

Expression of antimicrobial activity in food and clinical *Listeria monocytogenes* isolates

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Introduction

Listeria monocytogenes is an important foodborne pathogen responsible for cases and outbreaks of listeriosis associated with a variety of food products (Farber and Peterkin, 1991; Arslan and Özdemir, 2008). This pathogen can be transmitted by several foods, especially lightly processed ready-to-eat foods.

The excessive use of antimicrobials in both animals and humans can lead to the emergence of resistance patterns (Philips et al., 2004).

The aim of this study was to characterize food and clinical *L. monocytogenes* isolates in terms of antimicrobial sensitivity. Thus, minimum inhibitory concentrations (MIC's) of ampicillin, penicillin G, chloramphenicol, erythromycin, tetracycline and vancomycin were assessed for 370 food and 118 clinical *L. monocytogenes* isolates.

Material and Methods

The minimum inhibitory concentration (MIC, µg/ml) for all isolates was determined by the agar microdilution method (CLSI, 2007). The quality control strain used was *Escherichia coli* ATCC 25922. Each experiment was performed in duplicate.

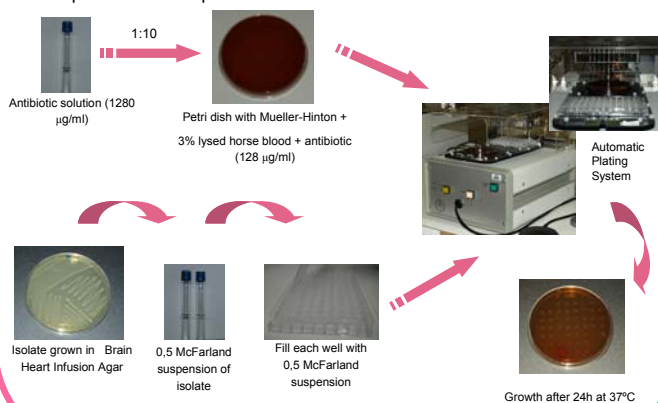


Figure 1. Schematic presentation of antibiotic resistance test procedure.

References

- Arslan, S., Ozdemir, F., 2008. Prevalence and antimicrobial resistance of *Listeria* spp. in homemade white cheese. *Food Control* **19**: 360–363.
- Charpentier, E., Courvalin, P., 1999. Antibiotic resistance in *Listeria* spp. *Antimicrobial Agents and Chemotherapy* **43**: 2103–2108.
- Clinical and Laboratory Standards Institute (CLSI), 2007. Performance Standards for Antimicrobial Susceptibility Tests; Approved Standard — V 27, No 1 (M100-S17). Clinical and Laboratory Standards Institute, Wayne, PA.
- Farber, J. M., Peterkin, P. I., 1991. *Listeria monocytogenes*, a foodborne pathogen. *Microbiological Reviews* **55**: 476–511.
- Phillips, I., Casewell, M., Cox, T., De Groot, B., Friis, C., Jones, R., Nightingale, C., Preston, R., Waddell, J., 2004. Does the use of antibiotics in food animals pose a risk to human health? A critical review of published data. *Journal of Antimicrobial Chemotherapy* **23**: 28–52.

Results and Discussion

Table 1. Distribution of *in vitro* MIC values of several antibiotics to food *L. monocytogenes* isolates

	Number of isolates with antibiotic MICs (µg/mL) of:															
	0,015	0,031	0,063	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512
Penicillin	1			21	242	102	2	2								
Ampicillin		1	1	25	209	132	2									
Erythromycin		1		22	306	16	13		2	1						9
Vancomycin				1	2	47	320									
Chloramphenicol									14	356						
Tetracycline					2	30	38	265	33				1			1

Table 2. Distribution of *in vitro* MIC values of several antibiotics to clinical *L. monocytogenes* isolates

	Number of isolates with antibiotic MICs (µg/mL) of:															
	0,015	0,031	0,063	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512
Penicillin				28	35	21	10	1								
Ampicillin				8	66	21										
Erythromycin				7	80	8										
Vancomycin							48	40	7							
Chloramphenicol									6	89						
Tetracycline						3	29	63								

All the clinical isolates were susceptible to all the antibiotics tested. Amongst food isolates, although the majority of the isolates in this study were susceptible, 0.5% of strains were resistant to tetracycline (MIC ≥ 16 µg/mL), and 4.1% and 2.7% were intermediary (MIC between 1-4 µg/mL) and resistant (MIC ≥ 8 µg/mL), respectively, to erythromycin.

Only 2 isolates demonstrated a resistance profile to tetracycline, an antibiotic largely used in veterinary practice, but the resistance of 10 isolates to erythromycin is a reason for concern, since erythromycin is used to treat pregnant women diagnosed with listeriosis or as a second choice drug in cases of ampicillin allergy (Charpentier and Courvalin, 1999).

It is significant to note that the isolates that were resistant belonged to dairy products (1 tetracycline resistant and 1 erythromycin resistant) and fermented meat products. These products are important vehicles of *L. monocytogenes* transmission, which can acquire, or transfer, antibiotic resistance genes between other bacteria in the intestinal tract.

Although *in vitro* antibiotic susceptibility testing does not always reflect the *in vivo* situation, results demonstrated that some of the isolates investigated are resistant to antibiotics of clinical importance, commonly used to treat listeriosis.

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