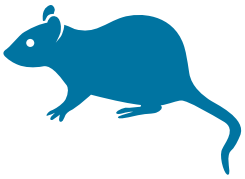

NSWROD SOP1 Ground baiting of rodents with anticoagulants

Background

Baiting with anticoagulants is used to minimise the impact of the introduced house mouse (*Mus musculus*), brown rat (*Rattus norvegicus*), black rat (*Rattus rattus*) and Oriental house rat (*Rattus tanezumi*). These are usually targeted in commercial and domestic premises, and for the protection of agricultural production, for conservation outcomes, and for eradication on islands.

Baiting with anticoagulants is one of the most common and effective methods of quickly reducing small populations of rodents and their impacts around buildings and storage facilities. However, once rodents begin to reach high numbers (i.e. during plagues), baiting with anticoagulants has little or no effect. Anticoagulants are generally restricted to use in and around structures and are not typically used for broad-scale application across the landscape or in crops. However, exceptions exist where certain anticoagulants have been registered for off-label use on some islands for conservation purposes where eradication of rodent populations is the aim (check with the APVMA or local state authorities i.e., EPA, LLS and NSW DPIE, for current permits).

Rodents are highly susceptible to the effects of anticoagulants; however, other species, especially some native animals and birds, and domestic pets and livestock, are also vulnerable to poisoning. Good baiting technique and safe storage helps to minimise the risk to non-target species and maximise the effect on targeted rodent populations.

This standard operating procedure (SOP) is a guide only; it does not replace or override the relevant NSW or federal legislation. The SOP should only be used subject to the applicable legal requirements (including WHS) operating in the relevant jurisdiction.

Individual SOPs should be read in conjunction with the overarching Code of Practice for that species to help ensure that the most appropriate control techniques are selected and that they are deployed in a strategic way, usually in combination with other control techniques, to achieve rapid and sustained reduction of pest animal populations and impacts.

Application

- Baiting with anticoagulants should only be used in a strategic manner as part of a co-ordinated program designed to achieve sustained effective control.
- Poisoning with anticoagulants is used as part of an early intervention strategy to quickly reduce small populations of pest rodents, and prevent a build-up in numbers. Rodent-proofing, habitat modification and good hygiene (e.g., keeping grass cut, stubble management, weed control and keeping rubbish around buildings to a minimum) can

then be used to reduce the potential or maximum population density and slow re-colonisation.

- Anticoagulants must only be used in and around commercial, agricultural, industrial and domestic premises. Agricultural buildings include grain stores, animal housing and farm machinery buildings. This poison must not be used near exposed human or animal food, food preparation or food storage areas.
- Anticoagulants must not be used for broad-scale application across the landscape or in crops, with the exception of some islands where eradication of rodent populations is the aim.
- Anticoagulant baits become less efficient when wet so should be placed in sheltered areas. Consumption of sub-lethal doses can lead to the development of bait aversion, although this is less likely to occur with anticoagulants than other poisons as the animals generally do not associate bait consumption with the developing symptoms owing to the delayed action.
- Because of the high risk of poisoning non-target animals, baits should be placed in areas that are inaccessible to domestic animals, livestock and wildlife, including birds. Baits should not be placed where they can contaminate streams, rivers or waterways. Where possible, baits should be applied in the late afternoon as rodents mostly feed at night, therefore, bait laid in the evening will be mostly consumed overnight before diurnal non-target species such as birds will have access
- Anticoagulants are not registered for the control of any of the native species of rodents in NSW.
- Alternate food sources should be eliminated as far as possible to improve the effectiveness of baiting.
- Containers which have held bait material should not be used for any other purpose, and should be disposed of correctly. Bromadiolone and coumatetralyl are emulsifiable in water so all equipment should be thoroughly rinsed with water and allowed to drain. When washing down in the field, waste water, bait and other waste should be buried in a pit or collected in a container marked 'Poison' and returned to the pesticide facility for appropriate disposal.
- Anticoagulants are listed as a Schedule 6 Poison under the Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP). These substances have a potential for causing harm and must be packaged distinctively with strong warnings and safety directions on the label.
- A person taking possession of coumatetralyl rodent bait prepared by an ACO must be given a copy of the pesticide label and the current APVMA permit and be aware of their instructions.

Animal welfare implications

Target animals

- All anticoagulants act by interfering with the Vitamin K-1 metabolism which affects blood clotting and the daily repair of blood vessels which in turn leads to internal

haemorrhaging. First-generation compounds are considered 'short acting', often requiring multiple doses to exert their lethal effects, whereas second generation compounds are more toxic with a more prolonged effect, and are lethal after a single dose.

- The effects of anticoagulants are gradual, developing over several days with poisoned rodents showing clinical effects of external bleeding, pale extremities, bloody diarrhoea and internal haemorrhaging at multiple sites throughout the body.
- The degree and duration of any suffering of animals depends on the site and severity of this haemorrhaging, which is influenced by the dose received, the compound used and the individual animal's genetic predisposition. Bleeding *per se* is not painful but the accumulation of blood in enclosed spaces is capable of producing moderate to severe pain.
- Symptomatic periods can range from a few hours to, more commonly, 1-3 days, with time to death ranging between 1-8 days, depending on the dose received, the compound used and the individual animal's genetic predisposition.
- Animals receiving sub-lethal doses can be ill and disabled for a considerable period, suffering damage to organs from internal haemorrhaging, blood loss and anaemia. Clotting times also often remain sub-optimal for weeks or even months. During this period they are vulnerable to other illnesses, starvation and predators.

Non-target animals

- Anticoagulants are toxic to a wide range of species including fish, mammals and birds.
- Poisoning of non-target species can occur either directly by eating baits intended for rodents (primary poisoning), or through scavenging the carcasses of poisoned animals or the consumption of live animals that have consumed baits but not succumbed to toxic effects (secondary poisoning).
- Primary poisoning of non-target, domestic animals is considered to be unlikely since repeated doses are usually required, although for many second generation anticoagulants this may not be the case. There is a lag period of several days after ingestion of the baits before onset of clinical symptoms, during which veterinary intervention should be given.
- Primary poisoning of non-target wild animals is also considered to be low since repeated doses are usually required, however the required veterinary treatment of these animals can be difficult, and usually does not occur.
- Anticoagulants, particularly second generation compounds, pose an increased risk of secondary poisoning due to the prolonged persistence in the tissues of the dead rodents and the ability of these compounds to progressively accumulate in the liver of other prey species, predators and scavengers over time. The transfer of this toxin through the food chain can also lead to tertiary poisoning where animals which consume carcasses or baits are then themselves consumed by a top order predator.
- The susceptibility of non-target species to primary poisoning is determined by many factors, including diet, the type of anticoagulant and bait carrier used, the sensitivity to the poison, body weight, concentration of anticoagulant in the bait, bait placement and palatability, timing of baiting and level of exposure to poison baits. In addition, factors

affecting secondary poisoning include the number of dead animals available for scavenging, the time period over which carcasses are available and the concentration of poison in the carcasses.

- Non-target animals affected by anticoagulants experience similar symptoms as target rodents; however, the onset of symptoms, the duration of action, the sites of haemorrhage and the time to death tend to vary. Some species, e.g., possums have been reported to experience symptoms for up to three times longer than rodents. This species variation may be due to differences in doses received compared to bodyweight, biochemical responses (such as poison absorption, distribution, metabolism and excretion), physiological responses (e.g., levels of clotting factors in liver or presence of alternate blood clotting factors) or behaviour (which can affect the location and severity of haemorrhaging).
- The type of anticoagulant compound (i.e. first or second generation) can affect the response of a non-target animal to therapy. In a dog, for example, a first generation compound such as warfarin, has a half-life of approximately 14 hours, and its clinical effects last up to one week, whereas second generation compounds have much longer half-lives (4-6 days), and their clinical effects can last anywhere between 12-30 days.
- To minimise the risks to non-target animals, the following monitoring and baiting strategies are recommended to either reduce the amount of toxic bait dispensed or minimise the broad distribution of baits in areas where rodent populations are low:
    - Monitoring – can be used to estimate the rodent population and its distribution and can provide a guide for the amount of bait required and effective bait placement. Monitoring can involve damage assessments, trapping or the use of bait cards which are squares of grid paper soaked in linseed or canola oil.
    - Pre-feeding with non-poisoned bait – allows an assessment of what animals are eating the bait and the quantities of poisoned bait needed for the control program.
    - Placement of bait – bait should not be spread out thinly but concentrated in known locations (bait stations). Bait stations should be located in sheltered areas, inaccessible to non-targets, particularly children and domestic animals, in areas where activity is obvious, such as active nests, along runs, under rubbish or where droppings are observed. Secure baits or container with wire or nails if possible. In the case of perimeter baiting, adhere to all stipulated directions and distance restrictions.
    - Timing of baiting – rodents mostly feed at night, therefore bait laid in the late afternoon / evening will be mostly consumed overnight before diurnal non-target species such as birds will have access.
    - Check bait stations regularly – bait stations should be checked at least twice a week in the first week of a baiting program, and at least weekly intervals after that. Bait stations that show no signs of activity should be removed or relocated to a new location.
    - Collection of uneaten bait – any uneaten bait at the end of a program should be collected and destroyed by either incineration or burial to depth of 50 cm.
    - Collection of rodent carcasses – where possible, any rodent carcasses should be located and collected daily and either destroyed by incineration or buried, to prevent secondary poisoning.

Workplace health and safety considerations

- Operators using anticoagulants must strictly follow the directions on the approved label when using, storing or disposing of the rodenticide.
- Anticoagulants are toxic to humans and should be handled with care. Exposure can occur from ingestion, inhalation of generated dust or skin contact. Toxic effects are produced after exposure to a high dose or repeated low doses over a period of time.
- Appropriate personal protective equipment including overalls, impervious footwear, face mask or safety glasses and elbow length rubber or PVC gloves must be worn when handling poisoned baits. A scoop or measure should be used if required.
- If the poisoned bait gets on the skin, immediately wash area with soap and water.
- After use and before eating, drinking or smoking, wash hands, arms and face with soap and water.
- After use, wash contaminated clothing, footwear and gloves.
- If poisoning occurs, go straight to a hospital or doctor or contact the Poison's Information Centre (Ph 13 11 26).
- Vitamin K-1 is an effective antidote and is readily available from hospitals and veterinary practices.
- For further information refer to the label and the Material Safety Data Sheet (MSDS), available from the supplier.

Equipment required

Poison baits

- Anticoagulant baits are commercially available from retail merchants such as supermarkets, hardware stores and agricultural suppliers.
- Anticoagulant baits intended for rodent consumption are available in either grain, pellet, paste or wax block form. Anticoagulants are also available in a tracking powder which adheres to the animal's feet and is consumed through grooming. Liquid formulations are also available which are added to water to make a toxic drink for rat control.
- Most anticoagulant baits are supplied in ready-to-use sachets or containers, however some bulk products may require the user to supply their own containers for bait distribution.
- It is recommended to concentrate baits at particular locations (bait stations).

Procedures

Assessment of site and estimation of rodent numbers

- It is recommended to conduct some form of monitoring of the population before conducting rodent control. This allows an estimation of the amount of bait required and effective bait placement to ensure all animals receive a sufficient dose.

- Monitoring can also assist in identifying any non-target impacts.
- Monitoring can involve trapping, damage assessments, or observation of droppings.

Laying of bait

Always read and follow all directions on the pesticide label.

- Anticoagulants can only be used in and around (within 2m) commercial, agricultural, industrial and domestic premises. Agricultural buildings include grain stores, animal housing and farm machinery buildings. This poison should not be used near exposed human or animal food, food preparation or food storage areas.
- The placement of baits is critical to achieve maximum effectiveness. Baits should be placed in areas where rodent activity is obvious, such as active nests, along runs, under rubbish or where droppings are observed. The bait container should be secured with wire or nails if possible. Most manufacturers recommend that the spacing of bait stations should not exceed 3 m for mice and 9 m for rats. The rate of application is 50-500 grams of bait per bait station.
- Baits should be placed in sheltered areas, inaccessible to non-target animals, particularly children and domestic animals, and protected from the weather.
- Rodents mostly feed at night, therefore bait should be laid in the late afternoon/evening to reduce access to diurnal non-target species such as birds.
- Bait should be checked at least twice a week in the first week of a baiting program, and at least weekly intervals after that. Baits that show no signs of activity should be removed or moved to a new location.
- Consumed bait should be replaced until all visible signs of rodent activity have ceased.

Collection of uneaten baits and rodent carcasses

- It is recommended that at the end of any control program all uneaten bait should be collected and destroyed either through a local authority landfill, or by incineration or burial to depth of 50cm. Consult the label for specific disposal requirements.
- Containers which have held bait material should not be used for any other purpose. Disposal of these containers should be through a local authority landfill, or if not available, buried below 50cm in a disposal pit.
- Rodent carcasses should be located and collected daily if possible, and either destroyed by incineration or buried.

Procedural notes

Users of anticoagulants must always refer to the relevant Commonwealth and State legislation for more detailed and up-to-date information on conditions of use including distance restrictions and bait distribution, storage, transportation and disposal.

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