

## PhageGuard E reduces *E. coli* on leafy green vegetables

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### Smart

PhageGuard E kills *E. coli* up to 99.9 %, outperforming chemical antimicrobial washes that consists of chlorine and hydrogen peroxide.

### Green

As the natural enemy of bacteria, phages specifically kill pathogens like Shiga toxin producing *E. coli* and leave the good ones intact. Organic phages do not require labeling and can be applied on organic foods.

### Easy

Easy to apply and no rinse required. PhageGuard E can be sprayed on whole heads or packaged cut green salads. It has no effect on taste, color or smell of the final product and as a processing aid it does not require labeling.

### Shiga toxin producing *Escherichia coli* on leafy greens

The nature of cultivation and consumption of fresh produce poses a great food safety challenge with respect to contamination with Shiga toxin-producing *Escherichia coli*. Despite the procedure of utilizing antimicrobial washes to minimize hazard risks, many recent Shiga toxin-producing *E. coli* O157 outbreaks and illnesses following the consumption of contaminated produce have occurred.

### Up to 99.9 % effectiveness without compromises

The fresh produce industry is looking for effective post-harvest and in-line interventions. PhageGuard E reduces *E. coli* O157 up to 99.9 % on leafy greens.

PhageGuard E, a two-phage cocktail concentrate, specifically kills *E. coli* O157. The two phages were isolated and selected from nature for their specificity and efficacy against a large database of *E. coli* O157 strains.

Phages are the natural enemy of bacteria. Unlike harsh chemical wash intervention, phages are completely harmless for fresh produce, personnel, equipment, water treatment installations and consumers. In addition, it kills *E. coli* O157 without affecting organoleptic properties such as taste, odor or texture of whole or cut salads.

All in all, this makes PhageGuard E a smart, green and easy to apply hurdle to further enhance food safety of leafy green vegetables.

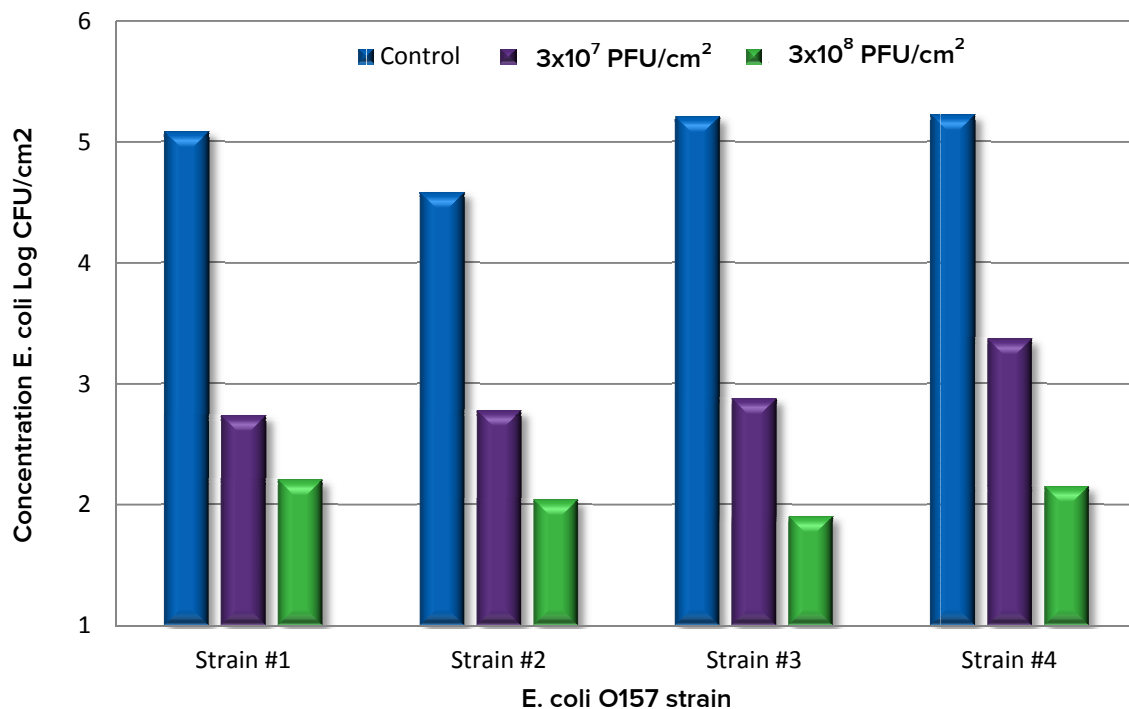
## How to use PhageGuard E

PhageGuard E is used as a post-harvest in-line spray or dip application. A PhageGuard E solution can be applied on whole heads after harvest or on cut salads in packaged boxes by using a conventional spray or electrostatic spray or by dipping. For successful phage applications the 3 D's of success are important:

- 🌿 **D**istribution – get full coverage of the surface area by spray-tumble or dip action and keep the surface wet to allow phage to encounter the bacteria for an instant kill
- 🌿 **D**osage – using the right amount of phage to assure adequate kill
- 🌿 **D**well or contact time - allow a minimum of 30 minutes before the next surface intervention (inactivating the phage) or chop (blow up the surface area). On wet surface are phage will remain effective for up to 24 hours.

## Effectiveness of PhageGuard E

To assess the effectiveness of PhageGuard E on leafy vegetables, romaine lettuce samples were contaminated with different *E. coli* O157 strains at a level of approximately  $1 \times 10^5$  CFU/cm<sup>2</sup>. Following contamination, the samples were treated with PhageGuard E dilutions to reach  $3 \times 10^7$  PFU/cm<sup>2</sup> or  $3 \times 10^8$  PFU/cm<sup>2</sup>, or alternatively with tap water (Control) to serve as a negative control. Samples were incubated for 24 hours at 4°C (39°F) before the *E. coli* O157 cells were retrieved and enumerated. Data is an average of three independent experiments with two samples per treatment.



**Figure 1. PhageGuard E reduces *E. coli* O157 on Romaine lettuce**

This research demonstrates PhageGuard E is equally effective on all four *E. coli* O157 strains. More phages result in a higher reduction of *E. coli* O157 on leafy vegetables, showing reductions up to 3-log or 99.9%.

## USDA & FDA approved

PhageGuard E is USDA and FDA approved. FSIS has completed its evaluation and has no objection to the use of the *E. coli* O157 bacteriophage preparation as an antimicrobial spray, mist, or wash application (or a mix of these application methods) on beef to control *E. coli* O157. No labeling statement is required when used under the accepted conditions of use. The approval for the use PhageGuard E on vegetables is pending.



### Conclusions



[www.PhageGuard.com](http://www.PhageGuard.com)

- PhageGuard E is a natural and effective antimicrobial against *E. coli* O157 on leafy vegetables, reducing the *E. coli* O157 up to 3-log.
- PhageGuard E kills *E. coli* up to 99.9 %, outperforming chemical antimicrobial washes consisting of chlorine and hydrogen peroxide.

**For more information regarding this application data sheet please use the following contact information.**

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