

Listeria monocytogenes Colonization of Sprouts

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INTRODUCTION

Listeria monocytogenes is a food-borne pathogen that infects humans and animals, and is characterized by high fatality rates. In nature, *L. monocytogenes* is a saprophyte, living in soil, silage, and agricultural environments, including feces. Little is known of the physiology of the bacterium as it relates to plants. We undertook this study, using sprouts as a model system, to begin to understand the *Listeria*-plant interaction. Contamination of sprouts has resulted in product recalls. Several different types of sprouts were used to study *L. monocytogenes* interactions with different types of plants.

Sprout growth/attachment Assay

- Seeds were sanitized with 3% (30,000 ppm) Calcium Hypochlorite, a common and recommended procedure in the sprouting industry.
- Seeds were placed in a Petri dish in 20ml of sterile water for 4 hours at room temperature on a bench top shaker.
- Water was removed and replaced with an *L. monocytogenes* suspension at 10^4 cfu/ml for 1 hour.
- Inoculating suspension was removed and replaced with sterile water.
- The seeds were allowed to sprout at room temperature with daily changes (or not) of the irrigation water.
- Daily, seeds/sprouts were sampled, homogenized, and plated onto Modified Oxford Medium to enumerate the *L. monocytogenes* present.

FIGURE 1. Daily change of irrigation water affects the number of strain 10403 present on the sprouts. Shown here after 3 days.

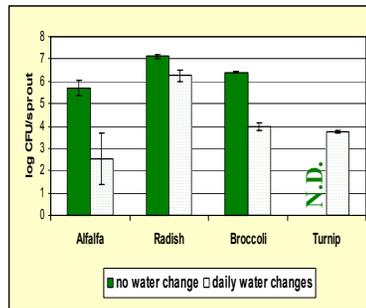
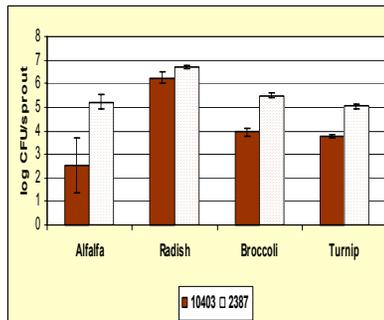
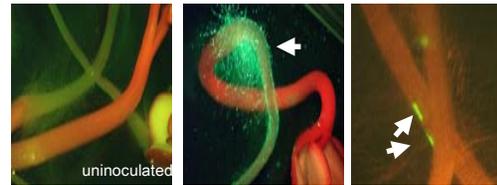


FIGURE 2. *L. monocytogenes* strain 2387 is a better colonizer of the different sprouts than strain 10403. Here with daily water changes. Shown here after 3 days.

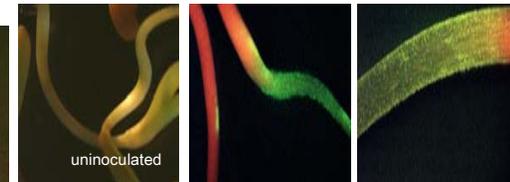


Photomicrographs of sprouts grown with GFP-*L. monocytogenes* (all size markers are 1 mm)

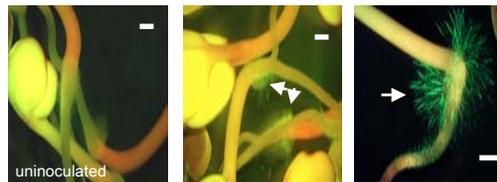
Radish – *L. monocytogenes* grows on root hairs and on primary root in microcolonies.



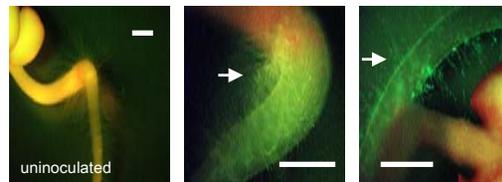
Alfalfa – *L. monocytogenes* peppers the root hairs along the primary root.



Broccoli – *L. monocytogenes* grows in root hair zone.



Turnip – *L. monocytogenes* grows in root hair zone.



CONCLUSIONS

- L. monocytogenes* grew on the sprouts in reproducible numbers and patterns.
- For alfalfa and broccoli, regular changing of the irrigation water led to less bacteria present on the sprouts possibly reflecting differences in attachment to those sprouts.
- L. monocytogenes* colonized radishes the best followed by broccoli, alfalfa, and then turnip.
- Strain 10403 colonized alfalfa poorly, but the other sprouts very well, indicating that *L. monocytogenes* may use different factors to colonize the different plants.
- Strain 2387 was a better colonizer than strain 10403.
- The bacteria targeted the roots of the plants for growth.
- For alfalfa, broccoli, and turnip sprouts, the root hairs were targeted for colonization. For radish, *L. monocytogenes* attached to the root hairs, but also formed microcolonies on the primary root and between the root hairs.