This study aims to evaluate the Listeria contamination and identify potential growth niches in a RTE food manufacturing SME.

**Introduction**

The most important post-processing contamination of ready-to-eat (RTE) foods has been identified as Listeria monocytogenes, being one of the causative agents of foodborne illness, along with environmental contamination that is considered a major source of RTE foods contamination.

**Results**

**The influence of cleaning operatives’ food safety culture in the identification and control of Listeria harbourage sites**

A number (n) of environmental samples from eight different production areas and areas identified in the investigation of two distinct growth niches during the separate time intervals. Identification of such growth niches was potentially attributed to an inaccessible location and a damage-free wall, with a total period of 2 and 6 months, respectively, establishing an increase in unverified Listeria positive samples having led to investigations and action mitigation. A number of Listeria spp. product positives have been reported prior to the mitigation of the first niche compared to none for the second one.

**Purpose**

The study aims to evaluate Listeria spp. contamination and identify potential growth niches in a RTE food manufacturing SME.

**Methods**

- The manufacturer is a small to medium enterprise manufacturing a large range of RTE foods (over 100), under a single production line, supplying some of the UK’s leading food chains and the food service sector.
- Their product range includes: meat, dairy and vegetables based dishes, pasta, and curries. This increases the odds of listeria presence.
- Their product positives have been identified (Figure 2), which led to investigation activities.
- Following investigations it was noted that there was a crash in the fabrication fabric of an area, resulting in the unacceptable and other liquids during the processing and cleaning operations, contributing to the creation of a niche that allowed the growth and survival of *L. monocytogenes*.
- The complexity of the repair required an interim cleaning procedure based on deep cleans with increased attention to the fabric area, allowing the identification of potential harborage sites.
- Negatives results immediately post-sanitizing followed by a positive result on the floor in the vicinity of the equipment after a longer period allowed the identification of the existence of the fabric area of the equipment, overlapping the low to high risk physical barrier, as the possible harborage site. This area was confirmed visually and by negative results following the assessment.
- Positive product samples (n) have been recorded during this period.

**Niche A – Caused by a hard to clean area and lack of training**

- The detection in a drain next to a piece of equipment has led to the initiation of a niche due to poor cleaning routines.
- The investigation of this niche has led to the identification of the underside of the framework of the equipment, overlapping the low to high risk area.
- The complexity of the repair required an interim cleaning procedure based on deep cleans with increased attention to the fabric area, allowing the identification of potential harborage sites. **Figure 1.**- Overview of positive results, detailing the time and location they have been sampled since the investigation started. Positive samples have been sent to an accredited laboratory for further identification. **Figure 2.**- Overview of positive results, detailing the time and location they have been sampled since the investigation started. Positive samples have been sent to an accredited laboratory for further identification.

**Niche B – Caused by damage to fabrication requiring repair**

- Over a period of 6 months, several (n) Listeria spp. positives including L. monocytogenes have been identified (Figure 2), which led to investigation activities.
- Following investigations it was noted that there was a crash in the fabrication fabric of an area, resulting in the unacceptable and other liquids during the processing and cleaning operations, contributing to the creation of a niche that allowed the growth and survival of *L. monocytogenes*.
- The complexity of the repair required an interim cleaning procedure based on deep cleans with increased attention to the damaged area.
- The range of the interim cleaning procedure has not been documented, however a recent report that the procedure has been communicated verbally to the cleaning operatives.
- No further issues have been reported after renovation of the fabrication defect.

**Significance of study**

- The case study highlights possible contamination via potential growth niches attributed to different sources of improper cleaning routines, showing the importance of prioritizing the implementation of strategies in order to identify and control growth niches.
- Niche A can be regarded as a good example of inefficient training of operatives regarding specific pathogens, which not only posed a risk to the final products but also infected the food safety culture. Given that the equipment was installed in a high risk area, the cleaning program is required to be validated to control microbial contamination and the results of the studies have shown that the food safety culture, environmental monitoring has occurred, and has been identified as a growth niche harboured in a RTE food manufacturing SME. The results of the study support further investigations of antiseptic cleaning procedures, and did not demonstrate sufficient knowledge regarding the importance of proper cleaning procedures and improper cleaning of the hard-to-reach area.
- Product contamination could not be directly linked to Niche A as no sampling characterisation of the isolates had been done.
- Niche B can be regarded as a good example of off-site work project fabrication renovation, showing the production relating nature of the manufacturing. Early cleaning procedures are optimised in this situation. However, there may be no risk to this, they need to be closely communicated. More importantly, management commitment was required to ensure that the equipment was not reinstalled without proper cleaning and management of built areas.
- The food safety strategies in the RTE foods industry, in some developed countries, are relatively good in terms of best practice cleaning and sanitizing procedures. However, there is a lack of longitudinal studies regarding observation of actual practices in relation to environmental areas. Such studies could aid in the development of specific intervention techniques that positively change the behaviour with the aim of improving cleaning efficiency and sanitation.

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**References**


**Microbiological results from 2012-2018 were reviewed to determine the influence of cleaning operatives’ food safety culture in the identification and control of Listeria harbourage sites**

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