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Screening of lactic acid bacteria isolated from foods for interference with bacterial quorum sensing systems

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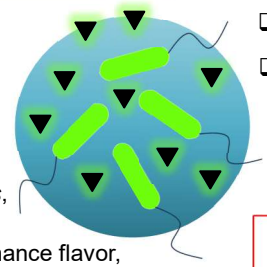
INTRODUCTION & STUDY'S AIM

- **Quorum sensing (QS)** is a cell-to-cell microbial communication system that regulates virulence, biofilm formation, antimicrobial resistance, and several other processes through signaling molecules called **autoinducers (AIs)**.

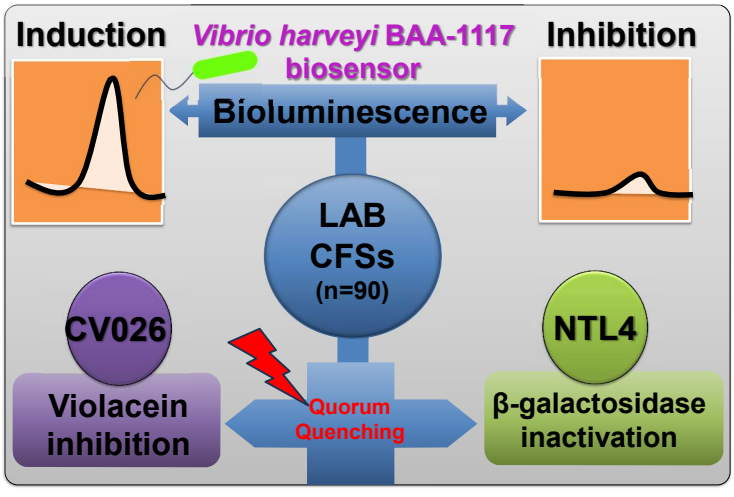


- **Lactic acid bacteria (LAB),** including *Lactococcus*, *Lactobacillus*, *Leuconostoc*, *Streptococcus*, and *Enterococcus*, are used in food fermentation to enhance flavor, nutritional value, and protect against harmful microflora.

❖ **This study investigated the potential of 90 foodborne LAB isolates of various genera to interfere with the QS system of bacterial pathogens.**

METHODS TO DETECT QS INTERFERENCE BY LAB

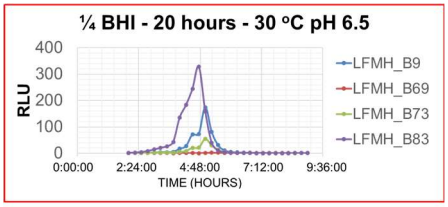
- Cell-Free Supernatants (CFSs) from 90 LAB isolates cultured for **20 hours** in **quarter-strength Brain Heart Infusion (BHI)** broth at **30°C** were collected, **pH-adjusted to 6.5,** and sterilized by filtration.
- The **anti-QS activity** of sterilized CFSs was initially screened using biosensor strains *Chromobacterium violaceum* 026 and *Agrobacterium tumefaciens* NTL4 (pZLR4) through an **agar well diffusion assay**, detecting inhibition of the QS system based on **acylated homoserine lactones (AHLs), the signaling molecules used by Gram-negative bacteria.**
- All the sterilized CFSs were also screened for interference with the **autoinducer 2 (AI-2) QS system**, used for interspecies communication **by both Gram-positive and Gram-negative bacteria**, using a **luminescence bioassay with the *Vibrio harveyi* BAA-1117 biosensor strain**.



RESULTS

❑ No Inhibition of AHL-based QS was detected.

❑ The optimal growth conditions for LAB (to collect their CFSs) were selected based on the best differentiation of four representative LAB strains in the bioluminescence assay. **Figure 1** shows the bioluminescence results for the selected growth conditions.



The RLU values indicate the level of AI-2 production for each LAB isolate.

Figure 1. The relative light units (**RLU**) of four representative LAB isolates—*Enterococcus faecium* (**B9**), *Lacticaseibacillus rhamnosus* (**B69**), *Enterococcus durans* (**B73**), *and Lactococcus lactis* (**B83**)—grown in quarter-strength BHI broth for 20 hours at 30°C.

❑ **62% of LAB isolates (47% + 15%) could produce their own AI-2 molecules** (relative AI-2-like activity), while the remaining **38% were unable to induce bioluminescence in *V. harveyi* system** (**Figure 2**).

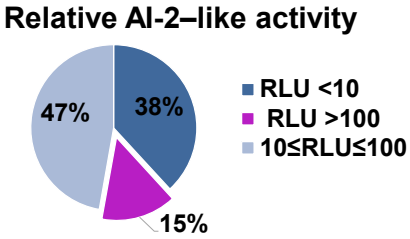


Figure 2. Pie chart showing the percentages of LAB isolates based on their ability to interfere with the AI-2 QS mechanisms.

❑ **Most of the LAB isolates that belonged to the 38% (that could not produce AI-2 signals) could inhibit AI-2-like activity (by at least 90%).**

CONCLUSIONS & FUTURE WORK

- **Most foodborne LAB isolates could interfere with the AI-2 interspecies communication system, by either producing their own signaling molecules or inhibiting AI-2-like activity.**
- **In the next steps, the most representative of those LAB isolates will be investigated for possible inhibition of biofilm formation by some important foodborne bacterial pathogens.**

AKNOWLEDGMENTS

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