

ANIMAL HEALTH EMERGENCIES ARISING FROM
CHEMICAL CONTAMINATION INCIDENTS

BY R S Belcher, Chief Chemist

DEPARTMENT OF AGRICULTURE, VICTORIA

THE TELODRIN EPISODE

In 1963, in south-western Victoria, the milk from 90 dairy farms was diverted from use for human consumption and was used for the manufacture of non-edible casein and soap. Calves were dying, dogs and cats were ill and there were reports of nervous symptoms in babies of nursing mothers in the district.

Chemical investigation of samples of milk and of specimens from the dead animals showed the presence of a previously unknown chemical in the samples. A follow-up investigation revealed that a new insecticide had been used in the district for control of underground grass caterpillar and it was shown that this was the chemical present in milk and specimens. It was present at a sufficiently high level to have been responsible for the deaths of animals and for the other adverse effects. The presence of the chemicals was also detected in the milk of nursing mothers who had consumed dairy milk from their family's farms.

By a very fortunate circumstance, the analytical procedures involved were only possible because the Department of Agriculture had taken delivery, 2 months previously, of a piece of equipment known as an electron capture gas chromatograph, specially constructed to their order on the basis of then very recent scientific developments. The instrument was the first in the Southern Hemisphere and about the sixth in the world.

The company responsible for the product was incredulous at the suggestion that the observed effects were derived from use of their product but, after having sent a specialist veterinary toxicologist out from Great Britain, who had examined the chemical results, visited some affected farms and returned to England, the company authorised purchase of all milk from farms which had used the product and set up a monitoring system by which samples of milk from all farms would be flown fortnightly to Great Britain for analysis until the milk was clear of chemical. Arrangements were made by the Victorian Department of Agriculture to monitor the milk also to ensure that any decision made to release the milk from the affected farms to the marketplace could be justified.

The chemical had previously been used on large scale trials in South East Victoria and other parts of the world but no adverse effects had been detected. It was discovered however in the course of this Victorian investigation that any residues ingested in feed by the cow were concentrated in colostrum and this concentration was a major contributor to calf deaths. It also appeared that particular seasonal conditions that year had been responsible for unexpected persistence of the chemical in the pasture. Some farmers may also, because of the pasture shortage, have grazed sprayed pastures too early and there is a suspicion that empty containers left around the paddocks may have been licked by cows in some cases, to give the animal a very high intake of the chemical.

The chemical used was known as isobenzan or by the trade name of "Telodrin". It is related to dieldrin and heptachlor. It was later banned from use in Victoria and is now no longer manufactured.

One point which appears to have been overlooked at the time was the fate of residues in the meat of the cattle and, as far as is known, no steps were taken to follow the meat through distribution system. It is believed that the number of cows sold for slaughter was probably very small and that by the time the milk was relatively free of the chemical, the level of residues in the fat of meat would also be low. This was unfortunately not verified and no analyses were carried out on male animals at the time, so it is probable that some chemical residues eventually reached the general public.

This example close to home illustrates, vividly, the possibilities and consequences of chemical residues in meat.

PBB's IN USA

You will recall that a similar situation, but much more extensive and severe, occurred in the United States in 1973 when the chemical fire retardant, polybrominated biphenyl (PBB), was mixed into stock feed in mistake for a feed additive. This resulted in severe contamination of animals, with deformities and stock deaths resulting, and of produce, land and people in two States of the USA.

In this case diagnosis of cause of the problem and recognition of the contaminant was very slow, and perhaps only a fortuitous circumstance in the laboratory, where an instrument was left on for a very long period, prevented an even longer delay in dealing with the situation. Symptoms in animals were not recognized, since poisoning with such a chemical had never been observed before. The chemical was of such persistence that there was no possibility of awaiting its excretion from the animals as in the Victorian case with Telodrin. As a result, large numbers of animals had to be destroyed, farms were quarantined and the legal repercussions are still being felt.

The Seveso Incident

Another case of massive contamination of agricultural land, including livestock, took place in Seveso in Italy on 10 July 1976 as a result of an industrial explosion. On 15 July the first animal deaths were reported and reports of children suffering skin rashes came in a day later. Not until two weeks later the explosion was the toxic agents TCDD Tetrachlorodibenzodioxin first identified. It was confirmed by the company three days later. The company had been carrying out normal manufacturing process for the product trichlorophenol, and as a result of a complex series of incidents and chemical reactions the kettle in which the reaction was taking place underwent extreme heating, blowing the dioxin into the environment through a blow-out valve. The consequence was the complete evacuation of people from the area around the factory and destruction of all livestock and companion animals.

Sources of Contamination

1. Animals may drink water or eat food contaminated by industrial wastes or spilled chemicals or by misuse of agricultural chemicals, such as overspraying of pasture.
2. Animals may be treated with contaminated veterinary drugs for some disease or treated by dipping or use of a pour-on for external parasites, with a contaminated product.
3. Animals may consume pasture or hay which has been contaminated with an agricultural chemical or industrial chemical used or contaminated at levels resulting in hazard to the animals or consumers of the product.
4. Animals may be fed prepared stock food or other food containing industrial or other contaminants.
5. Animals may consume soil from land contaminated at some stage with chemicals either from pollution or spillage.

Possible sources of chemicals range from in-factory contamination of produce through transport spillages to massive factory effluent such as at Seveso. Contamination of agricultural chemicals and drugs and misuse of these chemicals can also result in animals carrying quantities of chemicals hazardous to their own lives or to potential consumers of animal produce.

Detection of the Problem

In an endeavour to provide for fast action in reporting possible problems in contamination of animals and other agricultural produce with chemicals and to assist in speedy recognition of a problem, the Victorian Department of Agriculture has, in its Agricultural Disaster Manual, set up operational procedures in respect of episodes involving agricultural and veterinary chemicals. These procedures are intended to ensure that where certain triggers, which may indicate a possible episode, are activated, officers of the Department will communicate the matter with a senior officer who can evaluate the situation and determine whether there may be a possible chemical emergency.

Since officers of the Department are located in all rural areas and are in many cases a person who will be contacted very early by a farmer or other person in the case of an animal death or sickness, or of obvious hazard to animals, the network within the Department should be able to detect possible problems very early in a situation. Further, interdepartmental contacts between officers of the Country Fire Authority, the State Water Commission, and Health Commission of Victoria, enable early and effective communication with regard to possibilities of chemical contamination detected by those authorities.

In summary, the detection procedure is as given in the manual.

Details are available in the sheets attached.

Consequent Action on Chemical Emergencies

A detailed action plan has not yet been developed by the Department of Agriculture for the second stage of action in chemical emergencies in Victoria. Action Plans under the Victorian State Emergency Service exist to cover massive roadside spillages of chemicals and to cover massive factory fires and similar incidents. These have been triggered by the occurrence of incidents of this kind.

One problem with dealing with episodes of chemical contamination is that the effects and the consequences cover such a wide range of possibilities. A further problem is the difficulty of actually detecting whether the incident which has occurred actually constitutes a chemical emergency which requires putting an action plan into effect. However where it is considered that a chemical emergency probably exists, the following procedure is one which could be followed by the Chief Chemist on receiving advice either directly from an informant or via the Chief of Veterinary Field Services, and confirming the situation.

The State Emergency Service Red Phone System enables communication from the office of the Chief Chemist, State Chemistry Laboratory, to other organizations involved in the Disaster Scheme, as well as providing out-of-hours trunk line facilities for contact with the country centres. Since in the case discussed below, water contamination, the Rural Water Commission would probably be the combatting authority, they would be supported by the SCL and other authorities. The Commission would need to take steps to have farm water supplies and other uses diverted from contaminated water.

As an example, in the case of a reported massive contamination of a water supply such as by transport spill, or of an indication of large numbers of dead fish, or of effects on stock consuming the water, arrangements would be made possibly through the State Water Authority for immediate sampling of water. If the chemical was unknown, there might be required a considerable amount of investigation to determine the type of contaminant.

Other State Authorities will have been formed, the Health Commission of Victoria, Environment Protection Authority, the State Water Commission, at least, and the resources available to those organizations will be available for the purpose of identification and quantification of the problem, providing in particular microbiological resources and some resources for investigation of contaminants.

The Organic Chemistry Branch of the State Chemistry Laboratory has had considerable experience and has expertise in identifying and detecting agricultural chemicals but less experience in respect to other chemicals. However, the equipment available would be usually adequate for this task. Immediate action therefore would require recalling staff into the laboratory if the matter is out of hours, or within office hours, mobilizing the resources in the laboratory to the solution of the problem.

Arrangements are currently being made with other laboratories located in the City of Melbourne, including the Australian Government Analytical laboratory and the SEC laboratory, to have available their resources and staff to assist in a situation. This would enable additional equipment to be provided

and where around the clock monitoring of the situation was necessary, chemists of various laboratories could be utilised either working in their own laboratory or that of another authority.

The Department of Agriculture calls on the State Chemistry Laboratory in this case would be for monitoring stock both to diagnose chemical poisoning and if necessary to determine whether the stock was saleable at a later date.

Parallel to the chemical action, the Animal Health Services are responsible for ensuring the contaminated animals will not reach the food chain, and together with the chemist, in determining if and how the source of contamination can be neutralized. If necessary animals will need to be slaughtered and in cases where they are clearly showing toxic symptoms, this may occur immediately.

As another possible case, where contamination is suspected to occur to contaminated agricultural chemicals or feed, to contaminated pasture, the Chemist has the role of detecting, identifying and quantifying the degree of contamination. The case in point occurred two years ago when a quantity of a sheep pour-on was contaminated, once with a toxic organophosphorus chemical which caused the death of sheep, and once with an organochlorine chemical which could have resulted in contamination of the meat. In this case chemists in the State Chemist Laboratory, in co-operation with their counterparts in the other States, followed up and monitored the presence of the chemical in samples of the product.

Unfortunately there is no current legislation in Victoria which provides specifically for a quarantine of properties where stock are contaminated as there is in New South Wales and Western Australia, nor for the compulsory slaughter of such stock. Steps can be taken however, in conjunction with the Health Commission of Victoria, to have the stock condemned as food and destroyed under provisions of the Poisons legislation and Health legislation. This approach is fairly cumbersome but it has been exercised in the case of poultry contaminated with organochlorine chemicals due to the misuse of it in poultry houses. Milk and eggs can be quarantined or disposed of or rejected by the relevant marketing authorities in this State.

Once it has been determined that the source of contamination has been eliminated, and that stock were free from contamination, any restrictions can be lifted and normal activities continued.

Future Action

It is clear that there needs to be additional planning in this State to deal with chemical emergencies involving contamination of stock or agricultural chemicals and this needs to be backed up by legislation covering quarantine and destruction.

Steps will be taken during this year to produce the plan to cover the mobilisation of the chemical analytical facilities in Victoria to deal with such a problem and this will be integrated into existing plans in respect to animal health and environmental decontamination.