Inhibition of *Listeria monocytogenes* on Ready-to-Eat Meats by Bacteriocins-producing Probiotic Strains

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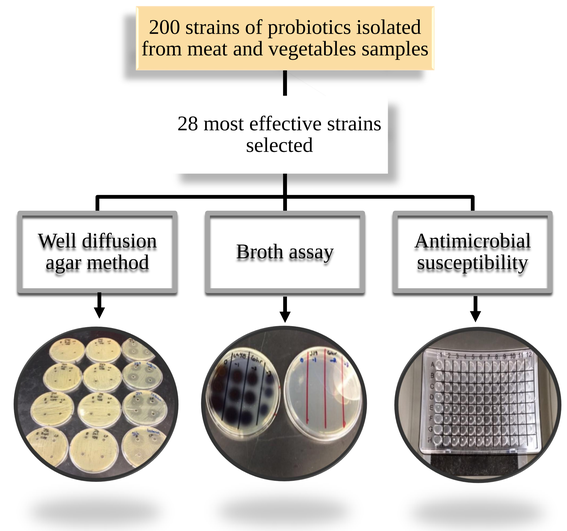
Abstract

The U.S. Dept. of Agriculture (USDA) established a “zero tolerance” policy for *Listeria monocytogenes* in RTE meat products. Therefore, it is important to prevent the contamination of RTE meat products with this foodborne pathogen. A possible solution to this problem is the use of probiotics, live microorganisms that when administered in adequate amounts confer beneficial health effects to the host. This study aimed to examine the effectiveness of three bacteriocin-producing probiotic strains to prevent the growth of *L. monocytogenes* in natural and cured hams.

Introduction

Listeria monocytogenes is a human foodborne pathogen and the causing agent of a disease known as listeriosis. The vulnerable populations are immune compromised individuals, elderly adults, pregnant women, and neonates. Ready-to-eat meat products can become contaminated with *L. monocytogenes* due to the food contaminated with the pathogen. Cured and non-cured RTE cooked meats are a major safety concern because of their long shelf-life, additionally they are consumed without heating. *L. monocytogenes* can proliferate to a threatening level during refrigerated storage because of its ability to grow on the presence of curing salt. Among the interventions used to mitigate *L. monocytogenes* are thermal processing, addition of antimicrobial agents, spraying of essential oils, and irradiation. Probiotics could be used as a natural intervention to mitigate this human foodborne pathogen.

Methods

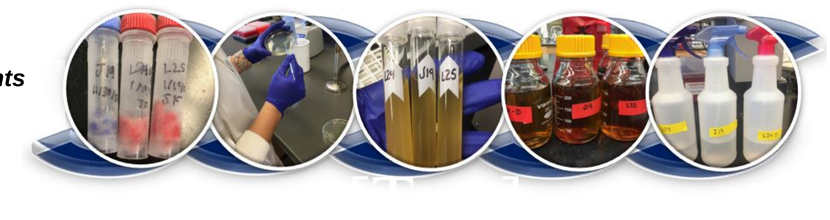


Methods

A total of 58 samples were evaluated to determine the antimicrobial potential of three different Lactic Acid Bacteria (LAB) strains (J19, L24-B and L25).

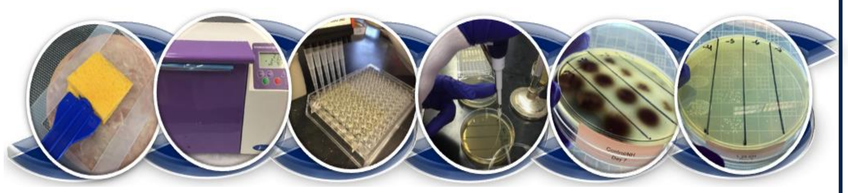
***L. monocytogenes* inoculum preparation**

Probiotic Treatments Preparation



***L. monocytogenes* inoculation on hams and Probiotic Spraying**

Bacterial enumeration



Results

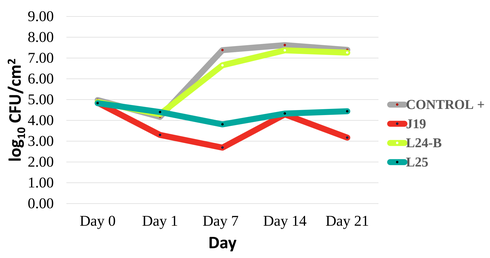


Figure 1: Reduction of *L. monocytogenes* in Cured Ham

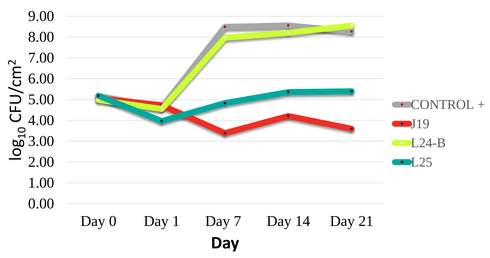


Figure 2: Reduction of *L. monocytogenes* in Natural Ham

Results

From the 3 probiotics examined *Enterococcus faecium* J19 produced the most significant results in both hams until the enumeration of day 21.

Reduction of *Listeria monocytogenes* in Cured Ham

		Probiotics Strains					
		J19		L24-B		L25	
DAY	REPETITION	Reduction log10 CFU/cm2	P value	Reduction log10 CFU/cm2	P value	Reduction log10 CFU/cm2	P value
Day 0	REP 1	-0.29		4.57		-0.69	
	REP 2	-0.12	0.241	0.09	0.190	0.00	0.196
	REP 3	0.13		0.10		0.15	
Day 1	REP 1	0.45		0.15		-0.06	
	REP 2	1.51	0.050	0.20	0.416	-0.23	0.333
	REP 3	0.87		-0.13		-0.23	
Day 7	REP 1	0.54		-0.25		0.29	
	REP 2	5.55	0.017	2.37	0.172	3.18	0.039
	REP 3	4.69		0.73		3.57	
Day 14	REP 1	1.71		0.06		0.81	
	REP 2	4.69	0.006	1.99	0.149	2.7	0.007
	REP 3	3.33		0.25		3.29	
Day 21	REP 1	2.42		1.05		1.63	
	REP 2	1.38	0.035	0.46	0.363	-0.52	0.126
	REP 3	4.22		0.13		2.95	

Figure 3: Reduction of *L. monocytogenes* in Cured Ham

In samples of cured ham, J19 reduced *L. monocytogenes* by 4.22 $\log_{10}$ CFU/cm^2

Reduction of *Listeria monocytogenes* in Natural Ham

		Probiotics Strains					
		J19		L24-B		L25	
DAY	REPETITION	Reduction log10 CFU/cm2	P value	Reduction log10 CFU/cm2	P value	Reduction log10 CFU/cm2	P value
Day 0	REP 1	-0.04		-0.16		0.27	
	REP 2	0.12	0.365	-0.41	0.196	0.03	0.333
	REP 3	0.11		0.19		-0.01	
Day 1	REP 1	0.77		0.77		0.12	
	REP 2	2.58	0.073	0.66	0.257	1.14	0.194
	REP 3	-0.11		0.07		0.65	
Day 7	REP 1	1.18		0.09		0.22	
	REP 2	5.26	0.010	1.55	0.102	3.04	0.025
	REP 3	5.10		0.52		3.66	
Day 14	REP 1	3.06		0.39		1.54	
	REP 2	4.72	0.006	1.25	0.202	1.44	0.030
	REP 3	4.35		0.36		3.20	
Day 21	REP 1	2.25		0.14		3.22	
	REP 2	3.02	0.004	1.08	0.263	2.52	0.00005
	REP 3	4.67		-0.28		2.87	

Figure 4: Reduction of *L. monocytogenes* in Natural Ham

In samples of natural ham, J19 had a reduction of 4.67 $\log_{10}$ CFU/cm^2.

Conclusion

- From the treatments used in this study, J19 and L25 were effective at reducing *L. monocytogenes* on broth types of ham.
- Higher pathogen reduction was achieved on samples of cured ham.
- On samples of natural ham, the pathogen has a increased growth compared to samples from cured ham this could due to the absence of antimicrobial agents as part of the ingredients (nitrites, diacetates, lactates, propionates, acetates and citrates)
- The results of this study showed that these new potential probiotics strains could be used as an intervention to reduce *L. monocytogenes* on RTE meat products.
- Further characterization is required to determine genomic specificities of these bacterial strains.

ICFIE