ABC Research Corporation Study

"The Effect of Various Applications of Two $Safe_2O$® Products on the Survival or Destruction of *Listeria monocytogenes* on Frankfurters During Storage at 40°F for up to 12 Weeks".

March 25, 2004

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A FOOD TESTING LABORATORY SINCE 1967

March 25, 2004

Dr. Maurice Kemp
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Dear Maurice,

Please find enclosed the revised report for the project entitled "The Effect of Various Applications of Two $Safe_2O$® Products on the Survival or Destruction of *Listeria monocytogenes* on Frankfurters During Storage at 40°F for up to 12 Weeks".

Please let me know if you have any questions or concerns. We at ABC Research appreciate this opportunity to do business with you and Mionix again.

Best Regards,

James E. (Ken) Kennedy, Ph.D.
Vice President, Research Microbiology

Enclosure:

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PROJECT REPORT
RESEARCH MICROBIOLOGY DEPARTMENT
ABC RESEARCH CORPORATION

DATE: March 25, 2004

PREPARED FOR: Mionix Corporation

CLIENT CONTACT: Dr. Maurice Kemp

TITLE: The Effect of Various Applications of Two $Safe_2O$® Products on the Survival or Destruction of *Listeria monocytogenes* on Frankfurters During Storage at 40°F for up to 12 Weeks.

OBJECTIVE: To evaluate the antimicrobial effect of $Safe_2O$® RTE -01 and $Safe_2O$® RTE -03 treatments on *Listeria monocytogenes* inoculated onto frankfurters (with and without Purasal Opti.Form™ additives) and subsequently stored at 40°F (4.4°C) for 12 weeks. The efficacy of the two $Safe_2O$® products combined with several different application procedures were evaluated.

EXPERIMENTAL APPROACH:

A. PRODUCT AND MATERIALS

Mionix provided the $Safe_2O$® chemistry, treatment equipment and treatment instructions as indicated. A commercial processor provided all required product (i.e., 16 oz.; eight to one franks) in the required condition as well as appropriate packaging materials for the test sample packages. Some product contained the antilisterial additive, Purasal Opti.Form™, and some did not contain this additive. The study also included frankfurters still in the casing as well as peeled finished product. ABC Research Corp. inoculated the samples and applied the treatments listed in the next section per the instructions of Mionix. The frankfurters were held at 24-28°F until starting the study.

B. PRODUCT TREATMENTS

1. a) $Safe_2O$® RTE -01 chemistry was applied to franks still in the casing via a "drench" technique. The $Safe_2O$® RTE -01 was applied as a drench (i.e., a shower-like dense spray) to the hotdogs for 15 sec. as they were rolled in a tray with a perforated bottom (to allow drainage). The product was introduced to the drench system at 24-28°F to simulate product temperatures under normal processing conditions and the $Safe_2O$® RTE -01 solution was at 35-45°F.
   b) After allowing the samples to drip for 15 sec., they were peeled and then inoculated with a *L. monocytogenes* cocktail inoculum as specified in Section C (below), vacuumed packaged (2 franks per package), stored at 40°F and analyzed over 12 weeks of storage. Additionally, a set of non-inoculated franks was likewise prepared to characterize development of psychrotrophic aerobic plate counts and lactic acid bacteria counts.

2. a) $Safe_2O$® RTE -01 chemistry was applied to franks (in the casing) containing Purasal Opti.Form still in the casing via the "drench" technique described previously (see Treatment 1a, above).
   b) See Treatment 1b (above).

3. a) $Safe_2O$® RTE -01 was applied to franks (in the casing) via the "drench" technique previously described (see Treatment 1a, above).
   b) After allowing the samples to drip for 15 sec., they were then peeled and treated a second time with $Safe_2O$® RTE -01 via a "spray system" at 35-45^{o}F. The time of spray application was 10 seconds. The rate of spray application was 40-50 ml/10 sec. using a Spray Systems Co., UniJet TG-SS2 nozzle spray tip connected to a pump with variable pressure control. The hotdogs were rolled in a tray (with a perforated bottom) under a spray nozzle (45 psi, at a distance of 11 in.) that provided complete coverage of the tray.
   c) After allowing the samples to dry for 15 sec., they were inoculated with a *L. monocytogenes* cocktail as specified below, vacuumed packaged (2 franks per package), stored at 40°F and analyzed over 12 weeks of storage. A set of non-inoculated franks was also prepared as described previously.

4. a) $Safe_2O$® RTE -01 chemistry was applied to franks (in the casing) containing Purasal Opti.Form still in the casing via the "drench" technique described previously (see Treatment 1a, above).
   b) See Treatment 3b (above).
   c) See Treatment 3c (above).

5. a) $Safe_2O$® RTE -01 was applied to franks (in the casing) via the "drench" technique previously described (see Treatment 1a, above).
   b) After allowing the samples to drip for 15 sec., they were then peeled and inoculated with a *L. monocytogenes* cocktail as specified below. After inoculation, the frank samples were held at 40°F for ca. 30 min. to dry and to allow bacterial attachment before being further treated.

c) After inoculation and drying, samples were then treated a second time with $Safe_2O$® RTE -01 via a "spray system" as previously described (Section 3b, above). After allowing the samples to drip for 15 sec., they were vacuumed packaged (2 franks per package), stored at 40°F and analyzed over 12 weeks of storage. A set of non-inoculated franks was also prepared as described previously.

6. a) $Safe_2O$® RTE -01 chemistry was applied to franks (in the casing) containing Purasal Opti.Form still in the casing via the "drench" technique described previously (see Treatment 1a).
   b) See Treatment 5b (above).
   c) See Treatment 5c (above).

7. a) Peeled franks were inoculated with a *L. monocytogenes* cocktail as specified below and held at 40°F for ca. 30 min.
   b) $Safe_2O$® RTE -01 was applied to peeled franks via a "dip tray" technique where the franks were completely immersed and rolled in a tray of $Safe_2O$® RTE -01 for 30 sec. at a temperature of 40^oF. The peeled product was introduced to the "dip tray" system at 24-28°F. After the dip, samples were allowed to drip for 15 sec. and then vacuumed packaged (2 franks per package), stored at 40°F and analyzed over 12 weeks of storage. A set of non-inoculated franks was also prepared as described previously.

8. a) Peeled franks containing Purasal Opti.Form were inoculated with a *L. monocytogenes* cocktail as specified below and held at 40°F for ca. 30 min.
   b) See Treatment 7b (above).

9. a) Peeled franks were inoculated with a *L. monocytogenes* cocktail as specified below and held at 40°F for ca. 30 min.
   b) $Safe_2O$® RTE -01 was applied to peeled franks via a "dip tray" technique as described previously (see Treatment 7b, above) except the dip time was 15 sec. at 100^oF.

10. a) Peeled franks containing Purasal Opti.Form were inoculated with a *L. monocytogenes* cocktail as specified below and held at 40°F for ca. 30 min. as described previously (see Treatment 9a, above).
    b) See Treatment 9b (above).

11. a) Peeled franks were inoculated with a *L. monocytogenes* cocktail as specified below and held at 40°F for ca. 30 min.
    b) $Safe_2O$® RTE -01 was applied to peeled franks via a "dip tray" technique as described previously (see Treatment 7b, above) except the dip time was 30 sec. at 100^oF.

12. a) Peeled franks containing Purasal Opti.Form were inoculated with a *L. monocytogenes* cocktail as specified below and held at 40°F for ca. 30 min.
    b) See Treatment 11b (above).

13. a) $Safe_2O$® RTE -01 was applied to peeled franks via a "dip tray" technique as described previously (see Treatment 7b, above) except the dip time was 30 sec. at 40°F.
    b) After allowing the franks to drip/dry for 15 sec., samples were inoculated with a *L. monocytogenes* cocktail as specified below.
    c) After inoculation, $Safe_2O$® RTE -01 was applied via a "spray system" at 35-45°F as described previously (see Treatment 3b, above).

14. a) $Safe_2O$® RTE -01 was applied to peeled franks containing Purasal Opti.Form via a "dip tray" technique as described previously except the dip time was 30 sec. at 40°F (see Treatment 13a, above).
    b) See Treatment 13b (above).
    c) See Treatment 13c (above).

15. a) $Safe_2O$® RTE -01 was applied to peeled franks via a "dip tray" technique as described previously (see Treatment 7b, above) with a dip time of 30 sec. at 40°F.
    b) After allowing the samples to dry for 15 sec., samples were inoculated with a *L. monocytogenes* cocktail as specified below, vacuumed packaged (2 franks per package), stored at 40°F and analyzed over 12 weeks of storage. A set of non-inoculated franks was also prepared as described previously.

16. a) $Safe_2O$® RTE -01 was applied to peeled franks containing Purasal Opti.Form via a "dip tray" technique as described previously (see Treatment 15a, above).
    b) See Treatment 15b (above).

17. a) $Safe_2O$® RTE -01 was applied to peeled franks via a "dip tray" technique as described previously (see Treatment 7b, above) with a dip time of 15 sec. at 100°F.
    b) See Treatment 15b (above).

18. a) $Safe_2O$® RTE -01 was applied to peeled franks containing Purasal Opti.Form via a "dip tray" technique as described previously (see Treatment 17a, above).
    b) See Treatment 15b (above).

19. a) $Safe_2O$® RTE -01 was applied to peeled franks via a "dip tray" technique as described previously (see Treatment 7b, above) with a dip time of 30 sec. at 100°F.
    b) See Treatment 15b (above).

20. a) $Safe_2O$® RTE -01 was applied to peeled franks containing Purasal Opti.Form via a "dip tray" technique as described previously (see Treatment 19a, above).
    b) See Treatment 15b (above).

21. a) Peeled franks were inoculated with a *L. monocytogenes* cocktail as specified below and held at 40°F for ca. 30 min. to dry as previously described.
    b) $Safe_2O$® RTE -03 was applied to peeled franks via a "dip tray" technique as previously described (see Treatment 7b, above) with a dip time of 15 sec. at 40°F.

22. a) Peeled franks containing Purasal Opti.Form were inoculated with a *L. monocytogenes* cocktail as specified below and held at 40°F for ca. 30 min. as described previously.
    b) See Treatment 21b (above).

23. a) Peeled franks were inoculated with a *L. monocytogenes* cocktail as specified below and held at 40°F for ca. 30 min. as described previously.
    b) $Safe_2O$® RTE -03 was applied to peeled franks via a "dip tray" technique as described previously (see Treatment 7b, above) with a dip time of 30 sec. at 40^oF.

24. a) Peeled franks containing Purasal Opti.Form were inoculated with a *L. monocytogenes* cocktail as specified below and held at 40°F for ca. 30 min. as previously described.
    b) See Treatment 23b (above).

Control samples were prepared and treated as follows:

1. Control-1: Peeled franks containing no Purasal Opti.Form were inoculated with a *L. monocytogenes* cocktail, vacuumed packaged (2 franks per package), stored at 40°F and analyzed over 12 weeks of storage. A set of non-inoculated franks was also prepared as described previously.

2. Control-2: Peeled franks containing Purasal Opti.Form were inoculated with a *L. monocytogenes* cocktail and prepared as described previously (see Control #1, above).

3. Control-5/13: Peeled franks were inoculated with a *L. monocytogenes* cocktail, held at 40°F for ca. 30 min. and then "spray" treated per Treatments #5 and #13 with distilled water rather than Mionix chemistry. Samples were then vacuumed packaged (2 franks per package), stored at 40°F and analyzed over 12 weeks of storage. A set of non-inoculated franks was also prepared as described previously.

4. Control-6/14: Peeled franks containing Purasal Opti.Form were inoculated with a *L. monocytogenes* cocktail, held at 40°F for ca. 30 min. and "spray" treated as described per Control #5/13 and Treatments #6 and #14.

5. Control-21: Peeled franks were inoculated with a *L. monocytogenes* cocktail, held at 40°F for ca. 30 min. and treated via the "dip tray" technique with distilled water rather than Mionix chemistry per Treatment #21. Samples were then vacuumed packaged (2 franks per package), stored at 40°F and analyzed over 12 weeks of storage. A set of non-inoculated franks was also prepared as described previously.

6. Control-22: Peeled franks containing Purasal Opti.Form were inoculated with a *L. monocytogenes* cocktail, held at 40°F for ca. 30 min. as described per Control #21 and Treatment #22.

7. Control-7/23: Peeled franks were inoculated with a *L. monocytogenes* cocktail, held at 40°F for ca. 30 min. and treated via the "dip tray" technique with distilled water rather than

Mionix chemistry per Treatments #7 and #23. Samples were then vacuumed packaged (2 franks per package), stored at 40°F and analyzed over 12 weeks of storage. A set of non-inoculated franks was also prepared as described previously.

8. Control-8/24 (applies to treatments #8 and #24): Peeled franks containing Purasal Opti.Form were inoculated with a *L. monocytogenes* cocktail, held at 40°F for ca. 30 min. and treated via the "dip tray" technique as described per Control #7/23 and Treatments #8 and 24.

9. Control-9: Peeled franks were inoculated with a *L. monocytogenes* cocktail, held at 40°F for ca. 30 min. and then treated via the "dip tray" technique with distilled water per Treatment #9. Samples were allowed to drip for 15 sec. and vacuumed packaged as described previously. A set of non-inoculated franks was also prepared.

10. Control-10: Peeled franks containing Purasal Opti.Form were inoculated with a *L. monocytogenes* cocktail, held at 40°F for ca. 30 min. and treated via the "dip tray" technique per Control #9 and Treatment #10.

11. Control-11: Peeled franks were inoculated with a *L. monocytogenes* cocktail, held at 40°F for ca. 30 min. and treated via the "dip tray" technique with distilled water per Treatment #11. Samples were allowed to drip for 15 sec. and vacuumed packaged as described previously. A set of non-inoculated franks was also prepared.

12. Control-12: Peeled franks containing Purasal Opti.Form were inoculated with a *L. monocytogenes* cocktail, held at 40°F for ca. 30 min. and treated via the "dip tray" technique per Control #11 and Treatment #12.

C. TEST MICROORGANISMS AND INOCULATION PROCEDURE

The following strains of *Listeria monocytogenes* were used to inoculate the frankfurters.

1. *Listeria monocytogenes* ATCC 19115 (Serotype 4B)
2. *Listeria monocytogenes* (Serotype ½a)
3. *Listeria monocytogenes* (Serotype ½b)
4. *Listeria monocytogenes* ATCC 7644 (Gibson)
5. *Listeria monocytogenes* ATCC 49594 (Scott A)

Each *L. monocytogenes* strain were individually propagated via at least two serial transfers in Trypticase Soy Broth with yeast extract (TSBYE) and incubated at 35°C for 24 h before the experiment. For each culture, bacterial cells were harvested by centrifugation at 10,000 x g for 10 min., washed twice with Butterfield's Phosphate Buffer (BPB) and resuspended in BPB. The different bacterial strains were combined utilizing equal volumes of each to prepare a cocktail with an approximate cell density of 1×10^8 CFU/ml for each strain. The final cocktail suspension was diluted in sterile BPB to obtain an inoculum with an approximate cell density of ca. 10^6 CFU/ml.

Individual peeled franks (treated or untreated) were placed in sterile trays and inoculated by adding 0.1 ml of the respective cocktail inoculum (ca. 10^6 CFU/ml) in 0.01 ml droplets across a surface area of ca. 10 cm^2 and then distributing it as a thin film over the surface. The inoculation technique was designed to obtain a target *L. monocytogenes* count of ca. 10^5 CFU per frank (i.e., ca. 2 x 10^5 per package). For inoculated franks to be subsequently treated, the franks were held at 40°F for ca. 30 min. before treating. For franks to be packaged with no treatment after inoculation and before packaging, the franks were not held at 40°F for 30 min. before packaging.

D. SAMPLE ANALYSES

Samples (test packages) were analyzed at Time-0 and after 24 h as well as after 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12 weeks of storage at 40°F.

Packages were aseptically opened and the contents (i.e., two hotdogs and any residual liquid) from each package placed in a sterile stomacher bag with 100 ml of Difco Neutralizing buffer. Samples were thoroughly shaken and massaged by hand for 1 minute and the rinsate serially diluted in BPB as required. *L. monocytogenes* was enumerated in inoculated samples via surface plating on MOX agar using the thin agar layer method (TAL) with Trypticase Soy Agar (TSA) developed by Kang and Fung (1999) to enhance recovery of sublethally injured bacterial cells. To increase the technique sensitivity for some samples, the samples were rinsed with 20 ml and enumerated using a MPN procedure (3-tube x 4 dilutions) with BAX-PCR analysis to derive the MPN count. Non-inoculated samples were assayed for psychrotrophic aerobic plate counts (APC, 5-7°C) using standard methods agar and for lactic acid bacteria counts (LAB) using LBS agar. All counts were expressed as CFU (colony forming units) or $\log_{10}$ CFU per sample package. Counts were transformed to $\log_{10}$ CFU/package. Averages and standard deviations of $\log_{10}$ transforms were calculated for each treatment and control variable. Log_{10} change between the initial counts (pre-treatment) or time-0 counts (post-treatment) and the respective treatment and control counts at each storage interval were calculated for each variable.

RESULTS:

Safe$_2$O® RTE-01 Drench and Drench/Spray Treatments.

For all the drench and combination drench/spray treatments, Safe$_2$O® RTE-01 was first applied as a one min. drench process to the hotdogs still in the casing. For Treatments 1 and 2, the hotdogs were inoculated after the drench process and packaged. For Treatments 3 and 4, the hotdogs were spray treated with Safe$_2$O® RTE-01 for 10 sec. following the drench process, inoculated and then packaged. For Treatments 5 and 6, the hotdogs were inoculated after the drench process, spray treated with Safe$_2$O® RTE-01 for 10 sec. and then packaged.

The results of Safe$_2$O® RTE-01 drench and combination drench/spray treatments on *L. monocytogenes* inoculated onto hotdogs without Purasal™ and subsequently stored at 40°F

are summarized in Table 1 and Figure 1. The entire database is presented in the Appendix Tables. Treatment 5 (i.e., drench/peel/inoculate/spray/package) resulted in an initial mean reduction of 2.39 log_{10} units as compared to an initial mean reduction of 1.35 log_{10} units for the corresponding control treatment (i.e., C-5/13 - inoculate/water spray/package). Treatment 5 also resulted in complete inhibition of *L. monocytogenes* growth as compared to time-0 (post-treatment) on the hotdogs without Purasal™ for 8 weeks of refrigerated storage whereas outgrowth in the corresponding control treatment (C-5/13) exceeded 1 and 3 log log_{10} units after 2 and 3 weeks of storage, respectively. Although some apparent increase or growth (i.e., 1.54 mean log_{10} units) of *L. monocytogenes* was evidenced on Treatment 5 samples after 9 weeks of storage at 40°F, no increase was observed at any other storage intervals including subsequent intervals of 10, 11 and 12 weeks of storage. In fact, there was a decrease in sample counts (vs. time-0) at every time interval other than 9 weeks for this treatment. The results for Treatment 5 samples suggest an anomalous biological spike in the *L. monocytogenes* levels and are statistically inconsistent with a genuine growth trend. Treatments 1 and 3 did not result in reductions of more than 1 log_{10} unit but did suppress the growth of *L. monocytogenes* to less than 1 log_{10} unit for 3 and 6 weeks, respectively. In contrast, *L. monocytogenes* increased by more than 1 log_{10} unit after 3 weeks in the corresponding control treatment hotdogs (i.e., C-1 - inoculate/package). Psychrotrophic aerobic plate counts (APCs) and lactic acid bacteria (LAB) counts on corresponding uninoculated hotdogs without Purasal™ were generally low and did not evidence any growth trend throughout refrigerated storage (Appendix Tables).

The results of $Safe_2O$® RTE-01 drench and combination drench/spray treatments on *L. monocytogenes* inoculated onto hotdogs with Purasal™ and subsequently stored at 40°F are summarized in Table 2 and Figure 2. The entire database is presented in the Appendix Tables. Treatment 6 (i.e., drench/peel/inoculate/spray/package) resulted in an initial mean reduction of greater than 3.12 log_{10} units as compared to an initial mean reduction of 1.99 log_{10} units for the corresponding control treatment (i.e., C-6/14 - inoculate/water spray/package). Treatment 6 also resulted in complete inhibition of *L. monocytogenes* growth (vs. time-0/post-treatment) on the hotdogs with Purasal™ for 12 weeks of refrigerated storage whereas some outgrowth (i.e., 1.11 mean log_{10} units) in the corresponding control treatment (C-6/14) was observed after 11 weeks of storage. Treatments 2 and 4 did not result in reductions of more than 1 log_{10} unit but did completely suppress the growth of *L. monocytogenes* for 12 weeks of refrigerated storage. *L. monocytogenes* growth was also completely inhibited in the corresponding control treatment hotdogs with Purasal™ (i.e., C-2 - inoculate/package) over 12 weeks of storage. Psychrotrophic aerobic plate counts (APCs) and lactic acid bacteria (LAB) counts on corresponding uninoculated hotdogs with Purasal™ were generally low and did not evidence any growth trend throughout refrigerated storage (Appendix Tables).

<u>$Safe_2O$® RTE-01 Dip (100°F) Treatments</u>.

For Treatments 9 and 10, the hotdogs were inoculated, dip treated for 15 sec. in $Safe_2O$® RTE-01 at 100°F, and packaged. For Treatments 11 and 12, the hotdogs were inoculated, dip

treated for 30 sec. in $Safe_2O$® RTE-01 at 100°F, and packaged. For Treatments 17 and 18, the hotdogs were dip treated for 15 sec. in $Safe_2O$® RTE-01 at 100°F, inoculated and packaged. For Treatments 19 and 20, the hotdogs were dip treated for 30 sec. in $Safe_2O$® RTE-01 at 100°F, inoculated and packaged.

The results of $Safe_2O$® RTE-01 dip treatments at 100°F on *L. monocytogenes* inoculated onto hotdogs without Purasal™ and subsequently stored at 40°F are summarized in Table 3 and Figure 3. The entire database is presented in the Appendix Tables. Treatments 9 (i.e., inoculate/dip 15 sec./package) and 11 (i.e., inoculate/dip 30 sec./package) resulted in initial mean reductions of 3.12 and >3.32 log_{10} units, respectively. Subsequent analyses after 2 weeks of storage indicated mean reductions of 4.36 and 4.98 log_{10} units for Treatments 9 and 11, respectively, vs. initial (pre-treatment) counts. By comparison, mean reductions for the corresponding control treatments, i.e., C-9 (inoculate/water dip 15 sec./package) and C-11 (inoculate/water dip 30 sec./package), were 1.40 and 1.49 log_{10} units, respectively. Treatment 9 resulted in inhibition of *L. monocytogenes* growth (vs. time-0/post-treatment) on the hotdogs without Purasal™ to less than one mean log_{10} unit over 12 weeks of refrigerated storage whereas outgrowth in the corresponding control treatment (C-9) exceeded 1 and 3 log log_{10} units after 2 and 4 weeks of storage, respectively. Treatment 11 suppressed the *L. monocytogenes* growth to <1 log_{10} unit through 7 weeks of storage and to <2.0 log_{10} units through 12 weeks of storage. Outgrowth in the corresponding control treatment (C-11) exceeded 1 and 3 log log_{10} units after 2 and 3 weeks of storage, respectively. Treatments 17 and 19 did not result in reductions of more than 1 log_{10} unit but did suppress the growth of *L. monocytogenes* to less than 1 log_{10} unit for 5 and 7 weeks, respectively. In contrast, *L. monocytogenes* increased by more than 1 log_{10} unit after 3 weeks in the corresponding control treatment hotdogs (i.e., C-1 - inoculate/package). Psychrotrophic aerobic plate counts (APCs) and lactic acid bacteria (LAB) counts on corresponding uninoculated hotdogs without Purasal™ were generally low and did not evidence any growth trend throughout refrigerated storage (Appendix Tables).

The results of $Safe_2O$® RTE-01 dip treatments at 100°F on *L. monocytogenes* inoculated onto hotdogs with Purasal™ and subsequently stored at 40°F are summarized in Table 4 and Figure 4. The entire database is presented in the Appendix Tables. Treatments 10 (i.e., inoculate-dip 15 sec.) and 12 (i.e., inoculate-dip 30 sec.) resulted in initial mean reductions of >3.12 and >3.32 log_{10} units, respectively. Subsequent analyses after 2 weeks of storage indicated mean reductions of >5.12 and >5.32 log_{10} units for Treatments 10 and 12, respectively, vs. initial (pre-treatment) counts. By comparison, mean reductions for the corresponding control treatments, i.e., C-10 (inoculate/water dip 15 sec./package) and C-12 (inoculate/water dip 30 sec./package), were 1.49 and 2.12 log_{10} units, respectively. Treatments 10 and 12 also completely inhibited *L. monocytogenes* growth (vs. time-0/post-treatment) on the hotdogs with Purasal™ over 12 weeks of refrigerated storage. In contrast, the corresponding control treatments (C-10 and C-12) evidenced >1 log_{10} unit growth by 8 and 7 weeks of storage, respectively. Treatments 18 and 20 did not result in initial reductions of more than 1 log_{10} unit but did completely suppress the growth of *L. monocytogenes* over 12 weeks of refrigerated storage. *L. monocytogenes* growth was also completely inhibited in

the corresponding control treatment hotdogs with Purasal™ (i.e., C-2 - inoculate/package) over 12 weeks of storage. Psychrotrophic aerobic plate counts (APCs) and lactic acid bacteria (LAB) counts on corresponding uninoculated hotdogs with Purasal™ were generally low and did not evidence any growth trend throughout refrigerated storage (Appendix Tables).

Safe$_2$O® RTE-01 Dip (40°F) and Dip/Spray Treatments.

For Treatments 7 and 8, the hotdogs were inoculated, dip treated for 30 sec. in Safe$_2$O® RTE-01 at 40°F, and packaged. For Treatments 13 and 14, the hotdogs were dip treated for 30 sec. in Safe$_2$O® RTE-01 at 40°F, inoculated, spray treated with Safe$_2$O® RTE-01 for 10 sec., and then packaged. For Treatments 15 and 16, the hotdogs were dip treated for 30 sec. in Safe$_2$O® RTE-01 at 40°F, inoculated and packaged.

The results of Safe$_2$O® RTE-01 dip treatments at 40°F and combination dip/spray treatments on *L. monocytogenes* inoculated onto hotdogs without Purasal™ and subsequently stored at 40°F are summarized in Table 5 and Figure 5. The entire database is presented in the Appendix Tables. Treatments 7 (i.e., inoculate/dip 30 sec./package) and 13 (i.e., dip 30 sec./inoculate/spray/package) resulted in initial mean reductions of >3.12 and 3.04 $\log_{10}$ units, respectively. Subsequent analyses after 2 weeks of storage indicated mean reductions of 4.69 and 4.98 $\log_{10}$ units for Treatments 7 and 13, respectively, vs. initial (pre-treatment) counts. Treatments 7 and 13 completely inhibited *L. monocytogenes* growth (vs. time-0/post-treatment) on the hotdogs without Purasal™ over 12 weeks of refrigerated storage. By comparison, mean reductions for the corresponding control treatments, i.e., C-7/23 (inoculate/water dip 30 sec./package) and C-5/13 (inoculate/water spray/package), were only 1.91 and 1.35 $\log_{10}$ units, respectively, but *L. monocytogenes* growth (>1 $\log_{10}$ unit) was evidenced by 1 week of storage for both control treatments. Treatment 15 did not result in a reduction of more than 1 $\log_{10}$ unit but did suppress the growth of *L. monocytogenes* to less than 1 $\log_{10}$ unit for 5 weeks. In contrast, *L. monocytogenes* increased by more than 1 $\log_{10}$ unit after 3 weeks in the corresponding control treatment hotdogs (i.e., C-1 - inoculate/package). Psychrotrophic aerobic plate counts (APCs) and lactic acid bacteria (LAB) counts on corresponding uninoculated hotdogs without Purasal™ were generally low and did not evidence any growth trend throughout refrigerated storage (Appendix Tables).

The results of Safe$_2$O® RTE-01 dip treatments at 40°F and combination dip/spray treatments on *L. monocytogenes* inoculated onto hotdogs with Purasal™ and subsequently stored at 40°F are summarized in Table 6 and Figure 6. The entire database is presented in the Appendix Tables. Treatments 8 (i.e., inoculate/dip 30 sec./package) and 14 (i.e., dip 30 sec./inoculate/spray/package) resulted in initial mean reductions of 2.86 and >3.32 $\log_{10}$ units, respectively. Subsequent analyses after 2 weeks of storage indicated mean reductions of >5.12 and >5.32 $\log_{10}$ units for Treatments 7 and 13, respectively, vs. initial (pre-treatment) counts. Treatments 8 and 14 completely inhibited *L. monocytogenes* growth (vs. time-0/post-treatment) on the hotdogs with Purasal™ over 12 weeks of refrigerated storage. By comparison, mean reductions for the corresponding control treatments, i.e., C-8/24

(inoculate/water dip 30 sec./package) and C-6/24 (inoculate/water spray/package), were 1.76 and 1.99 $\log_{10}$ units, respectively. Control treatment, C-8/24, suppressed the growth of *L.*

monocytogenes to less than 1 $\log_{10}$ unit over 12 weeks of storage whereas some outgrowth (i.e., 1.11 mean $\log_{10}$ units) in control treatment, C-6/14, was observed after 11 weeks of storage. Treatment 16 did not result in a reduction of more than 1 $\log_{10}$ unit but completely suppressed the growth of *L. monocytogenes* in hotdogs with Purasal™ over 12 weeks of storage. *L. monocytogenes* growth was also completely inhibited in the corresponding control treatment hotdogs with Purasal™ (i.e., C-2 - inoculate/package) over 12 weeks of storage. Psychrotrophic aerobic plate counts (APCs) and lactic acid bacteria (LAB) counts on corresponding uninoculated hotdogs with Purasal™ were generally low and did not evidence any growth trend throughout refrigerated storage (Appendix Tables).

Safe$_2$O® RTE-03 Dip (40°F) Treatments.

For Treatments 21 and 22, the hotdogs were inoculated, dip treated for 15 sec. in Safe$_2$O® RTE-03 at 40°F, and packaged. For Treatments 23 and 24, the hotdogs were inoculated, dip treated for 30 sec. in Safe$_2$O® RTE-03 at 40°F, and packaged.

The results of Safe$_2$O® RTE-03 dip treatments at 40°F on *L. monocytogenes* inoculated onto hotdogs without Purasal™ and subsequently stored at 40°F are summarized in Table 7 and Figure 7. The entire database is presented in the Appendix Tables. Treatments 21 (i.e., inoculate/dip 15 sec./package) and 23 (i.e., inoculate/dip 30 sec./package) resulted in initial mean reductions of >2.95 and >2.93 $\log_{10}$ units, respectively. Subsequent analyses after 1 week of storage indicated mean reductions of >4.95 and >4.93 $\log_{10}$ units for Treatments 21 and 23, respectively, vs. initial (pre-treatment) counts. Treatments 21 and 23 completely inhibited *L. monocytogenes* growth (vs. time-0/post-treatment) on hotdogs without Purasal™ over 12 weeks of refrigerated storage. By comparison, mean reductions for the corresponding control treatments, i.e., C-21 (inoculate/water dip 15 sec./package) and C-7/23 (inoculate/ water dip 30 sec./package), were 1.15 and 1.91 $\log_{10}$ units, respectively, and *L. monocytogenes* growth (>1 $\log_{10}$ unit) was evidenced by 3 and 1 weeks of storage for control treatments C-21 and C-7/23, respectively. *L. monocytogenes* increased by >1 $\log_{10}$ unit after 3 weeks in the hotdogs from the control treatment C-1 (i.e., - inoculate/package). Psychrotrophic aerobic plate counts (APCs) and lactic acid bacteria (LAB) counts on corresponding uninoculated hotdogs without Purasal™ were generally low and did not evidence any growth trend throughout refrigerated storage (Appendix Tables).

The results of Safe$_2$O® RTE-03 dip treatments at 40°F on *L. monocytogenes* inoculated onto hotdogs with Purasal™ and subsequently stored at 40°F are summarized in Table 8 and Figure 8. The entire database is presented in the Appendix Tables. Treatments 22 (i.e., inoculate/dip 15 sec./package) and 24 (i.e., inoculate/dip 30 sec./package) resulted in initial mean reductions of >2.95 and >2.93 $\log_{10}$ units, respectively. Subsequent analyses after 1 week of storage indicated mean reductions of >4.95 and >4.93 $\log_{10}$ units for Treatments 22 and 24, respectively, vs. initial (pre-treatment) counts. Treatments 22 and 24 completely inhibited *L. monocytogenes* growth (vs. time-0/post-treatment) on hotdogs with Purasal™ over 12 weeks of refrigerated storage. By comparison, mean reductions for the corresponding control treatments, i.e., C-22 (inoculate/water dip 15 sec./package) and C-8/24 (inoculate/ water dip 30 sec./package), were 1.45 and 1.76 $\log_{10}$ units, respectively. *L. monocytogenes*

growth (>1 log_{10} unit) was evidenced after 1 and 12 weeks of storage for control treatment, C-22, but was inhibited to less than one mean log_{10} unit over 12 weeks of refrigerated storage by control treatment, C-7/23. *L. monocytogenes* growth was completely inhibited in the corresponding control treatment hotdogs with Purasal™ (i.e., C-2 - inoculate//package) over 12 weeks of storage. Psychrotrophic aerobic plate counts (APCs) and lactic acid bacteria (LAB) counts on corresponding uninoculated hotdogs with Purasal™ were generally low and did not evidence any growth trend throughout refrigerated storage (Appendix Tables).

Summary.

The following $Safe_2O$® post-lethality treatments were effective in achieving a reduction of ≥ 2 log_{10} units of *L. monocytogenes* on inoculated hotdogs not containing Purasal™: T-5 (i.e., RTE-01 drench/peel/inoculate/RTE-01 spray 10 sec./package), T-9 (i.e., inoculate/RTE-01 dip 15 sec., 100°F/package), T-11 (i.e., inoculate/ RTE-01 dip 30 sec., 100°F /package), T-7 (i.e., inoculate/RTE-01 dip 30 sec., 40°F/package), T-13 (i.e., RTE-01 dip 30 sec./ inoculate/spray/package), T-21 (i.e., inoculate/RTE-03 dip 15 sec., 40°F/package), and T-23 (i.e., inoculate/RTE-03 dip 30 sec., 40°F/package).

The following $Safe_2O$® post-lethality treatments were effective in achieving a reduction of ≥ 2 log_{10} units of *L. monocytogenes* on inoculated hotdogs containing Purasal™: T-6 (i.e., RTE-01 drench/peel/inoculate/RTE-01 spray 10 sec./package), T-10 (i.e., inoculate/RTE-01 dip 15 sec., 100°F/package), T-12 (i.e., inoculate/ RTE-01 dip 30 sec., 100°F /package), T-8 (i.e., inoculate/RTE-01 dip 30 sec., 40°F/package), T-14 (i.e., RTE-01 dip 30 sec./ inoculate/spray/package), T-22 (i.e., inoculate/RTE-03 dip 15 sec., 40°F/package) and T-24 (i.e., inoculate/RTE-03 dip 30 sec., 40°F/package). The C-12 control treatment (inoculate/water dip 30 sec., 40°F/package) also achieved a reduction of ≥ 2 log_{10} units of *L. monocytogenes* on inoculated hotdogs containing Purasal™.

The following $Safe_2O$® post-lethality treatments were effective in suppressing the growth of *L. monocytogenes* to less than one log_{10} unit on inoculated hotdogs not containing Purasal™ during 12 weeks of storage at 40°F: T-9 (i.e., inoculate/RTE-01 dip 15 sec., 100°F/package), T-7 (i.e., inoculate/RTE-01 dip 30 sec., 40°F/package), T-13 (i.e., RTE-01 dip 30 sec./ inoculate/spray/package), T-21 (i.e., inoculate/RTE-03 dip 15 sec., 40°F/package), and T-23 (i.e., inoculate/RTE-03 dip 30 sec., 40°F/package). The following $Safe_2O$® post-lethality treatments were effective in suppressing the growth of *L. monocytogenes* to less than 2 log_{10} units on inoculated hotdogs not containing Purasal™: T-5 (i.e., RTE-01 drench/peel/inoculate/RTE-01 spray 10 sec./package) and T-11 (i.e., inoculate/ RTE-01 dip 30 sec., 100°F /package). *L. monocytogenes* proliferated in excess of 3 log_{10} units in all of the control treatments of hotdogs without Purasal™: $Safe_2O$® post-lethality treatments,

All of the $Safe_2O$® post-lethality treatments were effective in suppressing the growth of *L. monocytogenes* to less than one log_{10} unit on inoculated hotdogs containing Purasal™ during 12 weeks of storage at 40°F. The Purasal™ was also effective in suppressing the growth of *L. monocytogenes* to less than one log_{10} unit on inoculated hotdogs during 12 weeks of storage at 40°F without any post-lethality treatment.

The following post-lethality treatments were effective in achieving a reduction of ≥2 log_{10} units of *L. monocytogenes* and in suppressing the growth of *L. monocytogenes* to less than one log_{10} unit on inoculated hotdogs not containing Purasal™: T-9 (i.e., inoculate/RTE-01 dip 15 sec., 100°F/package), T-7 (i.e., inoculate/RTE-01 dip 30 sec., 40°F/package), T-13 (i.e., RTE-01 dip 30 sec./ inoculate/spray/package), T-21 (i.e., inoculate/RTE-03 dip 15 sec., 40°F/package), and T-23 (i.e., inoculate/RTE-03 dip 30 sec., 40°F/package). The following post-lethality treatments were effective in achieving a reduction of ≥2 log_{10} units of *L. monocytogenes* and in suppressing the growth of *L. monocytogenes* to less than 2.0 log_{10} units on inoculated hotdogs not containing Purasal™: T-5 (i.e., RTE-01 drench/peel/inoculate/RTE-01 spray 10 sec./package) and T-11 (i.e., inoculate/ RTE-01 dip 30 sec., 100°F /package).

The following post-lethality treatments were effective in achieving a reduction of ≥ 2 log_{10} units of *L. monocytogenes* and in suppressing the growth of *L. monocytogenes* to less than one log_{10} unit on inoculated hotdogs containing Purasal™: T-6 (i.e., RTE-01 drench/peel/inoculate/RTE-01 spray 10 sec./package), T-10 (i.e., inoculate/RTE-01 dip 15 sec., 100°F/package), T-12 (i.e., inoculate/RTE-01 dip 30 sec., 100°F /package), T-8 (i.e., inoculate/RTE-01 dip 30 sec., 40°F/package), T-14 (i.e., RTE-01 dip 30 sec./ inoculate/spray/package), T-22 (i.e., inoculate/RTE-03 dip 15 sec., 40°F/package), and T-24 (i.e., inoculate/RTE-03 dip 30 sec., 40°F/package).

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Table 1. Effect of Safe$_2$O® RTE-01 Drench and Drench/Spray Treatments on *L. monocytogenes* Inoculated onto Hotdogs without Purasal™ Stored at 40°F.

Time		Drench - Peel-Inoculate (Trt-1)	Drench - Peel-Spray-Inoculate (Trt-3)	Drench - Peel-Inoculate-Spray (Trt-5)	Control - no treatment (C-1)	Control - inoculate - water spray (C-5/13)
		Log_{10} CFU	Log_{10} CFU	Log_{10} CFU	Log_{10} CFU	Log_{10} CFU
Initial count (I.C.)		5.23	5.30	5.30	5.23	5.30
0	**Mean**	4.73	4.46	2.90	5.40	3.95
	Std. Dev.	0.12	0.15	0.80	0.05	0.60
Change (vs. I.C.)		-0.50	-0.84	-2.39	+0.17	-1.35
24	**Mean**	3.86	3.57	2.00	5.23	4.23
(hr)	Std. Dev.	0.17	0.08	0.00	0.06	0.04
Change (vs. I.C.)		-1.36	-1.72	-3.30	0.00	-1.07
Change (vs. time-0)		-0.87	-0.88	-0.90	-0.16	+0.28
1	**Mean**	3.82	3.68	<2.00	5.17	4.96
(wk)	Std. Dev.	0.31	0.16	0.00	0.05	0.47
Change (vs. time-0)		-0.91	-0.78	< -0.90	-0.22	+1.01
2	**Mean**	3.49	3.09	0.33	5.41	5.30
(wk)	Std. Dev.	1.02	0.28	0.58	0.07	0.55
Change (vs. I.C.)		-1.74	-2.21	-4.96	+0.18	0.00
Change (vs. time-0)		-1.24	-1.36	-2.57	+0.01	+1.35
3	**Mean**	4.76	3.21	0.00	6.65	6.96
(wk)	Std. Dev.	0.45	0.38	0.00	0.13	0.46
Change (vs. time-0)		+0.03	-1.24	-2.90	+1.25	+3.01
4	**Mean**	6.02	4.00	2.12	7.70	8.17
(wk)	Std. Dev.	0.82	0.69	1.09	0.22	0.39
Change (vs. time-0)		+1.29	-0.46	-0.79	+2.30	+4.22
5	**Mean**	4.06	3.93	<1.00	7.97	8.61
(wk)	Std. Dev.	1.09	0.60	0.00	0.31	1.11
Change (vs. time-0)		-0.67	-0.52	< -1.90	+2.58	+4.66
6	**Mean**	6.31	4.57	1.53	9.57	discontinued
(wk)	Std. Dev.	0.87	0.79	0.91	0.18	
Change (vs. time-0)		+1.59	+0.12	-1.38	+4.18	
7	**Mean**	6.69	6.52	1.00	9.72	discontinued
(wk)	Std. Dev.	0.95	1.34	0.00	0.19	
Change (vs. time-0)		+1.97	+2.07	-1.90	+4.32	
8	**Mean**	8.37	5.20	1.28	discontinued	discontinued
(wk)	Std. Dev.	0.95	1.55	0.49		
Change (vs. time-0)		+3.64	+0.74	-1.62		
9	**Mean**	9.39	8.29	4.44	discontinued	discontinued
(wk)	Std. Dev.	0.59	0.28	0.08		
Change (vs. time-0)		+4.67	+3.83	+1.54		
10	**Mean**	discontinued	7.93	<1.00	discontinued	discontinued
(wk)	Std. Dev.		2.24	0.00		
Change (vs. time-0)			+3.47	< -1.90		
11	**Mean**	discontinued	discontinued	1.26	discontinued	discontinued
(wk)	Std. Dev.			0.45		
Change (vs. time-0)				-1.64		
12	**Mean**	discontinued	discontinued	1.72	discontinued	discontinued
(wk)	Std. Dev.			1.25		
Change (vs. time-0)				-1.18		

Note: 1) Initial count = pre-treatment count calculated from inoculum count (CFU/sample package)
2) Time-0 = post-treatment count (CFU/sample package)

Table 2. Effect of Safe$_2$O® RTE-01 Drench and Drench/Spray Treatments on *L. monocytogenes* Inoculated onto Hotdogs with Purasal™ Stored at 40°F.

Time		Drench - Peel-Inoculate (Trt-2)	Drench - Peel-Spray-Inoculate (Trt-4)	Drench - Peel-Inoculate-Spray (Trt-6)	Control - no treatment (C-2)	Control - inoculate - water spray (C-6/14)
		Log_{10} CFU	Log_{10} CFU	Log_{10} CFU	Log_{10} CFU	Log_{10} CFU
Initial count (I.C.)		5.23	5.30	5.12	5.23	5.12
0	**Mean**	5.22	4.56	<2.00	5.44	3.13
	Std. Dev.	0.09	0.09	0.00	0.04	0.40
Change (vs. I.C.)		-0.01	-0.74	<-3.12	+0.21	-1.99
24 (hr)	**Mean**	5.05	3.40	<2.00	5.25	3.25
	Std. Dev.	0.09	0.19	0.00	0.42	0.48
Change (vs. I.C.)		-0.18	-1.89	<-3.12	+0.02	-1.87
Change (vs. time-0)		-0.17	-1.15	<0.00	-0.19	+0.12
1 (wk)	**Mean**	4.97	3.51	<2.00	5.23	2.20
	Std. Dev.	0.13	0.13	0.00	0.06	0.15
Change (vs. time-0)		-0.25	-1.04	<0.00	-0.20	-0.93
2 (wk)	**Mean**	4.72	3.09	<0.00	4.99	3.04
	Std. Dev.	0.13	0.27	0.00	0.08	0.56
Change (vs. I.C.)		-0.51	-2.21	< -5.12	-0.24	-2.08
Change (vs. time-0)		-0.50	-1.47	< -2.00	-0.45	-0.09
3 (wk)	**Mean**	3.95	2.82	1.10	5.10	2.95
	Std. Dev.	0.52	0.07	0.17	0.04	0.44
Change (vs. time-0)		-1.27	-1.74	-0.90	-0.33	-0.18
4 (wk)	**Mean**	4.16	2.10	<1.00	4.93	2.85
	Std. Dev.	0.16	0.17	0.00	0.11	0.74
Change (vs. time-0)		-1.05	-2.46	< -1.00	-0.51	-0.28
5 (wk)	**Mean**	4.28	2.26	<1.00	4.98	2.56
	Std. Dev.	0.25	0.45	0.00	0.06	0.49
Change (vs. time-0)		-0.93	-2.30	< -1.00	-0.46	-0.57
6 (wk)	**Mean**	4.18	2.20	<1.00	5.18	2.87
	Std. Dev.	0.16	0.17	0.00	0.23	0.36
Change (vs. time-0)		-1.03	-2.35	< -1.00	-0.25	-0.26
7 (wk)	**Mean**	3.72	2.10	<1.00	5.00	2.85
	Std. Dev.	0.54	0.17	0.00	0.07	0.47
Change (vs. time-0)		-1.49	-2.46	< -1.00	-0.44	-0.28
8 (wk)	**Mean**	3.81	2.00	1.00	5.10	3.38
	Std. Dev.	0.54	0.00	0.00	0.36	0.78
Change (vs. time-0)		-1.41	-2.56	-1.00	-0.33	+0.25
9 (wk)	**Mean**	3.42	<2.00	1.10	4.94	3.63
	Std. Dev.	0.47	0.00	0.17	0.24	0.25
Change (vs. time-0)		-1.80	< -2.56	-0.90	-0.50	+0.50
10 (wk)	**Mean**	3.19	<2.00	<1.00	4.81	3.32
	Std. Dev.	0.28	0.00	0.00	0.10	0.70
Change (vs. time-0)		-2.03	< -2.56	< -1.00	-0.62	+0.19
11 (wk)	**Mean**	3.64	<2.00	<1.00	4.81	4.24
	Std. Dev.	0.11	0.00	0.00	0.17	0.70
Change (vs. time-0)		-1.58	< -2.56	< -1.00	-0.62	+1.11
12 (wk)	**Mean**	3.02	<2.00	<1.00	4.51	3.46
	Std. Dev.	0.11	0.00	0.00	0.16	1.46
Change (vs. time-0)		-2.20	< -2.56	< -1.00	-0.93	+0.33

Note: 1) Initial count = pre-treatment count calculated from inoculum count (CFU/sample package)
2) Time-0 = post-treatment count (CFU/sample package)

Table 3. Effect of Safe$_2$O® RTE-01 Dip (100°F) Treatments on *L. monocytogenes* Inoculated onto Hotdogs without Purasal™ Stored at 40°F.

Time		Inoculate - Dip - 15 sec. (Trt-9)	Inoculate - Dip - 30 sec. (Trt-11)	Dip - 15 sec. - Inoculate (Trt-17)	Dip - 30 sec. - Inoculate (Trt-19)	Control - no treatment (C-1)	Control - inoculate-water dip -15 sec. (C-9)	Control - inoculate-water dip - 30 sec. (C-11)
		Log_{10} CFU	Log_{10} CFU	Log_{10} CFU	Log_{10} CFU	Log_{10} CFU	Log_{10} CFU	Log_{10} CFU
Initial count (I.C.)		5.12	5.32	4.95	4.95	5.23	5.12	5.32
0	**Mean**	2.00	<2.00	3.89	3.87	5.40	3.72	3.82
	Std. Dev.	0.00	0.00	0.04	0.60	0.05	0.19	0.17
Change (vs. I.C.)		-3.12	< -3.32	-1.06	-1.08	+0.17	-1.40	-1.49
24	**Mean**	2.00	<2.00	4.29	4.28	5.23	3.73	3.90
(hr)	Std. Dev.	0.00	0.00	0.28	0.19	0.06	0.08	0.10
Change (vs. I.C.)		-3.12	< -3.32	-0.66	-0.67	0.00	-1.39	-1.42
Change (vs. time-0)		0.00	<0.00	+0.40	+0.41	-0.16	+0.01	+0.08
1	**Mean**	<2.00	<2.00	3.83	3.75	5.17	3.64	4.06
(wk)	Std. Dev.	0.00	0.00	0.24	0.41	0.05	0.15	0.17
Change (vs. time-0)		<0.00	<0.00	-0.06	-0.12	-0.22	-0.08	+0.23
2	**Mean**	0.77	0.33	3.86	3.48	5.41	4.89	5.37
(wk)	Std. Dev.	0.68	0.58	0.14	0.46	0.07	0.41	0.15
Change (vs. I.C.)		-4.36	-4.98	-1.09	-1.47	+0.18	-0.23	+0.05
Change (vs. time-0)		-1.23	-1.67	-0.03	-0.39	+0.01	+1.17	+1.55
3	**Mean**	<0.00	0.00	3.07	3.30	6.65	5.65	7.03
(wk)	Std. Dev.	0.00	0.00	0.30	0.21	0.13	0.83	0.56
Change (vs. time-0)		< -2.00	-2.00	-0.83	-0.57	+1.25	+1.93	+3.20
4	**Mean**	<1.00	<1.00	3.73	2.46	7.70	7.23	7.81
(wk)	Std. Dev.	0.00	0.00	0.62	0.45	0.22	1.32	0.30
Change (vs. time-0)		< -1.00	< -1.00	-0.17	-1.41	+2.30	+3.51	+3.99
5	**Mean**	<1.00	<1.00	3.85	4.74	7.97	8.49	8.90
(wk)	Std. Dev.	0.00	0.00	0.55	0.61	0.31	0.09	0.20
Change (vs. time-0)		< -1.00	< -1.00	-0.04	+0.87	+2.58	+4.77	+5.08
6	**Mean**	1.26	2.54	5.43	4.17	9.57	9.68	
(wk)	Std. Dev.	0.45	0.42	0.61	0.79	0.18	0.31	discontinued
Change (vs. time-0)		-0.74	+0.54	+1.54	+0.30	+4.18	+5.96	
7	**Mean**	<1.00	1.40	8.66	4.54	9.72		
(wk)	Std. Dev.	0.00	0.70	0.15	1.42	0.19	discontinued	discontinued
Change (vs. time-0)		< -1.00	-0.60	+4.77	+0.67	+4.32		
8	**Mean**	<1.00	3.83	6.92	6.78			
(wk)	Std. Dev.	0.00	0.12	0.76	1.13	discontinued	discontinued	discontinued
Change (vs. time-0)		< -1.00	+1.83	+3.02	+2.91			
9	**Mean**	<1.00	2.69		6.78			
(wk)	Std. Dev.	0.00	2.93	discontinued	1.79	discontinued	discontinued	discontinued
Change (vs. time-0)		< -1.00	+0.69		+2.91			
10	**Mean**	<1.00	3.06		7.74			
(wk)	Std. Dev.	0.00	3.57	discontinued	3.24	discontinued	discontinued	discontinued
Change (vs. time-0)		< -1.00	+1.06		+3.87			
11	**Mean**	2.37	1.56		7.80			
(wk)	Std. Dev.	1.19	0.97	discontinued	0.30	discontinued	discontinued	discontinued
Change (vs. time-0)		+0.37	-0.44		+3.93			
12	**Mean**	<1.00	3.20					
(wk)	Std. Dev.	0.00	3.81	discontinued	discontinued	discontinued	discontinued	discontinued
Change (vs. time-0)		< -1.00	+1.20					

Note: 1) Initial count = pre-treatment count calculated from inoculum count (CFU/sample package)
2) Time-0 = post-treatment count (CFU/sample package)

Table 4. Effect of Safe$_2$O® RTE-01 Dip (100°F) Treatments on *L. monocytogenes* Inoculated onto Hotdogs with Purasal™ Stored at 40°F.

Time		Inoculate - Dip - 15 sec. (Trt-10)	Inoculate - Dip - 30 sec. (Trt-12)	Dip - 15 sec. - Inoculate (Trt-18)	Dip - 30 sec. - Inoculate (Trt-20)	Control - no treatment (C-2)	Control - inoculate-water dip -15 sec. (C-10)	Control - inoculate-water dip - 30 sec. (C-12)
		Log_{10} CFU	Log_{10} CFU	Log_{10} CFU	Log_{10} CFU	Log_{10} CFU	Log_{10} CFU	Log_{10} CFU
Initial count (I.C.)		5.12	5.32	4.95	4.95	5.23	5.12	5.32
0	**Mean**	<2.00	<2.00	4.67	3.97	5.44	3.64	3.19
	Std. Dev.	0.00	0.00	0.15	0.35	0.04	0.23	0.34
Change (vs. I.C.)		< -3.12	< -3.32	-0.28	-0.98	+0.21	-1.49	-2.12
24	**Mean**	<2.00	<2.00	4.55	3.77	5.25	3.15	3.53
(hr)	Std. Dev.	0.00	0.00	0.22	0.10	0.42	0.29	0.33
Change (vs. I.C.)		< -3.12	< -3.32	-0.40	-1.18	0.02	-1.97	-1.78
Change (vs. time-0)		<0.00	<0.00	-0.12	-0.20	-0.19	-0.49	+0.34
1	**Mean**	<2.00	<2.00	4.04	3.26	5.23	3.33	3.30
(wk)	Std. Dev.	0.00	0.00	0.06	1.01	0.06	0.29	0.16
Change (vs. time-0)		<0.00	<0.00	-0.63	-0.71	-0.20	-0.31	+0.10
2	**Mean**	<0.00	<0.00	3.64	2.73	4.99	3.19	3.14
(wk)	Std. Dev.	0.00	0.00	0.33	1.02	0.08	0.43	0.09
Change (vs. I.C.)		< -5.12	< -5.32	-1.32	-2.22	-0.24	-1.93	-2.18
Change (vs. time-0)		< -2.00	< -2.00	-1.02	-1.24	-0.45	-0.44	-0.05
3	**Mean**	<1.00	<1.00	3.37	2.30	5.10	3.03	3.62
(wk)	Std. Dev.	0.00	0.00	0.19	0.30	0.04	0.22	0.21
Change (vs. time-0)		< -1.00	< -1.00	-1.30	-1.67	-0.33	-0.60	+0.43
4	**Mean**	<1.00	<1.00	3.40	2.79	4.93	3.28	3.86
(wk)	Std. Dev.	0.00	0.00	0.17	0.49	0.11	0.05	0.68
Change (vs. time-0)		< -1.00	< -1.00	-1.27	-1.18	-0.51	-0.36	+0.67
5	**Mean**	<1.00	<1.00	3.17	2.26	4.98	3.49	3.86
(wk)	Std. Dev.	0.00	0.00	0.67	0.45	0.06	0.47	0.33
Change (vs. time-0)		< -1.00	< -1.00	-1.49	-1.71	-0.46	-0.15	+0.67
6	**Mean**	<1.00	1.88	3.10	2.10	5.18	3.51	3.91
(wk)	Std. Dev.	0.00	0.63	0.95	0.17	0.23	0.66	0.19
Change (vs. time-0)		< -1.00	-0.12	-1.57	-1.87	-0.25	-0.13	+0.72
7	**Mean**	<1.00	1.00	2.33	2.16	5.00	3.96	4.91
(wk)	Std. Dev.	0.00	0.00	0.58	0.28	0.07	0.08	0.70
Change (vs. time-0)		< -1.00	-1.00	-2.33	-1.81	-0.44	+0.33	+1.72
8	**Mean**	<1.00	<1.00	2.43	2.00	5.10	4.96	5.03
(wk)	Std. Dev.	0.00	0.00	0.51	0.00	0.36	0.63	0.20
Change (vs. time-0)		< -1.00	< -1.00	-2.23	-1.97	-0.33	+1.32	+1.84
9	**Mean**	<1.00	<1.00	2.00	2.00	4.94	4.97	4.68
(wk)	Std. Dev.	0.00	0.00	0.00	0.00	0.24	0.30	0.87
Change (vs. time-0)		< -1.00	< -1.00	-2.67	-1.97	-0.50	+1.33	+1.49
10	**Mean**	1.10	<1.00	2.00	2.00	4.81	6.29	4.91
(wk)	Std. Dev.	0.17	0.00	0.00	0.00	0.10	0.51	0.19
Change (vs. time-0)		-0.90	< -1.00	-2.67	-1.97	-0.62	+2.65	+1.72
11	**Mean**	<1.00	<1.00	2.00	2.00	4.81	5.86	6.86
(wk)	Std. Dev.	0.00	0.00	0.00	0.00	0.17	0.18	0.13
Change (vs. time-0)		< -1.00	< -1.00	-2.67	-1.97	-0.62	+2.22	+3.67
12	**Mean**	<1.00	<1.00	2.10	2.00	4.51	6.44	6.65
(wk)	Std. Dev.	0.00	0.00	0.17	0.00	0.16	1.90	1.64
Change (vs. time-0)		< -1.00	< -1.00	-2.57	-1.97	-0.93	+2.80	+3.46

Note: 1) Initial count = pre-treatment count calculated from inoculum count (CFU/sample package)
2) Time-0 = post-treatment count (CFU/sample package)

Table 5. Effect of Safe$_2$O® RTE-01 Dip (30 sec., 40°F) and Dip/Spray Treatments on *L. monocytogenes* Inoculated onto Hotdogs without Purasal™ Stored at 40°F.

Time		Inoculate - Dip (Trt-7)	Dip -Inoculate - Spray (Trt-13)	Dip - Inoculate (Trt-15)	Control - no treatment (C-1)	Control - inoculate - water dip (C-7/23)	Control - inoculate - water spray (C-5/13)
		Log_{10} CFU	Log_{10} CFU	Log_{10} CFU	Log_{10} CFU	Log_{10} CFU	Log_{10} CFU
Initial count (I.C.)		5.12	5.32	5.32	5.23	5.12	5.30
0	**Mean**	<2.00	2.28	4.78	5.40	3.22	3.95
	Std. Dev.	0.00	0.49	0.15	0.05	0.32	0.60
Change (vs. I.C.)		< -3.12	-3.04	-0.54	+0.17	-1.91	-1.35
24	**Mean**	<2.00	<2.00	3.97	5.23	3.43	4.23
(hr)	Std. Dev.	0.00	0.00	0.22	0.06	0.17	0.04
Change (vs. I.C.)		< -3.12	< -3.32	-1.35	0.01	-1.70	-1.07
Change (vs. time-0)		<0.00	< -0.28	-0.81	-0.16	+0.21	+0.28
1	**Mean**	<2.00	<2.00	3.63	5.17	4.79	4.96
(wk)	Std. Dev.	0.00	0.00	0.06	0.05	0.17	0.47
Change (vs. time-0)		<0.00	< -0.28	-1.14	-0.22	+1.57	+1.01
2	**Mean**	0.43	0.33	3.30	5.41	6.39	5.30
(wk)	Std. Dev.	0.75	0.58	0.87	0.07	0.56	0.55
Change (vs. I.C.)		-4.69	-4.98	-2.01	+0.18	+1.27	0.00
Change (vs. time-0)		-1.57	-1.95	-1.47	+0.01	+3.17	+1.35
3	**Mean**	0.86	1.00	3.89	6.65	8.27	6.96
(wk)	Std. Dev.	0.00	0.00	0.08	0.13	0.15	0.46
Change (vs. time-0)		-1.14	-1.28	-0.89	+1.25	+5.05	+3.01
4	**Mean**	<1.00	<1.00	3.60	7.70	9.17	8.17
(wk)	Std. Dev.	0.00	0.00	0.34	0.22	0.22	0.39
Change (vs. time-0)		< -1.00	< -1.28	-1.18	+2.30	+5.95	+4.22
5	**Mean**	<1.00	<1.00	4.95	7.97	8.59	8.61
(wk)	Std. Dev.	0.00	0.00	0.40	0.31	2.03	1.11
Change (vs. time-0)		< -1.00	< -1.28	+0.18	+2.58	+5.37	+4.66
6	**Mean**	1.80	1.00	6.79	9.57	discontinued	discontinued
(wk)	Std. Dev.	1.38	0.00	1.08	0.18		
Change (vs. time-0)		-0.20	-1.28	+2.01	+4.18		
7	**Mean**	<1.00	2.20	7.03	9.72	discontinued	discontinued
(wk)	Std. Dev.	0.00	2.09	0.42	0.19		
Change (vs. time-0)		< -1.00	-0.08	+2.25	+4.32		
8	**Mean**	1.39	<1.00	9.10	discontinued	discontinued	discontinued
(wk)	Std. Dev.	0.68	0.00	0.70			
Change (vs. time-0)		-0.61	< -1.28	+4.32			
9	**Mean**	<1.00	<1.00	9.03	discontinued	discontinued	discontinued
(wk)	Std. Dev.	0.00	0.00	0.09			
Change (vs. time-0)		< -1.00	< -1.28	+4.25			
10	**Mean**	<1.00	<1.00	discontinued	discontinued	discontinued	discontinued
(wk)	Std. Dev.	0.00	0.00				
Change (vs. time-0)		< -1.00	< -1.28				
11	**Mean**	1.67	<1.00	discontinued	discontinued	discontinued	discontinued
(wk)	Std. Dev.	1.16	0.00				
Change (vs. time-0)		-0.33	< -1.28				
12	**Mean**	<1.00	<1.00	discontinued	discontinued	discontinued	discontinued
(wk)	Std. Dev.	0.00	0.00				
Change (vs. time-0)		< -1.00	< -1.28				

Note: 1) Initial count = pre-treatment count calculated from inoculum count (CFU/sample package)
2) Time-0 = post-treatment count (CFU/sample package)

Table 6. Effect of Safe$_2$O® RTE-01 Dip (30 sec., 40°F) and Dip/Spray Treatments on *L. monocytogenes* Inoculated onto Hotdogs with Purasal™ Stored at 40°F.

Time		Inoculate - Dip (Trt-8)	Dip - Inoculate - Spray (Trt-14)	Dip - Inoculate (Trt-16)	Control - no treatment (C-2)	Control - inoculate - water dip (C-8/24)	Control - inoculate - water spray (C-6/14)
		Log_{10} CFU	Log_{10} CFU	Log_{10} CFU	Log_{10} CFU	Log_{10} CFU	Log_{10} CFU
Initial count (I.C.)		5.12	5.32	5.32	5.23	5.12	5.12
0	**Mean**	2.26	<2.00	4.75	5.44	3.36	3.13
	Std. Dev.	0.45	0.00	0.18	0.04	0.25	0.40
Change (vs. I.C.)		-2.86	< -3.32	-0.56	+0.21	-1.76	-1.99
24	**Mean**	<2.00	<2.00	3.74	5.25	3.11	3.25
(hr)	Std. Dev.	0.00	0.00	0.28	0.42	0.33	0.48
Change (vs. I.C.)		< -3.12	< -3.32	-1.57	0.02	-2.02	-1.87
Change (vs. time-0)		< -0.26	<0.00	-1.01	-0.19	-0.26	+0.12
1	**Mean**	<2.00	2.00	3.75	5.23	2.18	2.20
(wk)	Std. Dev.	0.00	0.00	0.58	0.06	0.15	0.15
Change (vs. time-0)		< -0.26	0.00	-1.00	-0.20	-1.19	-0.93
2	**Mean**	<0.00	<0.00	3.74	4.99	3.03	3.04
(wk)	Std. Dev.	0.00	0.00	0.46	0.08	0.11	0.56
Change (vs. I.C.)		< -5.12	< -5.32	-1.58	-0.24	-2.09	-2.08
Change (vs. time-0)		< -2.26	< -2.00	-1.02	-0.45	-0.33	-0.09
3	**Mean**	<1.00	<1.00	3.82	5.10	2.76	2.95
(wk)	Std. Dev.	0.00	0.00	0.20	0.04	0.14	0.44
Change (vs. time-0)		< -1.26	< -1.00	-0.94	-0.33	-0.60	-0.18
4	**Mean**	<1.00	<1.00	3.21	4.93	2.91	2.85
(wk)	Std. Dev.	0.00	0.00	0.44	0.11	0.27	0.74
Change (vs. time-0)		< -1.26	< -1.00	-1.55	-0.51	-0.46	-0.28
5	**Mean**	<1.00	<1.00	2.54	4.98	2.76	2.56
(wk)	Std. Dev.	0.00	0.00	0.58	0.06	0.15	0.49
Change (vs. time-0)		< -1.26	< -1.00	-2.21	-0.46	-0.60	-0.57
6	**Mean**	<1.00	1.10	3.17	5.18	2.63	2.87
(wk)	Std. Dev.	0.00	0.17	0.34	0.23	0.06	0.36
Change (vs. time-0)		< -1.26	-0.90	-1.58	-0.25	-0.73	-0.26
7	**Mean**	<1.00	<1.00	2.77	5.00	2.73	2.85
(wk)	Std. Dev.	0.00	0.00	0.21	0.07	0.15	0.47
Change (vs. time-0)		< -1.26	< -1.00	-1.99	-0.44	-0.63	-0.28
8	**Mean**	<1.00	<1.00	2.59	5.10	2.89	3.38
(wk)	Std. Dev.	0.00	0.00	0.59	0.36	0.14	0.78
Change (vs. time-0)		< -1.26	< -1.00	-2.16	-0.33	-0.48	+0.25
9	**Mean**	<1.00	<1.00	2.64	4.94	2.88	3.63
(wk)	Std. Dev.	0.00	0.00	0.57	0.24	0.86	0.25
Change (vs. time-0)		< -1.26	< -1.00	-2.11	-0.50	-0.48	+0.50
10	**Mean**	<1.00	<1.00	< 2.00	4.81	3.50	3.32
(wk)	Std. Dev.	0.00	0.00	0.00	0.10	1.33	0.70
Change (vs. time-0)		< -1.26	< -1.00	< -2.75	-0.62	+0.14	0.19
11	**Mean**	<1.00	<1.00	< 2.00	4.81	2.32	4.24
(wk)	Std. Dev.	0.00	0.00	0.00	0.17	0.28	0.70
Change (vs. time-0)		< -1.26	< -1.00	< -2.75	-0.62	-1.05	+1.11
12	**Mean**	<1.00	<1.00	2.00	4.51	3.77	3.46
(wk)	Std. Dev.	0.00	0.00	0.00	0.16	1.79	1.46
Change (vs. time-0)		< -1.26	< -1.00	-2.75	-0.93	+0.40	+0.33

Note: 1) Initial count = pre-treatment count calculated from inoculum count (CFU/sample package)
2) Time-0 = post-treatment count (CFU/sample package)

Table 7. Effect of Safe$_2$O® RTE-03 Dip (40°F) Treatments on *L. monocytogenes* Inoculated onto Hotdogs without Purasal™ Stored at 40°F.

Time		Inoculate - Dip-15 sec. (Trt-21)	Inoculate - Dip-30 sec. (Trt-23)	Control - no treatment (C-1)	Control - inoculate-water dip -15 sec. (C-21)	Control - inoculate-water dip -30 sec. (C-7/23)
		Log_{10} CFU	Log_{10} CFU	Log_{10} CFU	Log_{10} CFU	Log_{10} CFU
Initial count (I.C.)		4.95	4.93	5.23	4.95	5.12
0	**Mean**	<2.00	<2.00	5.40	3.80	3.22
	Std. Dev.	0.00	0.00	0.05	0.10	0.32
Change (vs. I.C.)		< -2.95	< -2.93	+0.17	-1.15	-1.91
24	**Mean**	<2.00	<2.00	5.23	4.71	3.43
(hr)	Std. Dev.	0.00	0.00	0.06	0.06	0.17
Change (vs. I.C.)		< -2.95	< -2.93	0.00	-0.24	-1.70
Change (vs. time-0)		<0.00	<0.00	-0.16	+0.91	+0.21
1	**Mean**	<0.00	<0.00	5.17	3.07	4.79
(wk)	Std. Dev.	0.00	0.00	0.05	0.12	0.17
Change (vs. I.C.)		< -4.95	< -4.93	-0.06	-1.88	-0.33
Change (vs. time-0)		< -2.00	< -2.00	-0.22	-0.73	+1.57
2	**Mean**	<1.00	<1.00	5.41	3.96	6.39
(wk)	Std. Dev.	0.00	0.00	0.07	0.18	0.56
Change (vs. time-0)		< -1.00	< -1.00	+0.01	+0.16	+3.17
3	**Mean**	<1.00	<1.00	6.65	5.34	8.27
(wk)	Std. Dev.	0.00	0.00	0.13	0.53	0.15
Change (vs. time-0)		< -1.00	< -1.00	+1.25	+1.54	+5.05
4	**Mean**	<1.00	<1.00	7.70	7.31	9.17
(wk)	Std. Dev.	0.00	0.00	0.22	0.46	0.22
Change (vs. time-0)		< -1.00	< -1.00	+2.30	+3.51	+5.95
5	**Mean**	<1.00	<1.00	7.97	8.56	8.59
(wk)	Std. Dev.	0.00	0.00	0.31	0.12	2.03
Change (vs. time-0)		< -1.00	< -1.00	+2.58	+4.76	+5.37
6	**Mean**	<1.00	<1.00	9.57	discontinued	discontinued
(wk)	Std. Dev.	0.00	0.00	0.18		
Change (vs. time-0)		< -1.00	< -1.00	+4.18		
7	**Mean**	<1.00	<1.00	9.72	discontinued	discontinued
(wk)	Std. Dev.	0.00	0.00	0.19		
Change (vs. time-0)		< -1.00	< -1.00	+4.32		
8	**Mean**	<1.00	<1.00	discontinued	discontinued	discontinued
(wk)	Std. Dev.	0.00	0.00			
Change (vs. time-0)		< -1.00	< -1.00			
9	**Mean**	<1.00	<1.00	discontinued	discontinued	discontinued
(wk)	Std. Dev.	0.00	0.00			
Change (vs. time-0)		< -1.00	< -1.00			
10	**Mean**	<1.00	<1.00	discontinued	discontinued	discontinued
(wk)	Std. Dev.	0.00	0.00			
Change (vs. time-0)		< -1.00	< -1.00			
11	**Mean**	1.00	<1.00	discontinued	discontinued	discontinued
(wk)	Std. Dev.	0.00	0.00			
Change (vs. time-0)		-1.00	< -1.00			
12	**Mean**	<1.00	1.10	discontinued	discontinued	discontinued
(wk)	Std. Dev.	0.00	0.17			
Change (vs. time-0)		< -1.00	-0.90			

Note: 1) Initial count = pre-treatment count calculated from inoculum count (CFU/sample package)
2) Time-0 = post-treatment count (CFU/sample package)

Table 8. Effect of Safe$_2$O® RTE-03 Dip (40°F) Treatments on *L. monocytogenes* Inoculated onto Hotdogs with Purasal™ Stored at 40°F.

Time		Inoculate - Dip-15 sec. (Trt-22)	Inoculate - Dip-30 sec. (Trt-24)	Control - no treatment (C-2)	Control - inoculate-water dip -15 sec. (C-22)	Control - inoculate-water dip -30 sec. (C-8/24)
		Log_{10} CFU	Log_{10} CFU	Log_{10} CFU	Log_{10} CFU	Log_{10} CFU
Initial count (I.C.)		4.95	4.93	5.23	4.95	5.12
0	**Mean**	<2.00	<2.00	5.44	3.50	3.36
	Std. Dev.	0.00	0.00	0.04	0.17	0.25
Change (vs. I.C.)		< -2.95	< -2.93	+0.21	-1.45	-1.76
24	**Mean**	<2.00	<2.00	5.25	4.55	3.11
(hr)	Std. Dev.	0.00	0.00	0.42	0.06	0.33
Change (vs. I.C.)		< -2.95	< -2.93	0.02	-0.40	-2.02
Change (vs. time-0)		<0.00	<0.00	-0.19	+1.05	-0.26
1	**Mean**	<0.00	<0.00	5.23	2.97	2.18
(wk)	Std. Dev.	0.00	0.00	0.06	0.32	0.15
Change (vs. I.C.)		< -4.95	< -4.93	0.00	-1.98	-2.94
Change (vs. time-0)		< -2.00	< -2.00	-0.20	-0.53	-1.19
2	**Mean**	<1.00	<1.00	4.99	3.22	3.03
(wk)	Std. Dev.	0.00	0.00	0.08	0.14	0.11
Change (vs. time-0)		< -1.00	< -1.00	-0.45	-0.29	-0.33
3	**Mean**	<1.00	<1.00	5.10	3.18	2.76
(wk)	Std. Dev.	0.00	0.00	0.04	0.24	0.14
Change (vs. time-0)		< -1.00	< -1.00	-0.33	-0.32	-0.60
4	**Mean**	<1.00	<1.00	4.93	2.63	2.91
(wk)	Std. Dev.	0.00	0.00	0.11	0.13	0.27
Change (vs. time-0)		< -1.00	< -1.00	-0.51	-0.88	-0.46
5	**Mean**	1.00	<1.00	4.98	3.14	2.76
(wk)	Std. Dev.	0.00	0.00	0.06	0.12	0.15
Change (vs. time-0)		-1.00	< -1.00	-0.46	-0.36	-0.60
6	**Mean**	<1.00	<1.00	5.18	3.17	2.63
(wk)	Std. Dev.	0.00	0.00	0.23	0.03	0.06
Change (vs. time-0)		< -1.00	< -1.00	-0.25	-0.33	-0.73
7	**Mean**	<1.00	1.00	5.00	3.18	2.73
(wk)	Std. Dev.	0.00	0.00	0.07	0.24	0.15
Change (vs. time-0)		< -1.00	-1.00	-0.44	-0.32	-0.63
8	**Mean**	<1.00	1.00	5.10	3.79	2.89
(wk)	Std. Dev.	0.00	0.00	0.36	0.22	0.14
Change (vs. time-0)		< -1.00	-1.00	-0.33	+0.29	-0.48
9	**Mean**	1.00	<1.00	4.94	3.56	2.88
(wk)	Std. Dev.	0.00	0.00	0.24	0.14	0.86
Change (vs. time-0)		-1.00	< -1.00	-0.50	+0.06	-0.48
10	**Mean**	<1.00	<1.00	4.81	3.34	3.50
(wk)	Std. Dev.	0.00	0.00	0.10	1.11	1.33
Change (vs. time-0)		< -1.00	< -1.00	-0.62	-0.16	+0.14
11	**Mean**	<1.00	<1.00	4.81	4.42	2.32
(wk)	Std. Dev.	0.00	0.00	0.17	0.61	0.28
Change (vs. time-0)		< -1.00	< -1.00	-0.62	+0.91	-1.05
12	**Mean**	<1.00	<1.00	4.51	5.74	3.77
(wk)	Std. Dev.	0.00	0.00	0.16	0.23	1.79
Change (vs. time-0)		< -1.00	< -1.00	-0.93	+2.24	+0.40

Note: 1) Initial count = pre-treatment count calculated from inoculum count (CFU/sample package)
2) Time-0 = post-treatment count (CFU/sample package)

Figure 1. Effect of RTE-01 Drench and Drench/Spray Treatments on *L. monocytogenes* Inoculated onto Hotdogs without Purasal Stored at 40°F.

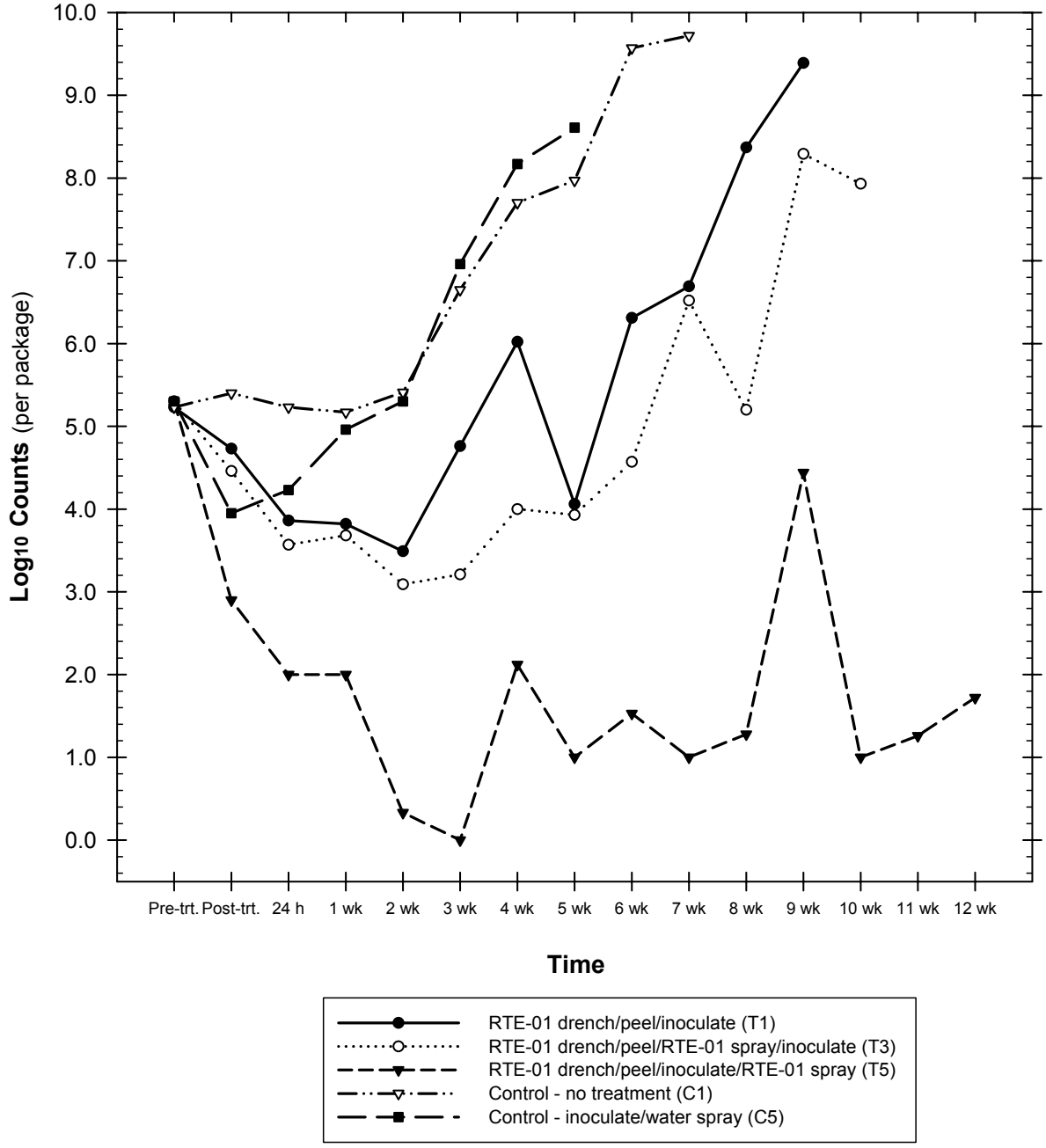

Figure 2. Effect of RTE-01 Drench and Drench/Spray Treatments on *L. monocytogenes* Inoculated onto Hotdogs with Purasal Stored at 40°F.

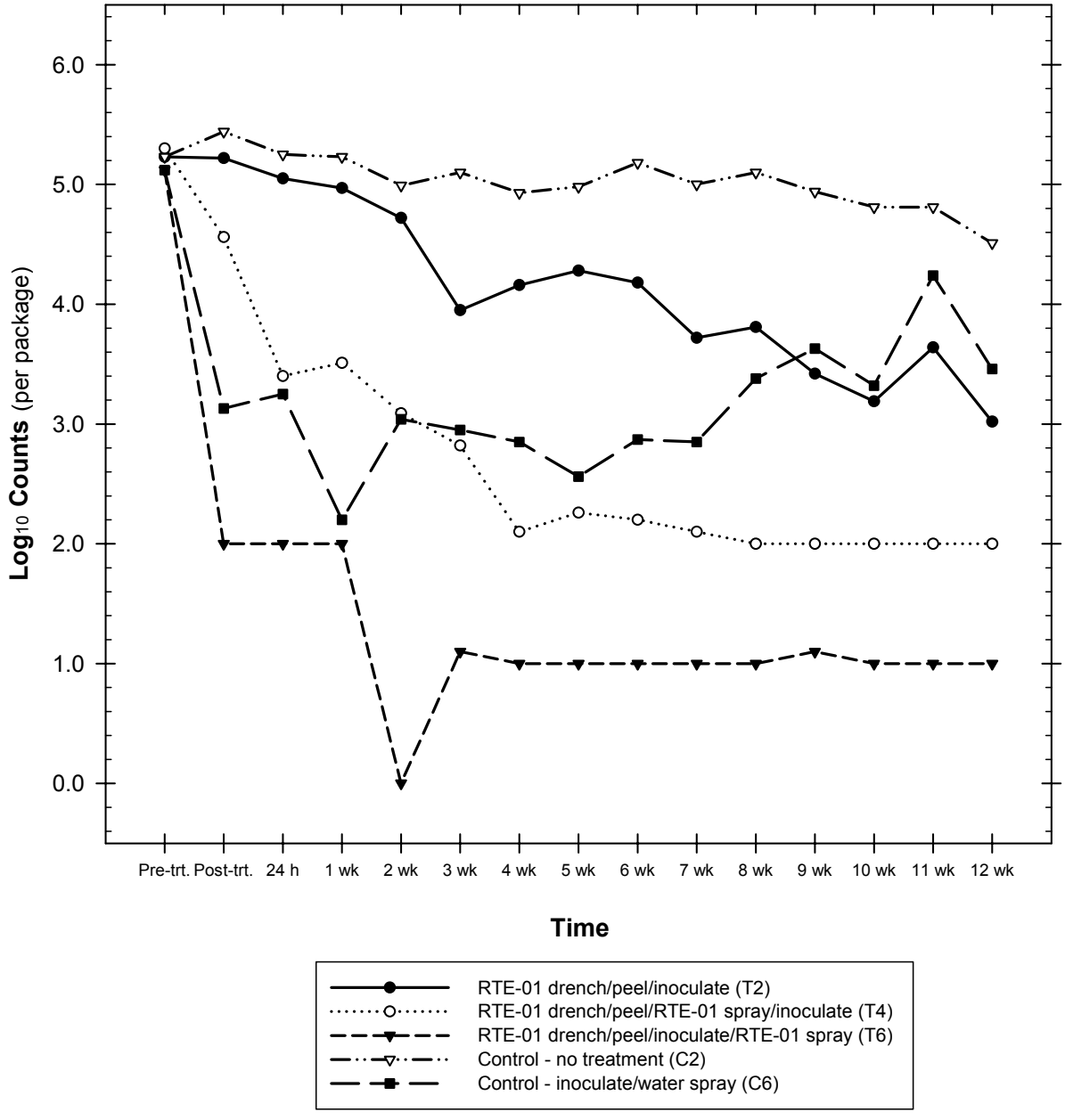

Figure 3. Effect of RTE-01 Dip (100°F) Treatments on *L. monocytogenes* Inoculated onto Hotdogs without Purasal Stored at 40°F.

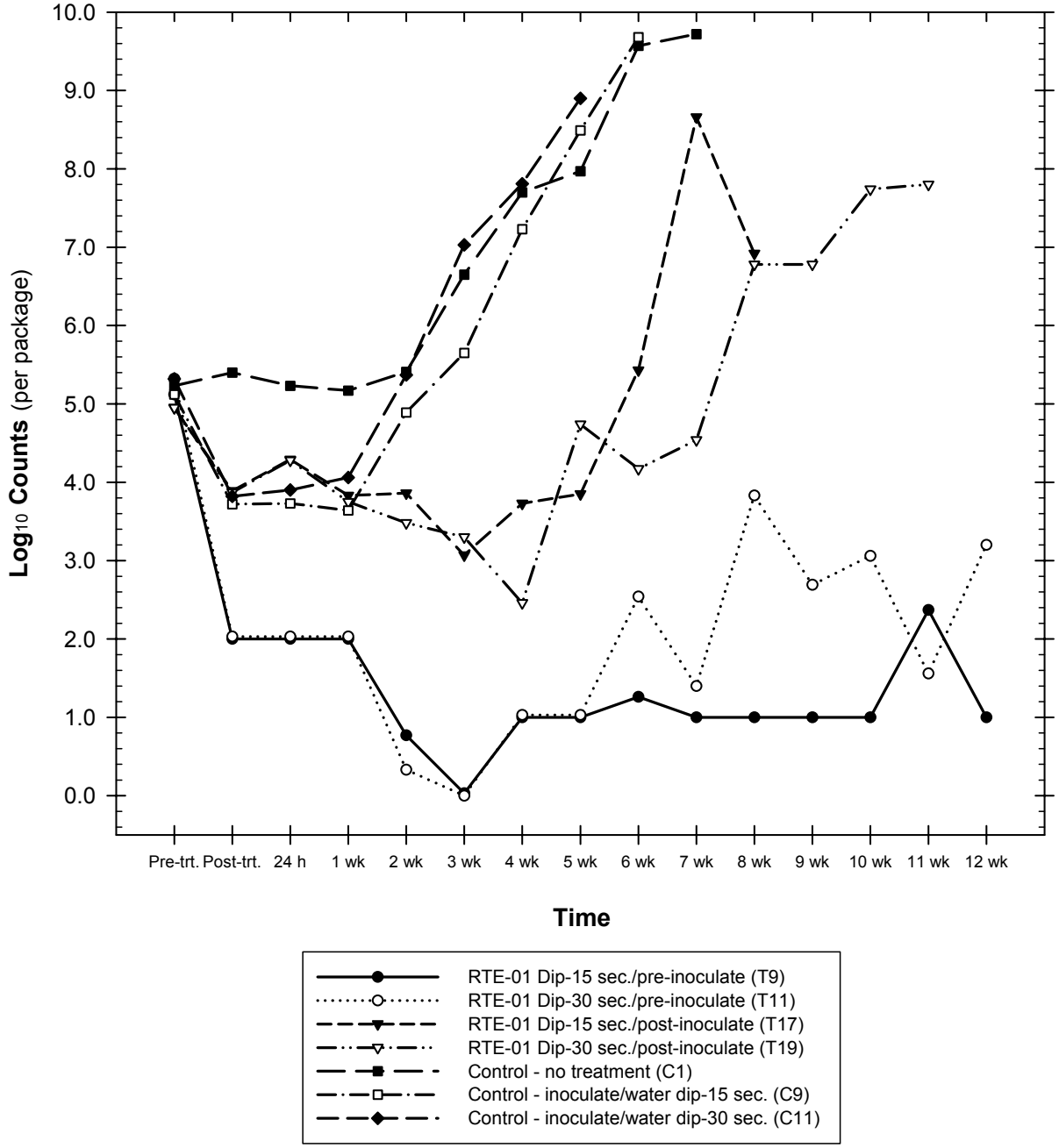

Figure 4. Effect of RTE-01 Dip (100°F) Treatments on *L. monocytogenes* Inoculated onto Hotdogs with Purasal Stored at 40°F.

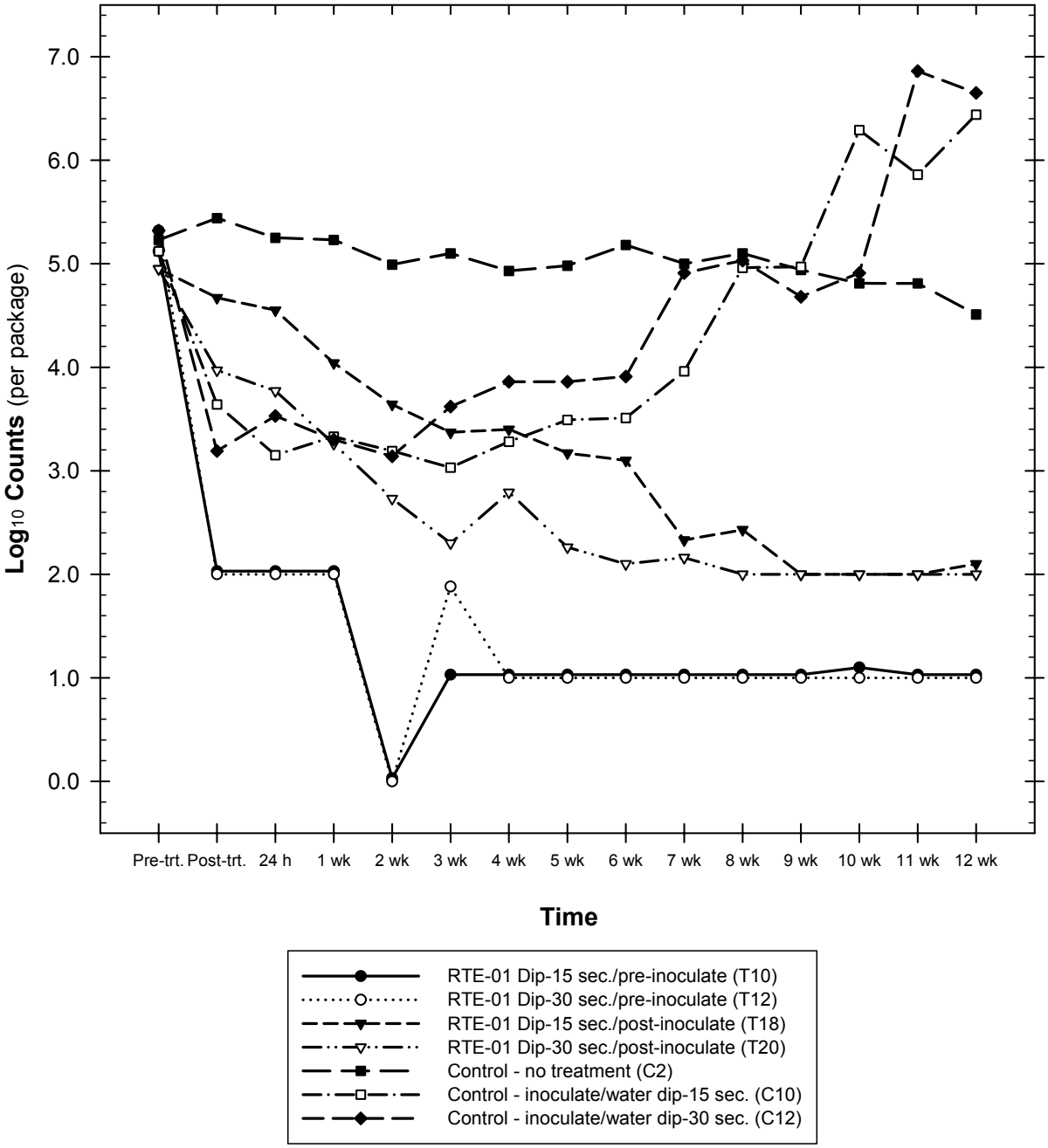

Figure 5. Effect of RTE-01 Dip (30 sec., 40°F) and Dip/Spray Treatments on *L. monocytogenes* Inoculated onto Hotdogs without Purasal Stored at 40°F.

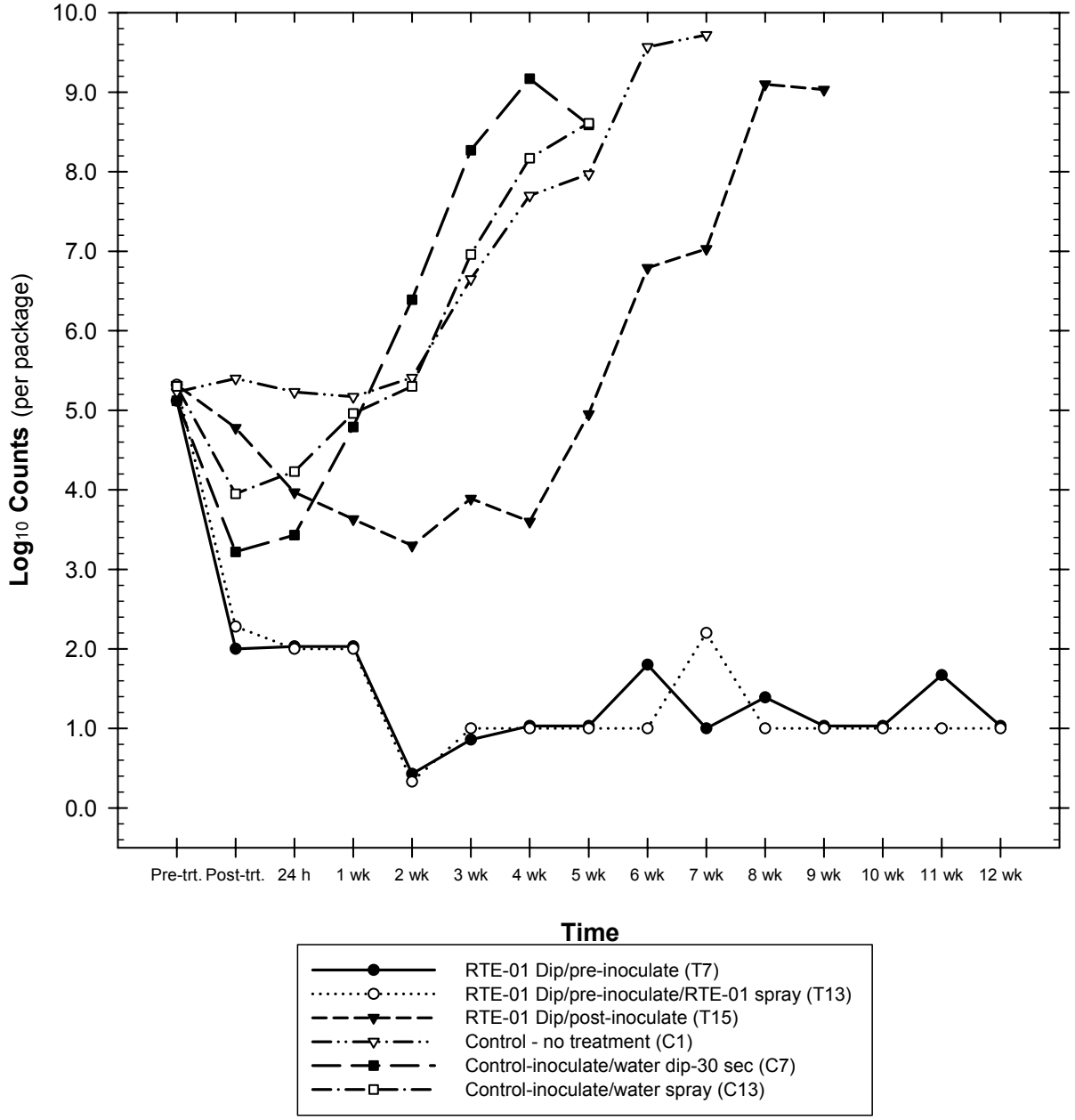

Figure 6. Effect of RTE-01 Dip (30 sec., 40°F) and Dip/Spray Treatments on *L. monocytogenes* Inoculated onto Hotdogs with Purasal Stored at 40°F.

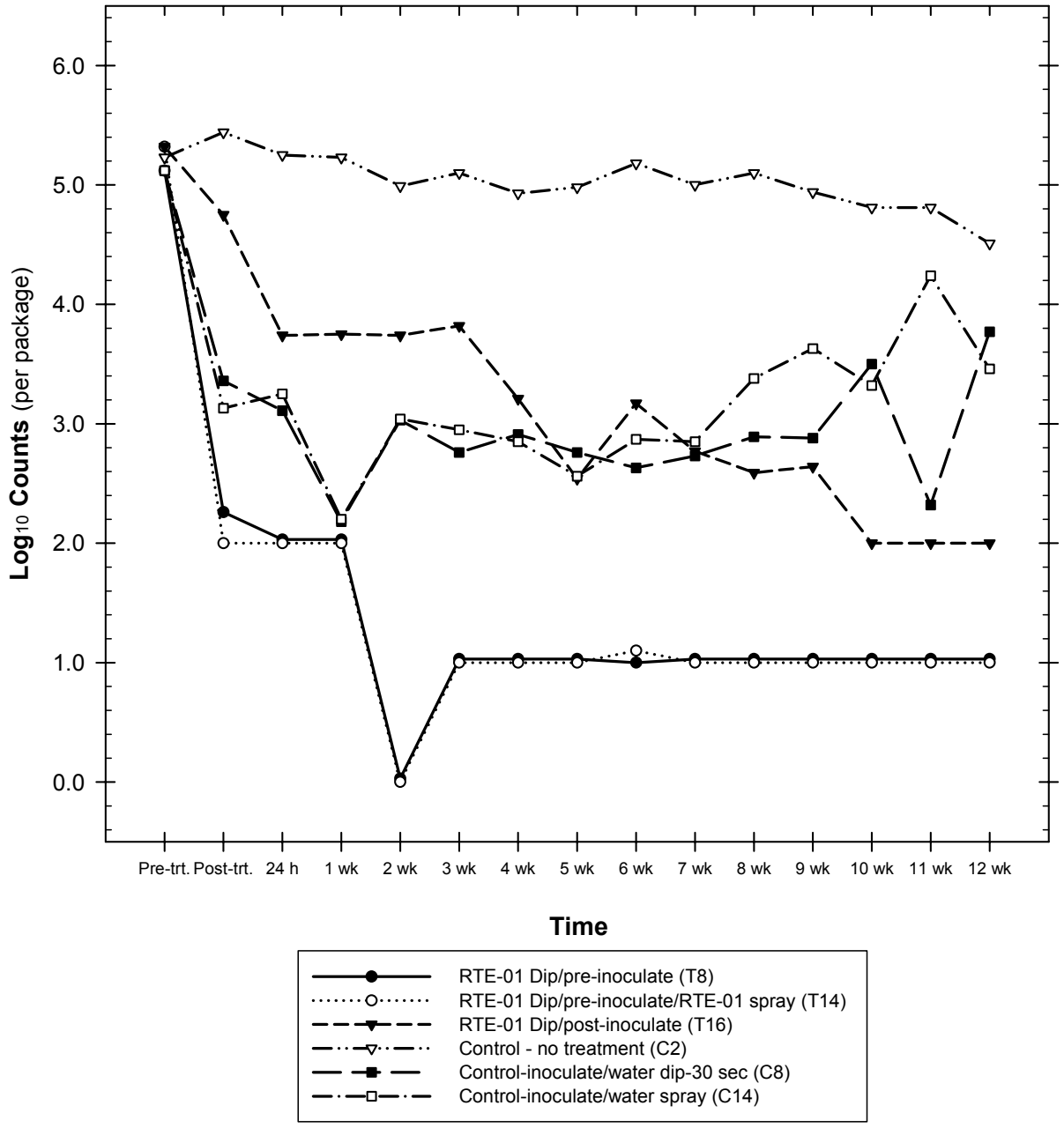

Figure 7. Effect of RTE-03 Dip (40°F) Treatments on *L. monocytogenes* Inoculated onto Hotdogs without Purasal Stored at 40°F.

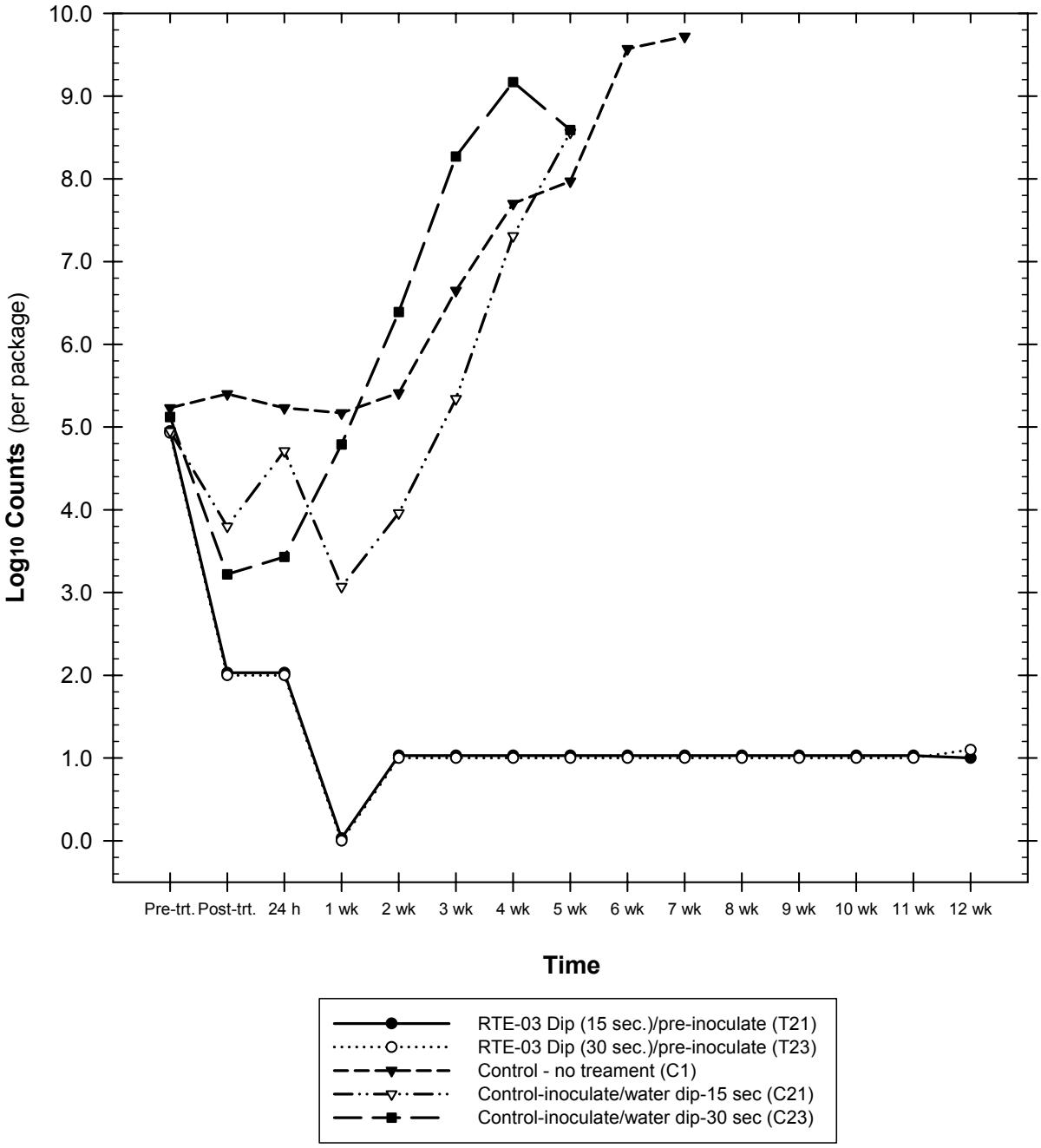

Figure 8. Effect of RTE-03 Dip (40°F) Treatments on *L. monocytogenes* Inoculated onto Hotdogs with Purasal Stored at 40°F.