

An assessment of animal welfare impacts in wild Norway rat (*Rattus norvegicus*) management  
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Online Resource 6:

## Standard Operating Procedure UKRAT004: Anticoagulant 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. Poisoning with an anticoagulant rodenticide (AR) is one of several rat management methods with varying degrees of efficacy, including spring traps, glue traps, live cage-traps, cholecalciferol, non-toxic lethal feeds, shooting, gassing, electrocution 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.

ARs are poisons that act by disrupting the target rodent's blood clotting mechanisms, ultimately causing death by internal haemorrhaging and external bleeding. This Standard Operating Procedure (SOP) is for poisoning rats using an AR. 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. It is important not to rely entirely on using rodenticides for rat control, and programmes that also incorporate physical and/or biological control will be more effective in the long-term.
- The majority of rodenticides available for use against rats are ARs. ARs interfere with the metabolism of vitamin K, which is involved with the production of blood clotting factors. If these are absent or below critical concentrations, the blood fails to clot and internal haemorrhaging and external bleeding occur.
- ARs are successful because they are 'chronic' poisons, meaning that symptoms of poisoning appear slowly (and so rats are more likely to consume a lethal dose) and because active ingredients are easily formulated into palatable bait. Rat infestations are typically reduced in 2-4 weeks. A further advantage of the relatively slow mode of action, with death occurring on average after 5-7 days (minimum 2-3), is that this allows use of an antidote in cases of accidental poisoning of non-target species including humans.
- Rat populations in many parts of the UK have become genetically resistant to several of the original (First Generation ARs (FGARs)). Where genetic resistance to FGARs exists it is not best practice to use them. Second Generation ARs (SGARs), which have more potent anti-clotting actions, are now widely used but resistance to some of these has also arisen among rat populations. SGARs are considered to provide an efficient and practical solution to rat infestations, bringing considerable benefits in food hygiene, public health and animal husbandry. However, compared to FGARs, SGARs are relatively persistent in the environment and they present a greater risk of both primary and secondary non-target poisoning. SGARs

should be used only when other methods of achieving rat control have been carefully considered and cannot provide an effective solution to the rat problem at the site.

- Although SGARs are hazardous to non-target animals, no alternative rodenticides are currently available that are safer and equally effective. Use of FGARs is preferable to SGARs in those areas where FGAR resistance is known not to exist among rats. However, FGARs may take longer to control rat infestations and more bait may need to be applied, because of their lower potency. Since 2016, all SGARs can be used 'in and around buildings'; some can also be used in other outdoor scenarios (in open areas or at waste dumps). Only bromadiolone and difenacoum (and the non-anticoagulant rodenticide cholecalciferol) may be used in permanent baiting programmes but resistance to bromadiolone and difenacoum in some areas should be taken into account.

- The UK SGAR Stewardship Regime, developed by the Campaign for Responsible Rodenticide Use (CRRU), is intended to assure the UK Health and Safety Executive that ARs can continue to be used and their risks can be reduced to an acceptable level. All professional pest controllers using SGARs must apply the CRRU UK Code of Best Practice (2015), which underpins the Regime. Long-term rodenticide baiting should no longer be routine practice and is permitted only in certain circumstances.

- Baits are available in various formulations. Formulation choice will depend on site characteristics, previous treatment history, the conditions of authorisation given on product labels, non-target species or other hazards, the outcomes of the COSHH, environmental assessment and cost. Generally, rodents may find particulate baits more palatable than wax blocks but blocks may be more suitable in adverse environmental conditions, e.g. in sewers. Treated grain may be less likely than wax blocks to be kicked out of burrows.

- Operators must be properly trained and competent in the use of the rodenticides concerned. They must be aware of the potential hazards that the rodenticides may pose. Product label instructions and directions for use should be read, understood and followed.

- Rats are wary of unfamiliar objects appearing in their territories, so - where permitted for the product, 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 rodenticides need to be used and non-targets are potentially exposed to it.

- Outside buildings, bait must be adequately protected from children and as far as possible from non-target animals. Packs/sachets or blocks can be carried away by rats and should be properly secured at the placement site. It is more difficult for rats to carry or hoard large

quantities of loose grain or pellet bait, so loose bait poses a lesser risk to non-target animals if dropped or made accessible by rats.

- 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, and where non-targets can be effectively excluded, rather than placing bait directly on the floor, plastic trays or other means should be used to contain bait and facilitate clearing up.
- Rats killed using rodenticides may die in inaccessible areas and, unless the bodies can be retrieved, they may cause problems with odours, in which case another method, e.g. traps, could be more suitable.
- 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

- ARs disrupt a poisoned animal's blood clotting response. The response is delayed, so for the first few days the rat appears well and eats normally. The nature, degree and duration of suffering depend on the site and severity of any haemorrhaging, which are in turn influenced by the nature of the compound, the dose received and individual predisposition. Time to death is typically 4-8 days and while there is variation, symptomatic periods range from hours to - more often - 1-3 days, and up to 4-5 days. Evidence suggests rats remain conscious throughout.
- Rats will die after a few days as a result of internal haemorrhage (into the gut, tissues, body cavities, joints, and inside the skull) or bleeding from external wounds or from orifices. Bleeding into joint spaces and inside the skull is known to be very painful in humans and there is a concern that anticoagulants may cause such pain in rodents. Bleeding into intra- and inter-muscular spaces is also likely to cause significant pain.
- Evidence from humans (whose clotting times may be sub-optimal for weeks or even months) suggests that sub-lethally poisoned rats could be ill or disabled for considerable periods, potentially compromising their welfare.

## 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.
- Rodenticide use presents the risk of primary non-target poisoning through access to poison baits or secondary non-target poisoning of predatory or scavenging species (e.g., cats, dogs and badgers) through access to poisoned rodent carcasses or to the poisoned carcasses of non-target bait feeders, such as wood mice or voles. 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.
- Predators generally need to consume several poisoned rodents before becoming ill but because ARs can bio-accumulate in the livers of predators or scavengers, dangerous levels can be reached and secondary poisoning can occur although this may be rare. Accumulated ARs have been found in the stomachs and livers of many wild carnivore species and fatal secondary AR poisoning has been implicated in the deaths of members of several wild bird and mammal species as well as domestic cats and dogs. Symptoms of secondary AR poisoning observed in non-target animals are similar to some of those observed in rats although the timescales involved can vary.
- Successful treatment may be possible in cases of companion animal consumption depending on the timeframe.
- The CRRU UK Code of Best Practice is designed to facilitate the effective use of rodenticides while minimising exposure to wildlife. This should be followed whenever rodenticides are used.

## 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 such 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 rodenticide 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; Vitamin K<sub>1</sub> is available as an antidote.
- Rodenticides must be stored in a safe and secure location, with a 'Hazard Warning' sign prominently displayed and containers properly labelled.
- Carcasses of poisoned animals 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, salmonellosis and Hantaan fever). 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 poisons and rat carcasses. Routinely wash hands and other skin surfaces if contaminated with faeces, blood and other body fluids and after handling poison. 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

### Poison

- AR 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 poisoning relies on locating rat runs and nesting areas. Before deploying poison, 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 poison

- 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, AR 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 poison 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, or – where permitted on the product label - inside burrows. 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. Inspect baits regularly; any spilled or exposed baits should be removed and disposed of safely.
- 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.
- Where possible, contamination by dust or moisture should be avoided.
- Always keep a record of the type of rodenticide 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. 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 and further stress to the poisoned 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. 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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