or group approaches food safety, in thought and in behavior, and is a component of a larger organizational culture (Yiannas, 2009). A food safety culture goes beyond the fundamentals of a food safety management system – comprised of regulatory compliance, standard operating procedures, policies, training and auditing – and incorporates communication efforts, awareness of responsibilities, commitment by management, and consideration of the entire organization as an integrated system that can affect food safety (Armstrong, 1999). Creating a culture of food safety requires application of the best science with the best management and communication systems.

Griffith, Livesey, and Clayton (2010b) proposed that six culture factors contribute to food safety performance: leadership; food safety management systems and style; commitment to food safety; food safety environment; risk perception; and communication. Chris Griffith, formerly at the University of Wales Institute Cardiff, has written that the formation of the values and beliefs and attitudes within a workforce regarding food safety is almost entirely dependent upon the knowledge, standards, motivation and leadership of the person in charge, and how they communicate with, and are trusted by, the staff (as quoted in Pennington, 2009). Organizational leaders can foster widespread employee support by demonstrating the organizational culture they advocate. Leaders can demonstrate cultural values and preferred behaviors through their reactions to critical incidents and organizational crises; role modeling, teaching and coaching; allocation of resources and status; organizational rites, ceremonies and stories; and how they recruit, select, promote and remove employees (Hellriegel & Slocum, 2004; Schein, 2004).

Operators need to know the risks associated with their products and how to manage those risks. Having technical staff in place to stay abreast of emerging food safety risks – and conduct ongoing evaluations of procedures, supplier requirements and front-line staff practices – provides a necessary foundation for a good food safety culture. Technical experts should be able to access primary research and learn from past foodborne illness outbreak incidents. An example of this positive culture would be an operator of a long-term care facility providing guidelines for a menu builder to reduce the risks of *Listeria monocytogenes* (such as not serving unheated cold-cuts to an immunocompromised population), including menu choices and alternative foods, while additionally providing guidance to residents on handling food that has been removed from a dining room and taken back to their living quarters. In this example, all individuals within the food safety system of the long-term care facility would ideally receive compelling, current and accurate information regarding the risks of *L. monocytogenes*.

3. Examples of organizational food safety culture failures in outbreaks of foodborne illness

Yiannas (2009) noted that having a strong food safety culture is a choice; an organization chooses to have a positive food safety culture because of the value it places on the safety of its customers and employees. A food safety culture must take precedence over other cultures that compete for priority within an organization, including the culture of saving money (Griffith, Livesey, & Clayton, 2010a). Cutting costs at the expense of food safety can be detrimental to a business. A company identified as the source of a foodborne illness outbreak can suffer significant damage to brand identity, financial losses and, in up to one-third of cases, bankruptcy (Griffith, 2000).

While proactively managing microbiological risks, organizations with a strong culture of food safety also anticipate that outbreaks of foodborne illness may occur despite the use of sound food safety systems. Preparations allow an incident to be managed before it becomes a crisis. When a foodborne illness outbreak occurs, Griffith et al. (2010a) propose that a business' food safety culture should be considered in addition to more traditional risk factors. The appraisal of food safety behaviors and attitudes of the management and employees at companies linked to outbreaks has become more common in recent years. Three examples follow of failures in food safety culture that led to large outbreaks and deaths from foodborne illness.

3.1. John Tudor & Son, 2005

Five-year-old Mason Jones was one of 157 people – primarily children – who became ill in an outbreak in South Wales caused by *E. coli* O157:H7 in September 2005. The outbreak was traced to the consumption of cooked meats provided to schools by John Tudor & Son, a catering butcher business. A packaging machine at the business, used for both raw and cooked meats, was identified as the probable source of contamination – where *E. coli* O157:H7 was most likely transferred from raw meat to cooked meat that was then distributed to four authorities in South Wales for their school meal programs. The 2005 outbreak was the largest caused by *E. coli* O157:H7 in Wales and the second largest in the United Kingdom to

date; ultimately 31 people were admitted to hospital and, tragically, Mason Jones died (Pennington, 2009).

A public inquiry into the outbreak determined that William Tudor, the proprietor of John Tudor & Son, had a significant disregard for food safety and thus for the health of people who consumed meats produced and distributed by his business. The inquiry heard that there had been serious, and repeated, breaches of federal food safety regulations at the catering butcher business. William Tudor had failed to ensure that critical procedures, such as cleaning and the separation of raw and cooked meats, were carried out effectively. He also falsified certain records that were an important part of food safety practice and deceived Environmental Health Officers (EHOs) on issues such as the use of the packaging machine. The business's Hazard Analysis Critical Control Point (HACCP) plan was also found to be poorly designed, inaccurate and misleading (Pennington, 2009).

A negative food safety culture had been established at John Tudor & Son. In his report, Professor Hugh Pennington, chair of the public inquiry, concluded that Tudors' food safety culture was completely different from that which might be expected from a business managed by a person with an advanced food hygiene qualification. The culture that emerged was one of little regard for the importance of food safety but where making and saving money was the priority. Evidence provided by employees of John Tudor & Son and EHOs, and documented by photography and video, indicated that cleaning of the facility and its equipment was inadequate; poor maintenance and damaged construction provided physical barriers to proper cleaning; staff were not adequately trained and had poor hygiene habits; and meat with off-odors that indicated spoilage was camouflaged with spices rather than being removed from the food chain (Pennington, 2009).

Griffith (2010) told the inquest the food safety culture set by William Tudor raised grave concerns. With the focus set on profit, employees at John Tudor & Son ignored microbiological hazards and undertook actions that increased the potential for cross-contamination from raw meats to cooked. The cavalier attitude toward food safety was further reinforced by William Tudor's falsifying of documents to deliberately hide potential difficulties. Although foodborne illness may not always be completely preventable, Griffith (2010) concluded that the risk of a business causing foodborne illness is, to a large extent, a consequence of its own activities.

3.2. Maple Leaf Foods, Inc., 2008

In August 2008, *L. monocytogenes*-contaminated deli meats produced by Maple Leaf Foods, Inc. of Canada caused 57 illnesses and ultimately resulted in 22 deaths. The first public alerts about the possible contamination of Maple Leaf Foods products were released on August 17, 2008, and on August 23, 2008 the Public Health Agency of Canada announced that there was a definitive link between the deli meats manufactured in a Toronto-area Maple Leaf Foods, Inc. plant and a listeriosis outbreak (Public Health Agency of Canada, 2008). Maple Leaf Foods, Inc. immediately recalled all products manufactured at the implicated plant (Maple Leaf Foods, Inc., 2008).

A panel of international food safety experts convened by Maple Leaf Foods, Inc. to investigate the source of the deli meat contamination determined that the most probable contamination source was commercial meat slicers that, despite cleaning according to the manufacturer's instructions, had meat residue trapped deep inside the slicing mechanisms. The meat residue provided a reservoir and breeding ground for *L. monocytogenes*.

But the outbreak was not simply a mechanical failure. An independent investigative review commissioned by the Canadian federal government provided 57 recommendations to prevent similar outbreaks in the future, far beyond better cleaning of meat slicers. The recommendations reflect broad findings of the review: that the focus on food safety was insufficient among senior management at both the company and the various government organizations involved before and during the outbreak; that insufficient planning had been undertaken to be prepared for a potential outbreak; and that those involved lacked a sense of urgency at the outset of the outbreak (Mason, 2009). The investigator specifically identified the need for cultures of food safety at food processing companies, calling for "actions, not words" from organizations that value food safety (Weatherill, 2009).

Evidence suggests that a positive food safety culture existed at Maple Leaf Foods, Inc. prior to the outbreak at some level, but not one sufficient to manage existing risks and the resulting outbreak. The plant linked to the outbreak received satisfactory marks for complying with federal regulatory requirements. Employees consistently addressed instances of non-compliance when they were identified. The plant's management maintained all required records, ensured that staff training took place, and ensured the established quality assurance program was followed. At all plants, the company conducted environmental testing that went beyond regulatory requirements (Weatherill, 2009). Prior to the outbreak, Maple Leaf Foods, Inc. conducted more than 3000 environmental tests annually at the implicated plant and tested products monthly (McCain, 2009). Although no product tests revealed the presence of *Listeria* spp., a number of environmental samples detected the bacteria in the months before the public was alerted in August to possible contamination (Canadian Food Inspection Agency, 2009; McCain, 2009). However, the company failed to recognize and identify the underlying cause of a sporadic yet persistent pattern of environmental test results that were positive for *Listeria* spp. and was not obliged to report its test results to the Canadian Food Inspection Agency (Weatherill, 2009).

The independent investigative review reported that, although a federally-mandated HACCP plan was in place at the time of the listeriosis outbreak, the understanding of Maple Leaf Foods, Inc. employees and the implementation of HACCP plan were still maturing. Additionally, *Listeria* spp. was not top of mind for many people working at the plant linked to the outbreak. Further, although staff notified their superiors of the repeated environmental presence of *Listeria* spp., this information did not reach the office of the Chief Executive Officer because it was thought that the plant's interventions had controlled the problem (Weatherill, 2009).

Dr. Randy Huffman was hired in the new position of Chief Food Safety Officer at Maple Leaf Foods, Inc. following the listeriosis outbreak and said of food safety culture, "every person in the organization should understand their role in producing safe food, and the challenge is in the communication of that message" (Weatherill, 2009, p. 36). Dr. Huffman's appointment, along with certain communication measures during the crisis – including empathetic television advertisements and online videos featuring the Chief Executive Officer – demonstrated the culture of food safety present among company executives. This proved sufficient to maintain consumer trust in the company, but failed to reflect a culture of food safety that truly permeated the entire organization. Further measures that could be taken to exhibit the company's food safety commitment to the public include providing a chronological accounting of the outbreak (who knew what when); adding warning labels to packages of ready-to-eat meats for persons at high risk for listeriosis; and, releasing details of product and environmental testing results, perhaps through the establishment of a website that provided *Listeria* spp. testing data in real time. The two reasons identified by Yiannas (2009) that organizations establish strong food safety cultures – recognition of the value of the safety of customers and employees, and reaction to a major event, such as a foodborne illness outbreak – may work in tandem to

strengthen the commitments of Maple Leaf Foods, Inc. to food safety in the future.

3.3. Peanut Corporation of America, 2009

In January 2009, Peanut Corporation of America (PCA) was linked to a growing outbreak across the U.S. caused by *Salmonella* serotype Typhimurium. On January 9, 2009, the outbreak strain was isolated by the Minnesota Department of Agriculture from an unopened container of King Nut peanut butter – a product manufactured solely by PCA at its facility in Blakely, Georgia. In the ensuing weeks, all peanuts and peanut products processed at Blakely plant since January 1, 2007 were recalled (CDC, 2009b). This included over 3900 peanut butter and other peanut-containing products from more than 350 companies (U.S. Food and Drug Administration (FDA), 2009b). PCA supplied peanuts, peanut butter, peanut meal and peanut paste to food processors for use in a wide range of products from cookies, snacks and ice cream to dog treats; to institutions such as hospitals, schools and nursing homes; and directly to consumers through discount retail outlets such as dollar stores (Chapman & Newkirk, 2009; Schneider, 2009). The U.S. Centers for Disease Control and Prevention (CDC, 2009a) reported that 691 people were sickened and nine died across 46 U.S. states and in Canada.

An article in the February 15, 2009 edition of The Washington Post described the business culture at PCA from the viewpoint of a former buyer for a major snack manufacturer. The former buyer recalled a filthy plant with a leaky roof and windows that were left open, allowing birds into the building. The company purchased only low quality, inexpensive peanuts and paid food handlers the minimum wage lawfully allowed (Layton & Miroff, 2009). The lack of a food safety culture was most evident in the description of how PCA dealt with finished product that tested positive for *Salmonella* spp. An FDA report identified many instances in which the product was retested until a negative result was achieved; in other instances PCA shipped the product to their customer despite the positive test or before the test result was received (FDA, 2009a).

The FDA further noted there were inadequate controls to prevent contamination and insufficient cleaning and sanitation. Facilities for hand washing were also used to clean utensils and mops, increasing the potential for recontamination of washed hands. Equipment settings – for example, roasting temperature and belt speed – had not been evaluated to ensure that the roasting step was sufficient to kill bacteria. Raw and roasted peanuts were stored directly next to one another, allowing for potential contamination of the roasted finished product. Gaps in the physical integrity of the building were observed around the loading bays and the air conditioning intakes in the roof that provided pests with open access to the plant (FDA, 2009a).

Despite these deficiencies, PCA maintained the highest possible rating from auditing firm AIB International (Schmit, 2009). Many foodborne illness outbreaks have been linked back to farms, processors and retailers that went through some form of certification, or had testing programs in place. Testing is used to verify that risk-reduction measures are working as intended, while audits generally reflect the state of food safety practices at one moment in time. The effectiveness of these activities as primary interventions is limited at best.

4. Behavior change in a culture of food safety

A change in organizational culture can lead directly to a change in front-line behaviors. For example, in a study by Larson, Early, Cloonan, Sugrue, and Parides (2000), a protocol founded in organizational theory was created, to assess the effect of institutional cultural change on staff hand washing practices. The protocol involved staff at levels in a particular hospital in the intervention design, implementation and monitoring of a hand washing behavior intervention. The intervention became an integral part of the organizational culture, and the frequency of hand washing was improved and maintained.

Education and training are the focus of many food-handling behavior interventions. However, research suggests that the impacts of food handler training programs are inconsistent, and program evaluation is rarely conducted (Almanza & Nesmith, 2004; Egan et al., 2007; Frash, Binkley, Nelson, & Almanza, 2005; Roberts et al., 2008). Further, measuring knowledge change is a poor indicator of changes in practices. Yiannas (2009) points out the limitations of focusing entirely on training as food safety culture indicators and suggests that it is just one factor of a good organization. Conscientious proprietors provide training and proper tools, and remove barriers, keeping in mind that the most important reason to educate and train is to influence behavior.

Citing the failings of several food handler intervention evaluations, Mitchell, Fraser, and Bearon (2007) state that, to be successful in changing behavior, food safety researchers need to gather data on actual practices of food handlers. Researchers have suggested that the only reliable measure of effectiveness of food safety culture-supporting intervention material is through the observation of food preparation practices (Anderson, Shuster, Hansen, Levy, & Volk, 2004; Chapman, Eversley, Filion, MacLaurin, & Powell, 2010; Redmond, Griffith, Slader, & Humphrey, 2004). According to Redmond and Griffith (2006), the primary benefit of observation is that it does not depend on reported actions and can be considered objectively by someone other than the performer of the action. Assessing food-handling practices of staff through internal observations, externally led evaluations and inspection results can provide indicators of a food safety culture. Results of these activity evaluations can be used by middle- and executive-level managers to modify interventions and further improve the organization's culture of food safety.

5. Supporting a culture of food safety

Recognition of personal responsibility for food safety is a prerequisite for implementation of proper food safety behaviors (Redmond & Griffith, 2004). Therefore, frequent information sharing and regular communication about foodborne risks with food handlers using a variety of messages and mediums is also important to support a culture of food safety (Yiannas, 2009). Costa (2009) advocates composing and communicating a food safety mission statement, a food safety budget, and the food safety responsibilities of employees. Messages that are compelling, rapid, relevant, reliable, repeated, multi-linguistic and culturally sensitive are thought to be the most effective (Jacob, Mathiasen, & Powell, 2010).

One tool that has been used to support a good food safety culture is food safety infosheets. Food safety infosheets (www.foodsafetyinfosheets.com) are standalone communication tools directed at food handlers. The tools are designed to meet the specific information needs of food handlers and generate dialog among this group. Food safety infosheets contain a news story about an outbreak of foodborne illness, graphics, and prescriptive information. The text of food safety infosheets focuses on consequences of food handler behaviors. Chapman et al. (2010) studied the potential for the novel communication tool to compel the food handlers in a food service setting to change their behavior. Infosheets were posted in highly visible locations, such as kitchen work areas and at hand washing stations. Video observation was

used to determine that the infosheets positively influenced the food safety behaviors of food handlers, as demonstrated through increased hand washing frequency and reduced number of cross-contamination events.

The infosheets used in the study were based on four emotion-generating factors that were found to support a culture of food safety within a workforce:

- Storytelling: Storytelling was used to bring attention to the consequences of particular actions or circumstances.
- Dialog: The infosheets were designed to generate dialog within food service settings.
- Surprise: The information was presented with elements of surprise, such as humorous graphic images or sobering data.
- Context: The infosheets put prescriptive food safety information into a relevant context for food handlers.

Beyond the sanitized nature of, "Employees must wash hands" signs, these tools support the food safety culture at a site by providing a personalized message, emphasizing control and when posted, demonstrate to all members of the organization the importance of risk-reduction practices (Chapman et al., 2010).

6. Marketing food safety

Organizations with good food safety cultures practice risk-reduction daily, and the best of these organizations communicate the details of those activities to the public. The openness and transparency provides a framework to increase optimistic trust and potentially reduce mistrust (de Jonge et al., 2008). Restaurants with strong food safety cultures are already able to do this through the restaurant inspection disclosure systems established in a number of locations around the world (Filion & Powell, 2009). A turkey processing plant in South Dakota constantly monitors its operations with by video cameras that can be accessed by auditors or USDA inspectors at any time (Keen, 2006). This technology can be utilized in providing transparency to interested members of the public, as well. Other new media, such as blogs and social networking sites, are quickly becoming important sources of information that can and should be utilized for the distribution of food safety information (Powell, Hubbell, Chapman, & Jacob, 2009).

Because Western economies are driven by competition, food safety can be used as a selling point. The food businesses that use the best science to promote microbiological food safety, and couple that with employee commitment, will capture the imagination of a hungry public. Conveying a positive food safety culture through open, transparent communication strategies can help buyers make informed decisions. The U.S.-based supermarket chain Publix voluntarily provides information to consumers on the shelf-life of deli meats and cheeses sliced at its stores through text printed on product packaging. Similar information has been provided on the packaging of ready-to-eat meat and poultry products produced for and marketed by Piller Sausages & Delicatessens Ltd. in Canada. Other producers of ready-to-eat products with a culture of food safety may choose to provide warning labels for pregnant women and other populations that are at risk for listeriosis infections and related complications.

A framework of science-based practices, that are thoroughly documented and supported by a culture of food safety, may inspire confidence in producers, processors, and retailers. Businesses that promote food safety culture can market their activities to consumers at retail, who, in turn, can feedback to those companies that make food safety a public priority (Fig. 1).

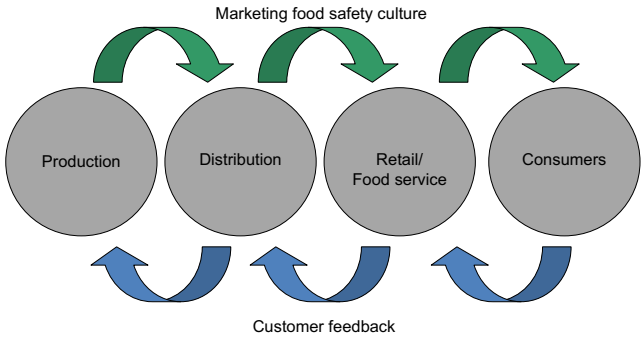

Fig. 1. Marketing of food safety culture through a supply chain.

7. Conclusions

Creating a culture of food safety requires application of the best science with the best management and communication systems. It requires commitment by an organization's leaders, middle managers and food handlers. It also must be supported and demonstrated by sharing information within the organization and with customers. The food safety failures of John Tudor & Sons, Maple Leaf Foods, Inc. and PCA are illustrative of an emerging recognition that the culture of food safety within an organization is a significant risk factor in foodborne illness (Griffith et al., 2010a; Yiannas, 2009).

Individuals focusing on food safety risks within an organization with a good food safety culture:

- know the risks associated with the foods they handle and how those should be managed;
- dedicate resources to evaluating supplier practices;
- stay up-to-date on emerging food safety issues;
- foster a value system within the organization that focuses on avoiding illnesses;
- communicate compelling and relevant messages regarding risk-reduction activities and empower others to put them into practice;
- promote effective food safety systems before an incident occurs; and,
- do not blame customers (including commercial buyers and end consumers) when illnesses are linked to their products.

The best food producers, processors, retailers and restaurants should go above and beyond minimal government and auditor standards and sell food safety solutions directly to the public. The best organizations will use their own people to demand ingredients from the best suppliers; use a mixture of encouragement and enforcement to foster a food safety culture; and use technology to be transparent – whether it's live webcams in the facility or real-time test results on the website – to help restore the shattered trust with the buying public.

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