Sodium Monofluoroacetate (1080)

W.F. (Bill) Benfield

1080 was originally patented in 1927 as an insecticide, it was not recommended for commercial use due to its high toxicity and persistence. (1) The name 1080 comes from its laboratory ascension number at the Patuxent Wildlife Research Centre in Maryland. The United States was the first country to use 1080 in pest destruction programmes, though its use is now banned there except for specific situations where permits are required. Its use is totally banned in the State of California.

In New Zealand it is the poison of choice for just about all pest control work, from possums and wasps to rats. It is also claimed that, through secondary poisoning, it can "target" stoats. Our small country spreads by air around 90% of the total world production of 1080, enough to kill around 20 million people per annum, on its lands, forests and waters. (2) Its mode of action is to interrupt the Krebs cycle, a process by which all oxygen breathing creatures convert carbohydrate and oxygen to energy, carbon dioxide and water. Technically, it can kill most things but varying susceptibility means that some, like fish or freshwater crayfish, can consume without obvious effect amounts that would kill other creatures.

Normally the toxicity of a poison is expressed as an LD50, i.e. a lethal dose for 50% of a population. In New Zealand dogs are most susceptible with an LD50 of 0.07mg per kilogram of body weight. The LD50 for a possum is 0.4mg/kg, for a mouse, 13mg/kg, (3). The LD50 for humans is 2mg/kg, so for a 70kg average person, 140mg is the LD50 dose. It is potent material; what is more, there is no known antidote for a lethal dose.

Both DoC and the AHB claim that their poisoning programmes target only species such as possum and rat. In the light of the universal nature of 1080, this claim does not hold up. 1080 can kill every living animal, bird or insect. (4) The only New Zealand native bird that has been tested is the weka, which has an LD50 of 8mg/kg

Insects have a vital role in the ecology of any forest, being the front line of the soil-making process and the base of the food chain for many of the birds. It is an important issue because we are spreading large amounts of broad spectrum insecticide over our forests. Peter Notman in his 1989 review of the science of the impact of 1080 on insects (5) raised the concern that there was little work being done on the subject. In 1989, John Hutcheson at the Forest Research Institute, Rotorua (6) studied weta which were fed cereal baits laced with 1080. In some cases

Figure 1. A hollow scooped in river gravels by a dying weka during its protracted death throes. Autopsy revealed the presence of 1080 in its body. Photo credit, Lewis Hore.

Figure 2. A weka scavenges a dead possum shortly after a 1080 drop. Photo credit, The Graf Boys.

Figure 3.Large native bush worms were found dead under 1080 baits after an AHB operation at the Waianakarua Scenic Reserve, North Otago. Photo credit, Lewis Hore.

the poison was only in the water that fed the foliage and hence was translocated in the plant to the weta's food; in others, the 1080 was in both the foliage and drinking water and finally, some weta were fed baits. In all cases wetas were affected. There was a 50% mortality rate among them and time taken to die was between five and fourteen days. It seems the LD50 of the weta may be high so they could carry a lot of poison and be a significant cause of secondary poisoning to kiwi and other birds.

What set out to be the definitive study of the effect of 1080 on insects was undertaken at the Whitecliffs Conservation Area, Taranaki in 1992. A line of ten pit fall traps was set out in a 1,000 square metre plot and a similar plot as a control was set up outside the poison zone. The first problem for the scientists was that the poisoned plot was substantially "missed". To correct this, baits were taken from elsewhere to achieve a more representative distribution, yet still only 38% of the nominal density. The study was further complicated by heavy rain setting in a few weeks after the poisoning operation at which point, the difference in insect numbers between the poisoned area and the control fell, suggesting 1080 contamination of the un-poisoned control. Despite these difficulties the results showed a roughly 50% decline in the number of insects in the poisoned area relative to the control area. This result would have been a considerable embarrassment to New Zealand conservation agencies promoting the use of aerial 1080 at the time they were about to receive major grants to conduct the work. For that reason, no fewer than six peer reviews were conducted, none of which overturned the original conclusions. Despite the six reviews, the work was not accepted or published, and the report effectively suppressed. (7)

A subsequent study was carried out. In this case the controls were in different forest and, of 400 traps used, only the results of 35 were analysed. With minimal analysis of the results, the impact of 1080 was undetectable. This study was not peer reviewed and was duly published by DoC. (8)

Although both DoC and AHB claim that insects are not affected by 1080, DoC actually has a registration for 1080 as an insecticide, i.e. P003660, issued 13/08/1992 for a 1%1080 wasp paste.

Why the concern about insects? Well, insects can be by many times the greater part of the forest wildlife than animal and birds. It is likely that there would be around 60 to 80 kilograms per hectare of native worms. To that must be added the beetles, grubs, maggots, wasps, flies, cicadas, leaf eating stick insects, weta, centipedes and the wood borers which help break down forest litter as part of the soil making. As far as I am aware, no-one has sought to assess the bio-mass involved, but it must be considerable. Poisoning this mass of insects on a 3 year cycle will increasingly jeopardize the health of the whole forest.

1080 is a "chain killer"; the carcass of the victim remains toxic until it finally breaks down, and even that happens slowly because 1080 kills the maggots that feed on the carcass just as it will kill the birds that feed on the maggots! Anything that scavenges or consumes the first victim is at risk of also being poisoned.

What happens to the excess unused poison in the environment? Dilution following heavy rain on cereal baits will reduce it, but others, like carrot or grain baits, are fairly resistant to weathering and can remain viable for months in the field. (20) The 1080 will only really start to degrade as the bait disintegrates and the toxin leeches into the soil. Thereafter, bacterial action will, over time, cause it to decay.

Although many benefits are claimed for 1080 as a conservation tool, rigorous analysis suggests some of these claims are flawed. If collateral damage to the wider ecosystems is also taken into account, then serious questions must be asked about whether 1080 be used at all.

1 Rammell C. & Fleming P. *Compound 1080*. Animal Health Division, Ministry of Agriculture and Fisheries. Wellington. 1978. P24.

2 M/s Pat & Quin Whiting O'Keefe. *Aerial Monofluoroacetate in New Zealand's Forest"*. Submission to the Environment Risk management Authority. 2007.

3 Rammell C. & Fleming P. *Compound 1080*. Animal Health Division, Ministry of Agriculture and Fisheries. Wellington. 1978. P19.

4 Eisler R. *Sodium Monofluoroacetate (1080) Hazards to Fish, Wildlife and Invertebrates: A Synoptic Review*. Patuxent Wildlife Research Centre. Report No. 30. Feb 1995.

5 Notman P. *A review of invertebrate poisoning by compound 1080*. NZ Entomologist. 1989, Vol 12. P67.

6 Hutcheson J. *Impact of 1080 on Weta Populations*. Investigation No. 5020/560. Forest health Group. F.R.I. Rotorua. June 1989.

7 Meads M. "Effects of sodium monofluoroacetate (1080) on non target invertebrates of Whitecliffes Conservation Area, Taranaki." Investigation No. 1414. June 1994. Unpublished.

8 Spurr E. B. *Impacts of monofluoroacetate-poisoning for possum control on non-target invertebrates*. DoC Report, Science for Conservation 21:1-10 (1996). <60>

1. 9 Rammell C. & Fleming P. *Compound 1080*. Animal Health Division, Ministry of Agriculture and Fisheries. Wellington. 1978. P49.

W. F. (Bill) Benfield is the author of the recently published book "The Third Wave; Poisoning the Land", published by Tross Publishing of Wellington. He has had considerable experience in sustainable viticultural management, and has a long interest in conservation and wider land management issues.