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Integrating Aerated Water and Peracetic Acid for Effective *Salmonella* Control on Hatching Eggs

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INTRODUCTION

Along the farm-to-fork continuum, hatcheries serve as a major entry point for *Salmonella Enteritidis* (SE) into poultry production. Contaminated hatching eggs can result in SE colonization of developing embryos, SE-positive hatchlings, and subsequent dissemination to grow-out farms. Early interventions at the hatchery level are therefore essential to reduce SE transmission through the egg-to-chicken pipeline. Disinfection of hatching eggs is a key component of SE control; however, conventional disinfectants such as formaldehyde, UV light, hydrogen peroxide, and benzalkonium bromide often show inconsistent efficacy and can negatively affect hatchability. These limitations underscore the need for effective, natural, and safe alternatives to control SE contamination during incubation and improve microbial safety in broiler production systems.

OBJECTIVE

Overall Objective

To evaluate the effectiveness of aerated water (AW) spray, alone or in combination with peracetic acid (PAA), in reducing *Salmonella Enteritidis* (SE) contamination on hatching eggs.

Specific Objectives

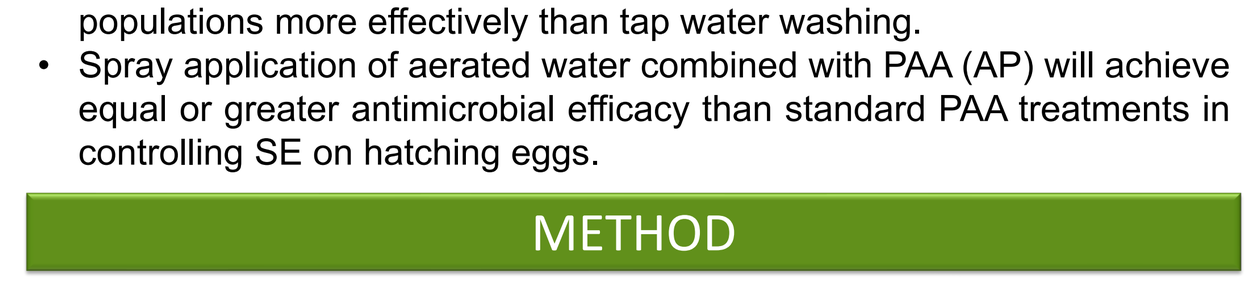
- To determine the reduction of SE populations on the eggshell surface following treatment with AW, AW + PAA, PAA alone, and tap water.
- To assess SE contamination in the internal contents of hatching eggs after each treatment.
- To compare the efficacy of AW + PAA treatment with conventional PAA and tap water washing methods.

HYPOTHESIS

- Washing hatching eggs with aerated water (AW) will reduce SE populations more effectively than tap water washing.
- Spray application of aerated water combined with PAA (AP) will achieve equal or greater antimicrobial efficacy than standard PAA treatments in controlling SE on hatching eggs.

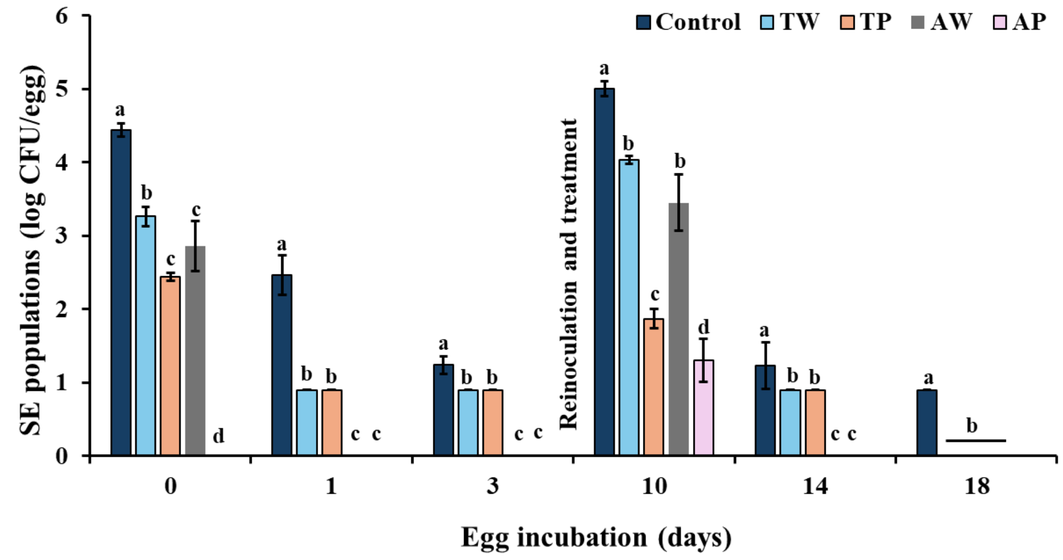
METHOD

Eggs: Broiler hatching eggs (n = 150) inoculated with a five-strain SE cocktail (~7 log CFU/egg).
Treatments: Control, Tap Water (TW), Aerated Water (AW; 30 mg/L O_2), Tap Water + PAA (TP; 80 ppm), Aerated Water + PAA (AP; 30 mg/L O_2 + 80 ppm).
Incubation: Treated eggs incubated for 18 days.
Sampling: SE enumerated on D 0, 1, 3, 10, 14, and 18; five eggs sampled per treatment/time point.
Analysis: Data analyzed in GraphPad Prism; significance set at $p \leq 0.05$.

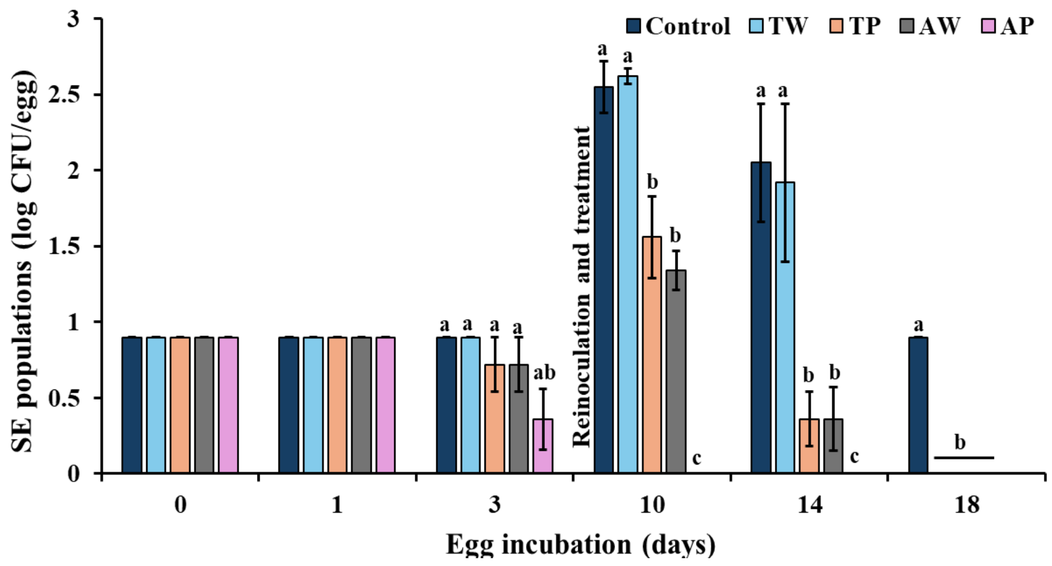


RESULTS & DISCUSSION

Spray application of AW and AP significantly reduces SE contamination on hatching egg surface



Spray application of AW and AP significantly reduce SE contamination inside the hatching egg



SUMMARY

- ✓ Aerated water (AW) treatment showed a strong antimicrobial effect on both the eggshell surface and inner shell membrane.
- ✓ No SE detected in eggs treated with aerated water + peracetic acid (AP) throughout 18 days of incubation, demonstrating effective pathogen control.
- ✓ Eggs treated with tap water + PAA (TP) retained detectable SE populations through D 18, indicating reduced efficacy without aeration.
- ✓ The consistent absence of SE in AW- and AP-treated eggs highlights their potential as practical and effective strategies for SE control hatching eggs.

CONCLUSION

- ➢ Aerated water (AW), especially when combined with peracetic acid (PAA), effectively reduces *Salmonella* Enteritidis contamination on hatching eggs.
- ➢ The AW + PAA treatment is organic-compatible and suitable for sustainable hatchery sanitation programs.
- ➢ This approach can enhance hatchery biosecurity and reduce pathogen transmission through the poultry production chain.

REFERENCES

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