BAITING TECHNOLOGIES – VERTEBRATES

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INTRODUCTION

The use of baits to control pest vertebrates is a technique that is thousands of years old. The Romans used the bulb of the red squill plant, *Urginea maritima*, which contains the cardiac glycoside, scilliroside, mixed with foodstuffs to control rodents. Purified forms of scilliroside are still used in some parts of the world today. Essentially the concept of mixing a chemical with a foodstuff and feeding it to a pest is no different now. We do know more about feeding behaviours of the animals we are attempting to control and, of course, more sophisticated active ingredients are used but the technology has changed little.

In this paper it is proposed to discuss the various elements involved when baiting against selected vertebrate pests, especially the commensal rodents – house mice (*Mus domesticus & Mus musculus*), brown rats (*Rattus norvegicus*) and black rats (*Rattus rattus*). Other vertebrate pests are mentioned but information on these is more scant.

COMMENSAL RODENTS

Obviously when one is considering a baiting operation it is imperative to know what the target species prefers to eat and how it feeds. This has been generally well established for the commensal rodents. In general all the species will eat most cereals most of the time, although they are all somewhat omnivorous. Therefore the vast majority of rodent baits are based on cereals.

Regardless of species, it can be said that the dominant force in rodent feeding behaviour is survival, particularly the avoidance of predation. However, the mechanism of feeding is different for the different species. Brown rats may be said to be 'wary' feeders, mice are 'inquisitive' feeders and black rats somewhere in between. Thus different baiting strategies have to be adopted, even if the same bait is used.

Rattus norvegicus (Brown rat)

Brown rats have been extensively studied and perhaps the most important feature of their behaviour is their neophobic response to any new objects and situations, including food and food containers, in their environment. A major effect of neophobia is that food consumption is severely curtailed and it can be several days before it gets back to normal. When a new food source, such as a bait, is made available to brown rats it can take several days before they touch it. Then they only take it tentatively. If the bait contains an acute active ingredient and only a sub-lethal dose is ingested then symptoms will rapidly occur. The rat has the ability to associate the symptoms with the food it has just eaten and it will ignore it in the future ensuring its survival. This phenomenon is known as "bait shyness" or "bait aversion". It can be overcome by pre-baiting which is simply laying unpoisoned bait base to allow the rats time to get used to eating it, then mixing in the rodenticide when the neophobic response has been overcome. This may take some time. With anticoagulant rodenticides pre-baiting is unnecessary as they are slower acting and tend to act as their own pre-bait.

When baiting for rats it is important to locate harbourages and runways so that the rats can be intercepted on their way to their usual food source. Rats tend to be creatures of habit and take quite large amounts of food from only a few selected locations. Therefore large numbers of baits are not always necessary but there should always be enough bait present to last between treatments.

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One proposed technique which offers a different approach to brown rat control is "pulse baiting". This consists of laying a smaller than usual amount of bait at the beginning of a treatment. In theory, all this will be eaten by the more dominant rats, who then die. Dominant rats have first choice of feeding time and site. Later, another relatively small amount of bait is laid and the next wave or 'pulse' of rats is killed, including those which took only a sub-lethal dose on the first occasion. This continues until all rats are dead. The value of this technique has yet to be proven with confidence and the situation can be envisaged where some rats continue to take sub-lethal doses over a number of 'pulses'.

Mus domesticus/M. musculus (House mouse)

In contrast to brown rats, the evidence for neophobic responses in house mice is at best equivocal. If neophobia does exist it is certainly not strong and is normally easily overcome. Mice readily accept new food, sometimes in preference to an existing source.

Mice appear to feed quite randomly, although it may be that a few feeding areas are more heavily exploited during the course of one night than others, but the sites of the more heavy feeding do vary from night to night. They are also not necessarily the closest to the harbourage.

Mice leave their harbourage, dash to a food source, take a small amount of food and then return to their harbourage. They repeat this sequence many times during the course of a night, frequently going to different food sources. If available, they may visit 20–30 different sources in one night.

If only one food source is available they may visit it up to 200 times during the night. For all practical purposes mouse feeding can be said to be totally unpredictable.

Thus baiting strategies against mice should always involve large numbers of baits – although it is not necessary to have large quantities of bait at each point. Sometimes only one wheat grain may be taken from a particular source.

Also, when moving, mice prefer to keep contact with a solid object for security so baits should invariably be placed against solid objects eg at wall/floor junctions.

A recent phenomenon occurring in small areas centred on Birmingham and parts of London has been noted in mice. They refuse to eat all the foodstuffs, particularly cereals, poisoned or otherwise, which are normally associated with mouse diets. Control by baiting was impossible until it was discovered what food they will eat. The foods involved were almost ignored by "normal" mouse populations. The phenomenon has been named "behavioural resistance" and is thought to have a genetic basis. Further work is being carried out to clarify the situation.

Rattus rattus (Black rat)

The feeding behaviour of black rats is intermediate to that of brown rats or mice. There is some evidence of a neophobic response but like mice they do tend to feed from many feeding points. However, they do not necessarily return to their harbourage between feeding bouts. Therefore large numbers of small baits should again be used. As black rats tend to be arboreal runways tend to be high up in buildings and baiting can prove difficult.

Even if the baiting is carried out perfectly if the active ingredient used is not satisfactory then failure will ensue.

RODENTICIDES

It is comparatively easy to find a suitable bait base for a rodenticide but the number of active ingredients is very limited.

Essentially they are restricted to the relatively slow acting anticoagulants, which cause death by internal haemorrhage and are by far the most widely used group. The others are a diverse group of compounds with differing modes of action which generally are less efficient than the anticoagulants.

Examples of anticoagulants are warfarin, coumatetralyl, bromadiolone, difenacoum, brodifacoum, flocoumafen and difethialone.

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