# Managing Feeder Cattle with Confirmed Lead Exposure

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## Abstract

A commercial feedlot unknowingly fed lead contaminated feed to a portion of cattle in the feedyard. Due to the lack of data and regulations concerning how to manage the exposed animals, a proactive field study was developed to collect information that would help mitigate food safety and economic losses in this and other similar situations. After conducting an investigation into the scale of lead exposure in the feedlot, cattle found to have elevated blood lead concentrations were enrolled into the study. The objectives of this study were to collect data on blood and tissue lead concentrations over a number of months post-exposure. This information would then be used to describe lead concentrations and correlations in blood and tissues over time. Liver biopsies and diaphragm were also evaluated, and production losses were examined.

## Résumé

Dans un parc d'engraissement commercial, une partie des bovins a été accidentellement nourrie avec des aliments contaminés au plomb. Étant donné le manque de données et de réglementation sur la gestion d'animaux exposés aux contaminations, nous avons lancé une étude pour recueillir de l'information qui pourrait aider à atténuer les problèmes de toxicité alimentaire et les pertes économiques, dans ce cas particulier et en situations semblables. Après avoir évalué l'étendue de l'exposition au plomb dans le parc, nous avons axé notre étude sur les bovins dont la teneur en plomb du sang était la plus élevée. Par la suite, nous avons recueilli, durant plusieurs mois après l'exposition, des données sur les teneurs en plomb du sang et des tissus, afin de décrire leur évolution et leurs corrélations possibles. Nous avons aussi effectué des biopsies du foie et du diaphragme, tout en examinant les pertes de production.

## Introduction

Recommendations on how to manage exposed animals and regulations on if/when they can enter the food chain are unclear or lacking;[3] some policy makers would therefore lean heavily towards a precautionary approach. Blood lead concentration is a good indicator of recent lead exposure and is the most frequently used sample for monitoring lead status in cattle. In the scientific literature, the estimated rate of lead depletion from blood and tissues varies broadly from 30 to 2,507 days, with a large degree of uncertainty.[1,2,4] There is insufficient data concerning the correlation of blood lead levels with lead levels of other tissues, and a lack of depletion studies on cattle that ingest lead pieces that may remain in the gastrointestinal tract, therefore providing long-term lead exposure.

## Materials and Methods

Blood was collected from animals during the initial investigation, and the acceptable level of lead in blood for an individual animal was set as <0.11 ppm, based on regulations elsewhere in the world and discussions with the Canadian Food Inspection Agency. Cattle with initial blood lead levels ≥0.11 ppm (range 0.11 to 0.89 ppm) were enrolled into the follow-up study to investigate the blood and tissue distribution of lead following exposure. Animals with levels <0.11 ppm were released from movement restrictions, but records of national identification numbers were maintained for further investigation if required.

Blood samples were collected from all animals at enrollment and subsequently at monthly intervals over a six month period. Thirty randomly chosen animals, 10 from each range of blood lead level (low 0.11 – 0.30 ppm, medium 0.31 – 0.50 ppm, and high 0.51 – highest ppm), had liver biopsies collected on enrollment and at month 2, 4 and 6 post-enrollment. Twelve animals per month, divided proportionally from each range of blood lead concentrations, were euthanized at the end of each month. Blood, kidney, liver, skeletal muscle, diaphragm and bone were collected from each animal. Battery fragments were collected if identified during examination of the digestive tract.

## Results

At the time of publication of the proceedings, laboratory and statistical analyses were ongoing. However, the objectives of this study were to:

1) determine the correlation between blood, muscle, kidney, liver, and bone lead concentrations
2) describe blood and liver lead depletion curves
3) evaluate liver biopsy as a diagnostic tool and its predictive value for animal entry into the human food chain
4) evaluate diaphragm as a sample for determination of lead skeletal muscle levels
5) evaluate production losses associated with lead exposure
6) provide information to food safety policy makers.

The results of each of these will be described in the conference presentation.

## Conclusions

There is currently a lack of information concerning the management of cattle exposed to lead, with respect to food safety. Results from this field study will provide much needed information on post-exposure blood and tissue lead concentration that can be used to formulate regulations for the disposition of exposed and unexposed animals in future lead exposure cases. This study was also a tremendous opportunity to collect information that will open a dialogue about this type of issue with Health Canada and other stakeholders in food safety.

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