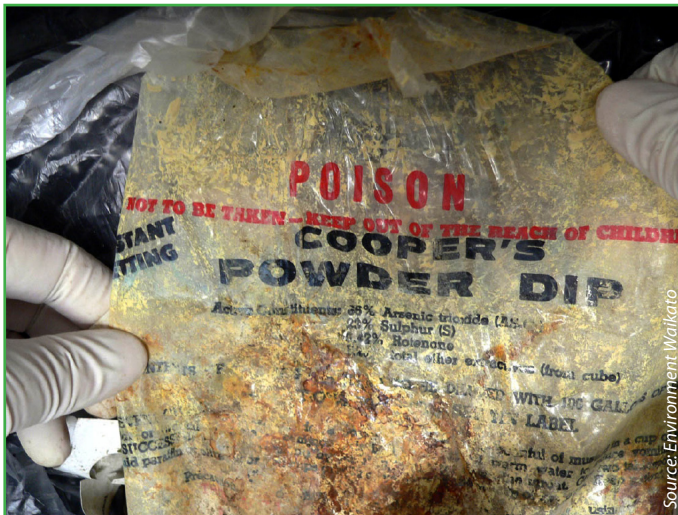


Sheep Dip Factsheet

ARSENIC

What is arsenic?

Arsenic was used to control parasites on sheep from 1840s until the 1980s. It was also the active ingredient in some pesticides and herbicides used in horticulture. Arsenic is a semi-metallic element that does not break down in soil and may slowly leach down through the soil and contaminate ground and surface water. Very high concentrations of arsenic have been measured in soil in the vicinity of former sheep dips in New Zealand.



Toxicity of arsenic

Humans

The type and severity of the toxic effects associated with exposure to arsenic will depend on the amount and the length of time that a person is exposed. Arsenic is very toxic to humans and is a known human carcinogen. Toxic effects associated with exposure to arsenic include irritation of the stomach and intestines, skin changes, reduced nerve function and damage to blood vessels. Repeated exposures to lower concentrations of arsenic can result in concentrations in the body that are fatal or can cause serious health effects. Concentrations of arsenic high enough to be fatal to a young child from a single exposure (e.g. eating soil) have been measured at sheep dip sites in New Zealand. Direct skin contact with high concentrations of arsenic can irritate the skin.

Animals

Arsenic is also very toxic to animals and affects the gastrointestinal tract and the cardiovascular system. Symptoms of arsenic poisoning in animals include watery diarrhoea, severe colic, dehydration and cardiovascular collapse. Cattle deaths have been reported in New Zealand from grazing on sheep dips.

Arsenic present in domestic drinking and stock water supplies

Arsenic can leach into surface and groundwater and at some sites, waste from sheep dips was disposed of directly into

waterways or drains. Arsenic concentrations in surface and groundwater can exceed the New Zealand Drinking Water Standard for arsenic of 0.01 mg L^[1] and the guideline for stock drinking water is 0.5 mg L^[2]. Concentrations of arsenic high enough to be fatal to humans and stock have been measured in groundwater contaminated by former sheep dips.

Arsenic residues in animal products

Arsenic can accumulate in the liver, kidneys and muscle tissue of animals and in eggs. There are regulatory limits under the Animal Products Act 1999 for arsenic (Maximum Permissible Limits or MPLs) in meat, offal, eggs and shellfish. Arsenic concentrations in animal tissues will decline once the animal is removed from the source of arsenic exposure. It is very difficult to predict the concentration of arsenic that will accumulate in an animal from the soil concentration and the period of exposure. Animals are exposed to contaminants in soil through soil ingestion, drinking arsenic-contaminated water, and to a lesser extent through feed and by exposure to contaminated dust. Sheep eat an estimated 125 g of soil per day and cows about 1kg. Wet muddy conditions, short pasture, feeding out of hay and silage, and consumption of fodder crops such as turnips and chowmollier will increase the amount of soil eaten by stock. Where residues are present, animals that dig or disturb the soil, including pigs, chickens and bulls, will have increased exposure to arsenic.

Arsenic residues in crops

Edible crops for humans and animal feed should not be grown on or in the vicinity of known or suspected sheep dip sites as they can become contaminated with soil containing arsenic



Swim-through dip

pesticides from dust and mud splash. Some crops are able to take arsenic up from soil. The testing of soil and irrigation water is recommended prior to planting crops for export, animal feed or domestic consumption. Irrigating crops with arsenic-contaminated water is not recommended as it can contaminate the crop and may over time increase the soil arsenic concentration.

Preventing animal exposure to arsenic

The soil arsenic guideline for the protection of livestock health is 38 mg kg^[3]. Areas around sheep dips that exceed this concentration in soil or that have not been tested should not be used for livestock. The main exposure pathways for animals are drinking contaminated water and ingesting contaminated soil. Animals may also be exposed to arsenic through licking old dip chemical drums or contaminated building materials. Sources of stock drinking water should be tested for arsenic if they are collected from surface water downstream of a sheep dip or from a bore located within 300 metres of a sheep dip. Stock should not be allowed to drink from surface water downstream from or within drainage areas of a known or suspected sheep dip. Sheep dip sites, including those located within stockyards or pens used to hold sheep after dipping, should not be used to raise cattle (including calves), poultry, eggs or pigs. Animals should not be held or reared for extended periods of time in stockyards that were used to hold sheep after dipping.

Preventing human exposure to arsenic

The two main exposure pathways for humans are eating contaminated soil and drinking water contaminated with arsenic. Children should not play near or on former sheep dips as this may put them at serious risk of harm or death. The New Zealand drinking water standard for arsenic is 0.01 mg L^[1]. Household drinking water supplies should be tested for

arsenic if they are collected from surface water downstream of a sheep dip or from a bore located within 300 metres of a sheep dip. Meat, eggs and vegetables raised on a sheep dip site are potential sources of human exposure to arsenic. Eating wildfoods (freshwater mussels, koura and watercress etc.) collected downstream from a sheep dip may also be a source of arsenic exposure. Mushrooms and edible plants (e.g. puha) or ferns should not be collected from the vicinity of a sheep dip.



Rectangular shower dip with sump (under corrugated iron)

Sources of further information

Sheep Dip Factsheet 1:

Sheep dips in New Zealand

Sheep Dip Factsheet 2:

Organochlorine Pesticides

Sheep Dip Factsheet 4:

Checklist for landowners and occupiers

All Sheep Dip Factsheets are available on

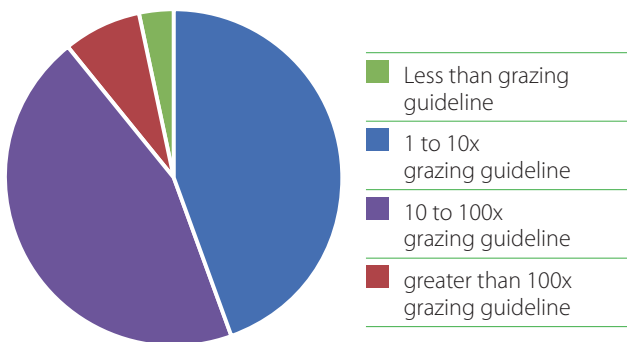
www.envirolink.govt.nz. Project number 820-TSDC59

Your Regional Council's contaminated sites officer, District Council environmental health officer or District Health Board health protection officer.

Identifying, Investigating and Managing Risks Associated with Former Sheep-dip Sites (2006). A guide for local authorities, Ministry for the Environment ME 775. <http://www.mfe.govt.nz/publications/hazardous/risks-former-sheep-dip-sites-nov06/risks-former-sheep-dip-sites-nov06.pdf>

Health and Safety Guidelines on the Cleanup of Contaminated Sites (1994). Department of Labour <http://www.osh.dol.govt.nz>

Distribution of maximum arsenic concentrations measured in soil at sheep dip sites in New Zealand



The data was sourced from Kim (2009) and Easton (2009)

Disclaimer

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This factsheet was prepared by Sally Gaw and Graham McBride for Tasman District Council through a Foundation for Research Science and Technology Envirolink grant. Sally is a lecturer in environmental chemistry at the University of Canterbury. She has ten years experience in managing contaminated land and was a member of the Ministry for the Environment's Pesticide Advisory Group. Graham is a farmer with national and international experience with managing legacy chemicals from agriculture. He initiated research into sheep dips in New Zealand.

[1] Drinking Water Standards for New Zealand 2005 (Ministry of Health, 2005)

[2] Australian and New Zealand Guidelines for fresh and Marine Water Quality (ANZECC, 2000)

[3] Health and Environmental Guidelines for Selected Timber Treatment Chemicals. (Ministry for the Environment and Ministry of Health, 1997)

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