Factors That Influence Staff Compliance with Cleaning and Disinfection Practices in a UK-Based SME Ready-to-Eat Food Manufacturer.

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Introduction

A previous review of environmental and end-products microbiological testing (2012—2018) from a small UK-based manufacturing business identified the need to enhance cleaning practices[1].

The food manufacturing business is responsible for supplying a large range of ready-to-eat (RTE) meals (>100), from a single production site, to some of the UK's leading retail and food service chains.

Given the product categories that the business produces, cleaning performance is critical to ensure product safety.

It is widely recognised that cleaning practices in food manufacturing environments can impact upon foodborne diseases[2]. Appropriate cleaning practices are required to prevent the formation of biofilms[3].

Although knowledge, attitudes and self-reported practices are not indicative of behaviour[4], undertaking quantitative and qualitative surveys with foodhandlers at a food manufacturing business may be useful to identify issues that impact upon cleaning practices and subsequent safety of food products.

Purpose

The aim of the research was to explore cleaning practices in a food manufacturing company to identify potential barriers and facilitating factors to support intervention development.

Methods

To explore cleaning practices at the business, the study included two component parts:

In-depth interviews: A semi-structured interview schedule was utilised to obtain qualitative data detailing the perceptions and practices of employees at the food manufacturing business relating to cleaning practices (*n*=13). Thematic analysis was undertaken using NVivo software.

Questionnaire: The survey was completed by all employees linked with cleaning practices at the food manufacturing business (*n*=20). Paper-based and digital-format surveys to increase accessibility were used. Respondents were provided with £15 gift voucher for completion of the questionnaire to improve response-rate. Statistical analysis was undertaken using SPSS.

Ethical approval was obtained from the Health Care and Food, Ethics Committee at Cardiff Metropolitan University for the two components of the study:

- Interviews ethics reference number: PGR-1547
- Questionnaire ethics reference number: PGR-3365

Results

Knowledge and awareness relating to cleaning

Demographic characteristics: The questionnaire was completed by 20 employees at the food manufacturing business, these included 14 food handlers (of which three were supervisors) and six managers (including technical managers and production managers). The majority (85%) reported having worked at the business for ≥5 years. Eighty percent reported regularly taking part in cleaning as part of their role at the business. Interviews were undertaken with thirteen employees involved with cleaning.

Pathogen awareness: As indicated in Table 1, all employees were aware of *Listeria monocytogenes, Salmonella,* and *Escherichia coli,* however significantly fewer food handlers were aware of *Staphylococcus aureus, Clostridium perfringens, Campylobacter* and Shigella.

Table 1. Reported awareness of foodborne pathogens among food handler (*n*=14) and management (*n*=6) employees.

Pathogen	Food handlers (%)	Management (%)	Chi-Square Tests
Listeria monocytogenes	100	100	No statistics computed
Salmonella	100	100	No statistics computed
Escherichia coli	100	100	No statistics computed
Staphylococcus aureus	36	100	$\chi2 = 7.013$, $df = 1$; $p = .008$
Clostridium perfringens	29	83	$\chi2 = 5.089$, $df = 1$; $p = .024$
Campylobacter	50	100	$\chi2 = 5.714$, $df = 1$; $p = .017$
Shigella	21	50	p>.05

Awareness of food safety and cleaning: Table 2, indicates that the vast majority of employees were aware of the severity of foodborne illness, the importance of cleaning, and the role and responsibilities of individuals to ensure food safety. No significant differences existed between foodhandlers and management (p >.05).

Table 2. Awareness of cleaning and food safety at the business among food handler (*n*=14) and management (*n*=6) employees.

Statements relating to cleaning and food safety at the business	Somewhat / Strongly disagree	Somewhat / Strongly agree
A poorly cleaned factory can increase the risk of food poisoning	0%	100%
Cross-contamination is of concern during cleaning	5%	89%
Food poisoning produced by the company is not an issue	95%	0%
Food poisoning is not a serious issue	100%	0%
Food safety is a top priority for the company	10%	90%
Operatives have a critical role in the food safety in the company	0%	100%
Supervisors have a critical role in the food safety in the company	0%	100%
Managers have a critical role in the food safety in the company	0%	100%
I have a critical role in the food safety in the company	0%	100%
The consumer is ultimately responsible for food safety	80%	0%
The company is ultimately responsible for food safety	0%	100%

Awareness of the importance of cleaning, pride, and a shared sense of responsibility for cleaning were indicated during the interviews:

> *"There is at least half a dozen staff in all the food areas who are 15-20 years plus in the food industry and they are cleaning… they are not just doing it because they are told to do it, there is a level of pride and experience there."*
> (Technical manager)

> *"We all are responsible, everyone takes part in the cleaning… we're all just 'mucking in' at the end of the shift!"*
> (Production manager)

Factors that impact upon cleaning

The questionnaires and interviews identified a number of factors relating to the product, people and resource that influenced cleaning practices at the business.

Table 3. Factors reported to influence cleaning at the business by employees (*n*=20).

Factors influencing cleaning at the business	Somewhat / Strongly disagree	Somewhat / Strongly agree
The number of staff available for cleaning	20%	65%
The type of product processed	15%	75%
Cleaning items (squeegees, sponges, etc.) supply	21%	68%
Water supply issues	25%	60%
Chemicals supply issues	40%	50%
Scheduled deep cleaning	20%	65%
Staff fatigue or tiredness from a busy week	30%	50%

Product: As shown in Table 3, the type of product being processed and scheduled deep cleans were frequently reported to impact upon cleaning practices at the business, interviews indicated that this was particularly the case, when producing 'free from' products, food handlers were aware of the importance of cleaning between products:

> *"If we're doing a nut product and after an allergen free product after not cleaning out tidy, there could be the risk of someone going into anaphylactic shock or something like that."*
> (Foodhandler)

> *"Well it's obviously specific to the different areas, but it's essentially to decontaminate. Whether there would be a changeover between lines… an end of day clean, and then of course a weekly, or a monthly ,or a quarterly deep clean."*
> (Production manager)

People: Employees indicated that availability of staff (65%) and staff fatigue (50%) had an impact on cleaning practices, staff availability fluctuates due to seasonality, employees believe that this would not have a detrimental impact upon hygiene standards:

> *"It's always done to the same standard, potentially they take more time to do so when there are lesser staff, but at the end of the day everybody pitches in."*
> (Technical manager)

Resource: The availability of items (68%) and chemicals (50%) required for cleaning were also indicated as factors that influence cleaning practices. A production manager indicated that the right tools were essential:

> *"If there's ever anything that they think it's difficult to clean, or they can't quite get at… in which case we facilitate by getting the right equipment and tools to do it. It's not always just the time and training, sometimes you have to have the right tools to get the job done."*
> (Production manager)

Water: Foodhandlers indicated occasional issues with supply of hot water, technical and production managers indicated that hot water supply had been improved due to investment in infrastructure and that foodhandlers would report issues with hot water supply:

> *"If there's ever an issue with the water temperature, they'll say about that."*
> (Technical manager)

> *"Cleaning would halt. Once sufficient water was available cleaning would re-commence."*
> (Production manager)

> *"I think we're pretty good that we did invest a bit of money over the years so that we can assure that we have hot water for this 10 - 11- 12-hour day, even 14-hour day if it came to it."*
> (Production manager)

Self-reported cleaning practices

Chemical handling: Staff indicated awareness of the importance of key practices when implementing cleaning, as indicated in Table 4 the application and rinsing of disinfectant were the least important factors when ensuring adequate cleaning.

Table 4. Perceived importance of actions when using chemicals to undertake cleaning among employees (*n*=20).

Practices	Responded: 1*, 2, or 3	Responded: 4, 5, 6, or 7	Responded: 8, 9, or 10*
Adhering to the contact time	0%	20%	80%
Covering the whole surface area	0%	0%	100%
Adhering to the proper concentration of chemicals	0%	0%	100%
Having mechanical action such as scrubbing	5%	5%	90%
Applying disinfectant	5%	10%	85%
Rinsing disinfectant completely	20%	10%	55%
Applying the correct detergent for the soil type	0%	0%	100%

Response scale 1: Not important — 10: Extremely important

Cleaning instruction cards (CIC): CICs are printed instruction cards, designed to provide practical cleaning instruction and guidance to staff responsible for cleaning. Positive attitudes were indicated and food operatives reported using CICs in the questionnaire (table 5).

Table 5. Self-reported practices relating to CIC usage at the business by foodhandler employees (*n*=14).

Statements relating to CIC usage	Strongly/ Somewhat disagree	Strongly/ Somewhat agree
I use the CICs when a new piece of equipment is installed in the factory	7%	79%
I use the CICs when I'm cleaning equipment I've not cleaned in a while	21%	71%
I use the CICs when I am told that I did not clean something properly	29%	57%
I use the CICs when someone asks me to do so	29%	64%
The CICs are useful for the cleaning tasks	0%	90%
CICs are easy to follow	0%	90%
The CICs are the most important instructions to follow during cleaning	5%	95%
The CICs are not suitable for the cleaning tasks	80%	15%

During the interview it was described that each piece of equipment has a CIC, some foodhandlers reported using CICs when cleaning, however it was suggested that some may not use CICs due to familiarity with the process, or that the process was common sense:

> *"Each piece of equipment we have [...] has its own cleaning card which will give you a step-by-step instruction on how to clean each item."*
> (Foodhandler - Supervisor)

> *"I think they're worthwhile having, but I think common sense should probably prevail over them."*
> (Production manager)

> *"I still go by the chart."*
> (Foodhandler)

> *"If you do it every single day, people don't tend to read them… they get into their own little way."*
> (Technical manager)

Some foodhandlers reported that CICs were not visible in their working areas, it was confirmed that a folder of CICs was kept in the office.

> *"No, nothing in my area."*
> (Foodhandler)

> *"We've got a folder under the desk [in the office]."*
> (Foodhandler - Supervisor)

Significance of study

- Completion of this study has indicated pathogen awareness and positive attitudes towards the importance of cleaning practices in the business.
- Factors such as the type of product being processed, the availability of staff, resource and hot water were reported to impact upon cleaning practices in the business.
- Self-reported practices indicated that some cleaning processes and chemical handling may not be adhered to due to familiarity or lack of accessible instructions
- Findings suggest the needs to undertake observational analysis of cleaning practices to inform the development of bespoke interventions to enhance and improve cleaning processes in the business.

References & Acknowledgments

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