

# BoviBrom<sup>®</sup> Air Monitoring

## KEY FINDINGS

- No significant level of any of the monitored substances was detected in the air
- Calculated exposure levels were well below the published exposure limits for the substances monitored

## STUDY OBJECTIVE

Determine exposure to DBDMH and its by-product during application of BoviBrom<sup>®</sup> to beef carcasses in the hot box<sup>1</sup> and near the carcass wash<sup>2</sup>.

## STUDY DESIGN

Air samples were collecting using either an SKC low-flow pocket pump model 210-1002 or an MSA Escort Elf high-flow pump. Standard method of air monitoring technology was used to capture data. Appropriate sampling medias were used, including silver-impregnated membrane filters,

PTFE filters, charcoal tubes and treated XAD-7 tubes. All sampling pumps were pre-and post-calibrated. Direct HOBr readings were recorded using a Sensidyne Model 20S detector tube system with Gastec tubes No8La. These tubes are recommended for measuring chlorine but are also recommended by the manufacturer for measuring HOBr. The sensitivity of these tubes for HOBr is approximately 25-50 ppb.

## RESULTS

The air monitoring data indicated that no significant level of any monitored substance was detected in the air. Calculated exposure levels were well below the published exposure limits for the substances. In addition, HOBr levels were measured periodically at several locations using a direct read instrument (detector tubes). Using this technique, it was determined that HOBr was not present in any significant amount in the air.

**Table 1. Industrial Hygiene Exposure Monitoring Results<sup>1</sup>**

Sample Location <sup>a</sup>	Sampling Media <sup>b</sup>	HOBr	Bromide-containing Aerosols	Bromoform	Other Halogenated Hydrocarbons <sup>c</sup>
Carcass Wash Entrance	Ag Membrane Filter (NIOSH 6011)	ND (< 1 ppb)	ND (< 1 ppb)	NA	NA
Field Blank	Ag Membrane Filter (NIOSH 6011)	ND	ND	NA	NA
Carcass Wash Exit	Charcoal Tube (NIOSH 1003)	NA	NA	ND (< 6 ppb)	ND (< 30 ppb)
Field Blank	Charcoal Tube (NIOSH 1003)	NA	NA	ND	ND

ND = none detected; the minimum detectable air concentration was: HOBr – 1 ppb; bromide – 1.0 ppb; bromoform – 6 ppb; other brominated hydrocarbons – 30 ppb.

NA = Not applicable to sample collected.

Established exposure limits are:

Bromoform – both OSHA and ACGIH list 0.5 ppm (500 ppb) as the 8-hour time-weighted average exposure limit.

HOBr – the OSHA and ACGIH 8-hour time-weighted average exposure limit is 0.1 ppm (100 ppb).

Bromide – There are no established exposure limits for bromide ion.

<sup>a</sup>All samples were area samples collected using pre-calibrated pumps.

<sup>b</sup>HOBr vapor was collected on silver (Ag) membrane filters (SKC 225-9006).

Bromide ion-containing aerosols were collected on PTFE pre-filters included in the Ag membrane cassette. Bromoform and other brominated hydrocarbons were collected on charcoal tubes (SKC 226-09). All samples analyzed at ENTEK Environmental Laboratories, 14285 Airline Highway, Baton Rouge, LA 70817. ENTEK is an AIHA-accredited laboratory.

<sup>c</sup>Other brominated hydrocarbons calculated as bromoform.

**Table 2. Industrial Hygiene Exposure Monitoring Results<sup>2</sup>**

Sample Location <sup>a</sup>	Sampling Media <sup>b</sup>	HOBr	Bromide-containing Aerosols	Bromoform / Other Halogenated Hydrocarbons <sup>c</sup>	Organic Amines <sup>c</sup>
Hot Box, East End Bay 3	Ag Membrane Filter (NIOSH 6011)	3.1 ppb	ND (< 0.5 ppb)	NA	NA
Hot Box, West End Bay 3	Ag Membrane Filter (NIOSH 6011)	2.9 ppb	ND (< 0.5 ppb)	NA	NA
Blank	Ag Membrane Filter (NIOSH 6011)	ND	ND	NA	NA
Hot Box, West End Bay 3	Ag Membrane Filter (NIOSH 6011)	2.0 ppb	ND (< 0.5 ppb)	NA	NA
Bovibrom Feeder Area	Ag Membrane Filter (NIOSH 6011)	1.7 ppb	ND (< 0.5 ppb)	NA	NA
Hot Box, East End Bay 3	Charcoal Tube (NIOSH 1003)	NA	NA	ND (< 4 ppb / < 4 ppb)	NA
Blank	Charcoal Tube (NIOSH 1003)	NA	NA	ND	NA
Hot Box, West End Bay 3	Charcoal Tube (NIOSH 1003)	NA	NA	ND (< 4 ppb / < 4 ppb)	NA
BoviBrom Feeder Area	Charcoal Tube (NIOSH 1003)	NA	NA	ND (< 4 ppb / < 4 ppb)	NA
Hot Box, East End Bay 3	Treated XAD-7 (OSHA 2060)	NA	NA	NA	0.17 ppm
Blank	Treated XAD-7 (OSHA 2060)	NA	NA	NA	ND
BoviBrom Feeder Area	Treated XAD-7 (OSHA 2060)	NA	NA	NA	0.22 ppm

ND = none detected; the minimum detectable air concentration was:  
HOBr – 1 ppb; bromide – 1.0 ppb; bromoform – 6 ppb; other brominated hydrocarbons – 30 ppb.

NA = Not applicable to sample collected.

Established exposure limits are:

Bromoform – both OSHA and ACGIH list 0.5 ppm (500 ppb) as the 8-hour time-weighted average exposure limit.

HOBr – the OSHA and ACGIH 8-hour time-weighted average exposure limit is 0.1 ppm (100 ppb).

Bromide – There are no established exposure limits for bromide ion.

Organic Amines – i.e. methyl amine 5 ppm.

<sup>a</sup>All samples were area samples collected using pre-calibrated pumps.

<sup>b</sup>HOBr vapor was collected on silver (Ag) membrane filters (SKC 225-9006).

Bromide ion-containing aerosols were collected on PTFE pre-filters included in the Ag membrane cassette. Bromoform and other brominated hydrocarbons were collected on charcoal tubes (SKC 226-09). All samples analyzed at ENTEK Environmental Laboratories, 14285 Airline Highway, Baton Rouge, LA 70817. ENTEK is an AIHA-accredited laboratory.

<sup>c</sup>Other brominated hydrocarbons calculated as bromoform. Organic amines calculated as methyl amine.

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<sup>1</sup>Data on file. Industrial Hygiene Report Feb. 14, 2011.

<sup>2</sup>Data on file. Industrial Hygiene Report Dec. 2, 2009.

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