Chlorine

INTERVENTION SUMMARY	
Status	Currently available
Location	Post-slaughter
Intervention type	Surface treatment
Treatment time	10-15 seconds
Regulations	Approved at levels complying to that of potable water – maximum permitted level is 10 ppm in Australia and the EU; in the US it is permitted at 20-50 ppm
Effectiveness	Not effective at 10 ppm
Likely cost	No cost if used water already treated by municipality
Value for money	Not recommended as a specific food safety intervention
Plant or process changes	Spray cabinet required
Environmental impact	Rapidly neutralised, few environmental issues
OH&S	Potential to produce toxic by-products Chlorine gas is toxic Secure storage of concentrate is required
Advantages	Ease of application. All plants have readily access to chlorinated water and most have chlorination equipment to vary chlorine strength
Disadvantages or limitations	Neutralised by high organic loads

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Chlorine was one of the first chemical treatments used to decontaminate carcass in the beef industry. Its antimicrobial activity is mainly due to its strong oxidative effect on bacterial cell wall. However, chlorine is rapidly neutralised by organic matter. This means that using this chemical before de-hiding would not be effective (i.e., because large amounts of organic material are often attached to hides). In addition, free chlorine gas, which is used to chlorinate water, is toxic, and chlorine can react with organic compounds to form carcinogenic compounds, called trihalomethanes (THMs) (Boorman *et al.*, 1999; Richardson, 2003). This, therefore, poses a health hazard to meat handlers working with chlorine.

Chlorine levels at above 10 ppm are not allowed for use in the food industry in Australia and the EU. In the US, 20 ppm chlorine has been approved in poultry washes/sprays, and at 50 ppm in poultry chill tanks. However, chlorine is not currently permitted for decontamination of red meat carcasses.

Reasonably good reductions in microbial counts have been reported using water chlorinated at 200 to 500 ppm. However, such high levels of chlorine are not permitted in the food industry, and lower concentrations are not effective. Water chlorinated to 200 ppm gave 1.5-2.3 log reductions in total aerobic bacteria on beef carcasses (Kotula *et al*., 1974), but the effects of carcass treatment with solutions of up to 250 ppm chlorine have been variable, with some very poor reductions being reported. Furthermore, Cutter and Siragusa (1995a) reported that sprays of 50, 100, 250, 500, and 900 ppm chlorine were only slightly effective (<1-log reduction in most cases) in reducing two strains of *E. coli* that had attached to the surface of beef carcasses and lean fat tissue.

References

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