Lead and Animal Health

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Agriculture and Food Development Authority

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This document was prepared through the cooperative efforts of personnel from Teagasc and from the Veterinary Laboratory Service of the Department of Agriculture, Food and Rural Development. Information and advice is directed mainly at the situation that exists in lead-enriched areas near Silvermines, Co. Tipperary.

LEAD AND ANIMAL HEALTH

Is lead poisoning common?

Yes. Lead poisoning is the most commonly-reported form of toxicity in farm animals in this country. Horses are the most susceptible, followed by cattle and then sheep. Young animals are more susceptible to the effects of lead poisoning than adult animals.

Where does the lead come from?

The most common sources of lead poisoning on farms are man-made materials. These include lead batteries, linoleum, and lead containing paints. Significant outbreaks of lead poisoning have been associated with contamination of silage by lead batteries accidentally shredded in the harvesting process.

In mining areas the main environmental sources of lead are:

Soil;
Stream sediments;
Mine-spoil heaps and abandoned mine sites;
Tailings ponds;

What are the signs of lead poisoning?

Lead poisoning is generally acute in onset and of short duration. Cases generally occur suddenly and usually involve only one or two animals. The most common signs are staggering, bellowing, muscle tremors, and blindness - followed by death in one or two days. Diagnosis of lead poisoning can often be made on the basis of clinical signs together with evidence of exposure to a known source.

View from mines with bare area in foreground

How can a diagnosis of lead poisoning be made?

Diagnosis of lead poisoning can often be made on the basis of clinical signs together with evidence of exposure to a known source. Laboratory anaylsis of blood samples (collected in special containers) can provide evidence in sipport of a diagnosis.

In the dead animal, lead poisoning can only be confirmed by analysis of tissue samples (kidney or liver). Where lead poisoning is suspected, carcasses or tissue specimens, collected by a vetinary practitioner, should be submitted for laboratory examination as soon as possible after death.

Can it be treated?

A treatment for lead poisoning is not currently available. Where cases occur, all animals should be removed from the suspected source.

How can I avoid lead poisoning on my farm?

Animals (including companion animals/pets) should be prevented from gaining access to:

(a) all man-made sources of lead, and

(b) in so far as is possible, all areas seriously enriched in lead.

SOURCES OF LEAD IN MINING AREAS

How can I find out the lead status of my farm?

Consult Map 13 in the Inter-agency Group Report and your customised farm map to obtain an indication of the amount of lead on your farm.

How do animals ingest environmental lead?

Soil is the main source of environmental lead for animals and all animals eat soil. This soil may be a contaminant on grass or silage. It may be taken up with roots. Some animals will consume much more soil than others. Soil consumption is highest in water-logged soils, in wet weather, at higher stocking rates, on poached soil and on soil damaged by machinery. Management systems should be designed to minimise the intake of soil by animals.

How much lead can grass contain?

Only a minute amount of lead is taken up by grass. However, significant amounts may be deposited on the surface of grass by splashing or as dust from soil that is enriched in lead.

How is stream sediment dangerous?

The amount of lead that dissolves in water is not considered toxic to animals. However, streams are dangerous because of lead in the sediment. Silt in slow-moving streams, or sediment lying at the bottom of "clear mountain streams", have been found to contain extremely high concentrations of lead. When sediment becomes stirred up in water, and animals drink this water, they can take in large quantities of lead. Sediment may also be spread on pastures as a consequence of flooding.

How is dust dangerous?

Dust can be deposited on grass in large amounts following dust blow from bare soil or tailings. The risk from dust-blow is reduced when bare areas are revegetated.

What amount of lead is dangerous?

We have adopted what we consider to be a cautionary level of 1000 mg/kg of lead in soil. This value has been derived on toxicology grounds and is similar to a value proposed for grazing animals in the UK.

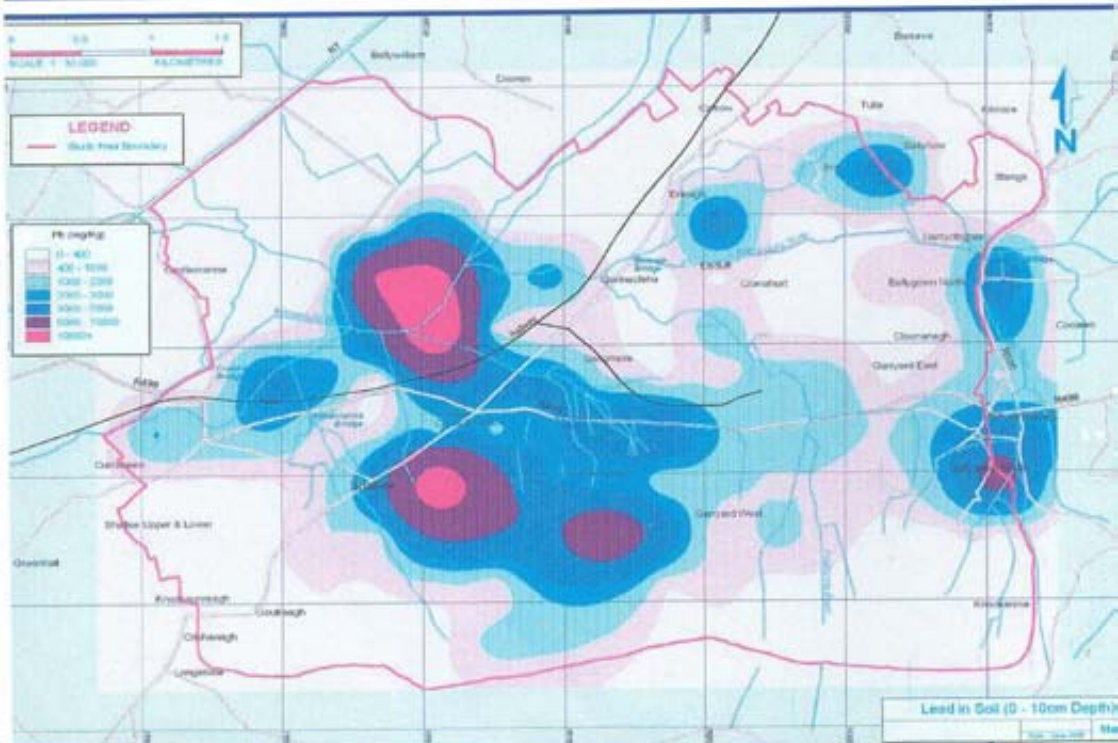
Are some forms of lead more available than others?

We have found no indication of this in soils or sediments from the Silvermines area. Research shows that lead present in soils and stream sediments is very soluble in strong acids such as are present in animals' digestive fluid. Thus, all sediments and all soils enriched in lead should be viewed with caution.

Do small amounts of lead have an effect over prolonged periods?

Chronic poisoning of the type seen in humans is not a problem in farm animals. Although the accumulation of lead in tissues over time may affect the suitability of some animal products (i.e. liver and kidney) for human consumption, the recent Department of Agriculture, Food and Rural Development studies have shown that quality of meat and milk from the Silvermines area is not affected.

Distribution of lead concentrations in the general Silvermines area, Co. Tipperary. Concentrations are highest in the areas indicated by red and purple.



RISK REDUCTION STRATEGIES

What can be done to improve the quality of soil with high levels of lead?

Farmers generally cannot change the lead levels of their soil. Treating the soil, or replacing or covering it with clean soil is too expensive. There is some scientific evidence that lead is stabilised in soil as a complex chemical compound containing phosphate. Thus it is necessary to maintain soil fertility.

1. Addition of phosphate fertiliser to soil of index 2 (or 3 under high management regimes). This will improve sward health as well as stabilising soil lead.
2. Liming to a final pH of 6.5, allowing 3-4 year intervals between each incremental addition of 5 t/ha (2 t/acre) of lime. This will again improve sward density and grass yield.
3. Ensuring healthy sward development by use of nitrogen at recommended rates.

Where ploughing with reseeding is considered necessary to improve pastures the negative aspects should be considered. After ploughing there will be a period where soil movement may occur especially on fields with a gradient. Animals may ingest more soil from these fields.

What can be done to improve the quality of the herbage?

There are good nutritional grounds for fertilisation in order to enrich herbage with phosphate and calcium as these are considered to lower the toxicity of lead to animals. Sulphur, which can be added with the nitrogen may do the same - as does zinc which is a co-contaminant with lead in the Silvermines area.

How should I manage the soil to minimise soil ingestion?

Essentially you should minimise the impact that animals and machinery have on the sward and soil surface. Avoid overstocking, grazing on soft ground, and out of season grazing. Pay particular attention to vulnerable areas at gateways and near water troughs. Where sward is damaged roll at an opportune time early in the year and allow a safe interval before grazing.

What can be done to avoid the effects of lead-enriched sediment?

Fence off drains and streams to restrict access by stock. When these are cleaned, dredgings should be disposed of close to the stream - possibly as a bank. It is important that exposed material be vegetated as soon as possible.

How do I cope with flooding?

Flooding can distribute sediment over the field. In areas that have been subjected to widespread flooding in the past it is likely that lead may be present in soil and sediment at similar concentrations. However, flooding will cause herbage to become coated with sediment. Remove animals from affected pastures for about 3 to 4 weeks until this coating is cleaned off by wind and rain and by grass growth.

How do I cope with windblow?

As with flooding, allow time for the deposit to wash or blow off the grass. Animals should be taken off affected pastures until then.

How can I adapt my management to take account of soil lead?

By taking action to minimise exposure of animals to soil and sediment. In addition, where there are areas of the farm with both high and low lead, advantage should be taken of the low lead areas to hold young animals and to give older animals a respite. Use high lead areas for silage. Make sure the surface is level and do not cut too low.

FINALLY

Are some animals more affected by lead?

Yes. Young animals, including calves, are particularly vulnerable. Special precautions need to be taken to prevent access of calves to affected areas - particularly to streams, drains and to sediment therein.

What is the risk in my area?

At the present time the risk of lead poisoning would appear to be greatest from sediments, less from soil lead and least from wind-blown lead. Therefore, precautions should be most stringent: (a) in areas bordering or enclosing drains and streams affected by water from the Silvermines mountain, (b) where soil lead is highest, between Shallee and Silvermines and (c) in the Yellow River catchment area. See also lead and stream maps in the Inter-agency Group Report.

What does the future hold?

The future is a mirror of the past but we can learn from it. Department of Agriculture, Food and Rural Development statistics have shown that, while animal deaths have occurred due to lead poisoning, they account for only a small proportion of annual animal fatalities. With extra caution, further deaths due to lead poisoning can be largely prevented.

Guidelines for Grazing Management in Areas of Lead-Enriched Soils

Soil and river sediments are the main source of environmental lead for farm animals - whether grazing or on conserved fodder, i.e. silage or hay. The following guidelines are intended to reduce the intake of lead by identifying means by which soil ingestion can be minimised.

Grazing Management

- Avoid poaching of land, i.e. avoid winter grazing or grazing on soft ground.
- Avoid over-grazing, (minimum sward height of 5 to 8 cm).
- Rotate grazing of fields.
- Animals should not be allowed to ingest herbage heavily contaminated by soil - whether this material arises as a consequence of poaching, flooding or by wind erosion from tailings pond areas.
- Avoid grazing cattle on land subject to river flooding.
- In affected areas, fence off rivers to prevent cattle having direct access to possible lead-enriched sediment.
- Fence off identified areas of lead enrichment, e.g. mine spoil, river dredgings.

Pasture Management

- Avoid disturbance of tailings pond/mine spoil areas.
- Soil should be analysed to establish nutrient status and lime requirement. Lime soil to pH 6.5 if necessary. Use adequate phosphate, following Teagasc guidelines. Apply adequate nitrogen to maintain dense/healthy swards.
- Roll grass in Spring before turn-out.
- Establish a permanent pasture with a tight matt.
- Avoid cutting grass or ripping soil with low blade settings on mowers/silage cutters.
- Use direct cutting of silage (i.e. no wilting).
- If ground becomes compacted, harrow after silage cutting and roll. Avoid ploughing where possible.
- Where re-seeding is required, part of the area should be tested to ensure that re-growth occurs. Care should be taken to ensure a firm seedbed. Late flowering - preferably diploid ryegrass varieties - should be used to ensure a dense sward.
- Dredged sediments should be placed within fenced areas adjacent to drains and never on pastures.