Ozonated Water

INTERVENTION SUMMARY	
Status	Currently available
Location	Post-slaughter
Intervention type	Surface treatment
Treatment time	15-60 seconds
Effectiveness	1-2 log
Regulations	Approved in the US and Australia
Likely cost	High capital outlay. The Ozone Safe Food website has a cost ($US) savings calculator to input data to compare with your current process but it does not include the capital cost of the equipment
Value for money	Worth consideration
Plant or process changes	A reasonable space needs to be available to install the application equipment, though the generation unit may be installed externally to the point of use
Environmental impact	No residual chemicals are generated and ozone readily decomposes to oxygen
OH&S	Ozone gas is toxic and measures need to be put in place when in use. For example, no personnel access to area being fumigated
Advantages	The ozone dissipates quickly No residual chemicals after treatment
Disadvantages or limitations	Possible discolouration of lean at high concentrations Potential for oxidation of fat An appropriate method to keep the concentration of ozone in solution at an effective level is very important

Disclaimer

Care is taken to ensure the accuracy of the information contained in this publication. However MLA cannot accept responsibility for the accuracy or completeness of the information or opinions contained in the publication. You should make your own enquiries before making decisions concerning your interests.

Ozonated Water

Ozone is a water-soluble, naturally occurring gas, which is a powerful oxidising agent. It is very unstable, and when exposed to air and water it rapidly decomposes to form ordinary oxygen. This means that ozone must be generated at the point of use. Ozone typically destroys microorganisms by attacking and oxidising the cellular walls and membranes. However, use of this chemical may elicit oxidation (increased rancidity) of fat and muscle pigments.

In Australia, ozone treatment is regarded as a processing aid in the Food Standards Code Standard 1.3.1, Clause 11 (FSANZ, 2013). There are currently no restrictions on its use, through good manufacturing practice (GMP) mush be followed. Ozone is also approved for use in the US on all meat and poultry products in accordance with current industry standards of good manufacturing practice (21 CFR 173.368; FDA, 2013).

Gram-positive organisms are more sensitive to ozone than Gram-negative organisms, and bacteria are generally more sensitive than yeasts and moulds. The efficacy of ozone treatment is affected by pH, temperature, relative humidity, concentration, and phase of microbial growth and by the presence of organic material (Sofos and Busta, 1991).

Ozone has been evaluated for its efficacy in reducing microbial numbers on meat carcasses and cuts. Only little effects were observed on microorganisms including *E. coli*. It was found that *E. coli* reduced by 1 log unit on beef samples when exposing to 72 ppm ozone (Cardenas *et al.,* 2011). Similarly, ozone at 5 ppm also caused a 1-log reduction of *E. coli* O157:H7 on pork carcass (Rahman *et al.* 2013). Furthermore, researchers at Kansas State University in the US combined ozone and peroxide in a system and determined its effects on pathogen levels in food processing plants (Ortega *et al*., 2007). It was found that these oxidative gases reduced all target organisms by at least 90% after a 24 hour exposure on stainless steel surfaces.

In a study where ozonated water was used in a simulated hide washing system (Bosilevac *et al*., 2005), a 2.1-log reduction in the total aerobic count was observed on the hides, while washing hide with water alone only reduced the total microbial count by 0.5 log. This is in contrast to the study of Castillo *et al.* (2003). The results of that study indicated no difference in numbers of *E. coli* O157:H7 and *S.* Typhimurium on the surfaces of a hot carcass after exposure to water wash containing 95 ppm ozone compared to that of water on its own.

A comprehensive review on the potential applications of ozone treatments for fresh and ready-to-eat red meat products was prepared by researchers at CSIRO (MLA, 2004).

Proponent/Supplier Information

Continental Water

18 Dividend Street

Mansfield

QLD 4122, Australia

Ph: 07 3434 1100

Fax: 07 3219 2266

Website: http://www.continentalwater.com.au/

Ozone Safe Food, Inc

18640 Collier AvenueBuilding N Lake Elsinore, CA 92530, US

Ph: +1 951 657 8744

Fax: +1 951 657 8817

Email: info@ozonesafefood.com

Website: http://www.ozonesafefood.com/

Hi Tech Pacific Australasia

P.O Box 24

Sumner Park

QLD 4074, Australia

Ph: 07 3715 5092

Fax: 07 3376 9463

Website: http://www.hitechpacific.com.au/

References

Bosilevac, J. M., Shackleford, S. D., Brichta, D. M., Koohmaraie, M. (2005) Efficacy of ozonated and electrolyzed oxidative waters to decontaminate hides of cattle before slaughter. Journal of Food Protection **68**: 1393-1398.

Cardenas, F. C., Andres, S., Giannuzzi, L., Zaritzky, N. (2011) Antimicrobial action and effects on beef quality attributes of a gaseous ozone treatment at refrigeration temperatures. Food Control **22:** 1442-1447.

Castillo, A., McKenzie, K. S., Lucia, L. M., Acuff, G. R. (2003) Ozone treatment for reduction of *Escherichia coli* O157:H7 and *Salmonella* Typhimurium on beef carcass surfaces. Journal of Food Protection **66**: 775-779.

FDA (2013) Code of Federal Regulations Title 21, Government Printing Office, USA

FSANZ (2006) Australia New Zealand Food Standards Code, Standard 1.3.3 – processing aids. http://www.foodstandards.gov.au/code/. Accessed 5th March 2014.

Meat & Livestock Australia (MLA) (2004) The potential applications of ozone treatments for fresh and ready-to-eat red meat products – Literature Review, MLA Project RMIPCK.006.

Ortega, M. T., Franken, L. J., Hatesohl, P. R., Marsden, J. L. (2007) Efficacy of Ecoquest radiant catalytic ionization cell and Breeze AT ozone generator at reducing microbial populations on stainless steel surfaces. Journal of Rapid methods & Automation in Microbiology **15**: 359-368.

Rahman, S. M. E., Wang, J., Oh, D.-H. (2013) Synergistic effect of low concentration electrolyzed water and calcium lactate to ensure microbial safety, shelf life and sensory quality of fresh pork', Food Control **30:** 176-183.

Sofos, J. N., Busta, F. F. (1991) Chemical food preservatives. In: Principles and Practice of Disinfection, Preservation and Sterilization (2nd Edition) (Ed: Russell, A. D., Hugo, W. B. and Aycliffe, G. A. J.) Blackwell Scientific, Oxford. Pp 351-397.