Description of Bacteria Found in Retail Delis

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Abstract

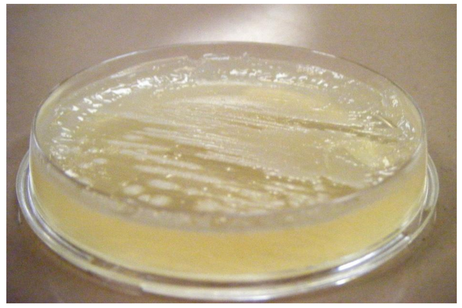
Listeria monocytogenes is a foodborne pathogen that can be found in delis nationwide. L. monocytogenes is a bacterium that when introduced to those with a compromised immune system can be deadly. This bacterium is estimated to cause about 225 deaths annually. If one harmful pathogen can be found in that environment, then there should be other dangerous bacteria to be found as well. If there could be dangerous pathogens living, then it would also be prudent to find out which are able to survive cleaning procedures within a deli. In order to test the theory that dangerous bacteria could still live after a cleaning process, we needed samples from across the country. The hypothesis was that there would a noticeable change after the cleaning, but there would still be a noticeable amount of bacteria present. Twenty-eight of delis nationwide volunteered to send samples to the lab. After some samples sent back were positive for *L. monocytogenes,* the stores with positive identification (part of a separate research study) were put through an intensive cleaning process to eliminate the bacteria. After the cleaning, more samples were collected to determine which bacteria survived through the cleaning. Samples taken from the delis before and after deep cleaning were grown on both *Listeria monocytogenes* plating medium (LMPM) and modified oxford agar (MOX). The morphology of each colony on each plate was cataloged and compared to each other. Looking at the data, several morphologies that had inconsistent appearances, such as an usual increase in appearances of bacteria or large differences in amounts seen between store, between the stores and time collected were selected to undergo diagnostic tests in order to determine the species of the bacteria. The comparisons recorded show that there is not a consistent fall in number of a type of bacterium found after the cleaning process. While most of the bacteria decreased, there were quite a few that increased after the cleaning. There was even some that increased in all three stores or only appeared in a one store. The selected representative isolates were frozen in order to be preserved for future research. You must show the significance of any increases or decreases by giving data. Critics will not believe you just because you said it happens. They want to understand how much, how often, and have things to critique and prove you wrong. Does moving from 4 sites positive to 3 sites positive mean the deep clean really decreased the prevalence of the organism? OR was it just random chance of the sampling that you caught it 4 times at first and only 3 times the second. BUT if your numbers were 14 positives before and 0 after, Most people will agree that the change is important. Show them how important/unimportant your data is.

Introduction

Salmonella, Escherichia **(***E. coli),* and *Listeria* are all bacteria that are associated with contaminated food and sickness. People don't want to ingest potentially toxic food, so cleaning practices have been adopted. Cleaning and sterilization sounds good in theory, but nothing is ever perfect and bacteria do find a way around these procedures. One of the places bacteria like to grow in are retail delis. *Listeria ,* for example, thrives in deli conditions. Naturally people would want to know their delis do indeed eliminate all harmful types of bacteria, and this became the question that we sought to answer. The purpose of the study was to find out what kind of changes occurred after a deep cleaning process. The hypothesis was that there would a noticeable change after the cleaning, but there would still be a noticeable amount of bacteria present. The variables of the study were the time the samples were taken (before and after the cleaning), the stores the samples were taken from, and the medium the bacteria were grown on. This study is a subset of another study in where all of the samples taken were tested for *Listeria* and all stores that tested positive were put through a deep cleaning process. The samples taken from these stores were used in this study. *Listeria* causes about 1600 cases of illness annually in the United States, so identifying what cleaning methods work and what doesn't could greatly reduce the amounts of food related illnesses.

Methods

The method started with basic descriptions of the colonies found on the plates, from three of the tested stores. Environmental samples are collected on sponges, and processed through a modification of the BAM procedure for isolation of LM. This uses BLEB, LMPM, and MOX. This process is what provided me with my samples. These basic descriptions, or morphologies, included their color, shape, and size. The descriptions were done to both the LMPM and MOX plates from before and after the deep clean. All of these morphologies were recorded on a table, and eventually moved to an Excel worksheet. This table included the morphology, the date, what plate was being read, the store, and the site the colonies were from. The sites are the location in the store the sample was collected from. There were 28 sites split into three different groups: transfer points, food contact points, and non-food contact points. The total numbers of same colonies were totaled up for each individual store and medium and were subtracted from the amount of the same colonies in the post-cleaning plates. The number of bacteria occurrences found in total for each store was compared together to show the differences between them. The different morphologies were then sub-streaked, or moved to a new plate (made from MOX or LMPM, depending on the original plate), so that they would be the only morphologies living on that plate. This allowed for purer samples. The next step was to label the morphologies with isolate numbers, such as S2-001. The newly sub-streaked isolates then need to frozen down in order to preserve the isolates for future research.. Next the isolates where put into a BHI medium to grow, as well as being in a liquid form (so that it would able to be frozen). The isolates where put in a solution of 30% glycerol and 70% water (30ml glycerol and 70ml water) to be frozen and used for a later date. Properly stored stock cultures of bacteria remain viable for decades.



Results

Table 1 & 2. *Differences in Number of Colonies Before and After the Deep Clean in MOX.* Table 3. *Differences in Number of Colonies Before and After the Deep Clean in LMPM*

MOX	Difference (A-B)		
Morphology	**Store #5**	**Store #8**	**Store #13**
Raised orange yellow colonies	0	0	-1
Flat bright yellow colonies	0	-2	2
Raised bright yellow colonies	-5	10	-4
Raised dark yellow colonies	0	0	0
Raised dark yellow colonies small	0	0	0
Flat dark yellow colonies	-1	3	0
Flat pale yellow translucent colonies	0	0	0
Raised pale yellow colonies	-2	0	0
Flat pale yellow colonies	7	7	2
Raised yellow wormlike colonies	0	2	0
Raised yellow white colonies	0	0	-1
Raised Orange colonies	-1	0	-1
Raised light orange colonies small	0	0	0
Flat grey black colonies	0	0	0
Raised brown orange yellow colonies	0	0	0
Raised brown yellow colonies	-2	0	-3
Flat brown colonies	0	2	-1
Raised golden brown colonies	0	0	0
Raised pale yellow brown colonies	1	0	0
Flat brown rough colonies	0	0	0
Raised dark brown colonies dark center	0	0	0
Raised light brown wormlike colonies	0	0	0
Raised and sunken orange brown colonies	0	0	0
Raised black brown colonies	-1	0	0
Raised Light brown colonies	0	0	0
Raised wormlike orange brown colonies	2	0	0
Grey to brown ringed colonies flat large	1	0	0
Raised brown colonies	-3	0	0
Flat brown yellow colonies	0	0	1
Flat brown translucent colonies	0	0	0
Flat green brown colonies	-2	0	0
Flat dark to light green ringed colonies	-2	0	0
Raised light bright yellow-green colonies	2	0	0
Raised green yellow colonies	2	0	0
Green brown translucent flat colonies	2	0	0
Raised wormlike white green colonies	0	0	0
Flat green yellow colonies	0	0	-1

LMPM	Difference (A-B)		
Morphology	**Store #5**	**Store #8**	**Store #13**
Pale yellow flat colonies	-1	0	-1
Raised dark yellow colonies	1	0	0
Bright yellow translucent colonies	2	0	0
Flat bright yellow colonies	2	0	0
Raised wormlike yellow colonies	1	0	-1
Raised yellow bright colonies	-3	-3	-6
Raised white yellow colonies	0	-1	0
Raised pale yellow colonies	0	-2	0
Flat white yellow colonies	0	0	-3
Raised teal colonies	1	0	0
Flat teal colonies	0	0	-1
Bright green yellow raised colonies	2	0	0
Blue green raised colonies	0	-2	0
Flat white colonies asymmetrical	12	0	1
Flat opaque white colonies	2	-1	0
Raised wormlike colonies	1	0	0
Raised white colonies	2	-8	-8
Flat white colonies	-8	-4	-9
Flat white colonies translucent	-1	-6	0
Raised white wormlike colonies	0	-2	0
Fuzzy fungus like white colonies	0	-1	0
Brown white colonies flat	0	-1	0
Powdery white colonies	0	0	-1
Orange Raised colonies	0	0	-2
Raised yellow orange colonies	0	0	-1
Raised wormlike orange colonies	0	0	-1

The results show an that there is usually a consistent drop or rise in the number of times the bacteria was found in a store, but there seems to some instances the stores are hugely inconsistent with each other. Instances like when two of the stores saw a drop while the other saw a huge increase in the number found or when a store found a large increase but the other two had little to zero instances of the bacteria.

Significance

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- The cleaning methods did not get rid of all the bacteria, so new cleaning methods for food safety must be explored.

Next Steps

- To continue the research one would have to revisit the stores the samples were taken from and discover what kinds of differences they have between each other. Also to determine the species of bacteria found to see if they are harmful.

Acknowledgments

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