The Hazards of Sheep Dipping

Fact Sheet

SUMMARY

Sheep dips, classed as "veterinary medicines", rather than pesticides, are used by every sheep farmer to protect sheep against external parasites. The majority of formulations contain organophosphate active ingredients, which it is now known can lead to both short-term and long-term effects on users. Farmers have not been properly protected either by the law or by regulators. This paper argues that although most dips have been in use for twenty to thirty years, insufficient attention has been paid to the adverse effects they have caused to users' health or to the development of alternative methods of control of disease in sheep.

Why sheep are dipped?

Sheep suffer from external parasites such as blowflies, or from keds, ticks, lice, and scab. MAFF has recently published advice for sheep farmers(1) stating "Sheep scab is a disease caused by a parasitic mite which lives on the skin surface. The feeding activities of the mite cause irritation and distress. This can result in stunting or severe loss of condition, loss of fleece, and death - especially of lambs ..." Dipping, by running sheep through a bath of dip solution, aims to rid animals of such parasites.

In the UK in 1988, about 40 million sheep on 18,765 farms were dipped. The manufacturers' association , the National Office of Animal Health (NOAH) refer to(1) "Britain's 95,000 sheep farmers and their staff dipping sheep twice a year [in the 1980s]."

Until 1989, the law required compulsory dipping twice a year in an effort to eradicate scab, a notifiable disease. In 1989 and 1990, only one dip was required. In 1992, dipping for scab ceased to be compulsory, and the disease became no longer notifiable. Instead, MAFF announced that it would not hesitate to prosecute those who did not deal promptly and satisfactorily with an outbreak of scab in their flocks(2) . MAFF complained that the sheep industry had failed to cooperate with the mandatory dipping policy. The industry in turn accused MAFF of failing to police compulsory dipping; NFU, the Sheep Veterinary Society, and NOAH issued statements warning of the dangers of ending compulsory dipping.

What are the costs and benefits and risks of the use of particular pesticides? A prominent commentator on dipping, Dr Jack Done of the Centre for Agricultural Strategy, Reading University, considers that compulsory dipping has brought us no nearer eradication than when it was begun in 1973. Eradication was successful in the period 1952 to 1972. Since 1973, statistical analysis shows that the mean annual incidence of scab in the five double-dipping years (1984-88) was not significantly different from that in any other five consecutive years. or from the whole period since sheep scab was introduced in 1972(3) . For 95 cases of scab in 1990, 35 million sheep had to be dipped.

The human cost of sheep dipping, the adverse health effects resulting from the exposure of operators and others to organophosphate active ingredients in the dips, is only now being recognised.

What are OPs?

Organophosphate compounds (OPs) were developed as chemical warfare agents because of their action in inhibiting blood cholinesterase activity: this means that in effect they can cause continual and uncontrolled stimulation of organs and muscles. There are a number of recent reviews of OP toxicology(4).

The World Health Organisation estimates that there are about 3 million acute severe incidents of pesticide poisoning every year. Up to half of these may be due to OPs.

Symptoms of exposure include initially headache, nausea, dizziness, anxiety and restlessness; which may lead to muscle twitching, weakness, tremor, vomiting, sweating, salivation, and blurred and/or dark vision. More

serious signs are tightness in the chest, coughing, pulmonary oedema. Behavioural signs include confusion or bizarre behaviour(5).

Long-term effects neurological effects have been demonstrated following exposure to pesticides containing OP active ingredients in the USA(6). Another Californian study warns that without information covering the victim's pesticide exposure history several weeks before an accident or illness, it is not possible to say whether a worker may have experienced depressed cholinesterase activity levels prior to the accident or illness. This failing in turn may lead to more illnesses being classified as short-term or single exposure illnesses, when the event is the culmination of earlier OP exposures(7). Indeed, if one of the symptoms of exposure are adverse effects on muscles and behaviour, it may be that previously-exposed workers are more likely to have accidents.

Do dips affect people?

The issue is now whether the common symptoms of OP poisoning can be attributed to the use of OPs in sheep dipping. The Ministry argument until recently has been that there was no clear evidence that sheep dips cause any unacceptable human risk when used according to label instructions. Other advice was that "...muscle and neurological effects can undoubtedly occur from OP exposure...far from claiming compensation in an accident, a careless worker could find himself liable for negligence in compromising the safety of his fellow workers"(8).

The correspondence columns of the farming press, and meetings of the Pesticide Exposure Group of Sufferers (PEGS) and SW EPA tell a different story. Sheep dipping 'flu', or example, is well known among farmers who dip flocks and is associated with the use of organophosphate pesticides. A letter describes thirty years' experience of dipping: "A severe headache, flu-like symptoms, and a burning sensation when passing water were the results for several weeks after dipping; also, if the weather was hot, giddiness and blurred vision for 24 hours. But then, as now, farm workers accepted it as part of the job"(9).

A recent small-scale survey carried out jointly by MAFF and the National Poisons Unit(10) has confirmed that the acute health effects can follow from exposure: "We wish to draw attention to the possible health effects of exposure to sheep dips containing OPs (diazinon, propetamphos, or chlorfen-vinphos). Toxic exposure to OP substances may cause acute cholinergic inhibition that correlates poorly with clinical effects...These findings are a matter of concern."

HSE has in a pilot study monitored 40 dip users in Devon during the 1990 season, taking blood and urine samples: it established metabolites of diazinon were present in urine, but did not provide evidence of how exposure took place or how much exposure there might have been(11). The study did validate urine testing methods. The study is also significant in establishing that OP metabolites were found in urine despite proper precautions having been taken.

Further work is to be done on the long term chronic effects of exposure by HSE. A team at the University of Newcastle is looking at the possible long term effects of exposure.

How many people are affected?

Fortunately, most of those who come into contact with dips are not adversely affected. There are many professional dippers who have shown no ill effects whatsoever. However it also seems to be the case that some unfortunate people who do wear protective clothing and observe manufacturers' instructions have also been made very ill.

In the period from 1985 to 31 March 1992, the Veterinary Medicines Directorate (VMD) received 232 reports of suspected adverse reactions to sheep dips, involving 315 individuals. 171 of these reports have been received since 1 January 1991.

PEGS was set up because of the widespread need for a support group for those suffering ill-health from exposure to pesticides. PEGS estimates that 2,500 of its 6,000 members are believed to be suffering from poisoning from sheep dips. Enfys Chapman, PEGS co-founder and spokesperson, complains: "The problem is getting OP sheep dip poisoning recognised and persuading the Ministry to take action"(12). At a meeting in

Devon to launch the National Action Group (OPs), it was estimated that 30 of the 80 people in the audience had suffered ill-health as a result of OPs. An informal telephone survey of sheep-farming members by the south-west regional staff of NFU showed that roughly a third of those contacted considered they had suffered "side-effects" as a result of OP dips. Reports of adverse effects following dipping come from many parts of the UK, and from Australia and New Zealand as well.

The stoic acceptance by farmers of ill-health has meant that the problem has been seriously under-reported. It is now acknowledged that there is under-reporting of pesticide poisoning incidents. General practitioners receive little toxicological training, and some of the symptoms of exposure to OPs can be general and vague. The occupational history of the patient is not always considered, and mis-diagnosis is possible.

In 1991, the then Chief Medical Officer of Health, Sir Donald Acheson, wrote to all doctors(13) about "the reporting of incidents where exposure to pesticides and certain veterinary medicines (for example, sheep dips) has resulted in possible adverse effects on human health. There is concern that such incidents may be under-reported. The purpose of this letter is to remind doctors of the reporting mechanisms." Where the use of a pesticide in the course of work may have affected human health, incidents are considered by the Pesticides Incidents Appraisal Panel (PIAP). It is suspected that PIAP does not receive reports reflecting the true incidence of pesticide poisoning. At the request of the ACP, HSE has now announced a three-year pilot project that aims to produce a national overview of the extent of pesticide poisoning(14). VMD now processes adverse reaction reports, but an examination similar to that proposed for pesticides may now be needed for the effects of exposure to veterinary medicines.

It is not only farmers who dip who may be at risk, but also people who subsequently handle sheep. Auction workers have been affected. A recent letter to Farmers' Weekly quoted instances of lorry drivers loading wet sheep who developed symptoms of OP poisoning, and a shearer who handled sheep that were dipped before clipping(15).

What are the sources of exposure?

Farmers are concerned that they have little protection from hazardous chemicals. Protective clothing alone is not a practical method of preventing exposure to dipping solution for a farmer having to haul a heavy sheep in and out of dips, and the "aerosol effect" of sheep shaking themselves dry after dipping means that the atmosphere is soon laden with chemical.

So far it is uncertain whether the route of exposure for those who have suffered adverse effects is dermal, inhalatory, or by ingestion. HSE has said that tests done in the 1980s showed that there were no traces of OP vapour in breathing areas, but considered that solvents and phenols might be inhaled and cause adverse effects. Phenol dips are to be withdrawn (see under Regulatory control). Current HSE advice does not recommend a face mask when dipping.

The Veterinary Medicines Directorate seems to take a different view. It has published advice for farmers(16) which is headlined "Sheep dip concentrates contain either an organophosphorous or a pyrethroid insecticide. Some may also contain phenols. These substances can be absorbed quite readily in the body through the skin, nose and mouth. Careless handling can endanger human health." Are face masks required?

MAFF advice is not clear(17). "Dip concentrates and dip wash must be handled with care at all times - some constituents if inhaled or absorbed through the skin can cause poisoning".

Protective clothing is advised by the literature for performing dipping operations. Current advice from HSE recommends personal protective equipment, which should include "rubber gloves, coverall, and a faceshield when handling the concentrate and rubber boots, rubber gloves and waterproof coat or bib apron when handling the diluted liquid and freshly dipped sheep"(18).

Although protective clothing is recommended. there are as yet no agreed standards for protective clothing for pesticides. In Germany, the Government has introduced new testing and "instructions for use" requirements for protective clothing. The pesticide manufacturer must include all details on wearing protective clothing in his

"instructions for use" literature. In the UK there is no clearly defined system of approval of protective clothing materials(19).

It is extraordinary that neither the VMD nor the HSE literature nor the MAFF literature contain any other health warning. They do not tell users what symptoms they may experience in case of accident or misuse.

The effects of dips on the environment

One angry farmer wrote to Farmers' Weekly(20) to complain "After spending an entire day some years ago telephoning MAFF, ADAS, the water boards, NFU etc to ask for advice on safe disposal, we had numerous instructions about how not to dispose of it, but not one practical piece of advice as to what we should actually do to get rid of it."

Recent advice to farmers on disposing of sheep dip is to pour it down "soakaways" or to spread it on fields away from surface waters. The EC considers that this may breach the 1980 Groundwater Directive, and that the dip must be incinerated, or dumped at licensed landfill sites.

A report by the Tweed River Purification Board(21) has shown that sheep dipping caused pesticide contamination in 17 out of 20 river catchments in the Borders area of southern Scotland in autumn 1989; 40% of sheep dips were thought likely to cause pollution. The pesticides concerned were diazinon and propetamphos. The Water Research Centre expressed concern about the lack of ecotoxicological data for such products.

The results of an earlier survey of the Grampian area, published at the same time, also reported pollution by organochlorine and organophosphate dips(22) . Indeed, an estimate was made of the "polluting potential" of the usage, disposal and spillage of chemical from a typical sheep dip tank. The resulting concentration of, say, propetamphos would lead to a flow of between 10 and 20 times the EC drinking water limit over a 24-hour period.

River authorities are concerned at the lack of invertebrate life that characterises rivers polluted by OP dips. Other 'non-target' species at risk, according to a recent VMD warning, are waterfowl and geese which are more sensitive to OPs than other farm animals.

Regulatory control

The main pieces of legislation that promote worker health and safety in pesticide use do not apply to sheep dipping.

The Food and Environmental Protection Act 1985 (FEPA), which governs pesticide use, does not apply to veterinary medicines. This is a pity, since FEPA provides that those who use pesticides should be "competent": and competent means the possession of a certificate of competence from a recognised training body in the safe use of pesticides.

The Control of Substances Hazardous to Health Regulations 1988 (COSHH) apply to the mixing of dip, but not to the dipping process, on the basis that the dip is then dilute and not a substance hazardous to health. COSHH requires an assessment of risk and health surveillance of users. Recent Ministry advice to farmers accepts that COSHH does not apply to dipping operations.

The OP active ingredients used in nearly all dips are under review by the VMD. A preliminary report from VMD(23) seeks further information including: Studies of farm operators, including blood tests and details of protective clothing. Studies to show which areas of the body are most exposed. Persistence of residues in fleece.

The agricultural uses of the active ingredient diazinon were reviewed by the Advisory Committee on Pesticides in June 1992 in a document that concluded too that studies were needed on the exposure of operators and consumers resulting from the use of professional non-agricultural products. Diazinon has been in use for over 30 years.

This is now being recognised by the licensing authorities. For 24 out of the 25 dips on the market, the active ingredients are the organophosphate insecticides diazinon, chlorfenvinphos and propetamphos. These are now being reviewed by the VMD as licensing authority. As a first step, VMD has indicated that dips containing phenol as a solvent in the formulation are to be withdrawn(24).

As in the case of agricultural pesticides (where some 250 out of 450 active ingredients are in review) the fact that an active ingredient is in review does not mean it is unsafe: but neither can its safety yet be fully guaranteed on the basis of a complete and up to date consideration of the evidence.

Further, the lack of access to information on pesticides means that users independent information on alternatives is not available. Freedom of access to information is required so that there may be informed public discussion of the risks of pesticides and the adequacy of controls; so that those who have experienced or observed unexplained ill-effects can assess the likelihood that these result from pesticide exposure; and so that pesticide users can make informed choices from amongst the pesticides available to them.

Conclusions

The policy of eradication of sheep scab, and the compulsory dipping of sheep in consequence, has not been particularly successful, and there has been a cost in terms of human pesticide poisoning. The goal of eradication may now need reviewing. The problems of sheep dips are specific examples of the problems of pesticides in general. A number of conclusions can be drawn:

A comprehensive policy

As with agricultural pesticides, it is not sufficient simply to replace one chemical that is now shown to be "unsafe" with one that is considered "safe". OPs themselves replaced the previous generation of environmentally damaging organochlorine compounds. The abolition of the compulsory dip may not necessarily reduce the use of OPs, as researchers consider that a large proportion of farmers continue to dip at the usual time, and follow a dip up with successive spray treatments of animals if parasites appear. A policy is needed that compares the costs and benefits of "safer" chemicals with non-chemical or reduced chemical control. Data needs to be available to users to enable them to make informed choices between methods of pest control, and users should be supported by effective legislation and post-market surveillance.

Costs and benefits

The costs and benefits of pesticide use need to be compared with the costs of non-chemical methods of control. Other methods of control are being developed following studies of the life cycle of the parasite, and including the application of "safer" chemicals on targets - not necessarily on the animal. One council has taken the interesting initiative of advising farmers against OP dips and in favour of "safer" dips containing pyrethroids, and backing the advice with the offer of a refund on presentation of the used carton(25). Other contractors have offered "mobile dip" services, including application and disposal(26). It seems likely that the goal of prevention of sheep scab will be effected by a combination of more emphasis on inspection and reporting, and safer and more selective treatments. However, investment may be needed from government to promote research into alternatives in a fairly small animal health market.

Health and safety criteria

It is clear from the history of sheep dipping that a policy of prescribing chemicals and leaving the use of such chemicals to farmers has not been successful. The agencies involved, MAFF, VMD, and HSE, have been reluctant to take up the reported problems of dipping. Conflicting advice has been tendered, and the legislation of FEPA and COSHH does not adequately protect dippers.

Transparency of decision making

Reviews of the health and safety of the OP active ingredients themselves, which have been in use decades, have not been carried out with thoroughness or urgency required. The lack of any effective and investigative post-market surveillance has prevented users from having their illnesses and symptoms addressed. There is an urgent need for the publication of the criteria on which the health and safety of pesticides, including sheep dips, are judged, and for the production of data sheets that enable users to make choices of pest control methods, and warn users of the symptoms to look for in cases of exposure to OPs.

When the lack of statutory protection and assistance to users is added to the lack of suitable and adequate protective clothing and advice; when users are warned that OPs can affect their health, but the effects are not spelled out; and when there is an ad hoc and inadequate reporting system, it is no surprise that the use of such OP sheep dips has caused ill-health.

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