



Microbiological Consulting Report

Prevention of *Listeria* Hysteria for Mushroom Growers and Packers

Ready-to-eat fresh-cut produce including mushrooms are subjected to the provisions of the Canadian Policy on *Listeria monocytogenes* in Ready-to-Eat Foods and the USFDA Food Safety Modernization Act Final Rule for Preventive Controls for Human Food. Although there have been no reported cases of listeriosis attributed to mushrooms, food safety recalls due to *Listeria monocytogenes* in mushrooms in recent years were devastating to the recalled mushroom growers and packers (packers) and the mushroom industry.

The packers should implement industry best practices of *Listeria* control for regulatory compliance, recall prevention, audit readiness, brand protection, and customer satisfaction. The implementation of a risk-based environmental monitoring program (EMP) is not only an industry best practice for *Listeria* control, but also a regulatory requirement. The goals of EMP are to verify the effectiveness of *Listeria* control, seek and destroy *Listeria monocytogenes* and harborages sites if present.

The good packers file the laboratory reports of EMP after reviewing. The better packers summarize *Listeria* findings in a table with when (date and time) and where (sampling site). The best packers with strong management commitment and food safety culture assemble a multi-disciplinary team that include production, QA, maintenance, and sanitation personnel to take actions from EMP trend analysis report. Some of the best packers conduct trend analysis by color-coding routine, intensified, and investigative vector *Listeria* findings on plant schematics with areas, zones and equipment, and overlay with transparent flow diagrams (e.g. people flow, product flow, drainage flow) for trend analysis and root cause analysis. Trend analysis is conducted to verify *Listeria* control via time and/or spatial patterns by observing if *Listeria* findings are increasing in particular sites or areas, increasing in the same area on multiple but non-consecutive sampling occasions, increasing in overall percentage, and/or moving from non-food contact surfaces to food contact surfaces. Statistical methods (e.g. Pareto analysis) should be applied in trend analysis and root cause analysis. Management review should be performed regularly to review the prevalence of *Listeria* spp., identify their fluctuations over time especially at sites with sporadic positives that may have



Microbiological Consulting Report

gone unnoticed previously, detect trends, and verify corrective actions before food safety recall due to product contamination.

The best of the best elite packers go one step further by taking a seek & destroy approach (S & D). The S & D is a science-based and systematic approach for packers to identify, control and eliminate *Listeria* growth niches proactively. Development of growth niches is facilitated by equipment design problems (e.g. mushroom slicing equipment, hollow areas of equipment) and unsatisfactory operational conditions (e.g. mushroom debris gets into difficult to clean location, mid-shift cleanup, and high pressure cleaning). If growth niches are not designed out of the process, they should be controlled by minimizing their contamination potential. The elite packers should validate the sanitation standard operating procedures especially the temperature, agitation, chemical, time, frequency and degree to disassemble equipment for effective cleaning and sanitizing to prevent biofilm formation in the growth niches. Tool for biofilm detection should be used during pre-operation to verify sanitation efficacy, during and after investigation to verify corrective action. There are 2 steps in the S & D. Firstly, the team disassembles equipment to routine daily sanitation level, inspects the disassembled equipment for organic buildup and growth niches, conducts microbiological tests if growth niches are identified, and evaluates the sanitation method during pre-operation. Secondly, the team repeats step one on the completely disassembled equipment.

Are you ready to improve from the good, to the better, to the best, and to the elite packer for prevention of *Listeria* hysteria and continuous improvement?

Dr. Ruby Lee
Senior Microbiologist & Senior Food Safety Specialist
NSF International
rlee@nsf.org