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**Project Title:** **Validation of Antimicrobial Interventions Including use of Peroxyacetic Acid (PAA) in a Spray Chill System and a Head Spray Cabinet in a Commercial Beef Harvest Operation**

**Presenter:** Brittney R. Bullard, Haley E. Davis, **Rinara C. Kiel**, Ifigenia Geornaras, Robert J. Delmore, and Keith E. Belk
Presenters email address: rinara.kiel@colostate.edu
Mailing address: Colorado State University
1171 Campus Delivery
Fort Collins, CO 80523

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**Objective:** The objective of this study was to validate the effectiveness of peroxyacetic acid (PAA) at 180-220 ppm for use in a spray chill system on beef carcass, and in a head spray cabinet against inoculated populations of non-pathogenic *Escherichia coli* biotype I, serving as surrogates for pathogenic *E. coli* and *Salmonella* spp., as well as natural microflora on beef carcasses and heads.

**Experimental Design & Analysis:**

Carcasses: On two test days, 20 carcasses (40 sides) received a PAA spray chill treatment, following inoculation. Carcasses were inoculated on two lower zones A and B. Both A zones (Inoculated [lower] and uninoculated [upper]) were sampled as the "Before Treatment" and then carcasses subjected to a PAA spray chill system (180 to 220 ppm) for 24 h. Both B zones (Inoculated and uninoculated; "After Treatment" samples) were sampled at the end of the PAA spray chill treatment. The purpose of this study was to validate the efficacy of the PAA spray chill system.

Heads: Over two test days, a total of 40 inoculated and 40 uninoculated heads received the PAA head spray cabinet (180 to 220 ppm) treatment. The right zone (right cheek) was sampled as the "Before Treatment" and the left zone (left cheek; "After Treatment" sample) was sampled at the end of the PAA head spray treatment. The purpose of this study was to validate the efficacy of the PAA head spray cabinet.

**Key Results:**

The 24 h PAA spray chill treatment reduced EB counts on inoculated samples ($P < 0.05$) by > 3.4 log CFU/cm$^2$, and 17.5% of the analyzed samples had counts that were below the detection limit (0.1 log CFU/cm$^2$) . For the uninoculated beef carcass control zones, EB counts were reduced to < -0.8 log CFU/cm$^2$ with approximately 82.5% of the sample counts below the detection limit, and APC samples were not significantly different from the control, but all samples were below the detection limit.

For the head wash PAA spray treatment, EB counts on inoculated samples were reduced ($P < 0.05$) by 0.9 log CFU/cm$^2$. In addition, the PAA spray treatment reduced ($P < 0.05$) APC of uninoculated (natural microflora) beef heads from 1.9 to 1.5 log CFU/cm$^2$. Uninoculated EB populations were reduced to < -0.3 log CFU/cm$^2$ with approximately 42.5% of the sample counts below the detection limit.

**Industry Application:**

A 24 h PAA spray chill (180 to 220 ppm) is an effective intervention on beef carcasses against inoculated surrogates for pathogenic *E. coli* and *Salmonella* spp. A PAA spray (180 to 220 ppm) treatment for heads is an effective intervention against microbial populations. Both interventions would be an appropriate approach in a multiple-hurdle system.

**Table 1.** Least squares mean *Enterobacteriaceae* plate counts (EB) and aerobic plate counts (APC; log CFU/cm$^2$; ± SE) for inoculated and uninoculated zones of beef carcasses before (untreated control) and after a 24 h peroxyacetic (PAA) spray chill (180 to 220 ppm).

| Inoculated/Uninoculated Beef Carcass Zone and Bacterial Count Type | Untreated Control | 24 h PAA Spray Chill |
|---|---|---|
| Inoculated (EB) | $5.8^a$ ± 0.5 | < $2.4^b$ ± 0.5 |
| Uninoculated (APC) | < $-0.2^a$ ± 0.3 | < $-0.2^a$ ± 0.3 |
| Uninoculated (EB) | < $-0.4^a$ ± 0.1 | < $-0.8^b$ ± 0.1 |

$^{a,b}$ LSMeans bearing different superscript letters within the same row are different ($P < 0.05$)

LSMeans with a less than symbol (<) indicate at least one sample within the treatment had counts that were below the detection limit (inoculated: 0.1 log CFU/cm$^2$ and uninoculated: -0.9 log CFU/cm$^2$)

**Table 2.** Least squares mean *Enterobacteriaceae* plate counts (EB) and aerobic plate counts (APC; log CFU/cm$^2$; ± SE) for inoculated and uninoculated zones of beef heads before (untreated control) and after a peroxyacetic (PAA) spray cabinet (180 to 220 ppm).

| Inoculated/Uninoculated Beef Heads and Bacterial Count Type | Untreated Control | Treated |
|---|---|---|
| Inoculated (EB) | $5.7^{a}$ ± 0.1 | $4.8^{b}$ ± 0.1 |
| Uninoculated (APC) | $1.9^{a}$± 0.2 | $1.5^{b}$± 0.2 |
| Uninoculated (EB) | < $0.3^{a}$ ± 0.1 | < $-0.3^{b}$ ± 0.1 |

$^{a,b}$ LSMeans bearing different superscripts letters within the same row are different ($P < 0.05$)