Context Matters: Environmental Microbiota of Ice Cream Processing Facilities Affects the Inhibitory Performance of Two Lactic Acid Bacteria Against *Listeria monocytogenes*

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Rationale

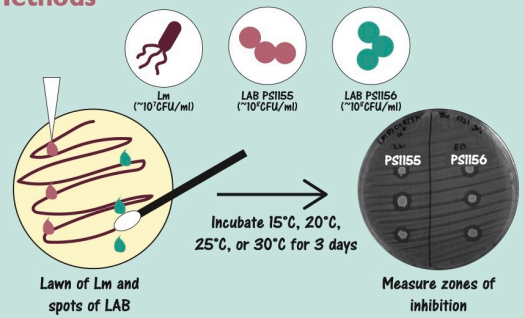
Listeria monocytogenes (Lm) may transfer ice cream products through cross-contamination in processing facilities [1].

Some lactic acid bacteria (LAB) can inhibit Lm and have been used to complement cleaning and sanitizing procedures of food processing facilities [2].

The presence resident environmental microbiota in food processing facilities may affect the inhibitory performance of LAB against Lm [3].

Can two LAB strains inhibit Lm strains isolated from dairy processing facilities?

Methods



Results

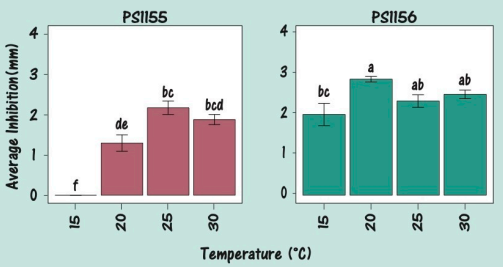
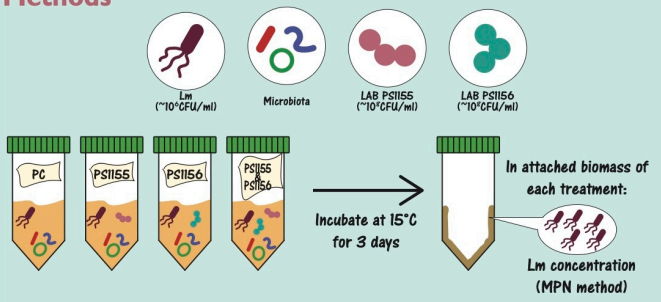


Fig. 1. Methods. Lawns of Lm were streaked onto BHI agar plates followed by spot innoculation of LAB strains PS1155 and PS1156. Plates were incubated for at 15, 20, 25, or 30 °C for 3 days. Zones of inhibition were measured after incubation. **Results.** Average inhibition of LAB strains PS1155 and PS1156 at different temperatures.

Can two LAB strains inhibit Lm when co-cultured with microbiota from three ice cream processing facilities?

Methods



Results

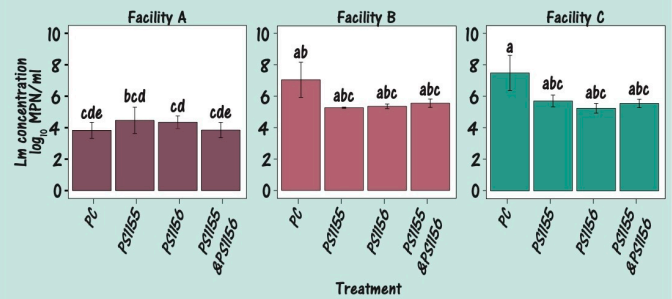
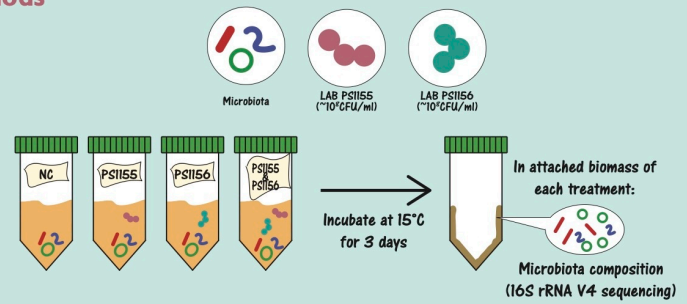


Fig. 2. Methods. Environmental microbiota collected from three ice cream processing facilities (A, B, C) was co-cultured with an 8-strain Lm cocktail and PS1155, PS1156, or both PS1155 and PS1156 for 3 days at 15°C. After incubation, the media was removed and the amount of Lm present in the attached microbiota was quantified using the Most Probable Number (MPN) method. **Results.** Lm concentration in attached biomass for each treatment and each ice cream processing facility microbiota.

Can two LAB strains attach to an abiotic suface when co-cultured with microbiota from three ice cream processing facilities?

Methods



Results

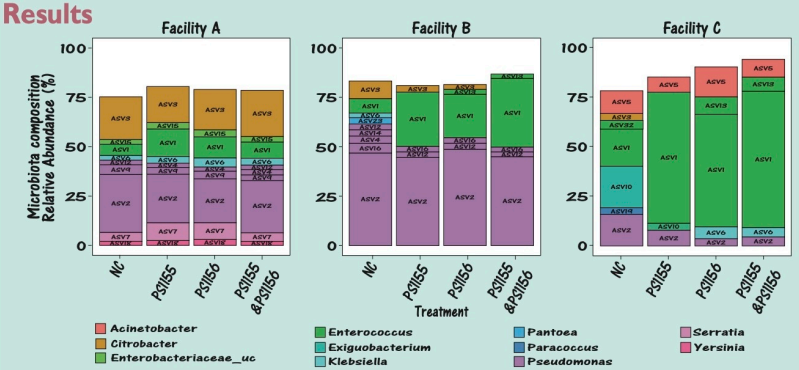


Fig. 3. Methods. Environmental microbiota collected from three ice cream processing facilities (A, B, C) was co-cultured with PS1155, PS1156, or both PS1155 and PS1156 for 3 days at 15°C. After incubation, the media was removed and the bacteria present in the attached biomass were characterized using the 16S rRNA V4 region amplicon sequencing. **Results.** Most abundant bacterial taxa in attached biomass for each treatment and each ice cream processing facility microbiota. ASV: Amplicon Sequence Variant; uc: unclassified

Conclusions

1) Inhibition of Lm by two LAB strains differed by temperature.
2) LAB did not significantly reduce Lm in attached biomass when co-cultured with the environmental microbiota of three ice cream processing facilities.
3) The microbiota composition of ice cream processing facilities affects the inhibitory action of the two LAB strains against Lm.

Future directions

1) Determine how some taxa may prevent attachment of LAB strains thus reducing inhibitory effect against Lm.
2) Test attachment of LAB strains to surfaces relevant to ice cream processing facilities.

Significance

The use of lactic acid bacteria to complement the sanitation of ice cream processing facilities to reduce the incidence of Lm needs to be validated with the natural microbiota of each facility to assure their efficacy.

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References: [1] Rietberg *et al.* (2016). Epid and Infect. 144(13):2728-2731; [2] Zhao *et al.* (2006). Appl Env Microb 72(5):3314-3320; [3] Sinclair *et al.* (in review) - mSphere