VERMIN AND NOXIOUS WEEDS DESTRUCTION BOARD

Department of Crown Lands and Survey

A MANUAL FOR THE USE OF 1080 IN RABBIT CONTROL.

by

B.R.G. WOODFIELD, M.Ag.Sc., Dip. Ag.

Director

The Keith Turnbull Research Institute

Frankston Victoria

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I N D E X

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INTRODUCTION

The introduction of the European rabbit *(Oryctolagus cuniculus* (L.)) into Australia in the middle of the 19th century could well be classed as one of the major disasters in this country's history. The rabbit proved ideally suited to the climatic conditions and bred prolifically. Its tolerance to extreme heat and cold, together with a very low water requirement, enabled it to spread over most of the continent.

Rabbits compete strongly with other grazing animals for feed and when possible select the best grasses and clovers. Also rabbits make pastures sour and unpalatable to stock and this further reduces the effective grazing area of a paddock. Eight rabbits exert a grazing pressure roughly equivalent to one sheep.

The burrows and extensive warren systems which rabbits dig not only reduce the available grazing area but also predispose some hilly country to tunnel erosion and severe gullying.

Over the last 20 years methods of poisoning the wild rabbit in Victoria have improved greatly. Many of the traditional techniques have proved ineffective and better knowledge on rabbit behaviour, efficient poisons, palatable baits and improved techniques have enabled control measures to almost eradicate rabbits from some areas.

A co-operative attitude towards rabbit destruction by the farming community and Government instrumentalities (Vermin and Noxious Weeds Destruction Board) has helped in more effective poisoning operations through local farming communities. The major primary producer organizations in Victoria through local Lands Department District Advisory Committees greatly assist in ensuring the success of rabbit control. However landowners carrying out the recommended techniques must be completely aware of the facts behind the recommendations to ensure effective kills. They must also be informed of any special characteristics of the poisons and bait used and any pitfalls that can be encountered in the field.

The greatest supporting technique to poisoning is the use of myxoma virus in the biological control of rabbits. It must always be emphasized that myxomatosis is only an erratic ally in our overall control program and, although of great assistance at certain times of the year, will never be the complete answer. Any improvement in the use of myxomatosis either by improving the strain or introducing a more efficient carrier, e.g. the European rabbit flea, will only succeed to a limited degree because of the existence of immune and resistant rabbits in the field.

Ripping, fumigation, and establishing improved pastures all have a role in the overall program but an ineffective poisoning campaign can lead to a build-up in the rabbit population often greater than that prior to poisoning.

The three main methods for the distribution of poison baits in Victoria are by the use of:

(a) trail - the bait is laid in a shallow furrow in areas that are accessible to farm equipment,

(b) broadcast - the bait is spread widely over an area by hand, on horseback or using a mechanical spreader. Used in rugged, often inaccessible country,

(c) aerial - this method uses agricultural aircraft to spread bait in otherwise inaccessible country. Bait is spread over the whole area.

The principles behind the recommendations however are all the same.

The information in this article endeavours to (i) clarify the facts in the poisoning recommendations (ii) highlight the pitfalls which often occur in the field and drastically reduce percentage kills and (iii) discuss the facts related to the use of the poison 1080.

1. Sodium monofluoroacetate (1080)

Fluoroacetic acid, $F.CH_2.COOH$, was first synthesized in Belgium in 1896. During World War II it was thoroughly investigated - mainly as a defence measure - and was developed as a rodenticide with the code number 1080. 1080 is a white powder having no smell or taste and readily dissolves in water. For safety reasons 1080 is impregnated with a purple dye (nigrosin) during manufacture. The powder readily absorbs moisture when exposed to the atmosphere and must be enclosed in plastic bags in air-tight

containers for storage. Throughout the world 1080 is only handled by qualified officers to prevent its misuse. This control is necessary because (i) 1080 is fairly difficult to detect and the post-mortem findings are not necessarily conclusive. (In comparison strychnine may be purchased from the supplier after signing a relevant "Poisons Book". Strychnine is not as rigidly controlled because in a post-mortem it can be readily detected. (ii) There is no practical antidote to 1080 poisoning. (iii) The main danger is in the handling of the powder or stock solutions of the powder. However after the poison has been mixed into bait at very dilute concentrations very little danger is present to the operator.

1080 is characteristically a slow-acting poison and most rabbits die away from the poisoning site, usually making for cover e.g. down a burrow.

(a) Mode of action of 1080

(Further information see Appendix "D")

In all animals (including man) food is eaten to store energy in the muscles to maintain life. The food is broken down in the body by a series of steps where energy is released at many points. Fluoroacetate acts in stopping this breakdown of food into energy. Instead of energy production there is a build-up of one of the components in this cycle called citric acid and 1080 poisoning leads to - (i) loss of energy to maintain life and (ii) a build-up of citric acid. Rabbits die without pain usually from heart failure. Dogs are highly susceptible to 1080 and death occurs due to upset of the nervous system. Rabbits found dead near a poison trail often appear to be asleep and show no evidence of stress. In comparison the poisoned dog will rush around madly and bite at anything within reach.

(b) Toxicity

1080 is highly toxic to rodents but much less so to humans and birds. In most cases toxicity varies according to body weight but there are some exceptions. A sliding scale for 1080 toxicity from the least to the most susceptible for some animals is as follows: birds, man, horse, rabbit, sheep, pig, cat, dog (most susceptible). The approximate lethal doses for some animals is shown below. These figures must only be used as a guide and may vary from one animal to another.

Duck	16.0 - 20.0 milligrams per kilogram of body weight
Poultry	10.0 - 14.0
Mouse	8.0
Horse	5.0
Eagle	3.0
Man	2.0 - 5.0
Rat	2.0
Wild rabbit	.75
Sheep	.45
Wallaby	.3
Cat	.3
Possum	.3
Dog (fox,dingo)	.09

(1000 mg = 1 g, 28.5 g = 1 oz and 1 kg approx. 2.2 lb)

Time of death is usually proportional to the amount of poison bait consumed. An adult rabbit eating one piece of carrot bait (approx. 6 g) will die in 2 to 3 hours, but with a stomach-full (approx. 60-70 g) will die in ¼ to ½ an hour. From the above toxic rates it is obvious that stock (mainly sheep) can consume enough to be poisoned accidentally. Most reports of accidental stock poisoning have been attributed to faulty fencing or allowing stock to graze in a paddock being poisoned for rabbits. Apart from the obvious financial loss due to stock poisoning the amount of bait consumed by the stock will also affect the rabbit kill.

(c) Stock poisoning

In the case of suspected accidental stock poisoning due to 1080 operations, the local veterinary officer should be consulted and samples should be taken as quickly as possible. These should be placed in a sealed container and forwarded without delay to the Chief of Division of Agricultural Chemistry, Department of Agriculture, Treasury Place, Melbourne. The details of the poisoning should be enclosed with the request for 1080 analysis (see Appendix "E"). In most cases the presence of carrot bait in the stomach of stock in a poisoned area will indicate the possible cause as 1080 but other causes must not be excluded. All stock must be excluded from poisoned areas. Appropriate "POISON LAID" signs must be

placed on all access gates in the poisoned area, and all immediate neighbours must be notified. These signs are available from your local Inspector of Lands.

(d) Danger to dogs

Dogs are very susceptible to 1080 poisoning and should be either tied up or muzzled during the poisoning operations. Foxes and feral dogs are similarly very susceptible to 1080 and large secondary kills have been achieved when foxes eat poisoned rabbits or the poisoned bait. The rabbit carcass decomposes quickly after poisoning and once the meat tissue has decomposed there is no danger of secondary poisoning. There is no 1080 residual in the fur, skin, or bones. 1080 is most concentrated in the stomach where some bait is still undigested and the rest of the poison concentrates in those tissues rich in blood, namely liver, heart, lung, kidneys and brain. 1080 is not absorbed through the intact skin and has no toxic vapour at normal temperatures. Dust from the powder can be absorbed through the nose and a respirator should be worn when mixing the stock 10% solutions. 1080 decomposes at 110°C (230°F) and is therefore destroyed by burning. Animals suspected of being poisoned should be given an emetic which may be successful in cases of small doses. Beware that the vomit from a poisoned animal is also potentially lethal.

(e) Danger to humans

The 1080 powder is made into a 10% solution for use by Victorian poisoning authorities (see Appendix "G"). 20 ml of this 10% solution is mixed with 9 kg (approx. 20 lb) of carrot bait. At these concentrations there is very little danger to the operator. In theory if a rabbit eats 50 g (half stomach) of bait then an average-sized man would need to consume ten rabbits, stomach and all to obtain a lethal dose.

The figures below give the approximate amounts of bait materials needed to supply a lethal dose to man.

Comparison of bait toxicity

Poison	Wt. of Man	Usual Dose Rate on Bait	Approx. lethal dose of bait
1080	70 kg	28.5 g pdr/90 kg	400 g
Strychnine	Average man	28.5 g pdr/7 kg*	6 g

* J. Dep. Agric. Vict. (1951) 49 : No. 3. (Metricated)

(f) Non-residual characteristics

1080 is not a cumulative poison. The original research work was carried out in England by Dr. Adrian who ate a sub-lethal dose based on experimental work with monkeys. If a sub-lethal dose of 1080 is ingested it is excreted within 24 hours.

1080 is broken down in the soil by naturally occurring bacteria and therefore there is no danger in water run-off. Considering the concentrations at present used for rabbit poisoning, 1080 offers no hazard to pollution of water in streams if animals should die close to a water supply. The dilution factors are extremely large even in the smallest of waterholes and streams.

(g) Effect on non-target animals

Trials over the last 15 years have indicated that birds are not affected by 1080 poison when mixed at the correct strength, however it is possible to poison possums and wallabies. In an endeavour to reduce this risk the Vermin and Noxious Weeds Destruction Board has divided the State into primary and secondary wildlife habitat areas. Primary wildlife habited areas, mainly natural bush and scrub, are not poisoned without consultation with officers of the Division of Fisheries and Wildlife. Where any major risk to wildlife occurs then other methods of rabbit control are used at greater expense to the Board.

1080 remains in the bait until the bait has decomposed. In normal poisoning operations using a furrow, the poisoned bait can be covered in after 3 or 4 days and stock returned to the paddock. For broadcast and aerial baiting with the baits spread over the whole area it is difficult to give a definite time for re-stocking after poisoning. Once the bait has decomposed then no risk exists to stock. During the winter months, when most aerial and broadcast poisoning is carried out, generally 5 to 6 weeks is a safe period. It is important that a few stock be returned to the poisoned area after that time to ascertain whether any danger still exists.

(h) Poisonous (1080) plants

1080 occurs naturally in some plants. In 1943 it was found in nature as the toxic principle of the South African poisonous plant

Dichapetalum cymosum (known as "Gifblaar" meaning "poison leaf"). Toxicity of this plant is highest in the spring and autumn particularly in the young leaves and seeds. Fluoroacetate has also been identified in the seeds of *Dichapetalum toxicarum* (or "ratsbane") which is used by witch doctors in Sierra Leone. In Australia, fluoroacetate occurs naturally in the seeds of *Acacia georginae*, a natural fodder in north-western Queensland and the Northern Territory.

Twenty-seven species of the genus Gastrolobium are poisonous due to 1080 synthesis and all occur in Western Australia. One of these species, *Gastrolobium grandiflorum*, also occurs in the Northern Territory and Queensland.

The genus Oxylobium has seven poisonous (1080) species that only occur in Western Australia.

(i) Regulations

The use of 1080 in Victoria is governed by "Regulations relating to sodium fluoroacetate" Health Act 1958 (No. 6270). The main points in these Regulations are:

(a) security - all 1080 must be kept in a locked compartment whether in powder or liquid form

(b) protective heavy-duty rubber gloves must be worn when handling 1080

(c) aerial and broadcast baiting may only be carried out after written permission has been obtained from the State Health Department. Special forms must be filled in by the landowner wishing to carry out aerial or broadcast baiting and submitted through his local Lands Department Inspector

(d) where the bait is laid in trails these must be covered with soil 3-4 days after the poison bait has been laid and the landowner must undertake to keep stock free of the poisoned area

(e) landowners must notify their neighbours when carrying out poisoning operations and the appropriate 1080 poison laid sign must be displayed at all access points to the property

(f) the mixed bait must be carried in water-tight containers.

2. Types of bait

The three main baits used in Victoria are oats, carrots and commercially prepared pellets. It is illegal to use wheat or fruit as baits with 1080. Carrots should be used wherever possible as it is difficult to

obtain more than a 75 to 80% kill with oats (see Appendix "A"). This may seem a good result and the extra trouble of handling carrots not worthwhile for the extra 15 to 20% kill. However it is this last 10% that is extremely important. If rabbits are reduced to very low numbers their breeding potential is severely hampered and the build-up again is slow. A kill of under 80% temporarily lowers the population and reproduction is stimulated to very quickly return the population to previous numbers or higher. It must be remembered that a doe drops her litter 30 days after mating and the young doe can breed at 3 months of age. Litter size varies with food availability but can average 4 live kittens per doe.

Previously it was believed that baits had to be cut into regular sized cubes before the rabbits would accept them. Actually any chunky piece of carrot up to 25 mm (1 inch) is quite effective and power-driven bait cutters have been developed by the Victorian authorities to cut the large quantities of bait required. When carrots are not available the manufactured pellet bait can be used and kills in excess of 90% can be achieved using these pellets.

38mm (1½ inches) of rain on either oats or pellet baits appears to render the bait non-toxic, however carrot bait withholds the poison and it must not be assumed that rain will leach the poison out. While carrot bait still remains on the ground it must be assumed that it is toxic. In any poisoning operation carrots are the best bait to use if available. Any oats which germinate are perfectly safe for stock to eat, the 1080 by that time having been leached out.

3. Social behaviour of the rabbit

Extensive studies of the social behaviour of the rabbit have been carried out by officers of the C.S.I.R.O. Division of Wildlife and their findings may be briefly summarized as follows:

Rabbits form social communities with clearly defined territories mainly during the winter months and these are controlled by a dominant buck and a dominant doe. The dominant buck, by use of a gland under his chin, marks out the boundaries of his territories so that each rabbit in the social community can determine their boundary. A rabbit trespassing outside his normal territory will be attacked by rabbits in neighbouring territories so

then each community of rabbits lives and eats within their own boundaries. These boundaries are only rigidly maintained during the breeding season and at other times the communities break up so that young rabbits can escape from these social restrictions.

4. Distribution of the bait

In any rabbit infested country there are certain areas where rabbits normally feed, so it is essential when siting trails or broadcasting that the bait be placed in these feeding areas. These areas are not necessarily closely associated with warrens. When social boundaries apply, ample bait, either in trails or by broadcasting must be laid to cover all possible feeding areas. If a social boundary area is missed then those rabbits will not cross outside their territory to eat the bait. From the knowledge of winter and summer social behaviour it is obviously necessary to lay more trail in winter months. The results of an aerial poisoning trial can be seen in Appendix "B".

The trail is best laid by using a single furrow offset disc which makes a cut approximately 10 cm (4 inches) deep and 30 cm (12 inches) wide. If the trail is made too deep, e.g. single furrow mouldboard plough, then the rabbit will not readily go down into this trail to eat the bait because its vision is restricted and it will be easy prey to predators. The trail is not a miracle attractant to rabbits. Its main use is in defining where the bait is laid and making it possible to cover the trail after poisoning operations have concluded. If the trail is placed in a feeding area within a social boundary rabbits certain will be attracted by the newly-turned earth.

5. Free-feeding

In any rabbit population there is a small percentage of inquisitive animals called 'good feeders'. These rabbits are normally the dominant members of the community and when any bait is laid they will be the first to sample it. The majority of the social community are 'shy feeders'. These rabbits are normally timid and will only sample bait after the 'good feeders' have shown that it is safe to do so. In order to achieve 100% of the population feeding on the bait it is necessary to lay two free-feeds

(without poison) several days apart prior to the poison feed. A guide to this procedure is three days between free feeds for trail poisoning and one week between feeds for aerial poisoning (see Appendix "C").

If operations are held up (e.g. bad weather) there is no need to alter the free-feed schedule. The memory of a free-feed remains with the rabbit for up to 4 weeks so any increase in time between the free-feeds will not affect the kill.

6. Important points to observe in achieving a 90%+ kill

(a) Use plenty of trail and ample bait

In any poisoning operation the cost of the bait is minor compared with the machinery and labour costs. Therefore ample baits should be laid to feed the maximum number of rabbits that may be present. In the first free-feed the 'good feeders' will usually eat all the bait regardless of quantity and on the second free-feed with the 'shy feeders' participating the bait will still be taken.

(b) Lay the carrot in a continuous stream

If the bait is laid in heaps several paces apart only the 'good feeders' will participate. Because of their dominant nature the 'good feeders' will exclude the 'shy feeders' from reaching the heaps of carrot. Although a full adult rabbit stomach only contains approximately 80 g (2-3 oz), one rabbit can consume up to 0.6 kg (1½ lb) of bait on one night because of rapid digestive processes.

(c) Exercise trail management

Lay ample bait on the first free-feed, in excess of your estimates (see Appendix "D"). Before laying bait for the second free-feed walk along the trail and estimate the take of bait. Where areas have not been touched do not follow on with poisoning operations. In this way the feeding areas where all the bait has been taken will become obvious. After the second free-feed observe which sections of the trail has been clean of bait (often dug up) and these are the areas to be poisoned. As a general guide half the amount of bait used on the second free-feed should be adequate for the poison feed. A rabbit will only consume up to one stomachful of the poison feed. After this the rabbit will feel the effect of weakened heart beat and make for cover as a natural instinct.

(d) Ensure that the bait is of highest quality

Nothing reduces the success of poisoning more than tainted bait. Do not use oil-impregnated drums or any other polluted container. The rabbit is a very selective feeder and will not eat anything that is not of first quality. Even a change in the variety of carrot from the first and second free-feed could cause the rabbit to become suspicious and could reduce the kill achieved. When a superphosphate broadcaster is used for distributing bait make sure that all the fertilizer is washed from the container before commencing operations. This principle also applies when using aircraft that have previously been used for spreading fertilizer.

Pellet baits that have been contaminated by mice or weavils should be destroyed as the kill obtained with these tainted baits will not be worth the effort.

(e) Do not allow spotlighting or any other activities in the poison area when free-feeding. This will only stop rabbits feeding on the area with a resultant loss in percentage kill. Similarly, trapping on poison trails prior to poisoning will not give a satisfactory result.

Group method

Neighbouring farmers within a district can be organized into a group of workable size to poison their respective properties simultaneously. The size of these groups and the number of groups necessary to cover the whole district vary considerably, usually from 5 to 20 in number. The size of a group can be determined by the total amount of trail and carrot required within that group. One group may comprise ten farmers each averaging 16 kilometers of trail, whereas another group may comprise fifteen farmers averaging 11 kilometers of trail. One large property may comprise a group on its own.

Advance organizing of groups

It is necessary for the supervising officer to organize groups prior to the commencement of the scheme. It takes three weeks to complete the poisoning of four groups. During this period a further four groups

can be arranged. The following example shows how four groups may be handled each three weeks:

Monday	Group 1 - first free-feed
Tuesday	Group 2 - first free-feed
Wednesday	Maintenance of equipment and vehicles
Thursday	Group 1 - second free-feed
Friday	Group 2 - second free-feed
Monday	Group 1 - poison feed (completion of Group 1)
Tuesday	Group 2 - poison feed (completion of Group 2)
Wednesday	Maintenance
Thursday	Group 3 - first free-feed
Friday	Group 4 - first free-feed
Monday	Group 3 - second free-feed
Tuesday	Group 4 - second free-feed
Wednesday	Maintenance
Thursday	Group 3 - poison feed (completion of Group 3)
Friday	Group 4 - poison feed (completion of Group 4).

The point to remember in the organizing of each group is that only four to five hours are available each day for cutting of the carrots, so the quantity that has to be cut in that time determines the size of the group. It is possible to cut about 60 bags at each cutting session (55 kg carrots to each bag).

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APPENDIX "A"

Method of assessing kills

To obtain an accurate idea of the kills achieved comparing oats with carrots the average of three similar rabbit counts made before poisoning were compared with the average of three similar counts made after the poisoning. These counts were made at the same time each night along a set route through the area to be treated. The table below shows the results obtained.

	Oats	Oats	Oats	Carrots
	No free-feed	Two free-feeds two days apart	Two free-feeds six days apart	Two-free-feeds three days apart
Number counted before poisoning	99	188	131	120
Number counted after poisoning	63	70	27	2
Estimated percent kill	35	63	80	98

APPENDIX "B"

Results of an aerial poisoning trial in the Western District of Victoria

Rates of "Take" in Experimental Plots - Results are Average Percentage "Take" from twelve plots

	First free-feed					Second free-feed			Poison feed			
Night	1st.	2nd.	3rd.	4th.	5th.	1st.	2nd.	3rd.	1st.	2nd.	3rd.	9th
	%	%	%	%	%	%	%	%	%	%	%	%
"Take"	9	38	46	58	94	80	88	92	19	22	22	No change

It can be seen from the results that only 9% of the bait was taken on the first night of the first free-feed. By the fifth night the rabbits were becoming accustomed to their new diet, and practically all of the bait was eaten. The same rate was used for the second free-feed, and by the third night practically all of the bait had been eaten. The poison feed was then laid at the same rate. After the third night no further bait was taken and a kill greater than 99% was obtained.

The 486 rabbits picked up in this experiment were analysed as shown below. Average weight of the carrot eaten on the "poison" night was 9 g (5/16 oz) per rabbit.

	Males	Females	Pregnant females	Total embryos	Average litter size	Milky females	Kittens
Number	239	247	59	271	4.6	13	144
Results %	49	41	25			5	30

APPENDIX "C"

A guide to rates of bait

A. Trail (rate per kilometre)

	1st Free-feed	2nd Free-feed	Poison
Carrots	8-16 kg	8-16 kg	4-8 kg
Pellets	2- 3 kg	2- 3 kg	1.5 kg

B. Broadcast (rate per kilometre)

Carrots	22 kg	22 kg	11 kg
Pellets	15 kg	15 kg	10 kg

C. Aerial (rate per hectare)

Carrots	6 kg	6 kg	4 kg
Pellets	4 kg	4 kg	2 kg

USEFUL CONVERSION FACTORS:

1 kilometre = 5/8 mile

1 kilogram = 2.2 lb

1 x 2 gallon bucket is approx. 3.5 kilograms of bait

1 hectare is approx. 2.5 acres

For an average rabbit infestation use 15 kilometres of trail per 100 hectares

APPENDIX "D"

(For Medical and Veterinary use only)

Sodium monofluoroacetate's action as a poison

"1080" is absorbed rapidly from the alimentary tract and blocks the energy cycle in animal cells. Dogs die of convulsions or of subsequent respiratory paralysis but in man while the central nervous excitation is obvious the fatal complication is failure of the heart muscles.

The effect on various animals is as follows:

Heart effects only	Nervous system effect only	Both effects
goat		pig
rabbit	dog	sheep
horse		man
wallaby		possum
deer		

Symptoms (Extracted from "Pathology of Domestic Animals: by Jubb and Kennedy, Vol. 1. 2nd Edition p. 117).

The syndromes of intoxication vary with the species affected but are chiefly neurologic, as in dogs which become extremely excited and convulsive, or chiefly cardiac,as in ruminants. Sheep may collapse suddenly and die within a few minutes or those less severely affected may develop cardiorespiratory distress and weakness if driven and shortly die. Some showing these signs, if left undisturbed, may recover to appear normal until again forced to exercise. The syndrome in cattle is the same as in sheep, death occurring with cardiac failure, fibrillation, cyanosis, dyspnoea, and terminal convulsions, and may be precipitated by exercise, excitement, or a large drink of water.

The postmortem findings in ruminants are referable to myocardial injury which may or may not be conspicuous, depending on the size of the dose and the opportunity for repeated episodes of poisoning. The concentration of fluoroacetate in *D. cymosum* is large and histological evidence of acute myocardial injury is seen. In *A. georginae* poisoning, both acute and chronic myocardial changes may be seen. There is some

flabbiness of the myocardium with prominent haemorrhages beneath the cardiac serosae. In acute cases there are irregular areas of myocardial pallor and mottling sometimes associated with older scars. There is myolysis or degeneration of Zenker type in the myocardial fibres in multiple foci in the heart with an intense mononuclear cell response. Loss of sarcoplasm leaves an open meshwork of reticulum and vessels which eventually condenses and scarifies to leave a fibrous tissue scar.

Haemorrhages of the heart and its membranes

Petechial and larger haemorrhages beneath the epicardium are so common in horses that have been allowed to die of their illness that they are almost to be regarded as normal. The incidence of haemorrhages in sheep and cattle is somewhat lower and they are seldom seen in dogs and cats. Subepicardial haemorrhages are common in instances of asphyxia or death in anoxia, and in many acute infectious fevers. Larger, ecchymotic haemorrhages which may involve most of the epicardium occur in the haemorrhagic diatheses. Subendocardial haemorrhages have the same pathogenesis but are considerably less common. Ecchymotic haemorrhages beneath the endocardium of the left ventricle occur in instances of acute cerebral injury and are useful as a diagnostic indication of clostridial enterotoxaemia in lambs and calves, being present in a considerable proportion of cases. Small interstitial capillary haemorrhages within the myocardium accompany those within the subscrosa.

APPENDIX "E"

Method for taking specimens for suspected 1080 poisoning

The following table shows the particular organs required for the various toxicological examination of animal specimens carried out at the State Laboratories. Wherever possible the amount of sample should be as indicated. Certain tests, as shown in the table, cannot be carried out in the presence of formalin, and the use of preservatives should be avoided. Tests on old decomposed specimens are unlikely to be of much value when the toxic substance itself is unstable.

The information requested with specimens is:

1. Type of animal
2. Locality from which specimen was obtained
3. Name of person to whom the specimen ultimately relates
4. List of organs supplied
5. Where appropriate, indication of a particular poison suspected.

This information is adequate for what may be regarded as routine examination, covering lead arsenic and cyanide determinations in large animals, together with strychnine and 1080 on farm animals, dogs and birds.

Other determinations shown on the list are carried out only in specific cases where definite evidence exists to justify the request. This is particularly so where chlorinated hydrocarbon or organic phosphorus pesticides are involved; these tests are extremely time-consuming and especially with organic phosphorus compounds, each test is specific to a particular substance. Requests for such analyses must therefore be in terms of individual pesticides, and not merely "organo-phosphorus compounds" or "chlorinated hydrocarbons".

In the course of lengthy investigations of this nature it is not uncommon to encounter chemical interferences or even indications of other toxic substances. These observations have often proved to be due to medication of the animal or to treatment of the specimen. Provision of a complete case history would avoid loss of time on useless investigations, and this information should be provided whenever a special determination is required. Points of particular importance are:

1. Information as to whether or not an isolated case is being dealt with.
2. Any known veterinary treatment prior to death, particularly concerning use of drugs.
3. Time lapses between death and necropsy, and between necropsy and submission.

Toxic Agent	Acute	Chronic	Quantity	Preservative
A.N.T.U.	Stomach contents Liver		100 g	Submit with little delay.
Barbiturate	Stomach contents Liver		100 g	
Carbamates	Stomach contents Liver Whole blood		100 g	No formalin. Submit with little delay.
Chlorinated hydrocarbons	Stomach contents Liver	Body fat	50 g	
Copper	Stomach contents faeces	Liver Kidney	50 g	
Cyanides	Stomach contents Heart,liver,) kidney)if animal has been dead some time.		100 g	No formalin. Submit in an airtight container with little delay.
Fluorine	Stomach contents	Bone, teeth	50 g	
Lead	Stomach contents Kidney, liver	Bone	50 g	
Metaldehyde	Stomach contents Liver		100 g	No formalin.
Mercury	Stomach contents Kidney, liver	Liver,kidney	100 g	
Nitrate-nitrite	Stomach contents		100 g	
Organo-phosphates	Stomach contents	Body fat	50 g	No formalin. Submit with little delay.
Phenols	Stomach contents Liver-brain		100 g	No formalin.
Phosphorus	Vomitus. Contents of intestinal tract		100 g	Submit in an air-tight container with little delay.
Selenium	Liver,spleen, kidney, urine	Hair, hoofs	100 g	
Sodium chloride	Stomach contents Liver		50 g	

Toxic agent	Acute	Chronic	Quantity	Preservative
*Sodium fluoro-acetate 1080	Stomach contents, liver, kidney and heart		100 g	
Strychnine	Stomach contents Liver, urine		100 g	
Thallium	Urine Stomach contents		100 g	
Warfarin	Stomach contents Liver		50 g	

APPENDIX "F"

*TREATMENT OF SODIUM MONOFLUOROACETATE POISONING

There is no highly effective antidote for sodium monofluoroacetate; medical treatment is mainly symptomatic. First aid treatment consists of immediate emesis and gastric lavage followed by an oral dose of magnesium or sodium sulfate to remove the poison from the alimentary tract before absorption of lethal quantities can occur. The patient should be kept quiet and barbiturates administered to control convulsion. Monoacetin (glyceryl monoacetate), acetamide, as well as a combination of sodium acetate and ethanol have shown antidotal effects in animals including monkeys. No report of their use in humans has appeared in the literature. The recommended dose for humans of monoacetin is 0.5 mg/kg of undiluted monoacetin intramuscularly every half hour for several hours and then at a reduced level for at least 12 hours. The site of intramuscular injection must be varied because of local pain and edema. If intramuscular administration is not feasible, a mixture of 100 ml of undiluted monoacetin in 500 ml of water can be given orally and repeated in an hour. If monoacetin is not available, acetamide or a combination of sodium acetate and ethanol may be given in the same dose. Intravenous administration of procainamide also has shown antidotal effects (restoration of normal rhythm in ventricular fibrillations). (Fleason et al 1969; Arena 1970).

Extract from "A Review of Sodium Monofluoroacetate (compound 1080)". United States Department of the Interior, Fish and Wildlife Service, Special Scientific Report No. 146, p 19-20.

APPENDIX "G"

Metrication of bait preparation

Preparation of 1080 stock solution

When only small quantities of 1080 solution are required:

one 0.25 kg sachet of 1080 powder in 2.5 litres of water.

When larger amounts of 1080 solution are needed:

two 0.25 kg sachets of 1080 powder in 5.0 litres of water.

(This stock solution contains 9.0% weight/volume of active ingredient).

Poisoning carrot bait

20 ml stock solution + 90 ml water to 9 kg (20 lb) carrot.

(This bait contains 0.020% weight/weight 1080).

Poisoning pellet bait

55 ml stock solution + 280 ml water to 11 kg (24 lb) pellets.

(This bait contains 0.045% w/w 1080).