



Guidelines for urban rat control

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Why control rats in the urban environment?

There are three species of rat in the Pacific, the Polynesian rat *Rattus exulans* (the smallest), the ship rat *Rattus rattus* and the Norwegian rat *Rattus norvegicus* (the largest).

Rats are one of the most damaging pests in urban zones, and it is necessary to control them because they:

- Consume our food;
- Contaminate products with their hairs, urine and droppings, reducing their quality;
- Damage crops in the plantations, reducing harvests;
- Are sources of infection, causing diseases in people, domestic animals and pets;
- Can transmit diseases between people, domestic animals and pets;
- Are a nuisance in houses with their noise and smell, reducing the quality of life;
- Damage other materials, such as cloths, mats and other domestic articles;
- Damage structures such as drainage ditches by their burrowing activities;
- Attack chicks, reducing production of chicken farms, and also reduce egg production by stressing hens.

How can rats be controlled?

In the urban environment the complete eradication of rats is not an option, there will always be some rats left to breed which then re-infest the town. So a programme for continued control is required.

Traps are of very limited use as most rats won't go in them. They can help, for example, inside buildings and homes where a single rat has to be removed. Setting traps successfully is a skill, and traps should only be used as an addition to an urban rat programme, not as the core part of it.

Cats are also of limited use as rats can go into small places cats can't reach. They can be useful in individual homes to deter rats from invading, but cats also present health risks by their presence and should never be used or encouraged in restaurants, shops or other public places where human food is stored, sold or processed.

The recommended method is the use of poison baits to kill rats. This recommendation is based on lots of peoples experience controlling rats in urban areas all over the world.

The urban rat control programme

A successful urban rat control programme has 2 main components:

- Cleanliness and hygiene:
 - Of houses, to remove refuges and alternative sources of food
 - Of public areas such as streets and parks, to remove refuges and alternative sources of food
 - Rubbish collection, to remove alternative sources of food
- Rat control, using poison baits to kill rats.

The first component requires the participation of the community. The second is done by a professional team under the direction of a supervisor / coordinator.

Cleanliness and hygiene

Rats live in small family groups and need 3 things to survive: food, water and a refuge (a safe place to breed). Good cleanliness and hygiene makes sure that these 3 things are kept as limited as possible, and so rats are more likely to take food offered as poison baits.

If you place poison baits without cleaning up litter and rubbish first, many rats will never eat it, as they have alternative food and safe places to eat it. This wastes valuable resources – manpower to place the baits and the baits themselves. For this reason cleanliness and hygiene are essential components of an urban rat control programme.

Rat poisons.

Modern rat poisons are second-generation anticoagulants (for example brodifacoum, bromadiolone, difenacoum, difethialone and flocoumafen) that work by preventing the blood from clotting. This means that they are slow, and usually take 2 – 3 days to work. There are two big advantages to this:

- As they are slow, rats don't associate feeling ill with the food they have eaten. Rats are social animals and communicate their food preferences between family members in the group, so more – up to 100% - rats in the group will eat the poisoned food before becoming ill.
- There is a simple antidote, Vitamin K, so in the case of accidental poisoning of a pet, domestic animal or child, there is time to seek medical or veterinary help and save life.

Baits are sold under different trade names in different countries, so check the active ingredient on the label before you buy. Always read the label and follow the instructions given. It is also strongly recommended that you consult the supplier and/or the manufacturer for technical support and advice, they can advise you on overall dose rates and give valuable information on using their product to the best advantage.

It is not good practice to use dosages of active ingredients in baits which are too low (leading to decreased effectiveness) or too high (causing repellency or increased

environmental risks). The following list may be regarded as a tentative recommendation for permissible dosage levels in ready-to-use rodent baits*:

Compound	% dry matter in bait
Difenacoum, bromadiolone	0.005-0.01
Brodifacoum, flocoumafen, difethialone	0.001-0.005

Rat baits are usually supplied as ready-to-use wax blocks of 5g, 10g, or 20g weights. They are simply placed on the ground in a sheltered spot – a bait station - where you know rats are moving, or expect them to be. Shelter is provided for 3 reasons:

- To protect baits from being eaten by non-targets, such as dogs or children
- To protect baits from the weather so that they last longer
- To provide an attractive safe place for rats to eat them – so that rats will come in and eat enough to kill them.

Good shelter can be given by a piece of wood or rock propped up to make a tunnel, or a section of bamboo or drainpipe cut to make a tunnel around 40cm long and 10cm wide. Each bait station should be labeled “DANGER - RAT POISON”, numbered, mapped and left in place more or less permanently.

Rat Baiting

The aim of a control programme is to knock down the population, and then keep it low. There will always be re-infestation from surroundings, and breeding by survivors. A female rat can breed at around 3 months of age, so the control programme must include a clean-up and a poison campaign at least once every 3 months, and preferably once every 6 weeks. During a poison campaign, modern anticoagulants are applied by “pulsed baiting” – this means that you leave 3 – 4 days between checking and renewing each bait, to allow the rats which have eaten the bait time to die.

As to the application rates, it is more difficult to fix recommended levels in the case of rodent control than in the case of other plant protection measures. Best practice depends on the type of active ingredient and bait used, the application technique, the population level of the target species, etc. In general terms, it is best to ensure that as high a proportion of the product as possible reaches its target and a minimum is wasted, consumed by non-target animals. This prerequisite is readily met when distribution of bait is done manually.

The system for rat baiting in a campaign are as follows:

1. Establish the permanent bait stations, numbered and mapped safe places to put poison.
 - a. Where there are many rats (“hotspots”) establish one bait station every 10m or even 5m apart.

* EPPO Standards. Guidelines for Good Plant Protection Practice Rodent Control for Crop Protection and on Farms.

- b. Where there are fewer rats establish one bait station every 20m or even 50m apart.
 - c. Be flexible: you can start with relatively wide spacing and decrease it if you find a lot of the baits are taken.
2. Place a 10g poison bait in each bait station.
3. Check the baits after 3 – 5 days. There are various decisions to make depending on the amount of bait consumed:
 - a. Where all the bait has been eaten, place twice as much new bait in the same bait station. So if 10g was put there to start with, now put 20g. You may also want to add some extra bait stations.
 - b. Where only part of the bait has been eaten, place the same amount again. So if 10g was put there to start with, now put 10g again.
 - c. Note the amount of bait eaten at each bait station, and the new amount placed.
 - d. Make sure you put out enough bait. If all baits are getting eaten at every check you need to put out more bait stations with more bait in each.
4. Check the baits again after another 3 – 5 days and repeat the bait checks detailed, above. Be reactive to the evidence of rat densities, add more bait and / or bait stations where there are a lot of rats, and decrease them where there are less. You may also want to check bait stations in the “hotspots” more often than those where the baits are not being eaten so readily.
5. Continue poison baiting only in high-risk areas (see below under “Define the area) where there are still signs of rats, until the next campaign.

Fine-tuning the baiting in a campaign will result from experience, knowing which areas need more bait stations, more baits to start with, more frequent checks and so on. For this reason the same group of people should always be used to apply the baits. Effective rat control is a skill and some people get very good at it.

Health and safety

Rat baits are poisonous to people and should only be handled by professional staff trained to understand their use – the baiting team. Latex or rubber gloves should always be worn when handling baits, bait tubes and any rat or bait-contaminated materials.

Planning an urban rat programme

The first thing to do is to plan the rat control programme carefully. You have limited resources, so you need to plan the most cost-effective way to use them. Follow the 7-point plan, below.

1. Define the area

How big is the area to be treated with a clean up followed by poison baiting? In an ideal world you treat the entire town, but if you don't have the resources, focus on the areas of highest public health risk – such as: markets, abattoir, hotel and restaurant zones. Assess

the rat population present by carrying out a visual inspection to look for signs of rats (droppings, damage, smell, etc), and also by placing non-poisonous baits at fixed bait points and seeing how much is eaten by rats. It may take a while for rats to start using a new food source, they may not start eating for several days. Slices of banana or coconut meat are good baits. By doing this you are also encouraging rats to start eating at certain bait points, and making it more likely that they'll quickly start to eat the poison baits placed in the same spots.

Where there is evidence of more rats you will need more poison bait.

Map out the areas to be treated as accurately as possible to get a clear idea of where exactly the work will be done. Pin a copy of the town map on the wall, showing the areas to be treated.

2. Work out the baits and manpower needed.

From the map made in point 1 you now have an idea of how big an area you want to treat, and, from the rat surveys (signs and non-toxic bait take) which spots have particularly high densities of rats – the “hotspots”. The first poison campaign (the knock-down), will probably need a lot of bait as you should aim to overdose the hotspots, while also putting down enough bait in the other areas to be treated to kill any rats around. The experience gained from the rat survey and mapping will help you work out how much bait you need, and also how much labour to apply the baits and carry out the checks. Be prepared to be reactive to where baits are being eaten, or left, and adjust the baiting accordingly.

Order enough bait for a full campaign in advance. It is difficult to predict exactly how much this will be, but you can calculate it from the area to be covered, with minimum bait stations spacing and 20g replacement at each check, following the protocol given above. You might want to carry out a small pilot programme in one area first, to give you a sense of rat densities.

Baits must be stored in a clean, dry and secure place. Wet or mouldy baits will not be eaten by rats.

3. Public awareness for clean-up campaigns

Before the first poison campaign (the knock-down) and then again before each successive campaign carry out a public awareness programme for the community living in the urban area, using all means available (radio, TV, schools, posters, etc). You want the entire community to be convinced that they must collaborate by picking up their rubbish and litter, tidying up their gardens etc. The appropriate government department also has to do the same for public areas. Government support is critical for this. Ideally, get a local bye-law passed to enforce collaboration.

4. Public awareness for poison baits

Rat poison is exactly that – poisonous! You are responsible for educating the public about the risks to themselves and their children, pets and domestic animals.

5. Inter-institutional cooperation – don't work alone.

Rats are a problem to everyone in the urban environment but the cost of their control is high so it is often difficult for a single agency to find the resources. So cooperate on this. The main agencies which stand to benefit directly from rat control are Public Health, Environmental Health, Quarantine, Agriculture and Environment. It is also useful to have the police on board, as you may need them to get access to private property harbouring rats but where the owners refuse to collaborate, or are absent. Form a working group and get everyone to share the costs and resources required (manpower, vehicles, etc).

Other urban problems which can benefit from collaboration by the same working group are mosquito control (vectors for dengue and malaria), and street dog control (bites, nuisance, disease).

6. Training the baiting team

Each member of the baiting team responsible for placing the baits needs to be trained in:

- Identification of the rat species
- Basic rat biology and ecology
- How to spot signs of rats
- Rat poisons, how they work and non-target risks
- Bait station design and placement
- The baiting programme
- Collecting data on the programme

7. Coordination and supervision of the programme

The programme needs a coordinator and a supervisor, which can be the same person but note that the roles are distinct.

Coordinator:

- Organises the training of the baiting team
- Organises and coordinates the community participation
- Coordinates the inter-institutional collaboration
- Ensures that the necessary materials (baits, labour, transport etc) are available on time and that baits are properly transported and stored
- Evaluates the effectiveness of each campaign, jointly with the supervisor
- Makes decisions at the programme level

Supervisor:

- Coordinates the work of the baiting team

- Ensures that the team are placing the bait stations and baits in an efficient way, with adequate bait stations and rebaiting
- Ensures that the team are completing the data sheets correctly
- Ensures that data is collected and entered into a database correctly
- Ensures that the baits are not presenting a risk to non-targets, such as children and pets (and staff)
- Ensures that the baits are being used in a professional and responsible way
- Identifies the areas of high rat densities and adjusts the baiting accordingly
- Evaluates the effectiveness of each campaign, together with the coordinator
- Makes decisions at the level of the daily work programme

Other considerations

Rat species

Which species of rat is present? This will make a difference to bait spacing, placement of bait stations and bait acceptance.

	Polynesian rat	Black rat	Norway rat
Acceptability of non-toxic baits*	Likes fruit	Likes fruit as well as cereal and meats/fish	Likes cereal, meat / fish
Acceptability of bait stations	Good - explores new objects	Good – explores new objects	Bad – is afraid of new objects
Bait station spacing	Put bait stations closer together – this is small rat	Medium.	Put bait stations farther apart – this is a big rat
Bait station placement	Climbs well, put bait stations on and off the floor	Climbs well, put bait stations on and off the floor	Does not climb, put bait stations on the floor and baits in burrows
Time of activity	Day and night	Night	Night

* Non-toxic baits are used in the preliminary survey to get an idea of the size of the problem and where the rat “hotspots” are.

Resistance to anticoagulants.

Resistance to anticoagulant baits can be a big problem in the urban environment, as it means that the baits no longer control the rat population. It is a genetic trait, each rat either is or is not resistant to a specific concentration of rat poison.

To cut down the risk of resistance developing:

- Plan the programme well
- Put down enough baits
- Don't use old baits

The programme design helps avoid resistance as rats are not exposed continually to the baits.

If resistance is suspected the best solution is to switch bait type for a period (such as a year) from an anticoagulant to one which has a different mode of action, such as cholecalciferol.

Data collection

Data must be rigorously collected by the baiting team and entered into a database on a regular basis. This allows bait consumption and labour to be collated and used to monitor the effectiveness of each campaign and the programme overall.