Georgia Tech Research Institute
Agricultural Technology Research Program

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Research Brief
October 2025

WHAT KILLED THE PAA?
Topic 6: Air Agitation Effects on PAA's Antimicrobial Activity

Problem Statement

Peracetic Acid (PAA) is a strong oxidizer and serves as an antimicrobial agent in poultry processing. PAA stock comes chemically stabilized. Once PAA is diluted with water or dosed into chillers and dip tanks, the chemical begins to decompose into acetic acid and water. PAA decomposition rates are reported as chemical half-life and measured in minutes. The chemical half-life is the time required for a quantity of PAA to reduce to half of its starting value. PAA decays rapidly in the presence of high organic loading common in immersion chillers, which can effect its antimicrobial activity. Organics in the chiller are found in the form of Total Suspended Solids (TSS); Fats, Oils, Grease (FOG); and Total Dissolved Solids (TDS), such as proteins, lipids, and salts.

This research brief presents results of the effects of different levels of air agitation on the antimicrobial activity of PAA while under immersion chiller-like conditions.

Objectives

- Determine the effects of varying levels of air agitation on the antimicrobial activity of PAA.
- Compare the effects of different levels of air agitation on PAA's ability to reduce a tracer strain of *Salmonella* inoculated on poultry parts: drumsticks, flats, and drumettes.

Key Takeaways

- Air agitation has a noticeable effect on PAA's antimicrobial activity.
- As air agitation increased, there was an associated increase in PAA's ability to reduce *Salmonella*.
- For low air agitation, there was an average 1.27 log reduction.
- For medium air agitation, there was an average 1.71 log reduction.
- For high air agitation, there was an average 1.91 log reduction.
- During the chilling process, foam was generated based on the amount of air agitation.
- As the air agitation level increased, there was an increase in the amount of foam generated.
- Foam and water were characterized for TSS, TDS, and FOG.
- As air agitation increased, the amount of TSS, TDS, and FOG in the water portion decreased, while the amount of TSS, TDS, and FOG in the foam increased.
- The removal of some of the organic compounds that cause rapid breakdown of PAA may allow PAA to persist longer in the water portion, thereby increasing *Salmonella* reduction.

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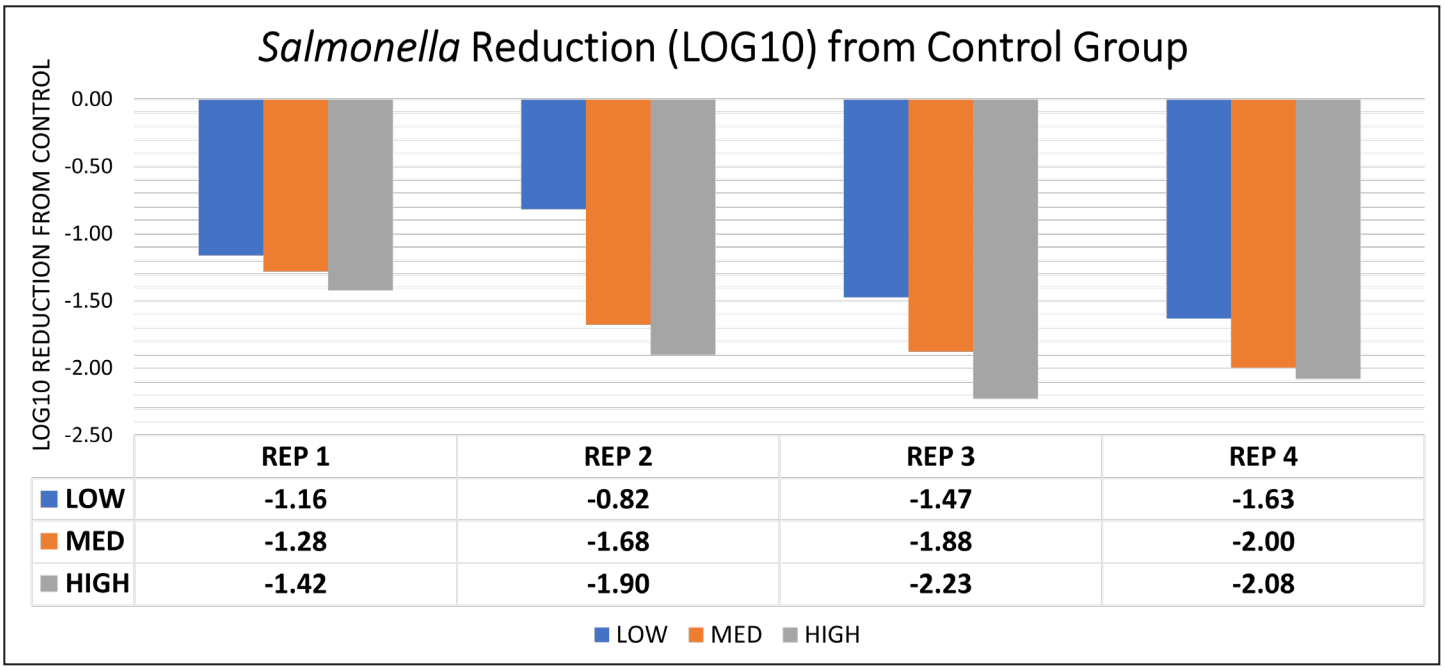
Research Methodology and Results

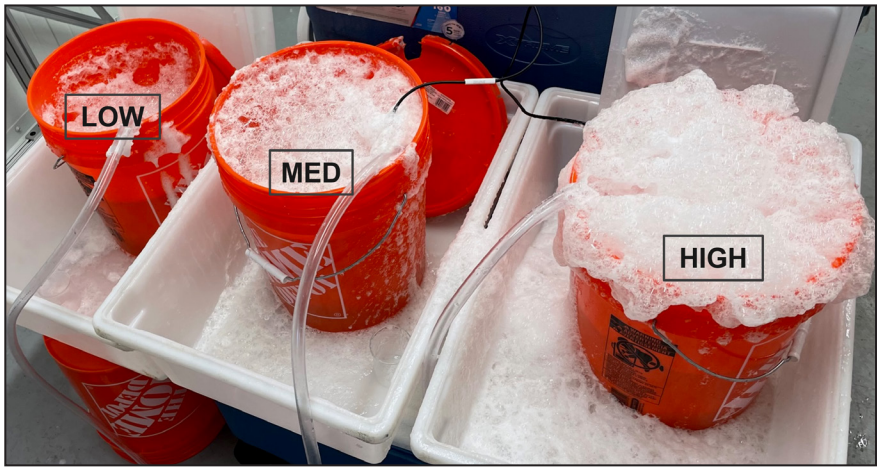
Air Agitation Effects on Antimicrobial Activity of PAA

This study investigated the antimicrobial efficacy of peracetic acid (PAA) on *Salmonella* present on chicken drumsticks, flats, and drumettes under different levels of air agitation during a chilling process. A tracer strain of *Salmonella* was used to ensure accurate reductions were monitored. After allowing *Salmonella* to attach to the chicken parts, samples were chilled for 60 minutes in water containing 100 ppm PAA, with air agitation classified as low, medium, or high. Across four replicates, all levels of air agitation led to substantial reductions in *Salmonella*, but high air agitation consistently produced the greatest reduction, averaging 1.91 log decrease, compared to medium (1.71 log) and low (1.27 log) agitation groups; see figure below.



	REP 1	REP 2	REP 3	REP 4
LOW	-1.16	-0.82	-1.47	-1.63
MED	-1.28	-1.68	-1.88	-2.00
HIGH	-1.42	-1.90	-2.23	-2.08

Notably, increased air agitation resulted in more foam formation, which was found to contain higher concentrations of total suspended solids (TSS), total dissolved solids (TDS), and fats, oils, and grease (FOG) than in the water portion. The water from high agitation treatments consequently demonstrated lower TSS and TDS, suggesting that organic matter, known to accelerate PAA decay, was removed by the foam, allowing PAA to persist longer and exert stronger antimicrobial effects.



These results highlight that air agitation notably enhances PAA's ability to reduce *Salmonell*a, likely by shifting foam and organic compounds away from the chiller water and sustaining PAA's activity against bacteria.