

Sheep dip banned to save rivers

In the 1990s health concerns over organophosphate sheep dips led to their partial replacement with the synthetic pyrethroid, cypermethrin. However, cypermethrin is around a 1,000 times more toxic to invertebrates¹. With mounting evidence of its environmental impact UK sales have temporarily been suspended. **Matt Shardlow** outlines the problem and the imperative to make this ban permanent.

Most sheep in the UK are regularly immersed in pesticide or showered and jetted with a pesticide. This practice is carried out to treat the two main ecto-parasites of sheep - scab, a subcutaneous infestation of tiny mites, and blowfly larvae which can colonise the rear end and backs of sheep, feeding on live flesh. Both problems cause loss of condition and value and, if left untreated, can result indirectly in the death of the weakened animal.

Until the 1990s the main dipping chemicals were organophosphates, but because of concerns for farmers' health only one of these, diazinon, remains licensed for dipping. Cypermethrin was introduced as an alternative and now has a significant share of the dipping chemicals market.

Pollution of ecosystems

Pollution from sheep dip chemicals can impact both terrestrial and freshwater ecosystems. It can occur during the process of dipping, dispersal by sheep, disposal of the dip and during wool processing.

Dipping

Sheep dipping uses large volumes of pesticides in open, rural settings with significant potential for leaks and spillages. Incidents have even occurred where heavy rainfall has caused sheep dip left in dipping tanks to overflow polluting surrounding land.

Dispersal by sheep

According to guidance sheep should be left to drip dry for 5-10 minutes at the dipping site². However, they may continue to drip as they move back to fields. In addition, rainfall can wash more chemical from the wool onto pasture and it is suspected that this can continue for several weeks after dipping. Most of this will initially pollute soil. However, where sheep are able to access streams or other fresh water sources it may directly enter the water course. Sheep crossing water or drinking from it may have cypermethrin washed from their fleece.

Disposal

The recommended method of disposal of used sheep dip is to dilute (with water or slurry) and then spray onto a 'sacrificial

area'. 'Sacrificial areas' are licensed by the Environment Agency (EA) or the Scottish Environmental Protection Agency who assess the slope of the land and its proximity to water courses. There is no requirement to consider the competency of the operator or the potential impacts on biodiversity resulting from the use of the area. Water can be polluted by unlicensed disposal directly into water, or by contaminated soil particles in run-off reaching water. Impacts on the ecosystem of the 'sacrificial area' are more direct and unlicensed disposal has even fewer safeguards. Every year an estimated 100 million litres of waste sheep dip is sprayed onto the land³.

Wool processing

The processing of wool involves washing fleeces resulting in cypermethrin being remobilised and entering water courses near wool processing factories.

Non-compliance with guidance

The UK government's Department for the Environment, Food and Rural Affairs (Defra) and its Health and Safety Executive guidance aimed at reducing the risks in sheep dipping is insufficient to prevent pollution. In addition, training of operators is not mandatory and it is questionable how many are familiar with current guidance. Indeed evidence from field studies has 'highlighted a substantial level of non-compliance'⁴.

Impacts of cypermethrin

At low concentrations cypermethrin can kill all of the insects and crustaceans in a water body. The most commonly quoted example is that a single sheep drinking from a river can deposit enough cypermethrin to kill all of these invertebrates for 10km downstream. In addition, the chemical binds with soil particles and concentrates in the substrate/water boundary. Hence the concentration of the chemical can be highest precisely where most vulnerable invertebrates live and where fish spawn.

It is not known how quickly short-lived, abundant invertebrate populations recover from pollution incidents, or how long the cypermethrin persists at the water sediment boundary inhibiting recovery. Invertebrate



Cypermethrin drips from dipped sheep affect biodiversity
Photo: Myles Joynt

abundance on stretches of the River Teifi in Wales are below 1% of their levels 20 years ago⁵ and an Environment Agency (EA) investigation found that sheep dip pesticides were the main cause⁶.

The situation with rare, long lived invertebrates is more critical. In 2004 5,000 white-clawed crayfish (*Austropotamobius pallipes*) were killed by sheep dip pollution in Cumbria's River Mint. This is an internationally endangered species in steep decline in the UK. It takes several years to reach maturity and populations may take 10 years to recover from a pollution incident. Repeated pollution incidents could clearly contribute to the extinction of this species in the UK. The very rare caddisfly *Glossosoma intermedium* was once found in three little rivers in Cumbria⁷. Following sheep dip pollution in two of its rivers, it now appears to be restricted to only one. It would only take a single sheep to cause the extinction of this species.

Invertebrate decline has a knock-on effect on the health of the river. Cycling of nutrients within the river is altered and there is less food for fish, birds and mammals associated with the river. There are many reports of very significant reductions in the size and abundance of fish in rivers affected by sheep dip pollution, although proving causality is notoriously difficult. However, there is clear evidence that cypermethrin at concentrations as low as 1 part per billion has an impact on the olfactory systems of salmonids (salmon, sea trout and wild brown trout) and may be reducing their breeding success putting populations at risk⁸. Concerns are now rife that cypermethrin pollution is affecting the fishing income in many areas, a very significant part of the rural economy.

On land the disposal of sheep dip can cause a persistent reduction in invertebrate populations on the 'sacrificial areas' with likely knock-on effects on bird populations⁹. The impact of cypermethrin dripping directly onto pasture from sheep has not been studied. Although the volume of chemical deposited is likely to be lower per unit area than is applied during disposal, the area affected is huge and invertebrate popu-

lations are likely to be negatively affected. It is not known how much cypermethrin reaches ground water or how much will end up in drinking water supplies.

Human health impacts

The health risks to operators exposed to the chemical and to the public are not clear. There is also the potential for groundwater supplies to be polluted. European Union (EU) drinking water limits are set at 0.1 µg/l limit (0.1 parts per billion)¹⁰ and yet cypermethrin is known to cause olfactory disruption in male Atlantic salmon at concentrations 100 times lower, than this (0.001 µg/l)¹¹. In addition, synthetic pyrethroid sheep dip mixed with slurry before disposal can result in a bacteriological bloom in the slurry. This can result in four times as many faecal coliform bacteria and pathogens being sprayed onto the agricultural land¹² increasing the risk of public exposure to these microorganisms.

The scale of the problem

Sheep dip chemicals cause around one third of all freshwater Environmental Quality Standard (EQS) failures, with between 39 to 70 failures in the period 2000-2003. Failures occur most frequently in areas of sheep rearing (Wales, Northumbria, Kent) and in areas associated with the processing of fleeces (West Yorkshire). Cypermethrin is the commonest cause for failure of EQS in rivers. Buglife estimates that every year at least 1,000 miles of rivers are ecologically destroyed by sheep dip pollution.

Data from the EA show that there has been a rapid increase in the number of recorded sheep dip pollution incidents from seven in 2002 to 12 in 2003 and then 43 in 2004. This is largely due to targeted water quality monitoring for sheep dip chemicals resulting in better detection. In Scotland there is no targeted monitoring and many incidents are being missed.

'Since August 2003, there have been 57 sheep dip related incidents in Wales alone, affecting 29 catchments. Most of these incidents have arisen from apparent routine use of cypermethrin'¹³. The EU Water Framework Directive (WFD) risk assessments estimate that around half of Wales is at risk of failing to meet the WFD objective of Good Ecological Status because of sheep dip.

Attempts to control this problem through guidance and the promotion of best practice to farmers have not worked. Such advice does not change the behaviour of the sheep, nor the mobility of the chemical which washes off them. In fact in December 2005 ADAS, the government's own advisor on sheep dipping, was prosecuted and fined £5,000 for causing serious damage to two rivers. Sheep dipping is simply too slap dash a process to be able to control the destiny of chemicals as toxic as those currently being used¹⁴. If the best in the business cannot stop polluting who can?

Alternative solutions

Fortunately there are alternatives and farmers in some parts of the UK, for example in Buckinghamshire, are already using them. Alternative chemical treatments include pour-ons and injectables. The chemicals involved (such as avermectins) are also toxic and likely to damage invertebrates in the pasture ecosystem, however, because lower volumes are used and the chemical preparations better at sticking to the animal, the damage they cause is significantly reduced.

Perhaps more importantly, greater emphasis needs to be put on tackling the causes of the problem - changing the management of sheep flocks so as to significantly reduce parasite burdens. Quarantining and reducing stock density are just two measures that could profoundly reduce the scale of problem. In theory sheep scab could be eliminated.

The campaign

In summer 2005 Buglife and the Salmon and Trout Association launched a campaign to ban sheep dipping with cypermethrin. The issue was raised through articles in the national press and local radio, the EA and the Veterinary Medicines Directorate (VMD) were lobbied and questions raised in the Houses of Parliament.

A VMD/EA 'public stakeholder meeting' was held in October 2005. However, 37 of the invitees were industry representatives or regulators, and only five of the invitees were from small charities representing fishing interests or invertebrate conservation. The meeting decided to develop a voluntary 'Pollution Reduction Programme' despite a lack of support for this approach from the five charities present. The EA estimate that even a 1% failure to follow guidance would be 'unacceptable' and result in extensive damage to 5,000 km of rivers. It is unreasonable to expect that the necessary levels of stringency can be implemented - a voluntary 'Pollution Reduction Programme' is inadequate to deal with the problem.

The campaign to ban cypermethrin from sheep dipping is now supported by, among others, the Angler's Conservation Association, Association of Rivers Trusts, Herpetological Conservation Trust, Pesticides Action Network UK, Pond Conservation, Royal Society for Protection of Birds, the Wildlife Trusts and the World Wide Fund for Nature (WWF-UK).

Successes

On the 14 February 2006 Defra Minister Ben Bradshaw admitted 'It is widely known that synthetic pyrethroids can cause environmental problems if they are allowed to come into contact with watercourses. Recent reports from the Environment Agency of pollution incidents caused by the synthetic pyrethroid cypermethrin used in sheep dipping have included the loss of aquatic insects and other invertebrate

species and possible [sic] resulting decline of the insect-feeding fish populations.'

On the 21 February he directed the VMD to suspend the license to sell cypermethrin for sheep dipping on environmental grounds with immediate effect.

Can we stop this damage?

Stopping highly toxic chemicals about the countryside is an outmoded and outdated practice. Surely it is time to question the entire practice of sheep dipping. We should be moving with steady determination towards managing sheep flocks to minimise parasite burdens, and using low volume targeted pesticide applications where necessary.

In the first instance we need to maintain pressure to make the ban on cypermethrin sheep dip permanent. The current ban is only temporary and VMD are awaiting a further submission from the manufacturers addressing the environmental concerns. More action may be required before the use of cypermethrin in sheep dipping can be consigned to the category of 'former environmentally damaging practice'.

References

1. Croxford A, *Sheep dip: impacts on aquatic life. R/FERAC report no. T/RFERAC/05. July 2005.*
2. Health and Safety Executive, *Sheep Dipping, 1999. www.hse.gov.uk/pubns/as29.htm*
3. Armstrong A, Philips K, *A strategic review of sheep dipping. Produced by ADAS Gleadthorpe. Published by Environment Agency R&D Technical Report P170, 1998.*
4. *Op cit 1*
5. O'Reilly P, *Sheep Dip Update: a commentary from Pat O'Reilly, FERAC Chairman, Wales. Presented at R/FERACs, January 2005.*
6. Rutt G, *A summary of investigations of sheep dip pollution in Southwest, Wales 2002 - April 2004. Environment Agency. Technical Memo. TMWO 10. April 2004.*
7. Wallace I, *Glossosoma intermedium Assessment. Biodiversity Action Plan (BAP) Priority Species Review. BAP Review - Invertebrate Group England and Wales, 2005.*
8. Moore A, *Sublethal effects of pollutants on salmonids. in 'Research on migratory salmonids, eels and freshwater fish stocks and fisheries.' Science Series Technical Report No. 119, CEFAS Lowestoft, eds. Potter ECE, and Dare PJ, 2003.*
9. Walker LJ, Butterfield JEL, Standen V, Evans PR, *Effects of sheep dip disposal on terrestrial invertebrates. R&D Technical Report P2-250/17/TR. University of Durham for English Nature and the Countryside Council for Wales, 2004.*
10. Environment Agency. *Pesticides in rivers, groundwater and pollution incidents, 2006. www.environment-agency.gov.uk/youremv/eff/1190084/business_industry/agri/pests/915588/?lang=_e*
11. *Op cit 7*
12. Semple KT, Hughes P, Langdon CJ, Jones K, *Impact of synthetic pyrethroid-sheep dip on the indigenous microflora of animal slurries. FEMS Microbiology Letters 15;190(2):255-60, 2000.*
13. *Op cit 2*
14. Environment Agency, *Sheep dip pollution costs ADAS research farm £5,000. Wales. Ref. TC319/05MW. 14 Dec 2005.*

Matt Shardlow is Director of Buglife - The Invertebrate Conservation Trust, 170A Park Road, Peterborough, PE1 2UF. matt.shardlow@buglife.org.uk