

Hot Water Rinses as a Bacteriological Intervention Strategy on Swine Carcasses

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Summary and Implications

Hot water rinses were applied to the forelegs of hog carcasses intentionally contaminated with manure. The water temperature varied from ambient temperature (25°C) to 82°C. The hot water washes were followed by a 1.5% acetic acid rinse, and the carcasses were sampled before the hot water rinse, after the rinse and after the acid rinse. The hot water rinses reduced the total aerobic population by approximately 2 log₁₀ cycles and the population of Enterobacteriaceae by approximately 2.5 log₁₀ cycles. The acid rinses reduced the total aerobic population by an additional 0.3 log₁₀ cycle (total of 2.3 log₁₀ cycles) and the population of Enterobacteriaceae to below detectable limits (total of 4 log₁₀ cycles). The experiments were repeated in a commercial slaughter operation, with similar results.

Introduction

Microbial contamination of animal carcasses during slaughtering is an unavoidable problem in the conversion of live animals to meat for consumption. Much of the initial contamination comes from the hide during removal. The exposed surface of the hide and the hair accumulates dust, dirt, and fecal material (3). It has been demonstrated that slaughter instruments could spread contamination into the internal organs of beef cattle, for instance. The workers in slaughter operations also can be a source of contamination, as *Salmonella* spp. and *Escherichia coli* has been isolated from the hands of workers even after thorough washing. A variety of methods have been developed to reduce the levels of contaminating bacteria on carcasses, although most of the current methods focus on washing and sanitizing procedures (4).

Decontamination of carcasses with hot water could have several advantages over the use of chemicals. Paterson (1969) reported that beef carcasses treated with a steam and hot water spray (80°C-96°C) for 2 min contained significantly lower bacterial number. Even though some discoloration on the carcass surface occurred initially, the normal color returned after cooling for 24 hours (1). Hot water treatments also have resulted in significant reductions in bacterial populations on hog carcasses (5). Animal carcasses are known to be contaminated with a variety of pathogenic bacteria, including *Salmonella*, *Campylobacter*, *E. coli* and *Listeria*. High-pressure washing with only water has

found to reduce the total aerobic and Enterobacteriaceae counts by 1 and 1.5 log cycles, respectively (2). Immersion in water at 80°C for 10 seconds of whole sheep carcasses taken off the end of the slaughter line in a commercial abattoir destroyed 99% of the contaminating coliform organisms and 96% of the total number of aerobic bacteria initially present on the surface tissues (6).

Because much of the laboratory data was reported previously, this report focuses on the research conducted in the slaughter establishment.

Materials and Methods

Market weight hogs were intentionally contaminated with fresh manure on their jowls. One jowl on each carcass was skinned, whereas the other was scalded. The jowls were washed with 82°C water, which reached the carcass at approximately 65°C. The water was applied with a low-pressure applicator operating at 25 psi. Following the water rinse, the carcasses were sanitized with acetic acid (1.8 % vol: vol) by using a commercial acid rinse cabinet.

Microbiological samples were taken by swabbing an area of the inoculum equivalent to 20 cm². The samples were sent to a commercial testing laboratory, where they were analyzed quantitatively for total mesophilic aerobic bacteria, total coliforms, generic *E. coli* and qualitatively for *Salmonellae*.

Results and Discussion

Figure 1 shows the effects of hot water and acid rinses on the populations of aerobic mesophilic bacteria, total coliforms, and generic *E. coli* on scalded hog carcasses. The combination treatment of hot water and organic acid reduced the aerobic mesophilic populations by approximately 2 log₁₀ cycles, and the total coliform populations by approximately 2.4 log₁₀ cycles. The population of generic *E. coli* was reduced from log₁₀ 2.4 to levels that were at the limit of detection for the methods used.

Figure 1. Hot water and acid treatment scalded hogs

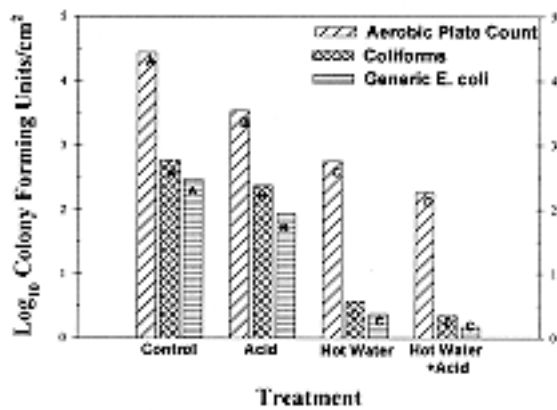
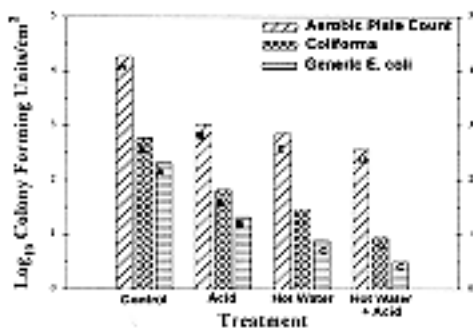


Figure 2 shows the effects of hot water and acetic acid rinses on skinned hog carcasses. The patterns of reduction were similar to those seen with scalded hogs, although the final populations of total coliforms and generic *E. coli* were slightly higher.

Hot Water and Acid Treatment Skinned Hogs



References

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