THINK WILDLIFE

Campaign for Responsible Rodenticide Use

CRRU IRELAND BEST PRACTICE REQUIREMENTS

Best Practice Requirements for Rodent Control and Safe Use of Rodenticides

Photo - Richard Mills

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Best Practice Requirements for Rodent Control and Safe Use of Rodenticides prepared by CRRU Ireland is available for download from the CRRU website

http://www.crru.ie

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Health and Safety Executive Northern Ireland (HSENI)

Irish Agricultural Supply Industry Standards (IASIS)

Irish Pest Control Association (IPCA)

Health and Safety Authority (HSA)

National Parks and Wildlife Service (NPWS)

National Pest Advisory Panel (CIEH)

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FOREWORD

Products containing second-generation anticoagulants (SGARs) have been on the market for nearly forty years and we have learned much about their characteristics in that time. They are an efficient and practical solution to rodent infestations in many urban and rural situations, bringing substantial benefits in food hygiene, public health and animal husbandry. However, they are also hazardous to non-target animals and persistent in the environment. Indeed, surveys conducted by Irish scientists have found residues of these compounds in the bodies of many predatory and scavenging species of mammals and birds. Often high proportions of populations are exposed and some individuals are killed. These properties might normally lead to the removal of such products from the market, but equally effective and safer alternatives are not available and the SGARs continue to be essential. If anything, they are becoming more widely used as resistance to the first-generation anticoagulants spreads in rodent populations.

This situation makes the implementation of risk mitigation measures, and the application of best practice, an absolute imperative for all users. These *Best Practice Requirements for Rodent Control and Safe Use of Rodenticides* define measures that, if thoroughly and effectively applied, will permit the continued use of anticoagulants and reduce adverse impacts on non-targets.

The Campaign for Responsible Rodenticide Use Ireland (CRRU Ireland) has developed these *Best Practice Requirements for Rodent Control and Safe Use of Rodenticides*, with assistance from a wide range of stakeholder organisations. The document is intended to provide assurance to the Pesticide Registration and Control Divisions of the Department of Agriculture, Food and the Marine, the Irish government body responsible for the regulation of rodenticides, and to the Health and Safety Executive for Northern Ireland, the government body responsible for the regulation of rodenticides in Northern Ireland, that anticoagulant rodenticides can continue to be used and the risks associated with their use can be brought down to an acceptable level.

These *Best Practice Requirements for Rodent Control and Safe Use of Rodenticides* **will be used as the basis for training and certification of all who carry out rodent control as a part of their professional duties and must be applied in practice by all professionals who use anticoagulants**.

These Requirements are addressed to, and are to be relied upon, by rodent pest management technicians and other professional users of rodenticides to guide their decision-making in carrying out their day-to-day duties. It is also addressed to other key stakeholders to guide them in their decision-making:

- Client companies and organisations and their Quality Assurance Managers;
- Quality Assurance Scheme Auditors;
- Environmental Health Officers;
- Department of Agriculture, Food and the Marine Inspectors; and
- Health and Safety Inspectors.

Note: References to legislation included in this document should be taken as references to the legislation concerned, as amended.

Dr Mark R Lynch

Chairman, Campaign for Responsible Rodenticide Use Ireland

BACKGROUND

The publication of this document, which gives rodent control guidance for professionals, might reasonably give rise to the question 'why do we need another one?

These *Best Practice Requirements for Rodent Control and Safe Use of Rodenticides* bring together all of our most recent understanding of the safe and effective use of rodenticides, acknowledging the risks associated with their use and providing practical advice so that the risks are minimised. While best practice for the safe and effective use of rodenticides is described, individual rodenticide product labels, based upon the outcome of a detailed assessment conducted by the Regulatory Authorities, prescribe in detail the specific conditions under which products must be used.

Anticoagulant rodenticides are essential to ensure food hygiene and for the protection of human and animal health, but the manner of their current use results in widespread contamination of non-target wildlife in Ireland. Some of the exposed species are of high conservation value. Contamination may be happening either because current rules are inadequate or because they are not properly followed. Whatever the cause, a new approach is evidently needed. CRRU Ireland, working with all stakeholders, will seek to ensure compliance with *Best Practice Requirements for Rodent Control and the Safe Use of Rodenticides*.

These *Best Practice Requirements for Rodent Control and Safe Use of Rodenticides* are more about changing emphasis than about changing practice. In the past, rodent control practitioners may have considered rodenticide application as their primary intervention. Now it must be seen to be a temporary solution that becomes necessary only after other procedures have been fully considered and implemented, where appropriate, to make sites less conducive to rodent infestation.

For some time, tamper-resistant bait boxes have provided a false impression that it is safe to deploy such equipment on sites and to apply anticoagulant rodenticide baits permanently in them. We now know that some of the contamination seen in Irish wildlife is the result of non-target small mammals entering bait boxes and feeding on bait. Equally many predators in Ireland such as Barn Owls and Red Kites feed to a large extent on target rodents and therefore may be exposed to rodenticides through feeding on both target and non-target small mammals.

The concept of 'risk hierarchy' should be at the forefront when deciding upon a rodent control strategy for any site. The key here is that any intervention conducted must be potentially effective, but in the risk hierarchy, the least severe methods must always be used. It is not necessary that all options in the risk hierarchy be employed and found to fail, before an effective solution is reached. But all should be considered.

These *Best Practice Requirements for Rodent Control and Safe Use of Rodenticides*, and the advice they contain, will be integrated into existing and new training courses for those who conduct rodent pest management in all user sectors, including professional pest control, Local Authorities, utility companies, and agriculture. Those with existing qualifications will be brought up to date with the new concepts and advice.

The *status quo* is not an option. The strategies and methods described in this document will promote effective rodent pest management and result in reduced risk of accidental exposure of humans and non-target animals.

In summary -

- **application details, manner and area of use, details of required restrictions, resistance information, and risk and safety information are all specified on product labels and must be complied with;**
- **it is not acceptable to bait sites repeatedly - obvious measures to make sites less amenable to infestation must not be ignored;**
- **long-term baiting may sometimes be required in situations where access to points of rodent entry to the site is not available, but must be justified and reflect a detailed and documented risk assessment; and**
- **practitioners must become better acquainted with the risks inherent in the use of anticoagulant rodenticides, especially when they are applied outdoors, and implement all appropriate risk mitigation measures.**

AGRICULTURE

PROFESSIONAL PEST CONTROL

LOCAL AUTHORITIES & UTILITY COMPANIES

CONTENTS:

1 INTRODUCTION

1.1 Rodents pose a threat to the health of both humans and animals. They may cause significant damage to commodities, especially stored food and animal feeds, and to the fabric of buildings and infrastructure, such as electrical cables, drains and sewers. In particular, rodents pose a risk to food safety and food hygiene because they are attracted to areas where food is stored, prepared and sold and because many food-borne pathogens are carried by rodents and transmitted to humans, companion animals (pets) and to farm livestock.

1.2 A range of statutory obligations with regard to pest infestation is imposed on Local Authorities, employers, land-owners, householders and those involved in the food, pharmaceutical, medical device and IT industries as well as in other sectors. A wide range of quality standards make necessary the management of rodent infestations throughout these industries, including on many agricultural enterprises. In some cases these require a pest-free status as a contractual obligation. Many other legal instruments refer to rodent infestation in different situations and impose a requirement to take the necessary steps to control and remove rodents.

1.3 This document outlines the strategies to employ to avoid infestation and the precautions that need to be considered when carrying out treatments to control the two main pest species in Ireland, the Norway rat (*Rattus norvegicus*) and the house mouse (*Mus musculus domesticus*). It assumes that those who use the guidance contained in it are competent and have been adequately trained and assessed as competent, to a recognized standard (*QQI Professional User – Pest Management Services*), or equivalent, and therefore:-

- have a detailed understanding of the biology, identification and management of vertebrate pests of food production, warehousing, distribution, retail and in Public Health,
- are capable of carrying out a planned approach to rodent control,
- can implement appropriate and effective rodent control strategies, based upon Integrated Pest Management (IPM) techniques, and
- are capable of preparing, using, handling, and disposing of rodenticides in accordance with the instructions printed on product labels and the guidance provided in this document and current national as well as European legislation.

1.4 These requirements are aimed at all those who conduct rodent control operations as professional users of rodenticides *i.e.* those who conduct rodent control as a part of their professional and/or occupational duties. A wide range of users fall into this category including those working as professional pest control technicians, both in the public and private sectors, agricultural workers who conduct rodent control as a part of their duties on farms and holdings, and those, such as maintenance staff, store-keepers and janitors, who need to control rodents to protect property, installations and produce.

2 RODENT CONTROL STRATEGY

2.1 It is important to review approaches to rodent control holistically and to integrate a range of control measures into the treatment strategy. All available control options should be considered – not just the use of rodenticides – including simple measures such as clearing away rubbish and proofing of buildings. **It is best practice to adopt an Integrated Pest Management (IPM) approach to rodent pest management**. Relying on rodenticides alone does not guarantee that the infestation will always be eradicated and numbers may quickly recover after treatment. It is important that, following the application of measures to reduce rodent numbers, consideration be given to ways of improving environmental management at the site. This should provide effective long-term control of rodent infestations. It is important to concentrate particularly on improving hygiene and proofing, as well as maintenance and repair of buildings.

2.2 Clients of rodent pest control service providers also have responsibilities in achieving effective rodent pest management. Recommendations made by pest control professionals must be carried out as part of a partnership approach to rodent pest management. The European Standard for pest management services (I.S. EN 16636; B.S. EN 16636) includes the following in its introduction:

'The goal of every pest management activity is the effective and economical reduction or elimination of damage caused by pests. The successful achievement of this goal is dependent on a partnership approach between the service provider and the client.

To achieve this goal, the professional service provider conforms to the principles established by the World Health Organization (WHO) in respect

of Integrated Pest Management (IPM), which can include a combination of habitat modification, biological control, physical control and chemical control.'

2.3 The primary aim is to avoid infestation, as once established, rats and mice can be difficult to control. Operations that are intended to prevent rodent access to food and water and to remove places of rodent harbourage for shelter and breeding rarely have significant impacts on non-target animals. All necessary operations that would contribute towards making sites less attractive to rodents should be implemented by those who are responsible for them.

2.4 In contrast, all interventions aimed at the removal of rodents, including the use of lethal or non-lethal traps and the application of rodenticides, such as gases, gels, liquids, foam and poisoned baits, have the potential to harm non-target animals and the environment. Although these risks can be mitigated by following best practice, they cannot be entirely avoided. Therefore, the appropriate strategy when choosing methods for the control of rodents is to employ methods that have the least risk of adverse impact (*i.e.* are the least severe) but which will be effective in the prevailing circumstances. This is the concept of "risk hierarchy".

3 THE 'RISK HIERARCHY'

3.1 General

Each site is different and will require a different set of measures, either to prevent rodent infestation or to remove an infestation when it has become established. Any measure considered could present a lower risk at one site and a higher risk at another. An important procedure in the determination of risk is a Risk Assessment (see point 5.5.3). However, the rodent carrying capacity of the site should always be reduced through improvements in environmental management. Beyond that, no hard and fast guidance can be given about the 'risk hierarchy'. Consideration should be given to the following general points when making decisions about which methods to use.

3.2 Efficacy

In many situations in which rodents present a risk of harm to humans and animals there are statutory responsibilities and rules requiring their removal. Therefore, a principal consideration must be the suitability of measures selected to achieve the results required efficiently to reduce or remove rodents.

Control measures based on the use of rodenticides must be proven to be sufficiently effective by those who seek authorisation to sell them. Efficacy data may be available in the public domain or obtained from manufacturers. All other methods, such as the use of traps, are not regulated with respect to efficacy. Their efficiency is uncertain and dependent on the competence, perseverance and (often) the ingenuity of those employing them.

It should be noted that killing rodents can only provide short-term control of populations. Sustainable control can only be achieved by reducing the rodent carrying capacity of the environment (see point 3.3-3.5).

There is concern that resistance to rodenticides in some areas of the country may exist. Professional users should be alert to this phenomenon and be prepared to adjust their control strategy if anticoagulant resistance is suspected (see section 7).

3.3 Proofing

Although they may be costly and require frequent maintenance, measures to prevent the ingress of rodents into buildings provide a long-term solution to rodent problems and are usually without adverse impacts. These measures should always be implemented. Proofing also needs to take account of the presence of bird species and avoid interference with or obstruction of their nests as most wild birds, their nests and eggs are protected under the Wildlife Act (1976) and the Wildlife (Amendment) Act (2000) and in the case of Northern Ireland under the Wildlife (Northern Ireland) Order 1985 as amended by the Wildlife and Natural Environment Act (Northern Ireland) 2011.

A diverse range of species can use buildings for nesting, feeding and roosting. A survey of farmyards and buildings recorded 41 bird species using such habitats at different periods throughout the year, and birds will also readily use other premises such as commercial and public buildings where rodent control may be necessary. All birds, nests, eggs and nestlings are fully protected under law. Wilful disturbance of an active nest (from the building stage until the chicks have fledged) is an offence, unless the building is occupied (in which case, the nest is only protected when there are eggs or chicks present). It is therefore vital to ensure that all buildings are fully and properly surveyed to ensure that active nests can be protected, and to avoid unnecessary disturbance, obstruction or prevention of access to nests. Where possible, proofing of buildings should be carried out during the non-breeding season (September to February). Care should be taken not to block access to birds nesting within buildings, particularly during the nesting season (March to August). Proofing of buildings at all times should ensure that bird species are not trapped within buildings. Several species will use buildings for roosting both during the night and day, and not all will be immediately obvious or visible.

Care is also required where a building is to be rodent-proofed and may provide a roost for bats. Bats will use a range of building types at different times of the year. All bat species are protected under the Wildlife Act (1976) and Wildlife (Amendment) Act (2000), and in the case of Northern Ireland under the Conservation (Natural Habitats, *etc.*) Regulations (Northern Ireland) 1995 (as amended).
It is an offence to wilfully interfere with any structure or place used for breeding or resting by a bat, or to wilfully interfere with a bat while it is occupying a structure or place which it uses for that purpose. Rodent proofing of buildings can generally be carried out without causing disturbance to or prevent access to bats. However if significant alterations are planned then a specific derogation licence may be required to proceed. The species present within the area which may be potentially impacted by the rodent control measures should be assessed as part of the Risk Assessment, and result in appropriate best practice rodent control procedures being followed thereafter (see Further Reading).

3.4 Denial of food and water

Operations intended to prevent rodent access to foodstuffs, such as the use of rodent-proof bins and close-fitting doors, are likely to be substantially free from non-target impacts, although such action will also prevent access to any other animals, such as wild birds, that may be relying on these food and water sources.

3.5 Removal of harbourage

In order to deter rodent infestations, sites should be cleared of all debris, rubbish, old machinery and equipment, unwanted stores of straw and hay, etc. Vegetation in the vicinity of buildings should only be removed having considered both its potential to harbour rodents and its value as a habitat for rodent predators and other species, keeping in mind the desirability of providing an open area around buildings, so that predators can take rodents. Required vegetation or scrub clearance should be carried out outside the nesting season (March to August) in accordance with the Wildlife Act (1976) and Wildlife (Amendment) Act (2000) and in the case of Northern Ireland in accordance with the Wildlife (Northern Ireland) Order 1985 as amended.

Failure to remove harbourage greatly reduces the effectiveness of IPM programmes. There is therefore an onus on users of pest control services to comply with recommendations provided regarding the removal of harbourage. If possible, areas around buildings may be laid to concrete, or other hard surfaces, to prevent rodent burrowing. The only non-target impacts of such operations will be on the other animals that rely on the materials taken away for cover and harbourage. For example, straw and hay bales are best removed during winter because they can provide breeding sites for barn owls. The presence or potential presence of such species should be assessed as part of the Risk Assessment.

3.6 Trapping

Trapping has several advantages. Any animals taken can be removed from the site and obviously there are no chemical residues. However, if not done properly trapping may have a detrimental impact on non-target animals, when these are accidently taken as 'by-catch'. A Risk Assessment will permit the likely extent of this risk to be determined.

Trapping and the Law - Several Statutory Instruments (SIs) apply to the process of trapping vertebrates. It is essential before setting rodent traps whether lethal or non-lethal, especially those used outdoors for rats, to consider both the target animals and any other animals that may be present and may enter traps accidentally. Traps used must be either an approved trap/device such as:-

- a cage or a trap designed to capture alive wild birds or wild animals,
- a spring trap which is **not** a gin trap and which is designed to secure either –
  - the immediate death, or
  - the immediate unconsciousness and subsequent death without intervening consciousness,

of wild birds or wild animals which it is designed to trap as set out in the Approved Traps and Snares Regulations 2003 or be approved in accordance with the Wildlife Act 1976 (as amended) and in the case of Northern Ireland, approved traps under the Spring Traps Approval Order (Northern Ireland) 2012. In Northern Ireland there is no specific legislation on the use of cage traps. It is recommended that users check each trap at least once in every 24-hour period to be compliant with the Welfare of Animals (Northern Ireland) Act 2011. Snares must be checked every 24 hours in accordance with the Wildlife (Northern Ireland) Order 1985 (as amended).

To minimise the risk to non-target animals, where possible, livestock and pets should be excluded from the trapping area and the traps must be set in natural or artificial tunnels. Purpose-made boxes designed to accept both traps for rats and mice are available.

External use of rodent (Rat and Mouse) break back traps – A Risk Assessment should be completed when using break-back traps externally. Best practice requires that, reflecting the outcome of the Risk Assessment completed, break-back traps be placed:-

- in areas where they cannot be accidentally triggered, and
- where the general public do not have access.

Break-back traps locations should be recorded on site plans and checklists.

Baited traps **must** contain a suitable attractant (*e.g.* chocolate, peanut butter or site approved attractant), as the use of toxic bait in traps presents unacceptable environmental risks.

It is essential that an initial follow-up occurs on the following working day to check whether, or not, non-target animals have been trapped *e.g.* bank voles, birds, domestic animals *etc*. Where there is a risk of trapping non-target species, traps should be left un-set on Friday afternoons and be set on the following Monday, and further follow-up checks should be conducted on a daily basis.

It is important to ensure that all those that have access to infested areas, including pest control call-out staff, property owners, care-takers *etc*., are made aware of the trapping programme.

External use of rodent (Rats and Mice) live catch traps - Trapping programmes should only proceed following completion of a site specific Risk Assessment carried out by a competent person. Trapping should only be undertaken by appropriately trained/ competent persons.

Traps used, must be either an approved trap/device as set out in the Approved Traps and Snares Regulations 2003 or be approved in accordance with the Wildlife Act 1976 (as amended) and in the case of Northern Ireland be approved traps under the Spring Traps Approval Order (Northern Ireland) 2012.

Best practice requires that traps be inspected at least once every 24 hours. Non-target animals caught in traps must be released unharmed back into the environment. Grey squirrels and mink must be dispatched humanely, in accordance with the Wildlife Act 1976, the Protection of Animals (Amended) Act 1965 and in the case of Northern Ireland in accordance with the Wildlife (Northern Ireland) Order 1985 as amended. Target rodents must also be dispatched humanely.

Traps fitted with electronic monitoring systems that operate on a 24hr, 7 days a week basis, where suitable for use, can serve to facilitate prompt inspection following activation.

Key considerations when using lethal and non-lethal rodent traps externally

a) Traps should only be set after consulting the manufacturer's instructions regarding pest species and trap location. If in any doubt the trap should not be set.

b) Where instructed by the manufacturer, traps should be set in an artificial or natural tunnel to minimise access of non-target species.

c) Every effort should be made to avoid trapping non-target species. Pest controllers and users who use lethal break-back traps must be able to recognise the signs and evidence of the presence of rodent pest activity – in the absence of clear evidence of the species present, the need for trapping should be reviewed and an alternative, and more appropriate, treatment method should be considered.

d) The entrance of trap tunnels should be restricted (e.g. with sticks) to discourage entry of non-target species.

e) Traps or the containers/vessels in which they are placed should be firmly anchored in the treatment area.

f) Traps should be checked daily and more often where on the basis of a Risk Assessment a need for more frequent checking is identified. Where traps fitted with electronic monitoring systems are used, inspection should take place at the earliest convenient opportunity following activation.

g) Traps should not be set in open or accessible areas where members of the public, animals and pets can gain easy access to them.

h) Suitable personal protective clothing and equipment must be worn when dealing with traps and rodent carcases to prevent the transmission of rodent borne disease.

i) Individual rodent pest management technicians must ensure that each trap chosen for use is approved for use in accordance with the Approved Traps and Snares Regulations 2003 or is approved in accordance with the Wildlife Act 1976 (as amended) – in the case of Northern Ireland approved under the Spring Traps Approval Order (Northern Ireland) 2012.

3.7 Glue (sticky) boards

Glue (or sticky) boards have **NOT** been approved in accordance the Wildlife Act 1976 (as amended). Accordingly their use is illegal, other than in Northern Ireland where it is strongly recommended that the *Pest Management Alliance Code of Best Practice for Humane Use of Rodent Glue Boards* is followed.

Glue (or sticky) boards present few non-target risks when they are used indoors for rat and mouse control. However, it is considered that these devices should be used only as a 'last resort' due to animal welfare considerations (see Further Reading).

3.8 Alphachloralose

The acute rodenticide alphachloralose may **ONLY** be used indoors for the control of house mice as an alternative chemical method to anticoagulant rodenticides. Among chemical methods of rodent control, and when applied correctly, it may be considered to present a reduced risk to humans and non-target animals, in comparison to anticoagulant rodenticides.

3.9 Phosphine gas

Provided care is exercised to ensure that fumigated burrows are only occupied by target rodents, the use of products that emit the toxic gas phosphine are unlikely to have primary non-target impacts. There is also no likelihood of secondary poisoning.

All users of phosphine generating products must be trained and hold a current nationally recognised qualification in the safe use of phosphine gas before purchase. These products carry significant risk to those transporting and applying them and current advice to users is as follows:

ALWAYS

Assess the risk to yourself, others and the environment prior to commencing work and adopt the necessary operational & engineering controls appropriate for the work **or** substitute the control measure for a physical or less toxic method (Health and Safety Assessment).

- Buy the product from an authorised stockist, show your proof of identity and qualification.
- Ensure that secure arrangements are in place to receive product at the nominated delivery address.
- Use a written order and include a specific description of the purpose for which it will be used.
- Store the product in a locked cabinet located in a dry and secure area away from residential properties and separated from workstations.
- Mark the storage area with the correct signage:
  -Warning sign I.S. EN ISO 7010:2012+A5:2015 – in the case of Northern Ireland BS EN ISO 7010:2012+A5:2015 - series (black and yellow triangle incorporating an exclamation mark);
  - A sign saying 'Gassing Compound – Do Not Use Water';
  - A sign saying 'in case of emergency dial 112 or 999';
  - A sign saying 'No Smoking'.
- Transport the product in an appropriate secure container in a separate compartment to the driver and passengers.
- Always read the label and product information before use.
- Follow label directions for use carefully.
- Use an appropriate applicator when placing tablets in runs and burrows.
- Use appropriate personal protective clothing and equipment, including in particular respiratory protective equipment when loading and venting the applicator.
- Use the entire flask contents on the job.
- Vent empty flasks and applicators thoroughly in a safe location and dispose of empty flasks as controlled waste.
- Maintain stock records *i.e.* delivery of stock into the store, and details concerning when and where stock has been used.
- Always write a treatment report that includes relevant contact numbers.

NEVER

- Purchase the product from a non-approved stockist.
- Sell or supply the product on to anyone else regardless of proof of qualification.
- Store the product in an area accessible to other people or below the level of the bund.
- Reseal and store a part used flask.
- Use the product in wet weather or in heavy mist or fog.
- Treat any species other than rats or rabbits.
- Treat a burrow if you are not 100% certain of the species that is occupying it (Risk Assessment).
- Treat a run or burrow within 10 metres of an occupied building.
- Transport empty flasks and used applicators in vehicles in such a manner that fumes may enter and effect drivers and passengers.

- Dispose of empty flasks without venting.
- Allow unsupervised members of staff to have access to the product.
- Allow untrained members of staff to use the product.

(see Further Reading)



3.10 First-generation anticoagulants

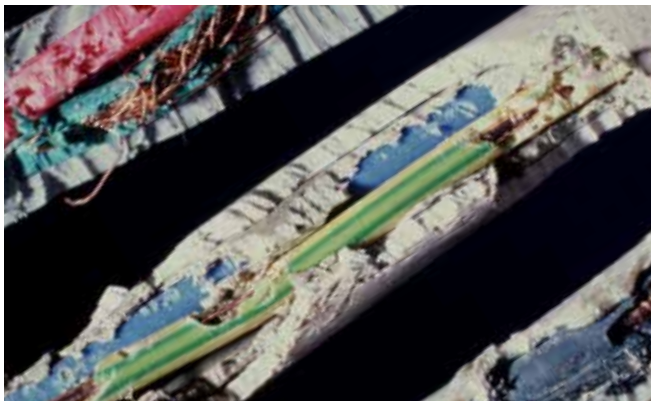
First-generation anticoagulants, warfarin, chlorphacinone and coumatetralyl, are less acutely toxic and are less persistent in animal tissues than the second-generation compounds. It may be assumed that they present a lower risk of both primary and secondary poisoning for non-target animals in most use situations. However, they are not free from risk to non-targets and larger quantities of these baits must be applied to ensure that a surplus is always available for rats to feed upon. It may also take longer to control rat infestations when using them.

Where there is known resistance to first generation anticoagulants they should not be used as this presents an unnecessary risk to non-target animals.

3.11 Second-generation anticoagulants

The second-generation anticoagulants, brodifacoum, bromadiolone, difethialone, difenacoum and flocoumafen, are acutely toxic, have chronic effects and have long biological half-lives. Therefore, in the 'risk hierarchy' they present the greatest risk to non-target animals and the environment. There is evidence that they may cause the deaths of non-target animals and they are widely present in the environment in the bodies of many non-target species, including species of high conservation value such as barn owls, red kites, kestrels and peregrine falcons. They should be used only when other methods of achieving rodent control have been carefully considered and found to be unable to provide an effective solution to the rodent pest problem present at the site. It is not possible to rank these compounds in respect of risk. However, resistance to bromadiolone and difenacoum, among both Norway rats and mice, should be considered when deciding which of the five compounds to use.

4 AVOIDING RODENT INFESTATIONS



The best way to deal with rodent infestations is not to have them in the first place. Failure to effectively implement all elements of IPM programmes greatly reduces their effectiveness. There is an onus on users of pest control services to comply with recommendations provided. There are two main approaches: -

Exclusion - The aim is to keep rodents out of vulnerable buildings without restricting access by bats and birds to their roosting and nesting sites, where relevant (see point 3.3). This objective needs to be realistic and practical and take account of the physical capabilities of rats and mice. In rural environments, buildings offering an attractive environment and a source of food are most vulnerable to rats during autumn and winter when they are likely to exploit weaknesses or faults in the structures or associated areas. Mice are less responsive to seasonal changes mainly because they live within the fabric of buildings. Their small size means that they can be easily introduced into otherwise secure buildings *via* the delivery and movement of materials such as feedstuffs, wood shavings and any other bulk items that are capable of providing a temporary refuge. Effective proofing of buildings or other structures against mouse entry is often extremely difficult due to their ability to get through very small gaps but efforts to limit entry will have some beneficial effect.

Routine inspections and repair to identified faults or damage should be implemented. In most situations it is best to control the rodent infestation before carrying out any proofing work. Although there may be some additional cost, the improvements will benefit the rodent control and prevention programme in the long term. Metal baffles around services such as cables and pipes and kick plates on the lower edges of doors will prevent them being gnawed by rodents. Door access that is only required occasionally can be temporarily proofed by adding a concrete fillet or wire mesh to the vulnerable ground level sections. Depending on the circumstances, drainage pipes or gullies should be proofed by fitting grilles, flaps, crushed wire mesh or other suitable materials.

Staff on site should be made aware of the importance of avoiding the creation of rodent access routes and harbourages when undertaking building works, modifying existing structures and when making changes to the management of the building. In the course of structural work it may be appropriate to incorporate access points to allow checks to be made for rodent activity and to permit the placement of rodenticide baits.

Hygiene – Two main areas require attention.

a) Feedstuffs

It is essential, wherever possible, to prevent rodent access to food. Food storage structures should be proofed against rodent ingress. Shortcomings in the storage and handling of food and feedstuffs, particularly where spillages occur and are allowed to remain, can be a significant factor in providing attraction for rodents and reducing the uptake and acceptability of rodenticide baits. Spoiled foodstuffs should be disposed of in a manner that renders them inaccessible to rodents. Rats require a source of free water, while mice in general do not. Water sources should be removed where this is possible.

However, both rats and mice have unrestricted access to feed present in many situations – particularly in some animal-rearing systems, such as free-range poultry and pigs and gamekeeping where game-birds receive supplementary feeding in hedgerows and coverts. In these systems, every effort should be made to prevent access to foodstuffs by rodents. If this is not done, long-term problems with rodents will remain.

b) Harbourage

Within and around buildings the availability of a wide range of materials will provide habitat for rodents. The following will encourage the presence of rodents:

- a build-up of rubbish around and within buildings;
- suspended ceilings and uncapped block walls;
- wall and ceiling insulation materials with direct access for rodents;
- the long-term storage of materials such as wood shavings, straw/ hay bales and packaging in areas accessible to rodents;
- stores containing equipment and spare parts;
- natural vegetation cover;
- ditches, hedges and banks, especially when poorly maintained;
- rubbish dumps, bins for fallen stock, and incinerator sites; and
- drainage systems and elevators or gantries that may provide a link between buildings.

All these areas require attention if sites are to be made less attractive to rodents as places to live and breed. Woodlands, scrub, hedgerows and other natural or semi-natural habitats, offer a refuge for predators of rodents. Such habitats that are not in the vicinity of buildings should be maintained to enhance natural pest control.

Required vegetation or scrub clearance should be carried out outside the nesting season (March to August) in accordance with the Wildlife Act (1976) and Wildlife [Amendment] Act (2000) and in the case of Northern Ireland in accordance with the Wildlife (Northern Ireland) Order 1985 (as amended).

5 WHAT TO DO BEFORE TREATMENT

5.1 General

Much can be done prior to the establishment of rodent infestations to make their occurrence less likely. If precautionary measures such as proofing and hygiene, discussed in the previous sections, are rigorously implemented rodent infestations will be infrequent, small, as well as being easy to deal with when they do occur. Small infestations of rats and mice can often be removed using physical means, such as traps. Small infestations of mice are particularly amenable to this approach. However, sometimes rodent infestations become established and require the application of rodenticides. The choice of rodenticide should be made after consideration of the 'risk hierarchy' described above (see Section 3), having completed a thorough inspection of the site to be treated and after the performance of necessary risk assessments. The sections that follow in this document describe best practice in the application of rodenticides for the control of infestations of rats and mice.

5.2 Details of the site

In commercial premises, public buildings or on agricultural land, it is important to establish who to report to on-site and if there are parts of the site where pest control technicians may have restricted/ no access.

If the site has been treated before, it is good practice to review the previous strategies, advice and potential problems associated with the site before visiting. It is important to involve the persons responsible for the site when considering the range of rodent control measures proposed. If previous advice has not been followed, then this will need to be revisited, underlining the importance of environmental management in the successful control of rodent populations. It is unacceptable to treat sites repeatedly with rodenticides in situations where the rodent problem could have been solved by proper maintenance of buildings and through carrying out a thorough programme of hygiene and removal of food and harbourage. The role of clients of pest service providers is critical in that regard (see point 2.2).

Where applicable, it is important to explain to those who have responsibility for the site that regular access to the site will be required during any treatment phase and at the end to remove bait that has not been eaten. Convenient times for revisits should be agreed.

5.3 Areas of Use

It is essential to apply rodenticides only in those areas where their use is permitted by the product authorisation and shown on the product label.

"Indoors" is defined as:

Situations where the bait is placed within a building or other enclosed structure and where the target is living and feeding predominantly within that building or structure;

"In and around buildings" is defined as:

'In and around buildings' shall be understood as the building itself, and the area around the building that needs to be treated in order to deal with the infestation of the building. This includes use in ships, in open barns or other open buildings, as well as use of tamper-resistant bait stations placed in open areas around buildings, but not in waste dumps or open areas such as farmlands, parks or golf courses. ***If rodents living outside a building can move freely to where the bait is laid within the building, then products restricted to use indoors may NOT be used****;*

(Source: EC (2009). Risk mitigation measures for anticoagulants used as rodenticides. European Commission, Directorate-General Environment, B-1049 Brussels, Belgium. Document CA-May09-Doc.6.3c. 8pp.)

In "Sewers" is defined as:

Situations where the bait is placed within a sewer or other enclosed underground drainage system and where the target is living and feeding predominantly within that system;

"Open areas" is a term without a concise definition:

An open area is one that fits none of the three preceding definitions and is an urban, suburban or rural space that is not directly associated with a building, examples of which include;

- 'areas such as parks, gardens, playgrounds, private or public forests, hedgerows, railway embankments, sidings, and marshalling yards, canal banks and locks, airfields, building sites, waste ground and sports grounds, *etc.*,
- areas used for the rearing of free-range and outdoor livestock, such as pigs and poultry, and rearing-pens used in the husbandry of game-birds,
- areas such as waste ground, building sites and waste dumps,
- areas used as food stores (potato/sugar beet clamps) in the open (*i.e.* in field),
- areas such as islands used by ground nesting seabirds'.

It should be noted, that the protection of growing crops, both in the open field and in glasshouses as well as the protection of in-field crop storage facilities, although regulated under legislation on the marketing and use of plant protection products rather than that relating to the marketing and use of biocidal products, is nevertheless the subject of this document.

5.4 Site Survey

It is necessary that a site survey be completed and/or a location list be compiled to establish the type, level and extent of the infestation. The survey will help identify important factors (*e.g.* degree of public access to the site; presence of children; and presence, or potential presence, of non-target animals, such as pets, farm livestock and wildlife) that will influence the choice of control strategies for that site. Evidence of poor housekeeping and hygiene, alternative sources of food and water, and obvious building/drain defects should be noted on the site plan. It may be useful to obtain photographic evidence of poor environmental management practices.

During the survey, rodents' food and water sources should be established. This will be particularly important if rodenticide baits are to be used as a part of the treatment strategy. Reducing the availability of alternative food and water at the start of the treatment, or shortly afterwards, can encourage rodents to feed on the bait. Where there are rats present, obvious defects such as broken pipes, defective sewer chamber covers, bad brickwork, half channels inside brickwork, stoppers missing from the rodding eye or surface water gullies should be noted and be brought to the attention of the responsible person, where applicable.

Where there is an obvious risk that may allow rat invasion from neighbouring properties, it is good practice to tell the responsible person of the risk that this may pose and, where appropriate, report it to the Local Authority which may be able to take appropriate action.

5.5 Risk Assessments

5.5.1 General

The information gathered during the survey should enable identification of hazards on the site and determine the risks posed to:

- human health (*e.g.* through accidentally eating bait, particularly by children);
- non-target animals present such as pets, farm livestock and wildlife (*e.g.* through eating bait and/or poisoned target rodents and/or other wildlife, such as field mice and bank voles);
- the environment through contamination of soil and water courses.

Consideration of these risks will determine which methods are most appropriate for dealing with the rodent infestation. After considering control measures, such as proofing, improvements in hygiene, environmental management and non-chemical approaches to control (*e.g.* traps), it may be concluded that use of a rodenticide is required. Before carrying out any treatment involving use of a rodenticide appropriate risk assessments should be conducted.

The environments in which rodent pest control procedures are to be carried out, for example on farms, in factories and in other commercial premises, may be intrinsically hazardous and it may be necessary to conduct a general assessment of risk in the workplace (see Further Reading).

5.5.2 Health and Safety Assessment

The Health, Safety and Welfare at Work (Chemical Agents) Regulations 2001 (in Northern Ireland the Health and Safety at Work (Northern Ireland) Order 1978) require that employers carry out assessments to identify any risks to operators and others who may be affected by treatments involving hazardous substances. There is a requirement to record the findings of the assessment. Employers may delegate responsibility for conducting assessments to identify risks to operatives and others at particular sites to pest control technicians employed by them, if the technicians concerned have been trained to conduct such assessments. A COSHH assessment is required in Northern Ireland.

The assessment conducted will help ensure that any rodenticide product selected, and its method of application, will result in effective pest control with least risk to the rodent pest management technician and anyone else who may come into contact with the rodenticide (see Further Reading).

5.5.3 Environmental risk assessment

It is good practice to conduct a Risk Assessment when a risk to the environment has been identified during the site survey. This assessment will consider the following:

- what is the treatment designed to achieve, what methods of rodent control may be used and how will success be measured,
- which non-target species may be present in, or frequent, the treatment site,
- what risks to non-target species have been identified,
- what steps are to be taken to prevent, or adequately control, exposure of wildlife and the environment,
- what are the facilities for the safe disposal of dead rodents and rodenticides,
- what is expected from the persons responsible for the infested site,
- what follow up measures are required,
- what environmental management measures are appropriate when the infestation has been removed to make the site subsequently less conducive to rodents?

All aspects of this assessment should be recorded in writing. When assessing the presence of non-target wildlife as part of the Risk Assessment, it is important to note that the types of wildlife which may use buildings vary significantly in their ease of detection. Non-target wildlife may use the site at different times and for many reasons including for breeding, shelter, or feeding. Certain species can be difficult to detect, and reliance must be placed on locating indications of their presence, whereas others which regularly frequent the site may not be present at the time of the survey. For example the barn owl is nocturnal and therefore will generally not be visible during a day-time search of a building. Rodent pest management technicians therefore need to be aware of the required survey methods necessary to determine occupancy, particularly for the species of conservation concern which may be impacted by rodenticide use. They should also be aware that even though a particular species is not recorded during a Risk Assessment, that finding does not mean that it does not occur in the area or use the specific site (see Further Reading).

5.6 Active ingredients

Active ingredients used in baits are divided into three main groups, reflecting the way they work. Acute rodenticides act rapidly (within 24 hours), but may induce bait shyness if a sub-lethal dose is taken. Sub-acute rodenticides may not cause death for several days, even though a lethal dose may be consumed during the first 24 hours and feeding may continue during this period. Chronic rodenticides are slow-acting - anticoagulants belong to this group. They cause death in a minimum of 2-3 days, but on average it takes 5-7 days.

Anticoagulants can be sub-divided into first- and second-generation anticoagulants (respectively FGARs and SGARs), based on their potency, or into multi-feed and single-feed anticoagulants, depending on the number of feeds required for a lethal dose. All anticoagulants have the advantage that a specific antidote (vitamin K1) is available in case of accidental ingestion.

The first-generation anticoagulants have the advantage that they are less acutely toxic to non-target animals and are less persistent in the environment. However, they are generally not recommended for use against house mice because of the suspected occurrence of resistance to first-generation anticoagulant rodenticides in that species.

The second-generation anticoagulants have the advantage that they require less bait to be eaten for the ingestion of a lethal dose and because resistance to them is less prevalent. However, they are more highly toxic to non-target animals and are more persistent in the environment.

The choice of active ingredient will be determined by the characteristics of the site, previous treatment history (if available), the conditions set out on product labels, the outcomes of the Health and Safety and Risk Assessments and consideration of the 'hierarchy of risk' described above. Another important consideration in the selection of active ingredient is the possible presence or absence of anticoagulant resistance. Where some resistance is present, the use of compromised anticoagulants exacerbates resistance problems and presents unnecessary and avoidable risks for non-targets species.

5.7 Bait formulations

The bait formulation should be appropriate to the conditions and circumstances of the infestation. A wide range of ready-to-use products is authorised under Regulation (EU) No 528/2012 of the European Parliament and of the Council of 22 May 2012 concerning the making available on the market and use of biocidal products, that include:

- meals,
- cut or whole grain;
- pellets;
- wax blocks;
- edible lards/gels/pastes;
- contact gels and foam;
- gases.

Once again, the choice of bait formulation will be determined by the characteristics of the site, previous treatment history (if available), the conditions of the product labels, and the outcomes of the Health and Safety and Risk Assessments. Generally, particulate baits may be more palatable to rodents than wax blocks but blocks may be better in adverse environmental conditions, such as sewers. When baiting burrows, treated grain is less likely to be kicked out of burrows by rats than wax blocks. Consideration should be given to the type of bait used and whether it could compromise security by being removed, hoarded or spilled during baiting operations. Rodent pest management technicians must check the approved instructions for use, as printed on product labels, prior to use of each product.

Remember:

- only use a product that is authorised under Regulation (EU) No 528/2012 of the European Parliament and of the Council of 22 May 2012 concerning the making available on the market and use of biocidal products, or pending the review of active substances and products in accordance with those Regulations, approved/registered under previous national legislation;
- comply with the statutory conditions of use, which are given on the product label;
- follow directions of use and other information supplied with the product;
- make sure all precautionary measures identified in the Health and Safety Assessment and the Risk Assessment conducted are carried out;
- follow the best practice requirements provided in this document.

Failure to do this may result in action by the enforcement authorities. Should the instructions for use printed on the labels of authorised rodenticide products be contravened, such use would contravene the terms and conditions associated with the authorisation of the product concerned. Such illegal use would render those responsible liable to prosecution and, on conviction, to penalties in accordance with the terms of the European Union (Biocidal Products) Regulations 2013 (S.I. No. 427 of 2013) – in Northern Ireland in accordance with the Biocidal Products and Chemicals (Appointment of Authorities and Enforcement) Regulations (Northern Ireland) 2013 (S.R. 2013 No. 206).

5.8 Toxic gases

Several rodenticide products are authorised for use which are intended for application in rodent burrows where they emit a toxic gas (phosphine) to exert a fumigant effect. Because of the obvious hazards of such products to human health, certain regulations apply to where they can be used, who can use them and how they should be applied. A Health and Safety assessment is always required - a COSHH assessment is always required in Northern Ireland. In all cases when they are used a Risk Assessment should be carried out. **Only persons with proof of professional competence for their use can purchase and use these formulations**. The risks to non-target animals is small so long as every effort is made to ensure that only target rodents inhabit treated burrows. They are not known to leave long-lived toxic residues in the environment or to have any secondary toxic effects. Whilst gassing is unlikely to provide the complete solution to any rat infestation, it can be a valuable method of reducing the size of a rat population quickly, following which rodenticide baits can be used more effectively to control the remaining population. Information on the safe use of products that evolve phosphine gas is provided above (see point 3.9). Information on training courses for their safe and effective use is available (see Further Reading).

6 GUIDANCE FOR TREATMENTS

6.1 Use a variety of control methods

It is important that pest management technicians do not rely solely on the use of rodenticides to control rodents. Programmes that integrate a range of methods, including physical and/or biological control, will be more successful in the long term than those that rely solely on chemical means. While trapping is labour intensive, it can prove useful in controlling small infestations and may provide an alternative means of control where the use of rodenticides is unacceptable. Break-back traps for use against mice and rats are available. If live-traps are to be used, they should be inspected regularly, at least once a day, and any captured animals humanely despatched (see point 3.6) (see Further Reading).

6.2 Rodent behaviour

Rats are particularly shy animals and nervous of strange objects that appear in their territories. It may be better to protect and secure bait points using existing materials, rather than introduce bait containers. During the survey, note any general features (such as gaps under paving flags) that could be used to place bait safely. This may eliminate the need for bait boxes and be more effective in bringing the rodents into contact with the bait. It may also reduce the total length of time bait needs to be laid and therefore reduce the likelihood of non-target animals coming across it. The choice of baiting method must reflect the outcome of the Risk Assessment conducted.

House mice are generally more inquisitive, and so are less likely to avoid new objects in their environment. As a general rule, mouse control is more likely to be successful if small amounts of bait are placed at a large number of locations.

These general descriptions of rat and mouse behaviour hold true in the majority of situations. However, eccentric behaviours by rodents are increasingly reported including the refusal of rats to take baits in the presence of established, long-term sources of alternative foods and mice which refuse to approach any apparatus of rodent control including bait boxes, and traps (lethal and non-lethal).

Remember that rats may carry bait away and hoard it, or drop it in areas where children or non-target animals can come into contact with it. If more bait is being consumed than expected for the size of the infestation, consider whether hoarding may be a problem.

If considered likely, search for any caches of bait and dispose of them safely. Secure packs/sachets or blocks at the placement site or reconsider the type of bait formulation being used. It is more difficult for rats to hoard large quantities of loose grain bait and the quantity of rodenticide in single pellets or grains will be substantially less than in intact packs/sachets or blocks, thereby reducing the potential risk to non-targets if bait is dropped by rodents.

Remember that rats may carry bait away and hoard it, or drop it in areas where children or non-target animals can come into contact with it.

6.3 Environment Management

Rodent control is not just about culling. For a rodent infesting population to prosper it needs food, shelter and water. If these elements are in short supply, then fewer young will be produced and the animals may even stop breeding. They may also become more prone to natural predators. In such circumstances rats may even move on and look for somewhere else more suited to their needs.

For rats and mice in open areas, removing low growing shrubs and other materials will make them more vulnerable to natural predators. This is particularly important close to buildings where, with a short dash, they can enter the building. Trees and shrubs too close to a building may provide a ladder that permits high level rodent entry. However, the site should not be cleared before treatment since this will disturb the rodent population and make bait acceptance more difficult to achieve. Vegetation or scrub clearance is only required within proximity to buildings and should be carried out outside the nesting season (March to August) in accordance with the Wildlife Act (1976) and Wildlife [Amendment] Act (2000). Woodlands, shrub, hedgerows and other natural or semi-natural habitats, offer a refuge for predators of rodents. Such habitats that are not in the vicinity of buildings should be maintained to enhance natural pest control. In Northern Ireland there are no specific dates prescribed, all nesting birds are protected and therefore it is strongly recommended that no scrub/tree removal is carried out between 1st March and 31st August in any given year (Landowners claiming agricultural subsidies are subject to additional restrictions).

Remove all alternative food sources as appropriate. Food waste should be placed in solid bins and not just plastic bags. Any food spillage should be swept up as quickly as possible. High risk foods should never be stored on the ground but on racks and shelves as high as is practical. Small amounts of food material should be placed in solid containers.

Rats need a reliable source of fresh water so it is important to restrict this through good maintenance of plumbing and other means that prevents access to water.

Each rodent infestation within a building starts with them finding an entry point in the first place. The extent of the infestation is then further enhanced if they are able to move freely within the building. Therefore a thorough check of all external areas is vital to find and block potential ingress points and with rats it is necessary to deal with the drains as well.

6.4 Placing the bait

Outside of buildings rats may be found in burrows, piles of rubbish, vegetation or other materials, sheds and garages or other buildings, compost heaps/bins, drains, ditches and hedgerows.

In all these places make sure bait is adequately protected from children and, as far as possible, from non-target animals.

If bait is placed in rat burrows treated grain is less likely to be re-exposed by rats than are wax blocks. Either cover the entrances of baited burrows to reduce the risks of bait being ejected and spilled or lightly block the burrow with a twist of straw or grass. Sites where burrow baiting is used should be visited more frequently than those where secure bait boxes are employed because of the greater likelihood of bait coming out of the burrows and being taken by non-target animals.

Baits applied indoors should not be placed directly on the floor as these are difficult to remove at the end of the treatment. Use plastic bait trays or other measures to keep bait where it is put and to facilitate recovery. It is necessary that account be taken of the risks of bait being disturbed as a result of the activities of rodents or other animals or changes to the site as a result of human activities. It is important that consideration be given to the size and the likely reactions of the rodent population (*i.e.* identify areas where rats may feel uncomfortable).

If suitable cover to protect baits cannot be found, use other measures unless (for indoor baiting) access to the areas where bait is laid can be controlled or restricted. Boxes for this purpose can be made, as long as they are fit for this purpose, or commercially available tamper-resistant bait stations can be acquired. Where the Health and Safety and Risk Assessments completed show that it is necessary, bait stations should be secured in position (*e.g.* when the bait is of a type that could be shaken out), and the instructions to prevent containers being opened should be adhered to.

An important point to note is that covering baits and tamper-resistant bait stations only protects baits from non-target animals that are larger than the target rodents. It is increasingly recognised that residues of anticoagulants found in wildlife are derived from baits accidentally taken by non-target small rodents, such as field mice and bank voles. Baiting should be avoided where a Risk Assessment indicates that feeding on baits by non-target small mammals is likely. Mouse droppings found in bait stations outside buildings will almost certainly be from these animals and are indicative of wildlife exposure to the rodenticide in use.

Rodenticides may cause rodents to die in inaccessible areas, where it will be difficult to retrieve the dead bodies. This could cause problems with odours. In such locations it may be appropriate to consider alternative control methods, such as the use of traps, to help retrieve the dead bodies.

6.5 Records

Make a written record of where bait has been placed, which rodenticide was used and how much bait has been laid. For complex and/or large sites ask the client for a site map or if not available make one yourself. Record the positions where bait has been laid.

Inform employees and others with regular access to the site that a rodenticide treatment is in place and of the products involved and any precautionary actions they should take. Where applicable, make those with responsibility for the site aware of the risks involved and the action they should take in an emergency. Leave with them a copy of your written record, including the site map showing the locations of baiting points. If possible, obtain their signature to confirm that they have received and understood the details of the work that has been carried out.

There may be instances where the treatment is carried out at a site where English is not the first language of many of those who work there. So, it may be difficult to ensure that the details of the treatment have been understood. Take reasonable steps to make sure that the hazards and risks associated with the treatment have been understood.

Photographs may be useful records of many aspects of rodent management programmes.

6.6 Monitoring

6.6.1 Using Toxic Bait

If a decision has been made that application of a rodenticide is needed and the treatment phase is underway, it is important to monitor it regularly to track its progress. During revisits:

- search for, remove and safely dispose of any carcases,
- make sure there is enough bait available,
- check that the baiting points remain secure,
- check for evidence of non-target mice/bank voles gaining access to baits,
- deal with spillages or other problems as they occur, and
- observe progress of the treatment.

Effective monitoring needs a reliable recording system which will enable identification of problems as the treatment progresses. This includes, for example, a reduction in efficacy of a usually effective rodenticide. Such observations should prompt a review of the treatment strategy.

6.6.2 Using Non-Toxic Bait

If the result of the site specific Risk Assessment demonstrates that use of a toxic bait is not justified, monitoring using a non-toxic or placebo bait and/or regular inspections should be conducted to confirm presence or absence of rodent pest activity.

6.7 Replenishing bait

Once laid, baits should be inspected frequently and where bait has been eaten, it should be replenished as necessary according to the schedule on the product label. Determine how frequently baits must be inspected from the label instructions and the characteristics of the infestation. As a general guide, baits should be inspected and replenished (if necessary) no later than seven days after they were first laid and at least fortnightly thereafter. More frequent visits will be required at sites with larger infestations, where burrow baiting has been used and where there are specific risks of bait disturbance and exposure to humans and non-target animals.

It is important to record the amount of bait put down, so a decision can be made as to whether, or not, a larger number of baiting points are needed. Continue baiting as instructed on the product label until all feeding activity has stopped, as overcoming the neophobic response in rats may take some time. However, if there is little evidence of bait takes after two weeks, it is unlikely that the treatment will prove to be effective and the bait should be removed and consideration should be given to an alternative strategy. Some populations of rats and mice are known to exhibit behavioural aversion to equipment used in rodent control, including rodenticide baits, bait boxes and traps. Conversely, if substantial bait takes continue over a long period, consideration should be given to the consumption of bait by non-target animals, and/or immigration of rodents onto the site from neighbouring infested sites. If neither of these is occurring, the presence of anticoagulant resistance must be suspected.

Some populations of rats and mice are known to exhibit behavioural aversion to equipment used in rodent control

6.8 Using non-anticoagulant rodenticides

While anticoagulants provide an effective and efficient method of removing rodents, if they are not available, if they cannot be used because of risks identified at the site or if resistance to them is suspected, alternative approaches may need to be considered. For example, in the case of house mice, alphachloralose is authorised for use indoors.

6.9 Removal of dying/dead rodents

Search for and remove any dying and dead rodents and dispose of them safely, in line with the product label. The following methods of disposal are consistent with best practice (in order of preference):

- *via* an on-site or on-farm small carcass incinerator (for which planning permission and required DAFM/DARD/NIEA licences have been obtained),
- with the site's or farm's domestic waste,
- in the site's or farm's normal non-hazardous waste, or
- by burial on-site, but away from sensitive areas.

If burying, bury deeply to a depth of a least 50cm to prevent recovery by foxes and badgers. This is particularly important to reduce the risk of secondary poisoning, especially in areas where birds of prey and other predators/scavengers are known to be active, and where populations of outdoor rodents are being controlled. For further advice on the disposal of rodent bodies contact the Environment Protection Agency (EPA), while in Northern Ireland, contact the Northern Ireland Environment Agency.

Search for and remove any dying and dead rodents and dispose of them safely, in line with the product label.

6.10 Reinvasion

The risks of reinvasion from neighbouring sites must be considered, especially in urban areas where general environmental management may be poor. It is good practice to liaise with other rodent control practitioners, Local Authorities, regulatory agencies and the general public to coordinate control strategies and reduce risk of reinvasion. Where members of the public wish to feed wild birds, they should be encouraged to use BirdWatch Ireland approved bird feeders and in the case of Northern Ireland, RSBP approved bird feeders, and should be aware that throwing bread and other food on the ground may, in addition to feeding the wild bird population, provide a food source for rats in the area. General advice on the storage of refuse and the use of rodent-proof bins should be provided where appropriate.

On farms, the risk of reinvasion may come from rats that are resident in neighbouring hedgerows, banks and ditches. Watercourses and hedgerows often provide a means of concealed movement of rats between sites. It is essential, during the initial site survey, to discover the full extent of the infestation and any sources of reinvasion and to take appropriate action.

6.11 Long-term/permanent baiting

Long-term/permanent external baiting should **never** be used as a routine rodent control measure, and is not required when implementing an effective IPM protocol (see point 2.2). However, in exceptional circumstances long-term baiting in and around buildings may be necessary at sites where there is a constant source of reinvading rats that cannot be dealt with at source. This, nevertheless, must be done in accordance with label instructions. Under normal circumstances the use of anticoagulant baits should achieve control within 35 days at most. Where activity continues beyond this time, further investigation is required including a review of the resistance status of the target population.

Long-term baiting at strategic points in and around a building may be justified when dealing with sites that are at high risk of re-infestation or the health risk associated with a particular site is considered high, such as a food manufacturing facility or hospital. Bait stations positioned outdoors may be visited by non-target small mammals, such as field mice and bank voles, and present a significant risk of exposure for a wide variety of non-target wildlife that take these animals as a food source. Remove rodenticide baits from outdoor bait points that show significant feeding by small mammals. This is recognisable by the size and colour of droppings found in bait stations.

Consider any long-term baiting programme carefully and ensure that such a strategy is justified by means of the Risk Assessment conducted for each location where this strategy is to be used and is documented. The preferred approach is to use either traps or non-toxic baits as a guide to the presence of an infestation of pest rodents that may then trigger the use of a rodenticide. Check baits regularly to establish whether rodents are present. It is not best practice to visit long-term bait points less frequently than recommended on product labels.

Bait stations should be established on likely runs with respect to the location of vulnerable buildings and premises. Where possible, these should be camouflaged. As well as being secure, the bait should be protected from the effects of moisture. Baits based on whole grain and wax blocks are usually the most suitable for this purpose. Wax blocks and sachets should, where necessary, be secured inside bait stations. Baits stations containing loose bait should be secured to the substrate to prevent the bait being shaken out.

6.12 Retrieval of bait

After treatment has finished, make every effort to ensure that all traces of the bait have been removed from the site and disposed of according to the label instructions. Leaving small remnants of bait in position will mean that susceptible individuals will succumb if they find and consume remnants, but others that are more tolerant or resistant will not do so. Routine service inspections should be frequent enough to prevent this occurrence, as well as being frequent enough to ensure compliance with the frequency of inspection specified on the product label.

Pest management technicians cannot rely on others to carry out such tasks. If denied access to properties to do this, it is best practice to record when attempts to retrieve the bait were made and to explain to the client in writing that responsibility for disposal has now been transferred to them. It is best practice to leave details of the requirements for disposal of the rodenticide(s) that have been used. If a previous practitioner has not removed the bait they laid, that practitioner should be given the opportunity to do so. If they do not do this in the time frame specified, they will have no further claim on it, but the current pest management technician has a duty of care to dispose of this rodenticide safely. Rodenticide that has been retrieved from a treatment undertaken may be reused if it is clean and has not been contaminated or marked by rodents, providing it can be stored in line with the approval conditions for the product.

6.13 Storage of bait for use

Keep all rodenticides secure in a suitable store, preferably away from other pesticides which may taint the bait and make it unpalatable. Requirements for the design and construction of pesticide stores and Requirements for their management and operation are available http://www.pcs.agriculture.gov.ie/sud/) (See Further Reading), in the case of Northern Ireland see http://www.pesticides.gov.uk/guidance/industries/pesticides.

Rodent pest management technicians should keep bait in its original packaging, except when put into a new container for use, to which a current copy of the product label should be attached. **It is illegal to offer such relabelled bait for sale, or to supply it to others.** Equipment used during treatments should be cleaned after use.

6.14 Operations after removal of rodent infestations

Once adequate control has been achieved the following environmental management measures should be considered and implemented as appropriate:

- improving hygiene and clearing rubbish,
- reducing harbourage,
- preventing access of rodents to food sources,
- proofing buildings.

Areas that are prone to infestation and re-infestation should be monitored regularly to prevent chronic infestations becoming established (see point 6.6). Where fly-tipping is suspected, it should be reported to the relevant Local Authority. Accumulations of rubbish may contribute to an infestation. The Local Authority environmental health department may be able to help remove such accumulations.

6.15 Rodent-borne diseases

Rodents carry diseases that may be serious, or even life-threatening, to people and animals. These may be caught by contact with surfaces or with water contaminated with rodent urine. Pest management technicians should wear waterproof gloves when working in areas that may be infested. Cover cuts and abrasions on exposed parts of the body with waterproof dressings. Some rodent pathogens can also be inhaled as fine particles derived from dry rodent excrement. Use an appropriate device for respiratory protection when working in dry and dusty environments that contain rodent debris.

Remove overalls and gloves and wash exposed skin thoroughly with warm soapy water before eating, drinking or smoking and after completing work. In the event of being cut, clean and dress the wound immediately. Further information can be obtained from the Health Protection Surveillance Centre (http://www.hpsc.ie) and in Northern Ireland from the Public Health Agency (http://www.publichealth.hscni.net/ or http://www.pesticides.gov.uk/guidance/industries/pesticides).

Rodents carry diseases that may be serious or even life-threatening to people and animals.

7 RESISTANCE

7.1 General

Treatment failures may be due to inappropriate, poor quality/old bait, inadequate quantities of bait, poor bait placement, bait shyness and reinvasion from surrounding areas. If these factors have been ruled out and the bait is being eaten without any significant decline in the rate of consumption, it may be a sign of the presence of anticoagulant resistance.

Resistance, Tolerance and Immunity explained - These terms are often mistakenly used to refer to same thing but they all have very different specific meanings

Resistance involves a genetic change within an individual rodent that enables it to be no longer susceptible to a particular rodenticide or toxin. This genetic change can then be passed on to its offspring so over time the whole population becomes resistant.

Tolerance is the ability of an individual to deal with increasing levels of a toxin through repeated regular exposure throughout its life, but this ability cannot be passed on to its offspring.

Immunity is the ability of an individual following exposure to a particular disease to no longer be susceptible to the disease. This ability is not due to any genetic change although it may be passed on through the placenta or by mother's milk.

Resistance to anticoagulant rodenticides is suspected in some rodent populations in Ireland. Such resistance may be confirmed through an on-going survey undertaken by CRRU Ireland.

On the basis of information available from other countries it is likely that anticoagulant resistance in mouse populations may be widespread and consequently second-generation anticoagulants or alternative methods may be more effective for their control. Consequently, the using of a second-generation anticoagulant, or other means of control, may be more effective and should be the first choice means of control.

7.2 How to recognise Resistance

The recognition of resistance is not easy or straight forward. If all baits have been cleared and no bodies are found, this may indicate a resistance problem, but under baiting can produce the same effect. At first, when all the bait has been cleared, the amount of bait placed at each location should be doubled or tripled and be followed up within a week. If there is resistance then after a week all the bait will again be cleared and there will still be no bodies. Concern should be raised if all the bait is cleared and the amount of bait consumed seems out of proportion with other evidence, such as droppings and smear marks.

Food will pass through a rodent's gut in a few hours whereas an anticoagulant will take several days to kill the rodent. Coloured droppings indicate that the rodent has eaten the rodenticide. However, if coloured droppings continue to be found beyond the normal period expected to gain control, no bodies are found, and the area has been baited in proportion to the level of infestation, such findings could be an indicator of resistance.

Under-baiting - If insufficient amounts of anticoagulant baits are used such that the rodent population can clear all the bait overnight and then there is no follow-up for 2 or 3 weeks, the rodents will have metabolised the rodenticide without having consumed a toxic dose. Rodents must feed on anticoagulant bait several times over a few days to consume a dose that elicits a toxic response.

In dealing with mouse infestations it is important to remember that mice feed little and often. Therefore extra bait boxes must be placed to kill them - under baiting encourages the development of resistance as only particularly susceptible individuals will be killed.

If all other possible explanations have been ruled out for the persistence of rodent populations and it is suspected that an infestation may involve a resistant population, CRRU Ireland should be informed (office@thinkwildlife.org). This information could identify areas of anticoagulant resistance and will complement information being compiled about the distribution of resistant rats and mice in Ireland.

DNA Testing – The genetic basis for rodent pest resistance to anticoagulant rodenticides has been mapped. It has been established that resistance to anticoagulant baits by Norway rats and house mice occurs at many European locations. Genetic testing is the best available means to prove that a particular population has such resistance. A survey to establish the extent and distribution of anti-coagulant rodenticide resistance in Norway rats and house mice in Ireland is being undertaken. Resistance to anticoagulants has been confirmed in many rat populations in England, Scotland and Wales.

There is confirmed resistance in Norway rats to the available first-generation anticoagulants warfarin, chlorophacinone and coumatetralyl and, in some areas, to the second-generation anticoagulants bromadiolone and difenacoum.

7.3 Managing Resistance

Where resistance is suspected, use of the bait to which it is suspected the rodents may be resistant to should be discontinued and the bait should be removed. Re-bait using a product with a different active substance. Resistance may just be to one rodenticide active substance, so this move alone may be enough to deal with the infestation.

If bait continues to be consumed without effect, it will be necessary to consider using a more potent anticoagulant rodenticide. If bait take is poor relative to the apparent size of the infestation, consideration should be given to the re-siting of the bait points and possibly to changing to another bait base, as well as to making other environment changes.

If resistance is to both bromadiolone and to difenacoum rodenticides, check the National Register of authorised biocidal products for other options (see Further Reading). The use of products containing brodifacoum, difethialone or flocoumafen are such options. When using any preparation it is essential to first read the label and to follow the instructions for use thereon. It is important to check the label of each consignment of product before use, as label texts are subject to regular updating.

If an external area is found in which rats have burrows, there may be an option to gas them with phosphine, as long as the area is 10m or more from a building (see point 3.9) and all non-target species can be excluded. A site specific Risk Assessment is always required.

Lethal and live traps can also be used provided it can be done in compliance with best practice (see point 3.6).

Behavioural resistance – Such resistance has been reported in mice and rats. If it is suspected that an infestation being treated contains such a population, it will be necessary to consider:

- an alternative treatment regime/control method (e.g. placing bait directly on the floor rather than in bait boxes if it is safe to do so),
- alternative formulations (e.g. contact gels and foam) or
- alternative bait bases (e.g. baits based on ingredients that are similar to those the rodents are eating at the site).

8 SPECIFIC CONSIDERATIONS FOR DIFFERENT SITES OF RODENT INFESTATION

8.1 General

Each rodent-infested site presents a different set of circumstances for professionals who are required to apply control measures. The role of clients of pest management service providers is critical in achieving effective rodent pest management (see point 2.2). Some sites, such as those in urban areas with little or no public access, will present few non-target risks. Sites with mouse infestations which are restricted to indoor locations will carry little risk of non-target exposure to wildlife, but there may be risks to human bystanders and to companion animals. At more exposed sites (*i.e.* open areas, industrial estates, canals, railways, *etc.*), which are accessible to wildlife, there may be significant risk of non-target exposure. As a rule of thumb, the further the site is from areas of human occupation and/or habitation the more likely there is to be a risk of wildlife exposure, either directly from consuming baits or indirectly from consuming poisoned target rodents and non-target small mammals, such as field mice and bank voles.

8.2 Domestic premises

Dealing with rodent infestations in and around domestic premises poses particular problems with regard to placement and protection of bait. It is important to explain to the householder the risks associated with the use of rodenticides.

Once baits have been laid, make sure the householder knows their location and is aware that they must not be moved or disturbed. Children and non-target animals, such as pets, may not be present at the time of survey and/or treatment, but may be there at other times. If this is the case, it is important to place baits in a manner to prevent contact. If adults with learning difficulties are present, it is essential that a responsible person has been informed of the treatment regime and the risks associated with the use of rodenticides. It is good practice to leave details about the products used, the appearance of the bait, the number and position of baits laid and the actions needed if bait is disturbed or consumed accidentally and to obtain, where practicable, the occupier's signature confirming full understanding of the treatment programme and the inherent risks to non-targets.

Unprotected stores of pet food may attract rodents and householders with pets should be advised to store such food in sealed containers. Poorly constructed compost heaps and compost bins placed directly onto soil may provide harbourage for rats and should be inspected during the survey undertaken. To discourage such infestations, householders should be given advice on their construction (placing them on hard flat surfaces such as concrete or stone paving flags) and advice on measures to exclude rats (*e.g.* by surrounding the base with fine chicken netting). General advice on the importance of sound structural maintenance of the property (*e.g.* sealing gaps under doors and around service pipes) should be given where appropriate.

The practice of feeding garden birds is common in domestic premises and food left available on bird tables and in bird feeders is highly attractive to rats. If rats become established around bird feeders the food should be removed to prevent access to it. Bird food should be stored safely in the same way as pet foods.

8.3 Block treatments

Effective control of rodents in the urban environment may be difficult in premises with multiple uses and/or occupiers. There may be several agencies involved in controlling rodents. Where possible, it is good practice to co-ordinate control measures to make sure all premises on that site are inspected and, where necessary, treated. This will reduce the chances of rodents surviving the treatment by avoiding control measures and reinvading treated areas.

8.4 Commercial (non-food) premises

The risk of infestation within commercial, non-food premises will be influenced by the work that takes place in them. A thorough survey should establish the areas that may be prone to infestation. Where catering facilities and food waste are on site these may be important areas to examine in detail.

8.5 Commercial (food) premises

Regulation (EC) No 178/2002 laying down the general principles and requirements of food law, places the primary responsibility to produce safe food on the food business operator. Regulation (EC) No 852/2004 on the hygiene of foodstuffs, requires that food business operators prevent animals and pests from contaminating food and have adequate pest control procedures in place. Owners/occupiers of food premises must, as a matter of routine, visually check for signs of pests and have a pest control reporting system in place. This should provide the rodent pest management technician with information on any recent sightings and may provide details of previous treatments. Food business operators can discuss appropriate pest control procedures with their supervising agency, *i.e.* the Health Service Executive, the Department of Agriculture, Food and the Marine, the Sea-Fisheries Protection Authority or the Local Authority Veterinary Service and in Northern Ireland with the Food Standards Agency, the Department of Agriculture and Rural Development or local councils.

8.6 Large institutions (e.g. hospitals, prisons, schools etc.)

Large institutions may have several locations that are prone to infestation. The presence of vulnerable individuals and restricted or limited access to particular areas will need to be considered when deciding on the control strategy. On-site kitchens may be an important focus of rodent activity. If waste disposal systems for food discharge directly into the drainage/sewer system, this could act as a rich source of food for rodents. Thus it is essential that a thorough survey be conducted and the methods and routes for disposal of food waste be established. Rodents may also invade other parts of the building when food is transported from the kitchen to where it is eaten. Service ducts may provide a route for the rapid spread of rodents through the complex and should be examined for evidence of rodent activity. If the ducting is classified as an enclosed space, then those undertaking inspections and treatments must be adequately trained to work in confined spaces.

Access restrictions to particular areas of the site may mean that it is not feasible to place traps and rodenticide baits in all parts. Integrating a range of control methods, combined with close monitoring of the progress of the control programme, is essential.

8.7 Parks, and other open areas

Dealing with rodent problems in open situations as defined at point 5.3, in both rural and urban areas, creates particular problems regarding the protection of bait points, particularly where rats may be associated with lakes and ponds. Baits should be placed directly into active burrows, especially in areas where the public has restricted access, such as islands on a lake. Loose grain and pelleted formulations may be suitable for such purposes. Cover all treated holes, and regularly monitor for evidence of bait consumption, spillage or disturbance. Record the position of all baits laid on a sketch plan, or *via* Geographical Positioning System (GPS) coordinates, as appropriate. Where bait is placed in areas of public access, and tamper-resistant bait stations are not used, it is a regulatory requirement that areas treated be marked during the treatment period, and a notice explaining the risk of primary and secondary poisoning as well as indicating the first-aid measures to be taken in case of poisoning, must be made available alongside the baits. When tamper-resistant bait stations are used, they should be clearly marked to show that they contain rodenticides and that they should not be disturbed.

Other open areas with public access where similar considerations would apply include railways (embankments, cuttings *etc.*), canals and the banks of natural water courses, reservoirs, footpaths, bridleways, cycle paths, allotments and airports/airfields.

8.8 Sewers

8.8.1 General

Sewers of all kinds provide an ideal environment for rats, especially if their structure is in poor repair. While rodent pest management in sewers is a responsibility of Irish Water, in practice rodent pest management in sewers is carried out in the context of Service Level Agreements (SLAs) with relevant Local Authorities or their agents.

The treatment of rodent infestations in sewers inevitably involves the application of a rodenticide. This is a specialist operation and is usually conducted by teams that are specially trained and equipped for such work.

The only way to successfully control rats in sewers is to develop a comprehensive and effective sewer baiting programme. Successful programmes require adequate funding, excellent dialogue with the rodent pest management service provider, a detailed plan, continuous monitoring, and committed staff that are provided with good equipment and appropriate protective clothing and equipment.

It should be remembered that sewers can be very dangerous places and safe working practices are essential. When using rodenticides always read and understand the label instruction.

Best practice requirements for the treatment of rat infestations in sewers is provided in the following paragraphs (see Further Reading).

8.8.2 Planning

Thorough planning is essential to ensure effective targeting of resources and correct application of baiting technique. It is recommended that areas for baiting should be agreed at least at intervals of six months when the outcome of the previous six month's activity can be assessed. The areas to be baited and frequency of baiting should be identified using historical data including results of previous treatments, details of surface infestations, along with relevant information concerning repairs and renewals of the sewerage system, as well as previous test-baiting results.

It is essential to have up-to-date drainage maps showing public sewers, manholes, catchment areas and direction of flow. Manholes chosen for baiting should ideally be in discreet catchment areas, for maximum reduction of the rat population in that catchment area and minimum opportunity for immigration from adjoining systems. Baiting should commence furthest from the sewer outfall and move towards the outfall or junction.

A survey of the area is important when planning strategy. The consideration of rat movements is important as there may be rat populations between manholes. If food premises drain into the sewer between manholes bringing substantial quantities of food waste into the sewer, the home range may be quite restricted and movement limited.

This limitation on the effectiveness of manhole baiting has to be recognised and such rats must be dealt with in other ways, such as by reducing the amount of food waste discharged to sewer, and ensuring good repair of drains and sewers with control over potential points of rat entry and exit.

Increasing financial constraints have placed considerable pressure on funding of sewer baiting making it imperative to develop and implement the most cost effective and efficient sewer baiting programmes with reduced budgets. In this less than ideal financial climate, where access to historical records of rat activity associated with manholes in the planned programme area are available, it is not considered necessary to carry out test baiting prior to treatment.

Resources saved by not carrying out test baiting can be redirected to develop a more comprehensive treatment programme.

In planning a sewer baiting programme where there are no previous historical records relating to levels of infestation available, or where a new contractor has been engaged, it may be necessary to test bait the system to establish the level of current rat activity. Some 10% to 15% of the manholes on the system should be selected for test baiting. These should include manholes that have been shown to have rat activity on a previous occasion together with manholes known to be associated with surface rat infestation in the designated area.

All "stuck" manhole covers identified during the course of the baiting programme should be referred for releasing, if necessary by a third party contractor. Once the cover is released the chamber should be baited immediately.

The relationship between sewer and surface infestations can be difficult to establish. There is evidence that where significant populations of rats live in sewers, more than 50% of surface infestations can be traced directly to sewer and drainage defects. Local Authority service requests for surface rat infestations for a given period, plotted on a GIS and overlaid on sewer maps is an extremely effective tool in planning sewer-baiting programmes The less urban an area becomes the less likelihood there is that such high levels of infestation from the sewers would exist.

To ensure that population recovery in sewers is slow, it is important that all surface infestations are also treated to prevent migration back into the sewers, and that all possible sites for harbourage including redundant lengths of drain or sewer are dealt with and any disrepair in the sewerage infrastructure is dealt with.

It is essential to have up-to-date drainage maps showing public sewers, manholes, catchment areas and direction of flow

8.8.3 Strategy

For the identification of catchments, up-to-date information on sewers in the form of maps is required by the rodent pest management service provider. However, information on some older sewers may not always be complete. The same is true for private sewers, which may become apparent only when there is major problem such as flooding or collapse.

Obtaining access to manholes can raise several difficulties, *i.e.* following resurfacing of roads tar macadam can partially, or completely, cover manholes to be raised. Parked vehicles also present problems in gaining access to manhole covers, either because cars are parked over manhole covers or streets that contain long rows of parked cars have limited access for other vehicles, including the sewer-baiting vehicle.

In large towns and cities the task of organising routine sewer treatments can often be time consuming. Greater progress can be achieved if the sewer baiting programme can be subdivided into smaller sub areas. In town centres where traffic congestion is high with access to manholes made difficult due to parked vehicles *etc.*, consideration should be given to programming these areas for treatment at less busy periods *e.g.* early morning or on Sundays.

In areas where re-housing schemes are in progress it is a good idea to attempt to disinfect the sewers of the district concerned before the local inhabitants are moved out. Otherwise rats that are looking for fresh harbourage may travel great distances - presumably because other rat colonies that they may meet during their search show hostility to them. Where sewers are under construction, or have been opened up for repair, it is wise to ensure that they are temporarily sealed-off.

Baiting strategies should include storm water overflows. Experience has shown that rat populations tend to be present on the banks of water courses close to the storm water outlets. To minimise the potential for reinvasion into the sewer network, sewer baiting should be undertaken within the storm water overflow. The banks of watercourse should be surveyed and surface rat activity controlled with rodenticide cleared for use in the external environment.

When surveying water courses, especially rivers which may be fast-flowing, it is essential that a suitable risk assessment be carried out. The baiting team should comprise a minimum of 2 technicians suitably equipped with waders and wearing a safety harness tethered to the "anchor man or woman" on the bank of the watercourse. Care should always be taken to ensure the rat activity evident on banks is of the Norway rat and not mistaken for signs of activity by bank voles *Myodes glareolus*, a non-target species.

8.8.4 Treatment

8.8.4.1 Rodenticides

The selection of an effective rodenticide active ingredient and bait formulation is a key component governing the overall success and cost effectiveness of the baiting programme.

Sewer bait is available in a number of formulations including loose grain, sachets and wax blocks. Of the three formulations loose grain bait is the more palatable to rats and therefore should be considered as the preferred option.

For sewer baiting, second generation anticoagulants are to be preferred over the older first generation anticoagulants because they are more toxic to Norway rats and this allows **pulse baiting** to be carried out in the sewer system. Of the second generation compounds the more toxic single feed rodenticides containing e.g. brodifacoum, flocoumafen and difethialone are to be preferred over older less toxic compounds such as difenacoum and bromadiolone. The use of these more toxic anticoagulants in a sewer treatment programme allows for greater cost efficiency.

In addition to human taste deterrents, sewer baiting formulations invariably contain mould inhibitors to slow down the rate of decomposition of the bait base whilst in the humid atmosphere found in the sewer environment.

Rodenticides authorised for use in sewers usually contain a higher concentration of active ingredient than those permitted for outdoor use. It is illegal to use rodenticides authorised only for sewer rodent control for the control of surface infestations.

Loose Grain Baits There are a number of ways to introduce loose grain baits into a sewer system. The objective is to place the bait onto the benching of the drainage inspection chamber in such quantities as directed on the product label. In shallow chambers, such as those found in domestic drainage systems, this can usually be achieved by spooning the rodenticide onto the benching with the aid of a long handled spoon. In deeper manholes a bait depositor is required. The required quantity of bait is placed into the depositor and lowered onto the benching. On contact with the benching the bait is released.

Alternatively a telescopic baiting tube can be used. The telescopic tube is introduced into the chamber and lowered onto the surface of the benching. The required quantity of sewer bait is then spooned into the tube and is gravity fed onto the benching. The usefulness of this piece of equipment is generally limited in deeper chambers by the total extended length of the equipment.

Loose grain bait placed either in polythene bags or preferably in bags produced from tubular synthetic stockinette the openings of which have been sealed using a bagging machine, is suitable for all depths of manholes and is particularly useful in deep chambers. The sachets or stockinette bags, which have the additional advantage of being somewhat self-sealing and containing the bait even if the bag is punctured by the rat during bait take, are attached to a length of cord or preferably wire and lowered onto the benching or just above invert level. The cord/wire is then fastened to a convenient step iron or affixed at a suitable point in the chamber close to ground level. This method is particularly useful when subsequently checking for takes on the bait by facilitating easy recovery of the bait for inspection. It also guards against the risk of "wash off" during flash flooding of the system. Stockinette bags containing the bait are usually made up in bulk at the operations depot the day before treatment is to commence.

Ideally the selection of bait formulation and method of application should be based on an individual assessment of the manhole to be treated, taking into account its depth, the presence of benching *etc.*

Bait Blocks Bait blocks are a useful alternative to grain baits. They are usually manufactured with a hole through the centre of the block which can be used to secure the block by passing a length of wire or nylon string through this hole which should then be tied. The block can then be lowered onto the chamber benching or to just above the invert level of the chamber and the wire secured to a step iron or to a convenient point on the brickwork at the surface of the chamber.

This method of laying bait has the advantage that the block can easily be recovered on subsequent visits to check for "takes" and is especially useful for preventing "wash off" in the chamber during storm surcharges.

8.8.4.2 Treatment methodology

It is essential to achieve as high mortality as possible. Population recovery of poorly controlled rat populations in sewers can be at a rate of 3% a week but with re-invasion this can rise to 12%. Thus it is possible for populations to recover within six months of treatment.

An effective sewer baiting programme requires an understanding of all difficulties that can exist in attempting such an exercise, from availability of funding, to access to sewers, from the nature of catchment areas, to practical problems such as clearing of keyholes in manhole covers before any attempt at lifting can be made.

To enable any sewer-baiting programme to be successful, the staff employed need to have an enthusiasm for the job, be fit, agile and be able to record details of the programme accurately. If these criteria cannot be satisfied, the programme will fail with both financial and operational consequences.

A critical requirement for an effective rodenticide strategy is to ensure that the necessary revisits to manholes are made consistently on a weekly basis or as indicated on the product label.

When selecting a sewer system for baiting, the number of manholes should not exceed that which can be effectively baited within one day or working week (5 days) by the assigned team. This will vary according to the area to be baited, travelling distances and traffic flows *etc.* It might be necessary, for example, in city centres to arrange for sewer baiting to be carried out in the early morning before traffic becomes congested or on Sunday mornings.

The number of manholes that can be baited per day by a team of two or three people will vary according to how much traffic there is, distance from the depot, ease of finding and lifting the manholes, difficulties caused by parked cars and other factors. A realistic assessment of the number of manholes that can be lifted for any area must be made before detailed planning can begin.

It is extremely important to ensure that a record of rat activity is compiled until no further activity is recorded. This may require two or three revisits. **A treatment strategy involving initial baiting followed by just one revisit is bad practice; is not cost effective; and will not result in successful control of sewer rat populations**.

Pulse baiting technique Pulse baiting is particularly appropriate for use in sewers and is the favoured approach. The pulse baiting technique was introduced for use with the more toxic anticoagulants, such as brodifacoum, flocoumafen and difethialone (see point 6.4).

This technique contrasts with saturation baiting, which involves use of other less toxic anticoagulant rodenticides, in which more bait must be laid and the rats have to eat more of the bait to consume a lethal dose. Pulse baiting is not necessarily more effective, but it is certainly cheaper, because both the amount of labour required and the quantity of bait used are much less than with saturation baiting.

Normally three baiting pulses are sufficient to remove almost the entire population, although more may be required in heavily infested systems. The intensity of baiting periods (pulses) depends on the rat population in a sewer or in and around the building and the rate of immigration from neighbouring areas. The intervals between pulses and the number of pulses have to be decided for each location based on the results of monitoring of the rodent population by test baiting.

Test baiting Ideally, manholes in discreet catchment areas should be chosen for test baiting, focussing on those where problems have been identified using data obtained on sewer condition, levels of surface infestations over time, and other historical data such as information indicating that particular manholes were previously associated with rat activity. Different manholes should be chosen for test baiting each time to ensure all manholes are test-baited over a number of years.

Sewage system junctions must be included, along with difficult to reach manholes in busy roads. Early morning starts will ensure these manholes are not missed. Pulse baiting is recommended.

It is recommended that 50 grams of rodenticide be laid in each manhole to be test-baited. The manhole **MUST** be revisited seven days later. If no takes are recorded, then no further action is necessary unless there is fresh evidence of rats within the manhole.

8.8.4.3 Recommended sewer baiting procedure

Initial baiting (Week 1) Lift and treat all manholes within the system to be treated. The amount of bait laid at each manhole may vary between 150-200 grams, according to the rodenticide used. The quantity of bait laid must always be in accordance with the label instructions.

First revisit (Week 2) Revisits should be made after a period of seven days to all the manholes visited during the initial baiting. There is often a delay in rats finding the bait and eating it, therefore any revisit scheduled sooner than this may result in some activity being missed. Findings during all revisits must be recorded.

Those manholes with 'complete' takes of bait should be re-baited with the same quantity of bait used during the initial visit. In addition, where positive takes are recorded, two manholes either side of the positive take in all directions must also be baited and included in subsequent revisits.

Additional bait should not be placed in manholes showing no rat activity. Manholes with incomplete bait "takes" should be "topped-up" to the level of bait applied at the initial visit.

Manholes in which complete bait "takes" are recorded, with a total absence of bait and where there is a suspicion that this has been caused by a surcharge (due for example to heavy rainfall) can be classed as "wash-offs".

If this is suspected, re-bait the chamber with the same quantity of bait used on the initial visit – 150-200 grams and in addition place 50-75 grams of sawdust/wood shavings adjacent to the bait.

If, on the subsequent revisit, both the bait and sawdust/wood shavings are absent from the benching a "wash off" is confirmed. Re-bait with rodenticide blocks secured to wires from the top of the manhole or from available foot irons or other attachment points. The blocks should rest on the benching where they will be easily found by the rats. Avoid suspending the blocks above the benching as these are unlikely to be found in the dark environment of the sewer.

Second revisit (Week 3) A revisit should be carried out to only those manholes in which bait 'take' was recorded during the first revisit (week 2) or those showing a potential 'wash-off'. Manholes adjacent to these "active" manholes should also be baited *i.e.* two manholes either side of the positive take in all directions.

Those manholes showing "partial takes" of bait should be topped up to the level applied in the initial baiting (150-200 grams) while those showing "complete takes" should be re-baited with a similar quantity.

Third revisit 3 (Week 4/5) As for revisit 2 (Week 3) only those manholes showing a 'take' of bait from the previous week need be visited and re-baited. Further revisits should be scheduled until all rat activity in the chamber has ceased.

Recovery rates of rat populations in sewers following treatment is high, therefore, the more successful the baiting programme is in achieving the complete elimination of the rat population, the slower any potential recovery of the population will be and the more cost effective the programme will be.

Reactive baiting Provision should be made in conjunction with the Local Authority for reactive sewer baiting to be carried out as and when required. It is therefore important for Local Authorities to liaise with the water company on a day to day basis and to notify them when investigation of reports of surface rat activity indicate that the source of the infestation may be drainage related.

8.8.5 Record Keeping

8.8.5.1 Treatment Records

Accurate records must be maintained to facilitate the effectiveness of revisits; to build up knowledge of heavily infested areas; to allow comparison with surface infestations; and to facilitate investigation of re-infestations. Where relevant, coordination with neighbouring Local Authorities will be required to ensure the effectiveness of sewer baiting programmes.

8.8.5.2 Sewer maps and mapping software

Access to Local Authority and water company electronic sewer mapping software is essential if effective records are to be produced and maintained. Such software systems provide required information such as direction of flow, depth of chamber, size of sewer and, most importantly, the unique reference number assigned to chambers that can be used to identify chambers in the sewer network when recording details of treatments carried out. Ideally, data should be recorded using electronic data recording equipment such as personal digital assistants (PDAs) or hand held computers.

In the absence of access to an electronic mapping system, hard copies of sewer maps should be provided by the Local Authority or water company as appropriate.

8.8.6 Communications

Regular operational meetings with the Local Authority and/or the water company are essential. Keeping all parties informed is of paramount importance to a successful sewer baiting programme. This should involve monthly written reports on the manholes which have been treated, the level of rodenticide "takes" that have been recorded along with any infrastructure issues that may have been encountered, such as broken step irons, damaged covers or rims, partial blockages *etc.* It is recommended that quarterly meetings are held to facilitate an exchange of views and to plan the way forward. This enables both parties to understand the difficulties and successes encountered in providing a professional sewer baiting programme.

Local Authorities may additionally find it useful to set up call-out baiting arrangements with their rodent pest control management provider. When a Local Authority investigates a rat infestation and suspects that there is a defect in the sewerage infrastructure, it is useful to arrange for localised sewer baiting in the vicinity of the defect. The rodent pest management service provider should be prepared to carry out such work at relatively short notice. It is also important to deal with any defects in private systems. This may involve testing of drains and private sewers using smoke tests or in some cases CCTV.

Results should be fed back into the infestation investigation to allow appropriate action and legal enforcement, if necessary.

The only way to successfully control rats in sewers is to provide a comprehensive and effective sewer-baiting programme

8.9 Farm buildings

The average farm has a range of buildings, including grain storage facilities and animal-rearing accommodation. Infestations may be found in all these places as well as in outdoor locations in the immediate vicinity. It is also likely that livestock, domestic animals, including cats and dogs, along with a range of wild birds and mammals use or visit various parts of the holding, and certain species which frequent the site may not be obvious at the time of conducting the Risk Assessment. Children may also be present.

The site survey should have identified where rats are living, travelling and feeding, as well as scope for the removal of food and harbourage to reduce the rodent carrying capacity of the site. The Health and Safety Assessment and the Risk Assessment should help decide on the most suitable methods of controlling rodents including, if rodenticides are to be used, the rodenticide active ingredient and formulation to be used, and the best method of presenting the bait to achieve rodent control with the least risk to children and animals.

8.10 Livestock Units

Do not place baits where animals are likely to be able to gain direct access. Avoid baiting in areas which could result in rodenticides falling into yards, pens or cages. Where pigs are present, it is particularly important that regular checks are made, because they will eat rodent carcasses and are particularly sensitive to warfarin.

8.11 Straw stacks and other stored commodities

Stored feeding stuff and bedding, such as stacks of bales kept outdoors or in open-sided barns, are particularly attractive to rodents, especially during winter. The incorporation of rodenticides as 'place packs' during the construction of stacks of hay and straw bales presents unacceptable risk to non-target animals and livestock because the packs cannot be reliably recovered.

If a significant rat infestation occurs, and bait is used either within or around the stack, take account of the possibility that baits may become exposed or disturbed as the stored material is used and that children or non-target animals may have unrestricted access to the site. In such circumstances, bait placed in plastic bags or applied loose may be particularly hazardous to wildlife and other animals, and may also contaminate the stored product. Persons that dismantle stacks must be informed as to the importance of ensuring that bait remains protected.

Suitable bait containers such as tamper-resistant bait boxes should be used. Lengths of drainpipe may also be used for protecting baits, but do not use pipes of excessively large diameter and ensure they are long enough to stop long-necked birds reaching the bait. Consider using pipes with baffles or restricted entrance sizes to reduce the risk of spillage of bait. These bait points may be in position for several months, so consider the placement position carefully.

Take particular care where a public footpath runs close to the treatment areas or other general access is foreseeable. In such circumstances it may be necessary to provide advice as to the treatment being carried out. This may require that warning notices be erected. Always refer to the product label for directions for use.

Monitor such treatments frequently and check for evidence of displaced bait points, spillage or interference.
As the straw or other material is used up, remove bait stations that have become exposed. Dispose of uneaten bait found by following label advice, or using the services of a licensed toxic waste contractor. Search for and remove any dying and dead rodents and dispose of them (in order of preference):

- *via* an on-site or on-farm small carcass incinerator (for which planning permission and required DAFM/DARD/NIEA licences have been obtained),
- with the site's or farm's domestic waste,
- in the site's or farm's normal non-hazardous waste, or
- by burial on-site, but away from sensitive areas.

If burying, bury deeply to a depth of a least 50 cm to prevent recovery by foxes and badgers. This is particularly important to reduce the risk of secondary poisoning, especially in areas where birds of prey and other predators/scavengers are known to be active, and where populations of outdoor rodents are being controlled. For further advice on the disposal of rodent bodies contact the Environment Protection Agency (EPA) while in Northern Ireland, contact the Northern Ireland Environment Agency (NIEA).

8.12 Ditches, hedgerows and woodland

Significant rat infestations in open countryside only occur in places where food availability is high. It is always best practice, given the 'risk hierarchy', to remove sources of food for rodents rather than to apply rodenticides (see point 5.5).

If baiting is required, dealing with rodent problems in open rural situations creates additional problems regarding the protection of bait points, particularly where rats are living in burrows excavated in soil.

Place baits directly into active burrows or use suitable boxes or containers. Loose grain, pelleted or sachet/pack formulations may be suitable for such purposes. Cover all treated holes, and regularly monitor for evidence of bait spillage or disturbance.

Baits placed in open areas far from human habitation are the most likely to be encountered by wildlife because of its greater abundance in these more remote areas. Special care is required in the use of rodenticides, especially the second-generation anticoagulants, in these situations. Where mouse droppings are found in bait containers in open areas they are likely to be from non-target small mammals, such as field mice and bank voles. The contamination of these animals by rodenticides is a significant source of wildlife exposure.

Accordingly the use of rodenticides in ditches, hedgerows and woodland presents particular challenges, as they are open to the public, to domestic and to wild non-target species. Appropriate risk mitigation measures should always be undertaken and rodenticides applied according to label requirements, the results of the Health and Safety and Risk Assessments conducted and the general principles of best practice.

8.13 Railways (embankments, cuttings etc.), canals and natural water courses, reservoirs

Railway embankments are well known as sites of rat harbourage and infestation. Rats damage cables in these areas, leading to signalling and power failures in the railway industry and causing significant economic damage and risk to human safety. A considerable amount of litter and undergrowth can be found along railways, which attracts rats. Rabbits are an example of a typical non-target species (in terms of rodenticide use) that are found along railway embankments and care should be taken to identify rabbit burrows (as well as the burrows of other non-target species), in addition to rat burrows before applying rodenticide.

8.14 Footpaths, bridleways, cycle paths

These areas are open to the public, domestic animals and non-target wildlife. The general principles of control in this document are also relevant here. Litter left by the public can attract rodents in these areas.

8.15 Allotments and Gardens

Gardens in open areas and compost bins used on allotments attract rats, providing a food source and harbourage. Correct use and maintenance of compost bins should be advised as it is essential that wire mesh be placed under compost heaps/bins, being careful not to leave protruding wire in order to minimise the risk of injury to gardeners and pets. Mesh with a hole-size of 10mm or less is ideal.

Composters must be looked after and well-maintained - regular checks should be made to ensure that the compost heap has not attracted rats. Signs to look for are clean holes within the compost material where a rat could have burrowed in or any holes in the ground around the base of the heap leading into the rotting matter.

A similar check needs to be made with plastic compost bins - look for any holes around the base of the bin or any holes/scratch marks on the bin. Holes or marks on the composter can be an indicator of rodent activity. A local pest management service should be contacted to deal with the problem. Properly managed compost heaps and bins will not create problems. If they are not properly maintained they can attract rats, as they provide food, shelter and warmth.

Compliance with this guidance can help to limit rat activity and therefore reduce rodenticide use in allotments and gardens, leading to a reduction in the risks posed to non-target species. Foodstuffs grown on allotments also attract rodents as does chicken feed and other domestic animal feed frequently found on such sites (see Further Reading).

8.16 Airports

A number of features of airports provide harbourage for rats and can be conducive to rat activity in the open areas of such sites. For example, areas of cultivated grass at airports intended to reduce habitats for flocking birds, and therefore to reduce aircraft bird-strikes, may provide rat harbourage. Natural predation of rats is also limited at airports due to the discouragement of raptors by various means and the exclusion of other carnivores by fencing. Although non-target species are discouraged at airports, they may still be present, as can airport workers, so the presence of these non-targets should be considered when compiling a control strategy.

Areas around airport perimeter fences are often subject to fly-tipping, thus providing harbourage and food sources for rats. Perimeters should be inspected for rodent activity.

The principles of rodent control described in points 8.7 through 8.13 are particularly relevant and should be adhered to, as well as the principles described throughout this document.

9 FURTHER ADVICE

Further advice on dealing with rodent infestations can be obtained from rodenticide manufacturers and distributors and also from:

- **Irish Pest Control Association (IPCA)**
  (Tel: 087 770 2059 website: http://www.ipca.ie/)
- **British Pest Control Association (BPCA)**
  (Tel: 01332 294288 website: http://www.bpca.org.uk
- **National Pest Technicians Association (NPTA)**
  (Tel: 01773 717 716 website: http://www.npta.org.uk/)
- **Chartered Institute of Environmental Health (CIEH)**
  (Tel: 020 7928 6006 website: http://www.cieh.org/)
- **Environmental Protection Agency (EPA)**
  (Tel: 053-916-0600; website: https://www.epa.ie)
- **Department of Agriculture Food and the Marine (DAFM)**
  (Tel: 01 615 7575; email biocides@agriculture.gov,ie; website: https://www.pcs.agriculture.gov.ie)
- **National Parks and Wildlife Service (NPWS)**
  (Tel: 01-888 3242; email nature.conservation@ahg.gov.ie; website: www.npws.ie)
- **Northern Ireland Environment Agency (NIEA)**
  (Tel: Pollution Prevention - 028 9262 3171; Wildlife Licensing – 028 9056 9551; email nieapollutionprevention@doeni.gov.uk

For guidance on legislation relating to health and safety at work, consult the Health and Safety Authority (HSA)
(Telephone: 01 614 7125; LoCall 1890 289 389 (9.30 to 4.30 Monday to Friday); Email wcu@hsa.ie;website: http://www.hsa.ie/).

For guidance on Environmental Risk Assessment, go to:
http://www.thinkwildlife.org/?wpdmact=process&did=OC5ob3RsaW5r

In Northern Ireland, for guidance on legislation relating to health and safety at work consult the Health and Safety Executive for Northern Ireland (HSENI)
(Infoline: 0800 0320 121; website: http://www.hseni.gov.uk/)

In Northern Ireland, for guidance on environmental risk assessment, go to:
http://www.thinkwildlife.org/?wpdmact=process&did=OC5ob3RsaW5r

10 FURTHER READING CONTINUED

Rodents and disease:

Zoonoses that can be acquired from rats: England and Wales. Public Health England. URL: http://www.hpa.org.uk/Topics/InfectiousDiseases/InfectionsAZ/Zoonoses/GeneralInformation/zoo010ZoonosesFromRats/.

Rodenticide Products Authorised for Marketing and Use:

Biocidal Product Register, Pesticide Controls Division, Department of Agriculture, Food and the Marine, Backweston Campus, Young's Cross, Celbridge, Co Kildare. URL: http://www.pcs.agriculture.gov.ie/biocides/

European Chemicals Agency Register for biocidal products which lists all authorised products and can be searched using filters to sort by Member State. URL: http://echa.europa.eu/information-on-chemicals/biocidal-products

Rodenticide Products Authorised for Marketing and Use in Northern Ireland:

Chemicals Regulation Directorate, Health and Safety Executive, Redgrave Court, Merton Road, Bootle, Merseyside, L20 7HS, United Kingdom. URL: http://webcommunities.hse.gov.uk/connect.ti/pesticides/view?objectId=6020

European Chemicals Agency Register for biocidal products which lists all authorised products and can be searched using filters to sort by Member State. URL: http://echa.europa.eu/information-on-chemicals/biocidal-products

Wildlife management policy:

Bats, birds, buildings and You! The Heritage Council. URL: http://www.heritagecouncil.ie/fileadmin/user_upload/Publications/Wildlife/Bats_Birds_Buildings_You/Bats_Birds_Buildings_You.pdf

Barn Owls in Ireland: Information on the ecology of Barn Owls and their conservation in Ireland. BirdWatch Ireland. URL: http://www.birdwatchireland.ie/LinkClick.aspx?fileticket=OTU%2bQ82oWBk%3d&tabid=1432

Guidance notes for experts undertaking surveys of traditional farm buildings under the Heritage Council's Traditional Farm Buildings Scheme. Prepared by BirdWatch Ireland for the Heritage Council. URL: http://www.heritagecouncil.ie/fileadmin/user_upload/Publications/Wildlife/Bats_Birds_Buildings_You/Bird_Survey_Requirements.pdf

Bat Survey Requirements, The Heritage Council. URL : http:// http://www.heritagecouncil.ie/fileadmin/user_upload/Publications/Wildlife/Bats_Birds_Buildings_You/Bat_Survey_Requirements.pdf

Other general best practice guidance:

Pest Control Procedures Manual. Chartered Institute of Environmental Health, Hatfields, London. 32pp. URL: http://www.cieh.org/policy/pest_control_rats.html.

I.S. EN 16636:2015 Pest Management Services – Requirements and Competencies, National Standards Authority of Ireland (NSAI). URL: http://shop.standards.ie/nsai/Details.aspx?ProductID=1797043

Guideline on Best Practice in the Use of Rodenticide Baits as Biocides in the European Union. The European Chemical Industry Council, European Biocidal Products Forum, Rodenticides Working Group. Brussels, Belgium. 23 pp. URL: http://www.cefic.org/About-us/How-Cefic-is-organised/Fine-Speciality-and-Consumer-Chemicals/European-Biocidal-Products-Forum-EBPF.

BRC Global Standard for Food Safety, Issue 7. URL: http://www.brcglobalstandards.com/Manufacturers/Food/FoodIssue7.aspx#.Vf07bd9VhBc

Campaign for Responsible Rodenticide Use. URL: http://www.thinkwildlife.org/.

A Household Guide to Composting. EPA. ISBN 978-1-804095-407. Available at: http://www.epa.ie/pubs/reports/waste/stopfoodwaste/compostingguide.html#.VTSsSyFVhBc

Best practice for specific sectors:

Pest control procedures in the food industry. Chartered Institute of Environmental Health, Hatfields, London, October 2009. 52 pp. URL: http://www.cieh.org/uploadedFiles/Core/Policy/Publications_and_information_services/Policy_publications/Publications/Pest_control_food_industry.pdf.

Rat Control and Game Management. Campaign for Responsible Rodenticide Use. 16 pp. URL: http://www.thinkwildlife.org/crru-guideline-on-responsiblerat-control-by-gamekeepers.

National Sewer Baiting Protocol Best Practice and Guidance Document. Chartered Institute of Environmental Health, Hatfields, London. http://www.cieh.org/WorkArea/showcontent.aspx?id=46452. 22 pp.

Risk Assessment

Short Guide to the Safety, Health and Welfare at Work (Chemical Agents) Regulations, 2001, Health and Safety Authority. URL: http://www.hsa.ie/eng/Publications_and_Forms/Publications/Chemical_and_Hazardous_Substances/short_guide_chemical.pdf

Environmental assessment when using anticoagulant rodenticides in Ireland. Campaign for Responsible Use Ireland. 6 pp. URL: http://www.thinkwildlife.org/.

The Control of Substances Hazardous to Health Regulations 2002 (as amended) Approved Code of Practice and guidance". URL: http://www.hseni.gov.uk/l5_control_of_substances_hazardous_to_health-2.pdf

Risk Assessment Simplified. URL: http://www.hseni.gov.uk/leaflet_risk_assessment_simplified.pdf

Traps

Code of Practice for Use of Vertebrate Traps. Chartered Institute of Environmental Health, Hatfields, London. 20 pp. In press.

Sticky (glue boards), Northern Ireland only

Code of Best Practice Humane Use of Rodent Glue Boards. Pest Management Alliance. URL: http://www.cieh.org/uploadedFiles/Core/Policy/Environmental_protection/Pest_management/NPAP/COP_Glue_Boards.pdf

Application of toxic gases:

The RAMPs UK Code of Good Practice. Register of Accredited Metallic Phosphide Standards in the UK. December 2013. URL: http://www.ramps-uk.org/wp-content/uploads/2014/02/RAMPS-Code-of-Practice.pdf. 8 pp.

Guidance on anticoagulant resistance:

RRAC Requirements on Anticoagulant Rodenticide Resistance Management. CropLife International. URL: http://www.rrac.info/content/uploads/RRAC_Requirements-Rodenticide-Resistance_Sept2015.pdf

RRAG mouse resistance guideline. 11 pp. Rodenticide Resistance Action Group. URL: http://www.bpca.org.uk/assets/RRAG-Housemouseresistanceguideline1.pdf

Anticoagulant resistance in the Norway rat and Requirements for the management of resistant rat infestations in the UK. Rodenticide Resistance Action Group. URL: http://www.bpca.org.uk/assets/RRAG_Resistance_Guideline.pdf.

Storage of Rodenticides

Requirement for the design and construction of pesticide stores, IASIS Limited 2013. URL: http://www.pcs.agriculture.gov.ie/sud/

Requirements on the Management and operation of pesticide stores, IASIS Limited 2013. URL: http://www.pcs.agriculture.gov.ie/sud/

Requirements for the fitting out and Requirements for the management and operation of pesticide display and sales areas, IASIS Limited 2014. URL: http://www.pcs.agriculture.gov.ie/sud/

Code of practice for using plant protection products. URL: https://www.dardni.gov.uk/articles/code-practice-using-plant-protection-products

Guidance on storing pesticides for farmers and other professional users. URL: http://www.hse.gov.uk/pubns/ais16.pdf

11 THE CRRU CODE

The rodenticide industry, acting as a whole, has recognised the need to address the concerns surrounding the responsible use of rodenticides and the need to ensure that rodenticides are used correctly and in ways that will minimise the exposure of wildlife. The industry has therefore initiated the Campaign for Responsible Rodenticide Use (CRRU).

Key to the campaign is a code of good practice for the responsible use of rodenticides in rural areas.

This stresses the need to adhere to the following good practice. It has adopted the logo 'Think Wildlife' to build recognition of the code and the overall campaign aims.

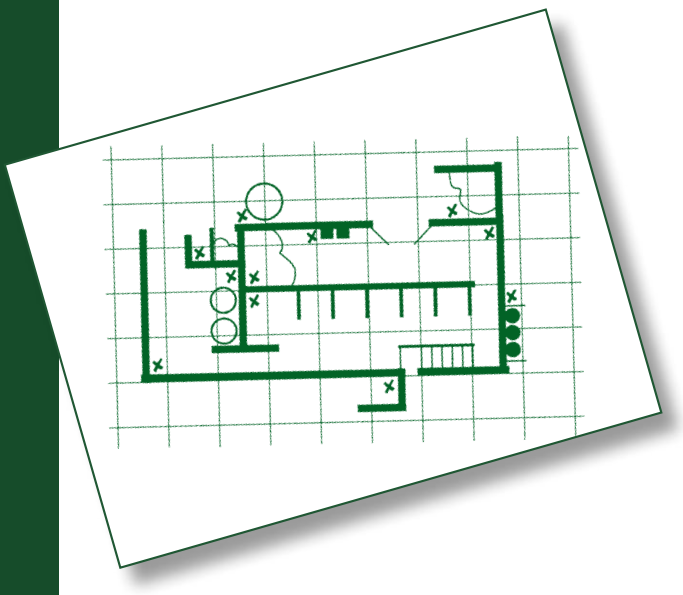
CRRU CODE IS:

Always have a planned approach

- Before treatment begins, a thorough survey of the infested site is an essential key to success when using any rodenticide.
- Environmental changes which could be made to reduce the attractiveness of the site to rodents should be noted for implementing after the treatment. Usually this will involve rodent proofing and removing rubbish and weeds that provide harbourages and cover. However, the site should not be cleared before treatment since this will disturb the rodent population and make bait acceptance more difficult to achieve.
- Obvious food, such as spilled grain, should be removed as far as possible and any food sources covered.
- Rodenticide baits should only be used for as long as is necessary to achieve satisfactory control.
- In most cases, any anticoagulant bait should have achieved control within 35 days. Should activity continue beyond this time, the likely cause should be determined and documented. If bait continues to be consumed without effect, a more potent anticoagulant should be considered. If bait take is poor, relative to the apparent size of the infestation, consideration should be given to re-siting the bait points and possibly changing to another bait base, as well as making other environment changes.

Always record quantity of bait used and where it is placed

- A simple site plan or location list identifying areas of particular concern pertinent to the site should be drawn up and retained on file.
- A record of all bait points and the amount of bait laid should be maintained during the treatment. Activity should be noted at each bait point, including any missing or disturbed baits, as the treatment progresses.
- By carefully recording the sites of all bait points responsible users of rodenticides are able to return to these sites at the end of the treatment and remove uneaten bait so that it does not become available to wildlife.

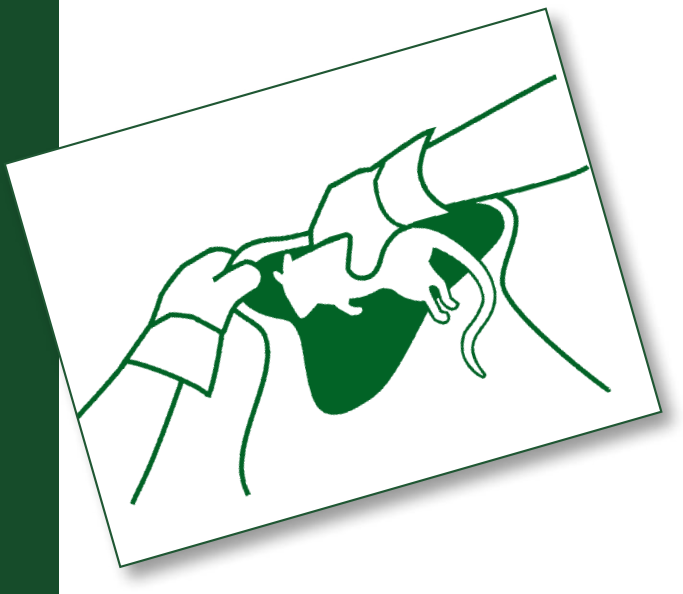


Always use enough baiting points

- Users should follow the label instructions regarding the size and frequency of bait points and the advice given regarding the frequency and number of visits to the site.
- By using enough bait points the rodent control treatment will be conducted most efficiently and in the shortest possible time. This will restrict the duration of exposure of non-target animals to a minimum.

Always collect and dispose of rodent bodies

- The bodies of dead rodents may carry residues of rodenticides and, if eaten by predators or scavengers, may be a source of wildlife exposure to rodenticides.
- It is essential to carry out regular searches for rodent bodies, both during and after the treatment period. Bodies may be found for several days after rats have eaten the bait and rats may die up to 100 metres or more away from the baited site.
- Any rodent bodies should be removed from the site and disposed of safely using the methods recommended on the label.

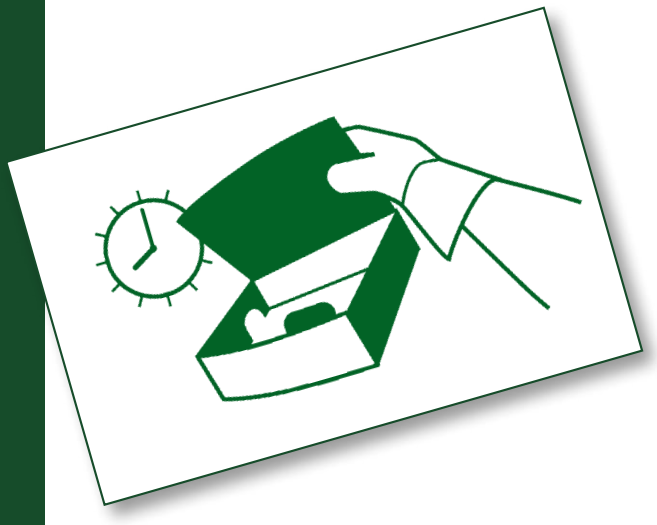


Never leave bait exposed to non-target animals and birds

- Care should be taken to ensure that bait is sufficiently protected to avoid accidentally poisoning other mammals and birds. Natural materials should be used where possible.
- Bait stations should be appropriate to the prevailing circumstances. They should provide access to the bait by rodents, while reducing the risks of non-target access and interference by unauthorised persons. They should protect the bait from contamination by dust or rain. Their design, construction and placement should be such that interference is minimised.

Never fail to inspect bait regularly

- Where the risk assessment or treatment records show that multiple visits are required, then those should be made as frequently as is considered necessary. Daily inspection may be required in some circumstances.
- At each visit, baits should be replenished according to the product label and a thorough search made to ensure that bodies and any spilled bait are removed and disposed of safely. Records of such visits should be maintained.



Never leave bait down at the end of the treatment

- Bait left out at the end of a treatment is a potential source of contamination of wildlife.
- On completion of the treatment, records should be updated to signify that the infestation is controlled and that, as far as reasonably practical, all steps have been taken to ensure that the site is now free of rodenticide bait.

For further details on CRRU see:

www.thinkwildlife.org
info@thinkwildlife.org

Notes:

CRRU Ireland is supported by the following companies:

BASF plc

Bayer CropScience

Bell Laboratories Inc

Killgerm Group Ltd

LiphaTech S.A.S.

LODI UK Ltd

PelGar International Ltd

Rentokil Initial plc

Syngenta Crop Protection AG

THINK WILDLIFE

Campaign for Responsible Rodenticide Use

For further details on CRRU see:
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www.thinkwildlife.org
info@thinkwildlife.org

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