

Sheep Dip Factsheet

ORGANOCHLORINE PESTICIDES

What are organochlorine pesticides?

Dieldrin, DDT, endrin, aldrin and lindane are organochlorine pesticides that were used as sheep dipping chemicals to treat sheep ectoparasites from the 1940s until 1961. Organochlorine pesticides break down very slowly in the environment and can persist for several decades. These pesticides are still being measured in high concentrations at sheep dip sites in New Zealand. Organochlorine pesticides were banned as active ingredients in stock remedies due to concerns over meat residues in 1961. The use and storage of these chemicals is banned under the Stockholm Convention for persistent organic pollutants. Dieldrin is the most common organochlorine pesticide contaminating soil and water within and adjacent to former dip sites. More than one type of organochlorine pesticide may be measured in soil and water samples collected from dip sites.

Toxicity of organochlorine pesticides

Humans

The toxic effects associated with exposure to organochlorine pesticides depend on the amount and the length of time a person is exposed to the chemical(s). Long-term/chronic exposures to organochlorine pesticides affect the central nervous system and can cause liver damage in humans. DDT and lindane have been classified as possibly carcinogenic to humans. DDT can also have adverse effects on development and reproduction and lindane can cause kidney damage.

Animals

The effects of organochlorine pesticides on animals are similar to those in humans. Concentrations of dieldrin in soil high enough to be fatal to young stock have been measured at sheep dip sites in New Zealand.



Source: Roy McGregor

Organochlorine residues in meat, milk and eggs

Organochlorine pesticides accumulate in the fat of animals and their concentration in body fat can be much greater than in soil. Organochlorine pesticides are slowly excreted and are broken down very gradually in animal livers. It can take several months for the concentration of organochlorine pesticides in an animal's fat to reduce by half once the animal

is no longer being exposed to organochlorine pesticides. Organochlorine pesticides can also accumulate in wool and lanolin, and milk. Animals are exposed to organochlorine



Source: Tasman District Council

Swim through dip

pesticides through soil ingestion (including soil attached to grass roots), by drinking contaminated water and to a lesser extent through feed and 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 can 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 organochlorine pesticides.

There are regulatory limits under organochlorine pesticides (Maximum Residue Limits or MRLs) in animal products, including meat, fat, milk, offal, poultry and eggs. Organochlorine residues in animal products are a risk to local and international trade and farmers can be prosecuted if organochlorine residues exceed regulatory limits. In 1987 Australian meat exports to the United States and Japan were banned because of detections of organochlorine residues in meat. The Australian 'Beef Crisis' cost millions of dollars in lost product, and on-farm management practices for organochlorines remain in place today. In 2007 NZ beef exports to Korea were suspended when endosulfan (a newer organochlorine insecticide licensed for use on plants) was detected in a consignment of beef. Food exports are worth approximately \$30 billion per year to the New Zealand economy.

Crop residues of organochlorine pesticides

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 organochlorine pesticides from dust and mud splash. Some crops are able to take up organochlorine pesticides from soil including root crops (carrots, potatoes) and cucurbits (pumpkins, squash and zucchinis). The testing of soil and irrigation water is recommended prior to planting crops for export, animal feed or domestic consumption. Irrigating crops with water contaminated by organochlorine pesticides is not recommended.

Preventing organochlorine pesticides residues in meat, milk and eggs

The safest course of action is not to graze or feed animals on land around or associated with sheep dips that has not been tested or where the organochlorine pesticides exceed 0.01 mg kg⁻¹. The levels of organochlorines generally found at sheep dip sites are not acutely toxic to stock so they can accumulate in their fat without the animals becoming noticeably sick. Just a few hours' grazing on organochlorine contaminated soil may be enough to elevate organochlorine pesticide levels in fat above acceptable levels (MRLs) depending on the soil organochlorine concentration. Animals should not be retained within, or fed on or in the vicinity of a known or suspected sheep dip, including yards used to hold sheep after dipping. Animals may also be exposed to organochlorine pesticides by licking old chemical drums or contaminated building materials.

It is very difficult to predict the concentration of organochlorine pesticides that will accumulate in an animal from the soil concentration. Fat biopsy testing of live animals is the surest way to determine if animals are accumulating levels of organochlorine pesticides that exceed the MRLs. The organochlorine concentration will depend on the amount of contaminated soil and feed an animal eats, as well as the age and type of animal and its fat content. Whether the animal is growing, producing milk or losing weight will also influence the amount of organochlorine pesticides accumulated in their fat. Organochlorine pesticides can be passed from the mother to the foetus and are released into milk. Even if the animals are removed from grazing land contaminated with organochlorine pesticides prior to slaughter, it can take a very long time for the organochlorine concentration to decrease to below regulatory limits. It is very difficult to decontaminate bulls and steers as they generally retain their body fat.

Sources of stock drinking water should be tested for organochlorine pesticides if they are drawn 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

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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.

of a known or suspected sheep dip. Sheep dips sites, including those located within stockyards, or stockyards used for holding wet sheep after dipping, should not be used to hold or rear raise cattle including calves, plus lambs, poultry, or pigs. Farmers need to ensure that they do not purchase stock (for example calves) that have been raised on organochlorine contaminated land, such as holding yards around a former sheep dip.

Preventing human exposure to organochlorine pesticides at dip sites

Potential sources of human exposure to organochlorine pesticides include soil ingestion, eating meat, eggs and vegetables raised on a sheep dip, and drinking contaminated water. Eating wildfoods (freshwater mussels, koura, waterfowl and watercress etc.) collected downstream from a sheep dip may also be a source of organochlorine exposure.

Young children should not be allowed to play on or near sheep dips. Organochlorine pesticides have been measured in water bores and streamwater at concentrations exceeding the New Zealand Drinking Water Standards. Household water supplies should be tested if they are drawn from surface water downstream of a sheep dip or from a bore located within 300 metres of a sheep dip.

Sources of further information

Sheep Dip Factsheet 1:

Sheep dips in New Zealand

Sheep Dip Factsheet 3:

Arsenic

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>