

# Investigation of Accidental Lead Exposure in Feeder Cattle

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## Abstract

A commercial backgrounding feedlot unknowingly fed lead-contaminated feed as evidenced by finding battery casing fragments and particles of lead plating in the feed bunk of a pen of animals with nervous disease. Investigation into the source of the contamination revealed that a large implement battery had been ground through the feed mixer. Over the next week, more than half of the animals within the pen where the exposure was centered showed evidence of nervous disease progressing to death or were humanely euthanized based on animal welfare considerations. The remainder of the pen showed little or no clinical evidence of exposure. Despite documentation that animals exhibiting no clinical evidence of lead toxicity may still have elevated blood and tissue lead levels, there are insufficient guidelines for ensuring that animals with potential lead exposure will be safe for human consumption. No specific regulations exist regarding the amount of lead permissible in Canadian beef. A disease investigation was undertaken to determine the extent of lead exposure in the feedlot and to formulate a plan for the disposition of exposed and unexposed animals.

## Résumé

Dans un parc d'engraissement de semi-finition, des bovins de boucherie ont accidentellement été nourris avec des aliments contaminés au plomb. C'est ce qu'indique la découverte, dans la mangeoire d'un enclos où les animaux manifestaient de graves troubles nerveux, des restes d'une enveloppe de batterie et des particules de placage de plomb. Une enquête a révélé qu'une grosse batterie d'instrument agricole avait été broyée dans le broyeur-mélangeur d'aliments. Au cours de la semaine qui a suivi, plus de la moitié des bovins de l'enclos principalement exposé ont manifesté des troubles nerveux graves dégénéralant jusqu'à la mort, ou ont été euthanasiés, pour des considérations de bien-être animal. Le reste de l'enclos a montré peu ou pas de symptômes cliniques d'exposition. Des études indiquent que des animaux ne montrant aucun symptôme clinique

d'intoxication au plomb peuvent quand même avoir une concentration élevée de ce métal dans le sang et les tissus. Toutefois, il n'existe pas assez de directives expliquant comment on peut s'assurer que la viande d'animaux potentiellement exposés au plomb soit sans danger pour notre consommation. Aucune réglementation ne précise la quantité de plomb admissible dans la viande de bœuf canadienne. Nous avons évalué l'étendue de l'exposition au plomb dans le parc d'engraissement et étudié un plan d'élimination des animaux exposés ou non.

## Introduction

A backgrounding feedlot observed reduced feed consumption and widespread depression in a pen of feeder steers prior to finding three animals dead. The pen of animals was examined and multiple animals were found to be exhibiting neurological symptoms, including bruxism, salivation, aimless wandering, blindness and ataxia. Attempts to examine individual animals resulted in anxiety, aggression and hyperesthesia.

The sudden epidemic of neurological disease suggested the potential for a common point-source exposure such as feed contamination, which was ultimately confirmed by the presence of battery pieces in the feed bunk. A presumptive diagnosis of lead toxicity was made. Blood samples were collected from animals with clinical evidence of disease for laboratory evaluation of lead levels. Post mortem examinations on animals that died included a thorough inspection of the digestive tract to detect the presence of lead.

During the initial week post-exposure, over half of the animals in the pen that received the bulk of the lead contaminated feed died or were euthanized, but a portion of the initial pen showed minimal or no clinical evidence of lead exposure. Surviving animals were segregated based on the severity of clinical symptoms to address animal welfare considerations. Two additional pens each had one death attributable to lead toxicity.

Generally, only animals exhibiting clinical signs after lead exposure are subjects of laboratory evalua-

tion, but it has been documented that animals exhibiting no clinical symptoms of lead poisoning may still have sufficient levels of lead in blood, muscle, kidney, liver, and/or bone to pose a public health risk if contaminated tissues are allowed to enter the human food chain. As blood lead levels do not correlate well with the presence of clinical signs, a more extensive evaluation of clinically normal animals is required to determine if they pose a safety risk for human consumption.

As a result, a complete disease investigation was undertaken to evaluate the extent of lead exposure in the feedlot. During the disease investigation, all of the animals on the lot were maintained in voluntary quarantine pending determination of exposure status for each pen.

### Materials and Methods

Blood is a good indicator of recent lead exposure and is the most frequently used sample for monitoring lead status in cattle. In this case, the acceptable blood lead level for an individual animal was determined to be less than 0.11 ppm. A stepwise blood sample survey of all pens in the feedlot was done to identify pens with a high likelihood of lead exposure. In exposed pens, all individual animals were tested. Liver biopsies were obtained and evaluated to assist with pen/animal diagnosis in some cases. Blood samples from control animals in local feedlots without lead toxicity were collected and analyzed to establish a regional background blood lead level.

### Results

Results of the pen survey indicated that 11 pens had evidence of exposure. Pens and animals with no exposure were released from movement restrictions. The 487 surviving animals with blood lead levels greater or equal to 0.11 ppm were subsequently enrolled in a research study to investigate the tissue kinetics of lead following exposure to assist in the understanding of lead toxicity in cattle. The regional background blood lead

level for feeder cattle was determined to be below 0.03 ppm.

### Conclusions

The results of this disease investigation demonstrate that when there is evidence of group-level lead exposure, based on confirmation of a clinical case, all animals should be evaluated for potential lead exposure regardless of whether or not clinical signs are observed. Although blood lead levels of clinically affected animals are generally higher than that of animals with subclinical lead exposure, the blood lead concentration ranges of these two groups overlap. Individual animals within the subclinical group can have high blood lead levels despite the absence of clinical signs of lead toxicity, and thus may possess the potential to pose a public health risk if slaughtered for human consumption. To ensure representative blood samples are obtained, blood collection should occur within 30 days of lead exposure. Results from the follow-up research study will provide much needed information on post-exposure tissue kinetics that can be used to formulate regulations for the disposition of exposed and unexposed animals in future lead exposure cases.

### References

1. Checkley S, Waldner C, Blakely B: Lead poisoning in cattle: implications for food safety. *Large Animal Veterinary Rounds*, October, 2002.
2. Miranda M, Lopez-Alonso M, Garcia-Partida P, Velasco J, Benedito J: Long-term follow-up of blood levels and haematological and biochemical parameters in heifers that survived an accidental lead poisoning episode. *J Vet Med* 53:305-310, 2006.
3. Rumbelha W, Braeselton E, Doneh D: A retrospective study on the disappearance of blood lead in cattle with accidental lead toxicosis. *J Vet Diagn Invest* 13:373-378, 2001.
4. Sharpe R, Livesey C: Lead poisoning in cattle and its implications for food safety. *Vet Rec* 159:71-74, 2006.
5. Yonge K, Morden B: Bovine lead poisoning in Alberta: a management disease. *Can Vet J* 30:42-45, 1989.
6. Waldner C, Checkley S, Blakely B, Pollock C, Mitchell B: Managing lead exposure and toxicity in cow-calf herds to minimize the potential for food residues. *J Vet Diagn Invest* 14:481-486, 2002.