

Efficacy of Different Powder Floor Guard Against *E. coli* O157:H7 and *Listeria Monocytogenes*

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Purpose

To determine the efficacy of four different powdered floor guards (antimicrobial) against *E. coli* O157:H7 and *Listeria monocytogenes*. [Table 1](#) lists the four different powdered floor guards used.

[Table 1](#): List of the four different floor guards used

Description
DBNPA
Sodium Dichloroisocyanurate
Floor Guard 2™
Quaternary Ammonium Compound Beads

Materials and Methods

The DBNPA powder formula contained 15% active DBNPA and 85% inert ingredients. The Sodium Dichloroisocyanurate powder formula also contained 15% active Sodium Dichloroisocyanurate and 85% inert ingredients. The Floor Guard 2™ >60% sodium Percarbonate as well as peracetic acid generating chemical to increase the efficacy. The Quaternary Ammonium Compound use was obtained from Zacky Farms LLC Stockton, CA. Six, 12 x 12 inch cardboard squares were wrapped with water tight plastic shrink wrap.

E. coli O157:H7

A solution of *E. coli* O157:H7 was grown in Criterion Nutrient Broth (Cat. No: C6471) at 35°C for 24 hours. The broth was centrifuged and liquid broth was decanted. The remaining bacterial pellet was then dissolved in 100mL of sterile buffered water. The six plastic wrapped squares were equally inoculated with the *E. coli* O157:H7 solution. The squares were allowed to dry for 45 minutes (See [Image 1](#)). There were two different controls used for this experiment. One of the control squares did not contain any powder and the other control square was treated with only the inert ingredients used in the DBNPA, Sodium Dichloroisocyanurate, and Floor Guard 2™ formulas. Each square was treated with 9 grams of each of the powdered floor guard which is equivalent to 2 pounds per 100 ft². The Quaternary Ammonium Compound beads were crushed

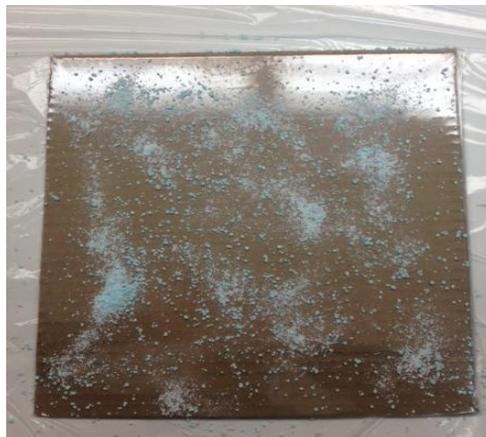
to mimic the change in the structural integrity caused from being walked on by employees throughout the day (See [Image 2](#)).

A total of 2.5 mL of Modesto City water was equally sprayed over each square which were then left to dry for 180 minutes. After, the squares were gently brushed to remove any remaining powder. A random 3 x 3 inch area on each square was swabbed using a sterile 3M Quick Swab (See [Image 2](#)). The swab was then transferred to a modified D/E Neutralizing broth to neutralize any remaining active antimicrobial. The broth was serially diluted and plated on 3M E. coli/Coliform Petrifilms®. The Petrifilms® were incubated at 35°C for 24 hours.

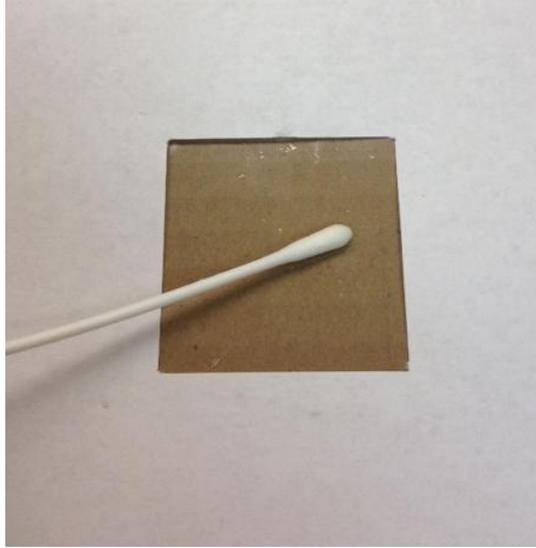
[Image 1](#) Shows the inoculated squares prior to treatment with the floor guard samples



[Image 2](#) shows the crushed Quaternary Ammonium Compound on the 12 x 12 inch square



[Image 3](#) Shows the 2 x 2 inch area that was swabbed.



Listeria monocytogenes

Listeria monocytogenes was grown in Criterion Listeria Enrichment Broth (Cat. No: C6031) at 35°C for 48 hours. The broth was then centrifuged and the liquid supernatant was decanted. The remaining bacterial pellet was dissolved in 100 mL of sterile buffered water. The six 12 x 12 inch plastic wrapped cardboard squares were equally inoculated with the *Listeria monocytogenes* solution and allowed to dry for 45 minutes. One of the control squares was left untreated and the other control square was treated with the inert ingredients present in the DBNPA and sodium dichloroisocyanurate formulas. The remaining four squares were treated with 9 grams of each of the floor guards. Each square was then sprayed with 2.5 mL of Modesto city water and were left for 180 minutes. The remaining powder was then gently brushed off. A random 2 x 2 inch area was swabbed using a sterile 3M Quick Swab (See [Image 3](#)). The swab was then placed in 1.0 mL of modified D/E neutralizing broth which is a broth that neutralizes a broad range of disinfectants. The broth was then serially diluted and plated on Criterion Oxford Listeria Agar plates. Listeria Agar plates were incubated at 35°C for 48 hours.

Results and Discussion

E. coli O157:H7 Results

Table 2 shows the average log₁₀ of *E. coli* O157:H7 remaining on the control and treated squares.

Description	log ₁₀ Remaining (CFU/in ²)	% Reduction
Control (untreated)	5.69	NA
Control Treated with Inert Ingredients	5.54	NA
DBNPA Formula	0	>99.999
Sodium Dichloroisocyanurate Formula	0	>99.999
Floor Guard 2™	0	>99.999
Quaternary Ammonium Compound	0	>99.999

The untreated control square had a log₁₀ of 5.69 CFU/in² *E. coli* O157H:7 remaining while the control square that was treat with the inert ingredients used in the DBNPA and Sodium Dichloroisocyanurate formula had a log₁₀ of 5.54 CFU/in² *E. coli* O157H:7. The squares treated with the DBNPA formula, Sodium Dichloroisocyanurate Formula, Floor Guard 2™, and Quaternary Ammonium Compound had zero remaining *E. coli* O157:H7 colonies remaining. Therefore, the data suggests that the DBNPA formula, Sodium Dichloroisocyanurate Formula, Floor Guard 2™ and Quaternary Ammonium Compound are effective as a floor guard against *E. coli* O157:H7 at an application rate of 2 lbs/100 ft².

Listeria monocytogenes results

Table 2 shows the log₁₀ of *Listeria monocytogenes* remaining on the control and treated squares

Description	Avg. log ₁₀ Remaining (CFU/in ²)	% Reduction
Control (untreated)	5.45	NA
Control Treated with Inert Ingredients	5.32	NA
DBNPA Formula	0	>99.999
Sodium Dichloroisocyanurate	0	>99.999
Floor Guard 2™	0	>99.999
Quaternary Ammonium Compound	0	>99.999

The untreated control square inoculated with *Listeria monocytogenes* had a log₁₀ of 5.45 CFU/in² remaining while the control square treated with inert ingredients had a log₁₀ of 5.32 CFU/in². The squares treated with the DBNPA formula, Sodium Dichloroisocyanurate Formula, Floor

Guard 2™, and Quaternary Ammonium Compound had zero remaining *Listeria monocytogenes* colonies. This data suggests that the DBNPA formula, Sodium Dichloroisocyanurate Formula, Floor Guard 2™, and Quaternary Ammonium Compound are effective as a floor guard against *Listeria monocytogenes* at an application rate of 2lbs/100ft².

Conclusions

- The results from this experiment showed that the DBNPA formula, Sodium Dichloroisocyanurate Formula, Floor Guard 2™, and Quaternary Ammonium Compound had a log₁₀ reduction >5.69 CFU/in² for *E. coli* O157:H7
- The results from this experiment showed that the DBNPA formula, Sodium Dichloroisocyanurate Formula, Floor Guard 2™, and Quaternary Ammonium Compound had a log₁₀ reduction >5.69 CFU/in² for *Listeria monocytogenes*.
- There are practical considerations when selecting a powdered floor guard. In instances where quat levels in effluent water need to be reduced, other floor guards such as the DBNPA formula, Sodium Dichloroisocyanurate formula, and Floor Guard 2™ are viable substitutes. If necessary, further analysis to determine the minimum amount of product that can be used to achieve the same or similar efficacy.