

Project Summary

'Plasma Activated Water: Investigating opportunities to reduce food waste in the poultry industry' Project

KEY POINTS

- Plasma activated water (PAW) performed as well as conventional chlorine sanitisers for cleaning eggs and reducing bacterial contamination.
- PAW reduced bacterial growth on chicken meat and, in several cases, outperformed chlorine-based treatments during refrigerated storage.
- Egg quality and freshness were maintained following PAW treatment, with no greater impact on eggshell integrity than current industry practices.
- PAW is generated using only water, air and electricity, offering a promising alternative to conventional chemical sanitisers.
- The technology has potential to extend poultry product shelf life, helping reduce food waste.

THE CHALLENGE

Eggs and chicken meat can become contaminated by spoilage organisms during production and processing, reducing shelf life and increasing the likelihood of products being discarded before consumption. While chlorine-based sanitisers are widely used to control bacterial contamination, there is growing demand for alternatives that can maintain food safety while reducing chemical use, residues and environmental impacts.

THE OPPORTUNITY

Plasma activated water (PAW) is an emerging sanitisation technology that combines water, air and electricity to generate naturally occurring antimicrobial compounds. Unlike conventional chlorine-based sanitisers, PAW leaves no chlorine residues and can potentially be produced on-site using renewable energy. If proven effective at commercial scale, PAW could help poultry, improve product quality, lower environmental impacts and meet increasing consumer demand for sustainable food production practices.

OUR RESEARCH

Evaluating a New Sanitising Technology

Researchers from Adelaide University worked with industry partner Feather&PECK to evaluate PAW as an alternative to conventional chlorine-based sanitisers used in chicken egg cleaning.

Egg Washing and Storage Studies

The project examined how effectively PAW reduced bacterial contamination on eggshells and whether it affected egg quality or the protective eggshell cuticle. Eggs treated with PAW were monitored over eight weeks under different storage conditions and compared with eggs treated using industry-standard sanitising practices.

Chicken Meat Storage Studies

Chicken meat cuts including breast, thigh and wings were treated with PAW and compared with conventional chlorine treatments. Researchers measured bacterial growth during refrigerated storage to determine whether PAW could help extend control microbial load.

Understanding How PAW Works

The team also identified bacterial species commonly found on eggshells and investigated how PAW damages bacterial cells and biofilms, providing insight into its antimicrobial mode of action

OUTCOMES

This project demonstrated that plasma activated water is an effective sanitising technology for poultry products.

For eggs, PAW reduced bacterial contamination and performed comparably to the industry-standard chlorine sanitiser. Egg quality and freshness were maintained throughout storage, and PAW had no greater impact on eggshell cuticle integrity than existing washing practices.

For chicken meat, PAW reduced bacterial growth during refrigerated storage and, in several cases, achieved better microbial control than chlorine-based treatments. These findings suggest PAW may offer opportunities to extend shelf life and reduce spoilage-related losses.

The project also expanded scientific understanding of the bacteria commonly found on eggshells and provided visual evidence of how PAW disrupts bacterial cells and biofilms.

Overall, the research establishes PAW as a promising alternative to conventional poultry sanitisers and provides a strong evidence base for further development and commercial evaluation.

IMPACT

This research supports the End Food Waste CRC's goal of researching evidence-based interventions with the potential to reduce food waste across Australia's food supply chain.

By improving control of spoilage bacteria, PAW has the potential to extend the shelf life of eggs and poultry products, reducing losses during storage, distribution and retail. The technology may also help improve future industry profitability by reducing product waste and increasing product quality.

Because PAW is generated using water, air and electricity, it offers a pathway to reduce reliance on conventional chemical sanitisers and their associated environmental impacts. The technology could also contribute to lower greenhouse gas emissions by reducing food waste and enabling more sustainable food processing practices.

More broadly, the project strengthens Australia's position in developing innovative food technologies that improve food safety, sustainability and resource efficiency.

NEXT STEPS

The next phase of research will focus on moving PAW from laboratory validation towards commercial implementation.

Researchers are currently investigating how PAW can be integrated into poultry processing systems at industrial scale, including evaluating production capacity, operational costs and compatibility with existing washing equipment. Additional work is also required to support regulatory approval pathways and confirm food safety requirements for commercial adoption. Many of the predicted impacts will only be realised with continued investment into further scientific research.

Future studies will further quantify shelf life extension benefits under commercial conditions and assess the economic and environmental impacts of large-scale implementation.

With promising results already achieved, PAW is now progressing towards pilot-scale testing and technology commercialisation, bringing the poultry industry closer to a sustainable, chemical-free sanitisation alternative that can help reduce food waste and improve food system resilience.

PROJECT TEAM

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PROJECT REPORTS/PUBLICATIONS

(Preprint) Vyas, H.K.N.; Abdo, A.I.; Kolbe, B.H.; Boahen, A.; Jia, S.; McWhorter, A.R.; Coad, B.R.; Richter, K. Plasma-Activated Water: An Emerging Technology for the Control of Eggshell-Associated Biofilms. *bioRxiv* **2026**, 2026.2001. 2012.699152.

PROJECT WEBPAGE

<https://endfoodwaste.com.au/plasma-activated-water/>

ENDFOODWASTE

COOPERATIVE RESEARCH CENTRE

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