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Electrolysed water:

A solution to the listeria outbreak

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Background

A recent outbreak of Listeria monocytogenes (listeria), connected to rockmelon originating from a farm in NSW, has shown that there is a need for more effective treatment of bacteria on fruit and vegetables.

Listeriosis is of grave concern to the community and can be fatal, particularly to the elderly, pregnant women and those with weakened immune systems.

A study published by the Department of Food Science and Technology at the University of Georgia determined that electrolysed water (eWater) was achieved complete inactivation of Escherichia coli (E coli) and Listeria. A separate study by the same University found similar results when testing bacteria concentration on stainless steel surfaces.

Further verification of eWater came in 2017 when the Department of Food Sciences at Rutgers University found soaking lettuce heads in eWater significantly reduced levels of Salmonella, E. coli and Listeria compared to tap water and acid sanitisers.

The NSW Vulnerable Persons Food Safety Scheme Consultative Committee (VPFSSCC) have even recommended that eWater be used as an alternative sanitiser, especially in environments where listeria is of concern.

Effects of chlorine and pH on efficacy of eWater

A study titled *Effects of chlorine and pH on efficacy of electrolysed water for inactivating Escheria coli O157:H7 and Listeria monocytogenes* published in the International Journal of Food Microbiology by the Department of Food Science and Technology, University of Georgia studied the effectiveness of eWater at inactivating bacteria with different chlorine and pH levels.

eWater of different levels of concentration was tested on bacterial cultures.

The study found:

> "The bactericidal activity of EO water increased with residual chlorine concentration for both pathogens, and complete inactivation was achieved at residual chlorine levels equal to or higher than 1.0 mg/l. The results showed that both pathogens are very sensitive to chlorine, and residual chlorine level of EO water should be maintained at 1.0 mg/l or higher for practical applications. For each residual chlorine level, bactericidal activity of EO water increased with decreasing pH for both pathogens. However, with sufficient residual chlorine (greater than 2 mg/l), EO water can be applied in a pH range between 2.6 (original pH of EO water) and 7.0 while still achieving complete inactivation of E. coli O157:H7 and L. monocytogenes."

This shows eWater's effectiveness at inactivating harmful bacteria.

Inactivation of Listeria by eWater

A separate study by the Department of Food Science and Technology, University of Georgia investigated the ability of eWater to inactivate listeria on stainless steel surfaces, such as those used in food preparation areas.

Researchers exposed stainless steel coupons to listeria for several hours then submerging the coupons in eWater for periods ranging from 10 to 300 seconds.

They determined:

> "Results obtained from this study demonstrated that 300 s EO water treatment on stainless steel surfaces significantly reduced the number of biofilm-forming bacteria from 1.9 x 10" CFUB2.5 cm2 to below detection levels. EO water treatment may be an effective means of inactivating biofilm forming bacteria on equipment surface during cleaning."

> "A fast inactivation rate of biofilms was observed within 30 s after application of the EO water. The inactivation rate of biofilms was reduced significantly after the first 30s treatment. This is probably due to a longer time required for EO water to penetrate to the inside of the bacteria clumps whereas microorganisms outside of the bacteria clumps will react with the EO water immediately. Extending the EO water treatment time to 300 s resulted in inactivation to below detectable levels"

This demonstrates the practical application of eWater.

Sanitiser efficacy in preventing cross-contamination

The Department of Food Science, Rutgers University have also studied the effects of eWater. In a study published last year they observed the effects of soaking lettuce heads exposed to several strains of bacteria, including listeria, in eWater, as well as tap water and commercial acid sanitisers.

This included placing contaminated lettuce heads in the same sink as non-contaminated samples to test cross-contamination.

Their finding included that:

- Soaking with electrolysed water prevented cross-contamination among lettuce heads and controlled bacterial populations during a triple use of crisping water.
- Soaking of inoculated Romaine lettuce with electrolysed water significantly reduced the population of *Salmonella, E. coli* O157:H7, and *L. monocytogenes* compared to tap water and commercial acid sanitizers.
- No difference was noted between tap water and commercial acid sanitizers in reducing foodborne pathogens on lettuce.

This shows the effectiveness of applying eWater directly to food as well as its efficacy over chemical sanitisers.

The NSW Vulnerable Persons Food Safety Scheme Consultative Committee

In 2014, the VPFSSCC published a report stating:

> "A paper prepared by the Authority's Science and Technical Unit was tabled in response to a question the Authority had received from a facility regarding the use of electrolysed water as an alternative to traditional chemical cleaning and sanitising products. It was noted that the Authority's position on this was that electrolysed water can be used, provided procedures are appropriately maintained and monitored to confirm the concentration of chlorine in the sanitising solution, especially in environments where Listeria monocytogenes is of concern."

This shows the acceptance of eWater a sanitiser by an official Australian body.

Summary

Electrolysed water has been demonstrated to be not only an effective sanitiser, particularly in regards to listeria, but its efficacy over other commercial sanitisers.

As listeria can live on the skin of the rockmelon, contamination can occur at any point from preparation to sale, so it is imperative that a solution be implementable from the beginning of the production cycle to the end.

And despite its ability to kill bacteria, eWater is completely harmless to people and the environment.

The electrolysis units and reticulated systems sold by us at eWater Systems can be installed at many of the locations fruit and vegetables can be shipped or sold, such as food production facilities and supermarkets.

eWater Systems can be contacted at 1300 EWATER or info@eWatersystems.com

References

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