

# *Listeria monocytogenes* Growth and Survival on Peaches and Nectarines as Influenced by Stone Fruit Packinghouse Operation, Storage, and Transportation

## SUMMARY

A recent multi-state *Listeria monocytogenes* outbreak associated with peaches highlights the potential for stone fruits to serve as a vehicle in *Listeria* transmission. Further, the outbreak also demonstrated the pathogen's ability to persist and survive on stone fruits during handling, storage and transportation. While investigations on the persistence of *Listeria* have been performed on other produce, there is a general lack of knowledge on the behavior of pathogens associated with stone fruits. Therefore, this study will investigate the survival and growth of *Listeria* on peaches and nectarines under packinghouse environment, storage and transportation conditions. It is expected that results from this study will provide quantifiable data on the effect of current practices on *Listeria* survival on stone fruits. Furthermore, identification of food safety risks associated with different steps within the packinghouse continuum will help develop comprehensive preventive controls for foodborne pathogens including *Listeria*.

## OBJECTIVES

The overall objective of this proposal is to investigate the survival and growth of *Listeria monocytogenes* on yellow flesh peaches and nectarines as influenced by stone fruit post-harvest processing conditions. In order to simulate post-harvest handling of stone fruits, *Listeria* survival will be evaluated at different stages during processing, which includes:

1. Unloading and staging conditions at the stone fruit packing facility [temperature:18-20 or 28-30°C, RH:40-50%, length of storage (1 to 18 h)]
2. Fruit waxing and fungicide application at the stone fruit packing facility [(temperature:18-20 or 28-30°C, RH:40-50%, length of storage (1 to 6 h)]
3. Cooling, storage and transportation conditions at the packing facility [temperature:1-2°C, RH:85-95%, length of storage - 4 weeks]

## METHODS

**Determination of the effect of stone fruit unloading and staging conditions (18–20 or 28–30°C [ambient cool and warm season temperatures], 40–50% RH [ambient], 1–18 h storage) on the survival of *Listeria monocytogenes* on peaches and nectarines.**

Peaches and nectarines (n=2/condition/sampling time) were spot inoculated with a two-strain mix of *L. monocytogenes* to achieve a high (~5 log CFU/fruit) and low (~3 log CFU/fruit) inoculation level. The fruits were then set aside at room temperature for 24 h to allow for inoculum drying. A set of samples were collected following drying to enumerate the starting *Listeria* load on the fruits. After drying, peaches were held at 18-20°C and 45±3% RH for 18 h to simulate stone fruit unloading and staging under ambient cool season conditions. Similarly, inoculated nectarines were held at 28-30°C and 45±3% RH for 18 h to simulate conditions encountered during the warm season. Fruits were sampled at 0, 2, 6, 12 and 18 h of storage, transferred to sterile stomacher bags containing 100 ml of buffered peptone water, and analyzed for surviving *Listeria* population by plating on modified Oxford agar.



**CONTACT** Mary Anne Amalaradjou  
Department of Animal Science,  
University of Connecticut  
U4040, 3636 Horsebarn Road Extn,  
Storrs, CT 06269  
860-486-6620  
mary\_anne.amalaradjou@uconn.edu

**AUTHOR** Mary Anne Amalaradjou

## RESULTS TO DATE

**Survival of *Listeria* on peaches under stone fruit unloading and staging conditions (Temp:18-20°C, RH:40-50%, storage time – 18 h; Figure 1).**

- Exposure to commercial stone fruit unloading and staging conditions (18-20°C, 45±3% RH) did not result in a significant reduction in *Listeria* populations at both inoculation levels ( $P > 0.05$ ).
- Approximately 4.5 and 3.1 log CFU/fruit was recovered throughout the experimental period (1-18 h) under high and low inoculum levels, respectively.

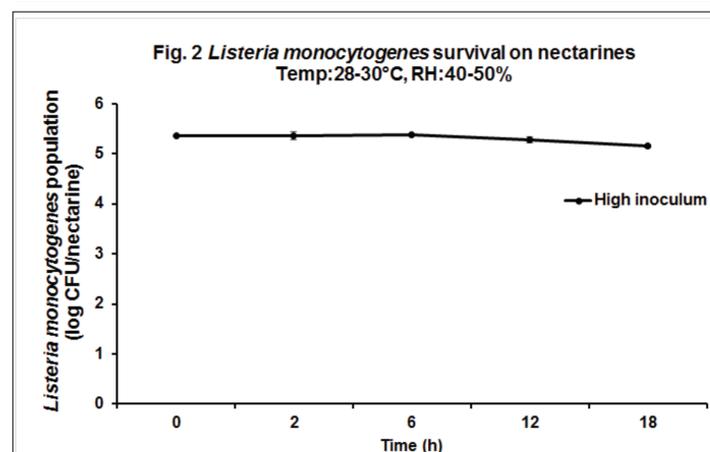
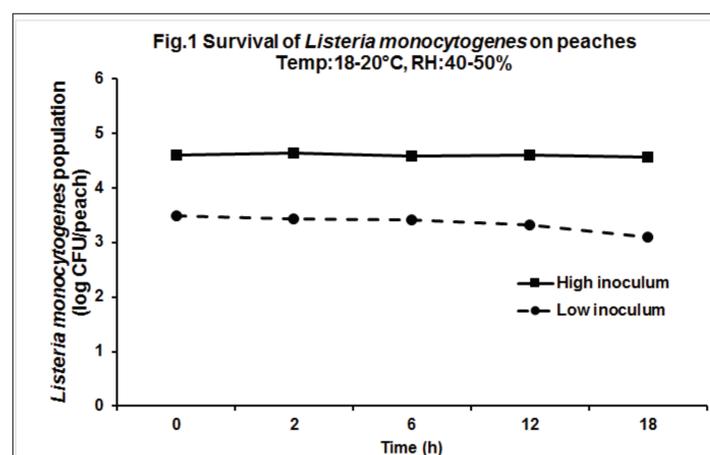
**Survival of *Listeria* on nectarines under stone fruit unloading and staging conditions (Temp:28-30°C, RH:40-50%, storage time – 18 h; Figure 2).**

- Storage of inoculated nectarines (high inoculum) under conditions simulating unloading and staging (28-30°C, 45±3% RH) did not result in a significant reduction in pathogen population ( $P > 0.05$ ).
- Approximately 5 log CFU/fruit was recovered until the end of study (18 h).

## BENEFITS TO THE INDUSTRY

Currently little information is available on the behavior of foodborne pathogenic bacteria associated with stone fruits. Therefore, there is a critical need to investigate the effect of different processing and storage conditions encountered during post-harvest stone fruit handling in order to develop preventive controls. Hence, in this project, we are undertaking a comprehensive and in-depth investigation on the effect of stone fruit packinghouse, cooling, storage and transportation conditions on *Listeria* survival and growth on peaches and nectarines. Through these objectives, the proposed research is expected to

- Provide quantifiable data on the ability of *Listeria* to persist (survival/growth) on stone fruits under current processing conditions.
- Identify variables within each processing step that enhance or inhibit *Listeria* survival and growth.
- Help develop targeted preventive controls and best management practices for post-harvest processing of stone fruits.



## ACKNOWLEDGEMENTS

Funding for this research was provided by the Center for Produce Safety and the California Department of Food and Agriculture (Specialty Crop Block Grant Program) under award number 2017CPS02. Graduate students involved in the project: Elza Neelima Mathew, Mohammed Shafeekh Muiyariikkandy, Deepa Kuttappan.

## LENGTH OF FUNDING

January 1, 2017 - December 31, 2017