

An assessment of animal welfare impacts in wild Norway rat (*Rattus norvegicus*) management

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Online Resource 7:

Standard Operating Procedure UKRAT005: Cholecalciferol rodenticide for rats

Background

Norway rats (*Rattus norvegicus*) frequent urban and rural areas and may be found on commercial, municipal and domestic premises. They cause significant economic losses, eating 25-30 g of food per day each and contaminating far greater quantities with droppings, urine and hairs. They also transmit disease, cause chewing damage and create fire hazards by gnawing electrical wires. Calciferol is a non-anticoagulant rodenticide used in the form ergocalciferol (Vitamin D₂) and more recently in the form of cholecalciferol (Vitamin D₃) to kill rats and mice; only cholecalciferol (CCF) is approved in Europe. Other rat management methods with various degrees of efficacy include anticoagulant poisons, non-toxic lethal cellulose baits, spring-traps, live cage-traps, shooting, gassing, electrocution traps, glue traps, chemical repellents and proofing. Sonic and electro-magnetic deterrents are also available but there is little or no evidence that these methods are effective.

CCF acts to stimulate the absorption of calcium from the intestines and to mobilise calcium from bones causing an increase in circulating calcium levels (hypercalcaemia) and calcification of soft tissues, particularly in the major arteries and kidneys. This Standard Operating Procedure (SOP) is for poisoning rats with CCF. This SOP is a guide only; it does not replace or override the legislation and should only be used subject to the applicable legal requirements.

Application

- The Prevention of Damage by Pests Act 1949 makes local authorities responsible for ensuring that their districts are kept free of rats (as far as is practicable). The Act also requires occupiers of non-agricultural land to notify the local authority if 'substantial numbers' of rats are living on or resorting to the land. Occupiers of agricultural land are not however required to notify the local

authority regarding rats on their land. Under the Act, local authorities have the power to require landowners and occupiers to control rat infestations on their land. Where necessary the local authority can conduct the control work and recover the cost from the landowner or occupier.

- Rats will thrive where there is cover, food and water and infestations occur in diverse circumstances as a result, including farms, food processing facilities, factories, hospitals, prisons, sewers, parks and gardens, and homes.
- Rats can legally be poisoned at any time of year. They may breed year-round during mild conditions or if living indoors. Control should be undertaken promptly as soon as a problem is identified. Leaving a small infestation unmanaged may allow it to develop, increases the risk of damage and disease and makes subsequent control more difficult and expensive.
- Long-term reduction in rat numbers might be best achieved by poisoning before breeding peaks, but killing females with dependent pups raises welfare issues for the pups.
- Rat management campaigns may involve the use of more than one method as a combination of methods may prove most effective. Choice of method(s) will depend on the scale of the problem, the resources available (including competence/experience of the person conducting the management) and risks to non-target animals, people and hygiene. Another factor may be whether the rat population is resistant to anticoagulant rodenticides.
- CCF, or Vitamin D3, is the naturally occurring form of Vitamin D, essential for the healthy development and function of mammals. Vitamin D is necessary for the formation of normal bone, but in high concentrations promotes excessive intestinal absorption of calcium and reabsorption of bone materials, which can lead to hypercalcaemia, osteomalacia and metastatic calcification of the blood vessels. The rodenticidal properties of CCF result from the effect of Vitamin D3 overdose, and calcification of blood vessels, particularly around the heart, heart failure and kidney failure have all been mooted as causes of death.
- CCF is a pro-hormone and fulfils the EU exclusion criteria on the basis of having endocrine disrupting properties as defined in Regulation (EU) No 2017/2100). However, the active ingredient is currently approved for use in the EU (and consequently the UK) because it is considered a valuable tool for controlling rats in areas where the prevalence of anticoagulant resistance is high.
- CCF is an acute poison, producing symptoms more quickly than anticoagulants. In order for CCF treatment to be effective, rats need to consume a lethal dose during their first or second feeds (2-3 days), after which they are likely to develop bait aversion. Bait aversion and wariness among rats may prevent CCF from being fully effective.

- CCF is reported to cause death in Norway rats within 1-13 days of consuming a lethal dose. CCF rodenticides are considered to provide a valuable alternative tool for managing rat populations, including those resistant to anti-coagulant rodenticides.
- However, palatability problems and degradation can compromise effectiveness, so it is less suited for outdoor use, especially if damp.
- Operators must be properly trained and competent in the use of the products concerned. Product label instructions and directions for use should be read, understood and followed.
- Outdoors, bait must be adequately protected from children and as far as possible from non-target animals.
- Rats are wary of unfamiliar objects appearing in their territories, so - where practical, and where this can be done safely for non-target animals - professional pest controllers may protect and secure bait points using existing materials rather than bait boxes. This may bring rats into contact with baits more effectively and reduce the length of time for which non-targets are potentially exposed to it.
- Baits must be appropriately secured. Unless you can place bait under suitable cover, or (when baiting indoors) restrict access by other species, you will need to use a secure bait box – either homemade or a commercially available tamper-resistant model.
- Indoors, rather than placing bait directly on the floor, plastic trays or other means should be used to contain bait and facilitate clearing up.
- Following successful treatment of rats, it is vital that foods are stored securely and food spills cleared up, potential harbourage is cleared, vegetation kept short around rat runs and burrows and structures proofed against access by rats; otherwise re-infestation is likely to occur.
- Revisit the site regularly to monitor for new activity/damage.

Animal Welfare Considerations

Impact on target animals

- CCF poisoning interferes with calcium homeostasis and while reports vary, they indicate that rats poisoned with CCF die within 1-13 days of ingesting a lethal dose.
- Fatal CCF cases in humans revealed calcification of heart and lung tissue, arteries and renal tubules. Human victims report severe frequent headaches, nausea, and pain and severe discomfort elsewhere in the body.
- CCF poisoned rodents display signs of pain and dysfunction including a reluctance to move, lethargy, weakness, anorexia, weight loss, hunched posture, rough coat and dehydration

followed at larger doses by tremors and coma. Calcification of blood vessels and internal organs have been recorded in rodents. The extended symptomatic period is associated with anorexia, bringing secondary disabling effects. Prolonged pain interferes with abilities to forage, exacerbating weight loss and dehydration, and hinders escape from predators.

- Sub-lethally poisoned animals may recover fully but this can take weeks and long-term effects may include renal damage.

Impact on non-target animals

- If lactating females are poisoned, their dependent pups will die of starvation or dehydration unless they are found and humanely killed.
- CCF is toxic to non-target animals and primary non-target poisoning is a risk. The resulting hypercalcaemia and associated physical impacts are difficult to reverse and antidotes are not readily available. Poisoned dogs have shown gastrointestinal haemorrhage, myocardial necrosis, calcification of vascular walls and, in the most severe cases, the kidneys and stomach. If you suspect a pet, or another non-target animal, has been poisoned call the vet straight away and if possible provide the toxin's name, strength and the amount the animal has been exposed to, as well as the animal's weight if that is known.
- This SOP does not involve pre-baiting but, if pre-baiting is used, care must be taken that this does not encourage non-target animals to eat the poison bait, although these risks may be managed using commonly-applied risk mitigation measures.
- There is some evidence that secondary poisoning may be possible if predators eat rodents killed with calciferol but this is not thought to be a major issue.

Health and Safety Considerations

- The GB Biocidal Products Regulation (2021) concerns the placing on the market and use of biocidal products. It is important that users of pesticides take all reasonable precautions to protect the health of humans, animals and plants, to safeguard the environment and, in particular, to avoid the contamination of water. Product label instructions must be followed.
- Operators must be properly trained and aware of the risks associated with rodenticide use.
- Users must satisfy the requirements of the Health and Safety Executive's Control of Substances Hazardous to Health Regulations (COSHH) for each rodenticide used, including the availability of adequate storage and suitable protective clothing. As with all pesticide use it will be necessary for users to have made a risk assessment of the compounds that they intend to use. Planning must include the action to be taken in the event of accidental poisoning. Records

should be kept of product use and its placement at the site. The requirements for protective clothing and safe working practices must be understood before treatments are carried out.

- If poisoned bait contacts the skin, immediately wash the area with soap and water. Wash hands, arms and face before eating, drinking or smoking and wash clothes after use. If poisoning occurs go directly to hospital.
- Rodenticides must be safely stored and containers labelled. They must be stored in a safe and secure location, with a 'Hazard Warning' sign prominently displayed and containers properly labelled.
- Poisoned rat carcasses and unused bait are classified as 'controlled waste' and so must be disposed of either by transfer to a licensed waste disposal facility or by burning or burial on site.
- Rats carry diseases that may be harmful to humans and other animals (including Leptospirosis [Weil's disease], Toxoplasmosis, Hantavirus and Salmonella). The Health and Safety at Work Act 1974 makes employers responsible for the health and safety of their employees, including managing the risk of rats transmitting disease. The COSHH regulations require employers to make sure an assessment is conducted to identify risks to human health arising from rat-borne diseases. Operators should be protected by tetanus immunisation.
- Good personal hygiene is encouraged when handling baits and rat carcasses. Routinely wash hands and other skin surfaces if contaminated with faeces, blood and other body fluids and after handling baits. Cuts and grazes should be treated and covered with a waterproof dressing and waterproof gloves should be worn, together with any additional protective equipment specified on the product label.

Equipment Required

Baits

- CCF baits.
- Bait trays, boxes or containers as required.

Other Equipment

- Personal protective equipment including waterproof gloves.
- Heavy metal or heavy wooden blunt implement for killing any poisoned rats that are discovered alive.
- Suitable waterproof bags for carrying poisoned carcasses and any collected uneaten bait.

Procedures

Surveying for rat activity

- Effective rat baiting relies on locating rat runs and nesting areas. Before deploying baits, carry out a survey to determine where rats are living, feeding and drinking and the routes they take between these places. All areas of activity must be identified to minimise the risk of reinvasion. All buildings and surrounding areas, including contiguous hedgerows and ditches should be surveyed.
- Key features to look for include holes/burrows (6-9cm diameter), runs (5-10cm wide through vegetation or along linear features – greasy marks may be left where rats contact hard surfaces), droppings (15-20mm long, straight and often flat at one end and pointed at the other, moist when fresh), damage (chewed/gnawed materials, e.g. food stuffs, edges of doorways and holes, wooden features, electrical wiring), footprints/tail marks in soft mud/dust/bulk grain, sightings of live/dead rats and a musky smell.
- The survey should also seek to establish any particular risks or likely problems, e.g., risks to non-target animals, hygiene failings and structural faults.

Environmental assessment

- An environmental assessment to consider the possible threats to wildlife and domestic animals should be undertaken and documented whenever rodenticides are used, particularly in outdoor locations. This must include any specific risks identified and the measures that are being taken to minimise adverse effects on non-target species. This should be regularly reviewed during the course of the programme and documented.

Deployment of baits

- Wear gloves for operator protection and to help mask human odours.
- Bait boxes or trays that are to be used may be deployed without bait a few days in advance of beginning AR treatment in order to facilitate habituation by rats; alternatively, CCF baited boxes or trays may be deployed straight away. Existing food sources should be removed wherever possible.
- Before embarking on a baiting programme, read the product label carefully to ensure that the correct, legal and safe procedure for that specific product is followed and to check the quantities of bait to be laid, the number and frequency of bait points.
- Careful placement of baits is crucial to maximise effectiveness. Baits should be placed in areas of obvious rodent activity, such as on runs, near active nests or droppings. Inside buildings, attention should also be paid to ledges, beams, partitions, bases of walls, conduits,

false floors and ceilings. Outdoors, bait stations may be placed in hedgerows, ditches or other habitat features if the label allows. Outdoors or where non-target access is a risk, baits should be well protected. Badgers, foxes and dogs are capable of overturning bait boxes and this risk should be reduced by securing bait boxes in position.

- Sufficient bait points should be established at appropriate locations that will cover all areas of rodent activity (following bait label instructions) but accounting for potential restrictions including hazards to non-target species, risk of contaminating sensitive areas (e.g. food preparation areas), adverse conditions and where baits will be regularly disturbed or eliminated.
- Baits must be placed so that they are not accessible to children, domestic pets, livestock or wildlife larger than the target.
- CCF baits can be left down for about 5-7 days, but should be checked daily; any spilled or exposed baits should be removed and disposed of safely. As soon as takes cease at individual points, all bait remaining in them should be removed.
- Where possible, contamination of baits by dust or moisture should be avoided.
- Risks to non-target animals should be managed, e.g., by using tamper-resistant bait boxes, choosing bait station positions carefully, limiting the duration of poisoned baiting periods, checking for and removing poisoned rodents and regularly checking bait station for signs of the presence of non-target organisms. If non-target species appear to be taking baits, then bait points should be moved or better protected. Poisoned bait should not be deployed at bait points where non-target uptake persists.
- Always keep a record of the product used, the quantity of bait laid and where this has been placed. A simple site plan indicating the location of bait points will help to keep track of the treatment.
- Bait points should be checked regularly and topped up as necessary. Replace any baits that become damp or wet and replenish depleted baits. If bait is allowed to run out, become unpalatable, or there are insufficient bait points, then control is likely to be unsuccessful. Keep a record of bait inspection/replenishment visits too.
- At the end of treatment, remove any remaining bait and update records to indicate that the infestation is controlled and that as far as is reasonably practical all steps have been taken to ensure that the site is free of rodenticide bait.
- Once effective rat control has been achieved this can be replaced by a prevention strategy.

Humane killing of poisoned rats

- Any rats that are found alive but poisoned should be killed quickly and humanely using an appropriate method.

- The most suitable technique for humane killing in these circumstances is destruction of the brain with a strong and accurate CBH using a suitable implement.
- The operator should approach poisoned rats alone and carefully to minimise panic, further stress and risk of additional injury to the trapped rat.
- Kill the rat swiftly, by striking the back of the rat's head accurately and strongly with a suitable heavy and blunt instrument.
- Death of the animal should always be confirmed by observing the following:
 - o Absence of rhythmic, respiratory movements;
 - o Absence of eye protection reflex (corneal reflex) or 'blink';
 - o A fixed, glazed expression in the eyes; and
 - o Loss of colour in mucous membranes (become mottled and pale without refill after pressure is applied).
- If the animal is not dead then repeat the killing method at once. Use a secondary method to ensure death (cervical dislocation, exsanguination, destruction of the brain) before disposing of the carcass.
- Personnel performing manually applied CBH must be properly trained and monitored for proficiency with this method of humane killing. No more than a few animals should be killed in this way at one time.
- If lactating females are poisoned, efforts should be made to find any nests containing dependent pups and humanely kill them, to prevent them from dying of starvation or dehydration.

Collection and disposal of rat carcasses

- Rats can carry infections that are dangerous to humans and other animals while poisoned animal carcasses present the risk of secondary poisoning to non-target animals. Wherever rodenticides are used, it is a requirement that rodent carcasses are regularly collected and disposed of. Because Rats poisoned with calciferol may die 4-10 days after consuming a lethal dose, searching for bodies may need to continue beyond the end of the treatment. Other animal carcasses should also be dealt with in this way. Carcasses must be disposed of safely. For further advice contact your Local Authority.

Further information

- Contact Natural England's Wildlife Management Advisors for more information and advice on site assessment and monitoring of rat numbers.

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