

Biocide tolerance of *Salmonella* isolates recovered from clinically ill cattle

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Introduction

Cleaning and disinfection are common control methods to reduce *Salmonella* transmission in cattle herds. However, cleaning and disinfection protocols have had varied effectiveness against *Salmonella* in farm environments, and residual contamination is often reported. Biocide choice is critical when designing effective cleaning and disinfection protocols, yet little is known regarding *Salmonella* susceptibility to commercial products. Our objective was to determine the minimum bactericidal concentration (MBC), defined as ≥ 3 log reduction, of 6 biocides used in livestock production or veterinary medicine. We hypothesized that some label guidelines would not substantially reduce *Salmonella*.

Materials and methods

To assess this, a 48-well microtiter assay was developed that included 2-fold serial dilutions of Clorox® Germicidal Bleach, chlorine dioxide, chlorhexidine gluconate, KennelSol™, Rescue™, and Virkon® S. The lowest concentration tested was chosen based on the label directions for use and increased to 12 to 14 times the initial concentration, depending on the biocide. A neutralizer was used to inactivate biocides and simulate 10-minutes of contact time between bacteria and biocide, in accordance with some biocide label instructions. A second assay was run concurrently, using sterile water as a sham for neutralizer. Six isolates each from *Salmonella* serovars Dublin, Newport and Typhimurium recovered from ill cattle were tested in duplicate. Bacteria were enumerated to determine the log reductions after biocide exposure.

Results

Dilutions listed on KennelSol and Virkon S labels resulted in eradication of all isolates with or without neutralization. For all isolates, Clorox MBCs were either 625 or 1250 parts per million (ppm) within the label guideline for hard, nonporous surfaces (2400 ppm). However, the 200 ppm guidance for food contact surfaces failed to significantly reduce any isolates tested, which is a public health concern for cattle-derived *Salmonella* strains that are transmitted through the food supply. Rescue required a 2- to 4-fold concentration above label suggestion to achieve biocidal effects within 10 minutes when neutralized, but MBCs fell within suggested guidelines after 24-hours in the sterile water assay.

Significance

This assay identified biocides that were rapidly effective against *Salmonella*. Since isolates were recovered from clinically ill cattle, results may be particularly pertinent for guiding biocide choice on cattle farms experiencing salmonellosis outbreaks. Future work should define MBCs required to significantly reduce *Salmonella* biofilms and account for potential variation in biocide effectiveness based on surface material.

