

Exploring Industry Perspectives of Listeria Control in Food Manufacturing.

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Introduction

The persistence of *Listeria monocytogenes* in food production environments is widely acknowledged^{1, 2} and management of the pathogen is complex, particularly for small and medium sized enterprise (SME) food manufacturers.

Despite 'environmental factors' such as the facilities and the hygienic design of equipment having been identified as key contributors to persistence of the pathogen,³ given the foodhandler can be a significant route to pathogens in food,⁴ there is a need to consider the 'people factors' that can contribute to issues associated with listeria in the food manufacturing industry.

Adequate training and supervision should be provided to assure hygienic practices are accomplished,⁵ however perceptions of employees from senior management through to food handlers can impact upon implementation of hygienic practices.

Although perceptions of risk, control and responsibility are explored in consumer food safety research,⁶⁻⁸ this approach is seldom applied to industry based data. Furthermore, data detailing managerial perspectives of problems associated with listeria in food manufacturer SMEs are lacking.

Consequently, this study aims to explore the perceptions of risk, control and responsibility of food manufacturers in relation to *L. monocytogenes*.

Purpose

The purpose of this study was to explore manufacturers perceptions of organisational factors that may influence the control and management of listeria.

Methods

Development of interview schedule: A review of literature relating to listeria management, organisational culture and perceptions of risk, control and responsibility was conducted to inform the design of an interview schedule.

Data collection: The Food Innovation Wales producers directory was utilised to identify SME manufacturers producing various food products associated with *L. monocytogenes*. Semi-structured interviews were conducted with managing directors/technical managers from SME food manufacturing businesses ($n=10$).

Data analysis: Interview transcripts were analysed utilising a thematic analysis approach using NVivo 12 (QSR International).

Ethical Approval: Approval was obtained from the Health Care and Food, Ethics Panel at Cardiff Metropolitan University.

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Results

Perceptions of risk associated with Listeria

The potential risk of listeria upon the business was widely discussed during the interviews:

"If we had any Listeria problems that's really going to affect our reputation. The industry is being very much word of mouth industry that's based on reputation, so if we had any issues, that would really disrupt our sales." (Participant 001).

"For the consumer there's a food safety risk. As a business, there'll be loss of confidence by our customers. There'll be potential loss of business through, they'll take their business elsewhere. Fines, prosecution, publicity, product recall. So the ramifications are very, very real and very, very significant. So it's not to be taken lightly." (Participant 004).

"It's our obligation as well to customers, it's our reputation on the line then and if we're churning out product after product with Listeria contamination, we will recall them, then it's not good for us" (Participant 010).

"I don't think there's any real major risk. ... The risk on the health of customers." (Participant 006)

Senior management from participating manufacturing businesses indicated an awareness that incidents associated with listeria can occur:

"It could happen anywhere. There can be events that can happen that, you can't foresee. I think it's how you manage them that is important. Making sure that there is due process in your business to be able to deal with any potential food crises that arise." (Participant 004).

Consequently, discussions indicated that manufacturers need to take a proactive approach to deal with potential risks associated with listeria. However, some felt that they were more reactive than proactive in relation to listeria due to the pathogen seldom being found in the environment or products. Suggesting complacency may be an issue:

"It's a case of better the devil you know than the devil you don't. The more aware we are of Listeria, the more proactive we can be then in preventing it and to stop it causing us a problem." (Participant 010).

"We are proactive, we do GMP audits. We do walkabouts, we will pick up issues whether it'll be fabric and structure, equipment, practices. So we do enforce standards in the factory that are aimed at, you know, good manufacturing practices and food safety." (Participant 007).

"I would say we have proactively routine swabbing. We routinely swab, based on what we think is appropriate." (Participant 008).

"As we haven't had any issues with Listeria for a while, I'd say we're probably reactive to it. You can maybe call us proactive, but just through choice of chemical, but I don't think it's something we consciously do is to be proactive against Listeria." (Participant 010).

The relationship between perception of risk and control was discussed:

"Well, at the moment generally with listeria I wouldn't say this is a big risk consider also the lab results I have. [The risk] is low at the moment but it's low because we have daily cleaning. I mean if we didn't have that control, it could be really high, you know? So low [risk] at the moment because we control it I believe." (Participant P002).

Similarly the association between perception of risk and perception of responsibility was referred to:

"I think the biggest risk for anybody in a technical field is unconscious incompetence." (Participant 004).

Although the potential risks associated with the pathogen were understood, many perceived the risk to be low, suggesting optimistic bias and the illusion of invulnerability. Optimistic biases can hinder actions that would lower risks.⁹

Perceptions of control associated with Listeria

Reliance in controlling Listeria in food manufacturing sites was placed upon having HACCP procedures in place:

"We have a full documented HACCP procedure that's followed and that documents any potential risks and exactly how they should be adhered to." (Participant 001).

Key control measures that were reported to be implemented to control Listeria were related to cooking and storage temperatures however the most cleaning and hygiene was most frequently discussed:

"The major critical control points are obviously where we store the product and cooking temperatures." (Participant 001).

"The cooking is at 81 degrees for six seconds, which obviously it's enough to kill listeria. ... So usually listeria doesn't really grow at zero degrees or at least it is very slow to grow. We have all the fridges set up to three degrees" (Participant 002).

"I think cleaning is the main thing that's controlling it." (Participant 003).

"I would consider that the cleaning and the hygiene of the factory is rather critical." (Participant 005).

"It's all around hygiene and personal hygiene and machinery hygiene." (Participant 010).

"Cleaning without aerosols is vital. And making sure all the product is contained and out of the way when cleaning has been done, so, there's no product in the area. Making sure the cleaning is done correctly and they clean from top to bottom and not the other way around." (Participant 007).

Although aware of the control mechanisms in place, respondents acknowledged the importance of employees implementing the correct practices:

"I think the cleaning, for me, is the biggest thing but then... you've got to look at, the people who are doing it." (Participant 003)

Indeed, the least controllable factors were perceived to be associated with the behaviour of employees. Consequently control was believed to be strengthened by facilitating staff education and training to ensure practices are implemented:

"So the staff implementing the processes and also the staff implement how we handle the ingredients. ... So that's probably something we've got least control on because any information we pass on to the staff is only as good as the information we know." (Participant 001).

"I think a big part of it is just making sure that people are educated so the people are aware of why we do things." (Participant 004).

"You have to trust the operator to be doing things correctly. So, although you have some control over them, you never have full control over people. It's usually people that cause the problem." (Participant 007).

However, potential barriers in ensuring sufficient training and supervision in relation to implementation of control measures were discussed in relation to food manufacturing site that have high staff turnover:

"You've got issues where if you've got a high staff turnover so your teaching is wasted then. So, if you've got people in, that are in jobs that they're unfamiliar with, how they've been supervised and managed, you can't, people are busy and you're short of staff they tend to cut corners." (Participant 004).

Many perceived themselves to have high levels of control for Listeria, however findings may indicate the illusion of control, whereby people overestimate their ability to control events or feel a sense of control over outcomes.¹⁰

Perceived responsibility for Listeria

It was evident that study participants believe that the control of listeria in a food manufacturing site is a shared responsibility :

"Everyone has a responsibility to a certain degree for anything." (Participant 001)

"So I would say everyone is, would be responsible in different ways, but everyone." (Participant 002)

Although discussions indicate a holistic approach in relation to responsibility which incorporates all members of the workforce, considerations were made where by different job roles have different levels of responsibility. Links were made between responsibility and control. With having senior management roles, some respondents perceived themselves to have greater levels of responsibility for listeria than other employees within the business:

"I would say it would be from Director level and then any communications then down through the team and for myself and with the Production Team then. So we would work together." (Participant 005).

"Technical are responsible for making sure that products brought in are not putting the business at risk. Production are responsible for maintaining GMP standards in the factory and following the procedures that technical put in. The production manager, is accountable for making sure that factory staff comply with the procedures. Then we've also got a technical role making sure that what we have put in place works and that it's being maintained. And hygiene then have got a key role in making sure that the factory is clean. So it's not one particular individual or one particular set of people. It's the holistic approach." (Participant 004).

"So firstly our QA consultant, making sure that all our controls are in place and our systems are in place. Then obviously the Managing Director, sets the precedent and the values. Then our Production Manager, who's actually in day to day overseeing production and it's his responsibility to ensure that our procedures are kept and followed, they (production) definitely have themselves responsibility." (Participant 001).

As the food business operator, ultimately me. Because I take responsibility from a top level, but then it's the guys on the shop floor that are responsible in ensuring that it doesn't spread or doesn't come in in the first place." (Participant 010).

"So the senior management team have to have responsibility of ensuring that any controls that are needed are given the time and resources that they need really." (Participant 006).

"Obviously it [responsibility] is escalated for me as a technical manager, making sure there is clear procedure or clear instruction how to control. I'm making sure that there is the right chemical for example, I make sure we are checking the chemical's working properly. We are checking if the operator knows how to clean. We are refreshing the training how to clean." (Participant 002).

Despite manufacturers acknowledging "everyone" has responsibility for ensuring listeria control, managers reported 'people' attributes associated with organisational culture to be a difficult factor to control in terms of listeria management and indicated that pride and ownership were important in adopting responsibility:

"Getting everybody on board and getting everybody's understanding across is quite critical." (Participant 005).

"So everyone is really kind of, take pride and ownership of their job, their role." (Participant 002).

Findings suggest some senior managers to have a strong internal locus of control. Internal-external control can affect the perceiver's attribution of responsibility which can impact upon behaviour.^{11, 12}

Significance of study

- Given findings relate to 'the people', 'the processes' and 'the proactivity' of manufacturing businesses, there's a need to consider the potential influence of food safety culture dimensions upon implementation of effective listeria control in food manufacturing.
- Consideration of specific pathogen risks in food manufacture in relation to food safety cultural dimensions may assist development of highly targeted and effective interventions.
- Cumulatively, this study has identified potential factors, such as; optimistic bias, illusion of invulnerability, illusion of control, and perceived attribution of responsibility that can potential hinder actions to reduce the risks associated with Listeria in food manufacturing.
- To enable the implementation of effective listeria management plans and the development of successful learning opportunities, managerial perceptions of risk, control and responsibility in relation to listeria management need to be considered and addressed.

Optimistic bias, illusion of invulnerability, illusion of control, and perceived attribution of responsibility may hinder implementation of effective listeria management.

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