

Ecological interaction in bi-species biofilms of *Listeria monocytogenes* with a dominant microbiota in the meat industry

Objectives:

- Observe the ecological relationship that exists between *L. monocytogenes* with the dominant residential microbiota established in bi-species biofilms.
- Observe the influence of time on the generation of these structures.
- Understand how they behave to find an effective way to eliminate them in the food industry.

Conclusions:

- *P. fluorescens* and *P. fragi* have been shown not to influence the growth of *L. monocytogenes*. In contrast, *Bacillus* spp., *B. megaterium* and *C. zeylanoides* inhibit the growth of the pathogen to different degrees, achieving a final reduction in the number of adhered cells,
- The influence that both the time and the washing and renewal of nutrients have on the bi-species biofilms formed has also been observed. In all cases *L. monocytogenes* tends to slow down or stagnate over time.
- The use of non-effective biocides against certain species or their surface implantation should be evaluated to select the residential microbiota in industry.

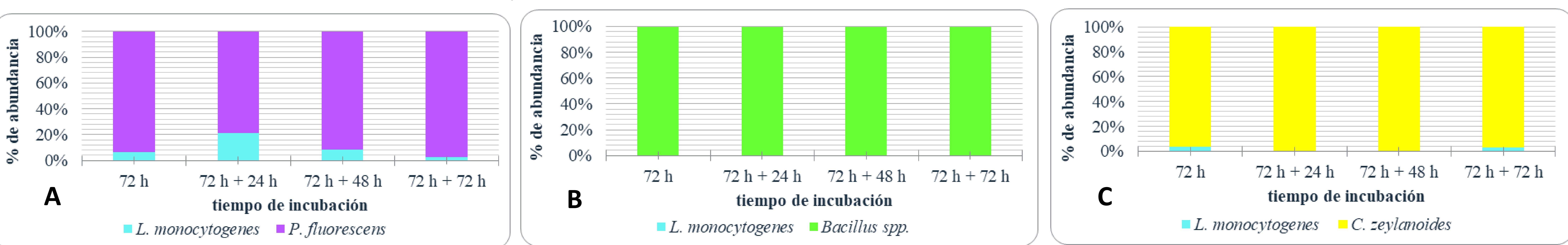
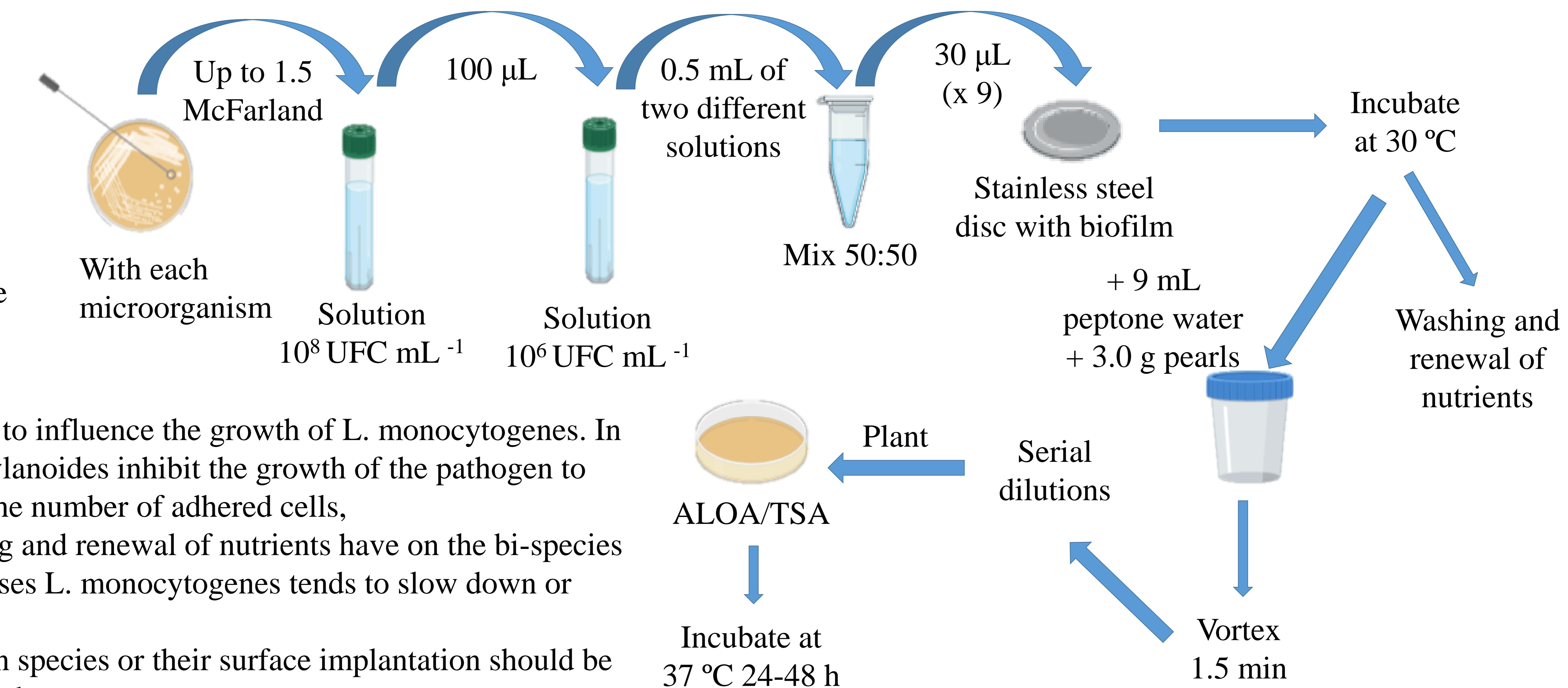


Figure 1. Comparison in % of the growth of *L. monocytogenes* in the 4 times studied (72 h, 72 h + 24 h, 72 h + 48 h, 72 h + 72 h) with (A) *P. fluorescens*, (B) *Bacillus* spp. and (C) *C. zeylanoides*

Table 1. Count of *L. monocytogenes* in control (A) and in biofilm with *P. fluorescens*, with *P. fragi*, with *Bacillus* spp., with *B. megaterium* and with *C. zeylanoides* in the times studied. Values in a row that lack a common lowercase superscript differ significantly ($P < 0.05$). Values in a column that lack a common uppercase superscript differ significantly ($P < 0.05$)

Tiempo de incubación (h)	<i>L. monocytogenes</i>	<i>L. monocytogenes</i> + <i>P. fluorescens</i>	<i>L. monocytogenes</i> + <i>P. fragi</i>	<i>L. monocytogenes</i> + <i>Bacillus</i> spp.	<i>L. monocytogenes</i> + <i>B. megaterium</i>	<i>L. monocytogenes</i> + <i>C. zeylanoides</i>
72	5,42 ± 0,13 ^{AA}	5,79 ± 0,2 ^{AA}	5,08 ± 0,31 ^{AA}	1,69 ± 0,38 ^{AB}	3,5 ± 0,27 ^{AC}	4,01 ± 0,33 ^{AC}
72 + 24	4,84 ± 0,27 ^{AA}	5,52 ± 0,22 ^{AA}	4,68 ± 0,22 ^{AA}	0,63 ± 0,17 ^{BB}	3,49 ± 0,3 ^{AC}	2,97 ± 0,35 ^{AC}
72 + 48	5,34 ± 0,24 ^{AA}	5,34 ± 0,24 ^{AA}	5,12 ± 0,35 ^{AA}	1,5 ± 0,24 ^{AB}	3,55 ± 0,33 ^{AC}	3,69 ± 0,34 ^{AC}
72 + 72	5,36 ± 0,34 ^{AA}	4,99 ± 0,33 ^{BA}	5,17 ± 0,27 ^{AA}	1,95 ± 0,52 ^{AB}	3,5 ± 0,39 ^{AC}	2,82 ± 0,56 ^{BC}