

# **Affects of Apple Development and Damage on the Internalization of *Escherichia coli* O157:H7 as Observed Under Field and Laboratory Conditions**

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## **ABSTRACT**

The number of food borne illnesses associated with the consumption of fresh fruits and vegetables and their minimally processed products (juices) has increased over the past years. Of particular interest is the ability of microbial pathogens to internalize and survive in fresh produce that are commonly used for juices. This research project addresses the issue of the ability of *Escherichia coli* O157:H7 to internalize and survive in whole apples before and after harvest. Four cultivars of apples, Redfree, Red Delicious, Golden Delicious, and York, were inoculated under field conditions with a surrogate strain of *E. coli*, *Escherichia coli* ATCC 25922. The Redfree cultivar was inoculated at the beginning of its growth stage (day 0), and again 30 days later, and sampled for two weeks, until *E. coli* was not recoverable through microbiological methods after three successive sampling days.

Red Delicious, Golden Delicious, and York cultivars were spray inoculated with the surrogate strain two weeks before their anticipated harvest date and sampled every other day until *E. coli* was not recoverable for three successive sampling days. For each cultivar, the presence of *E. coli* ATCC 25922 was not detectable after 7 to 9 days. In the laboratory study the Red Delicious, Golden Delicious, Rome, and York cultivars received one of three treatments; unblemished control, bruising, or puncturing. The apples were inoculated by immersion in cold water containing *E. coli* O157:H7 GFP, incubated for three days then microbiologically analyzed for presence of the bacteria. In all cases, the punctured apples of each cultivar showed the greatest uptake of *E. coli* O157:H7 GFP. *Escherichia coli* O157:H7 GFP was visualized in flesh and core sections of untreated, bruised, and punctured apples of all cultivars. The microbe was found in between cells, but not within cells of the apple.

Internalization of *Escherichia coli* in whole apples on the tree is not likely, and leads to the conclusion that internalization is a post-harvest problem. Internalization may occur before pressing or processing of apples, leading to an increased risk of infection with *E. coli* for consumers of apple products that are not properly treated to destroy pathogens. Internalization does occur when apples are immersed in solutions containing the pathogen *Escherichia coli* O157:H7, and better post harvest controls need to be implemented in order to prevent this in whole apples that are used for cider and juice production.

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