Research hails chlorine dioxide gas potential to combat Listeria threat on RTE meat processing kit

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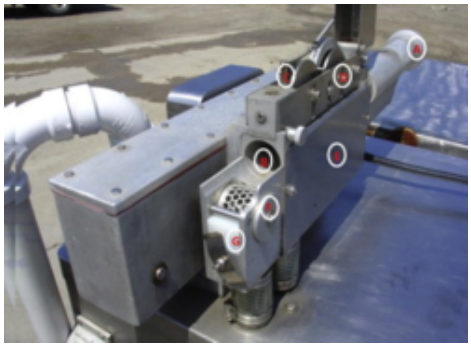
Chlorine dioxide (ClO2) gas has the capacity to completely inactivate Listeria monocytogenes (LM) on ready-to-eat (RTE) meat processing equipment, according to new research.



Scientists from the US found that exposing an industrial meat slicer and hot-dog peeler to the gas for up to 30 minutes led to *"complete pathogen inactivation"* of around 5 log CFU/cm2 – demonstrating its potential as a sanitizing agent.

The joint team from Purdue University and Ohio State University said the work was carried out to comply with the US Department of Agriculture's (USDA) zero tolerance approach to LM. They targeted RTE products as these were considered high risk for LM.

In 2008, Listeria-tainted equipment at a Maple Leaf plant in Canada was found to be the cause of contaminated RTE meat linked to deaths of 22 people.

The study – Inactivation of Listeria monocytogenes on Ready-to-eat food processing equipment by chlorine dioxide gas by Richa Vaid et al – is published in this month's edition of the journal Food Control.

Biofilms and sanitization

While sanitization is commonly carried out in processing plants, their effectiveness can be affected by a wide range of factors including the ability of bacteria to form protective shields known as biofilms.

The study identifies a raft of sanitizing agents, including ClO2 but said the latter is usually employed in liquid rather than gas form.

The team examined the effect of ClO2 on biofilm and non-biofilm (planktonic) LM samples. It used five strains of the pathogen - FSL 103-M, FSL N1-227, Scott A and one strain of *L. innocua, for the planktonic cells as well as L. monocytogenes* 311 and 82, for the biofilms.

The researchers found that increasing time and concentration improved inactivation and CIO2 of 2 mg/l at 30 minutes expose was most effective and this was selected for further examination.

"Data showed that no growth (i.e. no turbidity after 5 days) was observed in triplicate samples after 30 minutes and 70 minutes of treatment with 2 mg/l for planktonic cells and biofilms, respectively," said the study.

It was likely that biofilms were thought to be more resistant because the external layers of the extracellular substrate were initially easily and quickly eliminated by the sanitizer but it needed longer to penetrate deeply into the matrix.

Complete inactivation

In the final scale-up study on the RTE processing kit, only LM planktonic cells were used "*on the assumption that cleaning and sanitizing are procedures performed daily (or more frequently) with the purpose of reducing the risk of pathogen contamination and preventing microorganism persistence (i.e. biofilms)",* said the research.

Different parts of the equipment were selected and the results showed the ability of the gas for *"complete microbial inactivation"* on both the slicer - where the initial LM population before treatment was 5.78 log CFU/cm2 – and the peeler, where the number of *L. innocua* cells were measured at 6.15 log CFU/cm2.

The researchers said that while CIO2 gas had been applied to decontaminate hard food contact surfaces such as stainless steel, epoxy resins and plastics, theirs was the first to validate its use for RTE meat processing equipment.

Its regulatory approval for use, readiness of supply and efficacy of performance, mean that CIO2 meets many criteria laid out by US federal authorities as a sanitizing agent against LM, said the paper.

Valentina Trinetta, Richa Vaid, Qin Xu, Richard Linton, Mark Morgan, Inactivation of Listeria monocytogenes on Ready-to-Eat food processing equipment by chlorine dioxide gas, Food Control, Available online 16 February 2012, ISSN 0956-7135, 10.1016/j.foodcont.2012.02.008

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