
Supporting Documentation for Critical Limits in Acetic Acid Spraying of Beef Carcasses

During January – September, 2006, we collected samples at five Wisconsin beef slaughter plants that use acetic acid spraying as a beef carcass intervention treatment. Four plants were investigated once, and the fifth plant was investigated twice. For each investigation, we obtained carcass sponge samples before the acetic acid spray treatment and the next day (after treatment). Overall, 61 carcasses were tested.

We analyzed the samples for generic *E. coli*, coliforms, and Enterobacteriaceae. These types of bacteria are called “indicator” bacteria because their presence usually indicates fecal contamination. Until further notice, you can regard these indicator groups as “stand ins” for pathogenic *E. coli* O157:H7. We also did the Aerobic Plate Count test, which is for “all” bacteria, actually those that can grow in the presence of oxygen at body temperature.

It was clear from the results that there was usually some low-level fecal contamination of carcasses before the acetic acid spray intervention. For example, generic *E. coli* was detected on 47 out of the 61 carcasses (77%) sampled before acetic acid spraying.

It was also clear from the results that the acetic acid spraying intervention treatment consistently resulted in a decrease in the three indicator groups of bacteria (generic *E. coli*, coliform, and Enterobacteriaceae). For example, generic *E. coli* was only detected on 13 of the 61 carcasses (21%) sampled after spraying and overnight chilling.

These results validate acetic acid spraying as an easy and effective beef carcass intervention treatment IF the following 4 Critical Limits are met.

1. Beef carcasses must be sprayed with a 1:1 mixture of commercial vinegar (5% acetic acid) and water (resulting in a 2.5% acetic acid solution). The spray solution must be prepared, handled, and applied according to the Organic Acid SOP that follows.
2. The sprayed carcass must be chilled until the next day, the day after slaughter. The carcass cooler temperature must reach 41°F or colder by 8:00 a.m. on the morning after the slaughter day.
3. The carcass cooler temperature must be maintained at 41°F or colder until the carcass is fabricated.
4. The carcass cooler must be equipped with a fan to create air movement.

It is recommended that you adjust your HACCP plan to include these Critical Limits. You also should develop monitoring and recordkeeping procedures to ensure that the Critical Limits are met.

Survey of Antimicrobial Effects of Beef Carcass Intervention Treatments in Very Small State-Inspected Slaughter Plants. 2007. R. Algino, S.C. Ingham, and J. Zhu. *Journal of Food Science*. Vol. 72. M173-179.

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The University of Wisconsin-Madison Center for Meat Process Validation provides science-based HACCP support to small meat processors in meeting state and federal mandates for safe food processing and handling. For more information on the Center contact Dr. Steve Ingham, 1605 Linden Drive, UW-Madison, Madison, WI 53706 (608) 265-4801 Email: scingham@wisc.edu

Organic Acid Spray SOP

Currently there are three types of organic acid spray solutions available for use: acetic acid (vinegar), lactic acid, and FreshBloom® (a mix of citric acid, ascorbic acid and erythorbic acid). The type of acid used each slaughter day shall be recorded in the Organic Acid Spray SOP Log, along with the amounts of acid and tap water used to prepare the solution. The organic acid solution shall be prepared to yield the following concentrations:

Acetic Acid: 2.5% (vol/vol). Commercial vinegar is usually 5% acetic acid (label will be checked), so a 50:50 dilution in tap water will normally produce the 2.5% solution.

Lactic acid: 2 - 2.5% (vol/vol). Purchased lactic acid is usually 88% (label will be checked), so adding 3.25 fluid ounces of that solution to a gallon of water will result in a 2.1% solution, or adding 3.75 fluid ounces of that solution to a gallon of water will result in a 2.4% solution.

FreshBloom® will be prepared at a rate of 8 ounces (weight) per gallon of water to result in a final concentration of 5.9% (wt/vol).

Regardless of the acid used, the following 3 basic steps shall be followed.

1. Each carcass half shall be thoroughly rinsed with tap water (Final Wash step) before the organic acid spray is applied.
2. Each organic acid spray solution shall be prepared fresh on the day of use with tap water (cold or hot) and stored on the slaughter floor for that day's use only.
3. Each carcass half shall be sprayed thoroughly on the exterior (hide) surface from top to bottom and back to the top. Then the interior (gut) surface shall be sprayed from top to bottom and back to the top. Whole heads, removed head and cheek meats, livers, hearts, or tongues shall be sprayed in one application of the same organic acid spray used for carcass halves.

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