



Chartered
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Critical Review of the “Environmental Risk Mitigation Measures for Second Generation Anticoagulant Rodenticides” proposed by the HSE

A review commissioned by the Chartered Institute of Environmental Health from Adrian Meyer of Acheta

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Introduction

The HSE recently released a discussion document relating to the Environmental Risk Mitigation Measures for Second Generation Anticoagulants (SGARs).

The National Pest Advisory Panel of the Chartered Institute of Environmental Health(CIEH/NPAP) were concerned about several aspects of the proposed consultation and have commissioned Adrian Meyer, one of the UK's leading experts on rodent behavior and control to prepare a report on the scientific evidence relevant to its response.

The discussion document covered a wide range of issues relating to the use and application of SGARs. Within the document the HSE identify five Options relating to the principle of restricting outdoor use of SGARs as a risk mitigation measure to minimise the risk of primary and secondary poisoning of non-target species. A substantial proportion of rodenticide baits used by professionals are used in outdoor situations, either around buildings or away from buildings.

The Stakeholder Engagement lists five possible options for restricting the use of SGARs. The HSE have identified option 2 as their preferred choice. Since CIEH/ NPAP agrees with this preferred choice, this review concentrates only on the issues raised in option 2.

The Stakeholder Engagement document lists option 2 as follows:

Option 2 - Restrict SGAR use to in and around buildings and sewers

A second alternative would be to limit the use of SGAR active substances to “in and around buildings”. It will be necessary to formulate a workable definition of use ‘in and around buildings’. While a current UK definition exists for “indoors” (see option 1), no similar definition has been agreed for “around buildings”.

Any such definition should be clear enough to allow users to understand where they can or cannot use a particular product, flexible enough as to not unduly restrict how and where a product can be used, but above all, the definition must be legally enforceable.

Factors which could be considered when proposing a definition include:

- That the infestation must be connected to a building*
- That the infestation must be affecting the building, its occupants or contents*
- Where the infestation is living and/or feeding*
- Where treatments can take place*
- How far from a building can an infestation be before it is not considered associated with the building*

It is important that any definition arrived at cannot be interpreted in a way which would allow unrestricted ‘outdoor’ use, for example use in open areas.

The following definition is proposed:

“This product can be used to treat rodents in and around buildings where:

- ‘in buildings’ is as applied to rodenticides under COPR (see option 1)*
- ‘around buildings’ is defined as “where a rat population is living and/or feeding predominantly within 5 m of a building or other enclosed structure, and is having a significant impact on the building or its occupants. Bait stations or covered bait points should be placed around the perimeter of the building, and burrow baiting is permitted providing that it is within 5 m of the building. Baiting should not take place along hedgerows or in woodlands.”*

Review of HSE Preferred Option (Option 2)

1. General

Option 2 has a number of clear advantages not only over the alternative options but also as a significant improvement over the current position, permitting as it does the use of all the SGARs externally. The proposed change would allow users a wider choice of not only anticoagulants but also a wider choice of formulations.

It would also permit for the first time the use of anticoagulants that are applied using the “pulse” baiting technique against Norway rats (*Rattus norvegicus*) externally. Crucially, this technique requires the application of significantly smaller quantities of rodenticide, potentially reducing the risk of non-target access.

An additional benefit is that it would allow, for the first time, the external use of brodifacoum, flocoumafen and difethialone, against anticoagulant resistant Norway rat infestations. Such an extension of use would permit the application of an anticoagulant management strategy to control the spread of resistance and, potentially, to eliminate populations of Norway rats over significant areas of the United Kingdom that are already resistant to all the anticoagulants currently approved for use against them.

For a full summary of the current position on Norway rat resistance see the Rodenticide Resistance Action Group document “Anticoagulant resistance in the Norway rat and Guidelines for the management of resistant rat infestations in the UK” and “The Current Status of Anticoagulant Resistance in Rats and Mice in the UK. (both available at www.bpca.org.uk/rrag/documents.html)

The ability to control otherwise resistant Norway rats is in itself a clear advantage, however the extension of use would also have a further significant environmental benefit. Currently, attempts to control Norway rats using anticoagulants to which they are resistant results in those undertaking the rat control applying very large amounts of rodenticide (which will not work) over very long periods, sometimes years.

This allows extension of the risk period and potential on-going access by non-target small mammals and birds and the related risks of primary poisoning and then secondary poisoning via non target species. The resistant rats continue to be active and, at the same time, carry maximum loads of rodenticide, presenting increased secondary poisoning risks (Daniels et al., 2011).

In addition, the costs in terms of both labour and material of these extended and ineffective applications are high. The use of effective anticoagulants will result in the availability of baits not only in very significantly reduced quantities but also over very much shorter periods of time and reduced treatment costs (Meyer, A.N. (2009).

2. Distance from Buildings

The major concern with Option 2 is not in the generality of the proposal but in the specific restrictions that it is suggested should apply within the approval conditions.

It is proposed by the HSE that the use of rodenticide baits containing the SGARs is restricted to “around buildings”. More specifically, it is proposed that this is restricted to “Bait stations or covered bait points should be placed around the perimeter of the building, and burrow baiting is permitted providing that it is within 5 m of the building. Baiting should not take place along hedgerows or in woodlands.”

Historically, rodenticide labels have recognized that the dynamics and structure of rat infestations are all different. They have left decisions on bait placement to those who have surveyed the pattern of activity and are doing the treatment.

Labels have reasonably required that baits are placed “safely” (following a risk assessment by the person applying the rodenticide) within areas of rat activity and that access by non-target species is controlled. The arbitrary restriction to baiting to only within 5 metres of buildings cannot be justified on the basis of known rat activity patterns and is likely to reduce the efficacy of the treatment and increase the risk to non-target species by prolonging treatment times.

A review of the available literature on movements of Norway rats and their home ranges in the United Kingdom indicates great variability in Norway rat activity between infestations.

Some of the earliest work using radio transmitters (K.D.Taylor. 1978 and K.D.Taylor and R.J.Quy. 1978) undertaken around farm buildings and adjoining farmland indicated that the mean range length of the female rats was 340 m and for the male rats was 660 m.

Movement was undertaken primarily along cover but several individuals occasionally crossed open ground, covering distances of up to 500 m. Most movements were between homesites and food sources up to 500 m away.

Males changed homesites on average every 7 days and females every 14 days. These changes were related more closely to interaction with other rats than with attempts to move closer to food sources.

The maximum distance travelled by a rat was 3.3 km, made by a male rat in a single night.

Differing results are obtained when using different monitoring techniques. Results from Hartley and Bishop (1979) using mark-recapture techniques found the mean range length of 11 male rats on farmland to be 66 m, whereas Taylor (1978), using radio-tracking, found the mean range of 7 males on a farm to be ten times as large.

Hardy (1979) found that a mixed sex populations of rats around food stores (a relatively stable and predictable environment) had a mean range length of only 65 m.

Some authors report smaller territory sizes (Lund, 1994), with one male and one to several females with their offspring having a territory size of only 10-30 m!

David Macdonald (1999) reports that female rats at Wytham refuse tip, where food was plentiful, had linear ranges averaging only 85 m, whereas those based in the relatively poor environment of a nearby stream had mean home ranges of 428 m; similar results were observed for males. He concludes that “Clearly, home range is likely to vary greatly with circumstances.”

Much of the work and research on rat home ranges has been undertaken in rural areas because these areas are easier to work in. It is difficult to find any comparable research from urban areas. We are thus dependent upon the expressed views of those whose experiences are based on their work in urban areas.

Robert Corrigan (2001) in his book *Rodent Control* covers the issue of home ranges. He states “An “average” home range of an established Norway rat in urban areas is 25-100 ft (8-30 m) from its nest. But the specific environment dictates the home range of most rodent families. Rats living close to easily accessible food tend to have shorter home ranges. Conversely, they will travel several hundred feet each night if necessary to acquire essential resources. Other factors such as the season, sex and population density also affect the home range of a local population. Being aware of the variability of home ranges has important implications for PMPs (Pest Management Professionals) attempting to bait or trap rat infestations in a cost effective and efficient manner”.

My own experiences mirror those of Robert Corrigan. Typically, in built environments the activity patterns of rats will extend from about 5 m to 50 m around the infested area. These areas will become more extensive as the environment opens up. In very central urban areas where the rat activity may be more likely to be associated with a drainage defect, the activity patterns may be less than 5 m, although more commonly it extends some 5 to 15 m. In almost all cases the exact shape and nature of the infestation will depend upon the availability of cover, food and human activity patterns and are infinitely variable.

From experience I believe that a baiting restriction of 5 m from buildings will have a negative impact on the efficacy of Norway rat control. The least impact will be on those undertaking control in central urban areas where you are almost never more than 5 m from a building (see comments from London Boroughs – Part 3). The less dense the housing and building density becomes, the more difficulty will be encountered under the 5 m restriction. As one enters rural areas and farm situations the significant majority of Norway rat infestations will not be controllable cost efficiently or quickly under the 5 m restriction and many will not be controllable at all.

It is clear from personal experiences and from more detailed radio-tracking and other research results that typically, Norway rat home ranges extend from some 10 m to 35 m and more around the infested area. In farmland and more open rural areas they will extend in some far less common situations for several hundred meters. The precise paths of activity taken by the rats will depend upon the structure of that habitat and they will typically be moving from their nesting and harbourage areas to feed along what they estimate to be the safest route.

In situations where rats are moving the longer distances it is very unusual for rodent control to be undertaken over these distances for very practical reasons.

Firstly the cost of extending the treatment is prohibitive both in terms of material and labour costs. Secondly, those undertaking control on a contract basis will restrict their activities to the areas owned by their customer and these are usually within the 25 – 35 m of maximum activity. Those undertaking their own control will usually restrict control to the areas they own.

Current advice on rat control requires that baits and traps are placed to intercept these activity pathways and where appropriate to bait near harbourage and nests and even within the burrows for maximum efficacy.(Ref: The British Pest Management Manual)

Alan Buckle (University of Reading), a rodent control consultant and chairman of both the Rodenticide Resistance Action Group and the Campaign for Responsible Rodenticide Use, expresses his views on the 5 m restriction. He says:

“The building and its resources are the main attraction for the entire rat infestation. So most rats will get into the 5 m zone, only some will spend much more time there than others. As the treatment within the 5 m zone proceeds, the situation will change over time. Rats occupying territories including bait points will enter the 5 m zone, take bait and if they are susceptible will be killed. This will result in fewer intra-specific conflicts in and around the 5 m zone and allow more marginal animals to come into the baited zone, more often and for longer periods, take the bait and, again, if they are susceptible, die. This model, in which cohorts of rats are controlled depending on the distance of their home-ranges from the 5 m zone, results in a very protracted treatment, which is more costly and provides both extended exposure to human/animals to rat-borne diseases and prolonged exposure of non-targets to anticoagulants.

“As far as resistance is concerned, if the 5 m rule applies then only an area around buildings, within a larger infested area, will be baited. In terms of the entire infestation, this will inevitably result in under-baiting. Rats that are closer to the bait and/or more likely to enter bait stations/point and/or more ready to give up their normal food to take the bait, these will get first shot at the bait and may take a lethal dose. However, those living further from the baited zone, and with one or more of the preceding conditions, whether resistant or not, will, more often than those living closer, come to bait points to find them with little or no bait. Among those finding some bait, the less susceptible rodents are more likely to survive an inadequate baiting regime. Hence resistance is exacerbated.

“Every person who has ever been trained in rodent control has been told to survey and then treat the entire infestation, within the entire infested area. They have never been told, up to now, to treat only a part of the infested area, possibly only a small part. If the 5 m zone comes to pass we will need to rethink the foundations of rodent control best practice. The reason for the requirement to find and treat the entire infestation is to remove it as quickly as possible to protect human/animal health and hygiene. In my view, if the 5 m is applied these will clearly become subsidiary to protecting the environment.”

“Another impact of this will be that no-one will go further than 5 m from the buildings when doing a rat survey. Why bother when you cannot put bait there? “

John Charlton, a consultant with over 30 years’ experience when asked for his views on the 5 m restriction said:

“The basic principal of rodent control is to take the rodenticide to the target. Bait placed in close proximity to the harbourage or burrow is more likely to be taken than when placed in the vicinity of alternative food. While it may be good practice to remove all alternative food when carrying out a treatment, this is often not possible or impractical. The 5 metre restriction would greatly inhibit best practice, i.e. eradication in the shortest time, in food industry areas such as delivery yards, car parks, compactor areas where rats are more likely to be seeking refuge away from the immediate locale and human activity, yet close enough to pose a risk to food safety and public health”.

It is clear that any labeled constraint to restrict baiting to within 5 m of a building is not appropriate either with regard to the likely extent or patterns of rat activity patterns, nor the likely best baiting strategy. The restriction restricts in an arbitrary way the ability of the technician laying the bait to bait in the most appropriate and safest areas.

The outcome of such a 5 m restriction therefore would be to lead to treatment failure in many situations and increased costs of treatment and extended lengths of time over which baits were in position leading to increased environmental and non-target risk in very many others.

In addition, any labeled requirement to bait only within 5 m of a building will lead to baits being placed in areas where maximum human activity and domestic animal activity is likely to occur. Any restriction to baiting only within 5 m of a building is not compatible with the current labeled requirement to “bait safely and prevent access by non-target species and humans”.

Experience and data from research suggests that ideally no restrictions should be placed on technicians as far as the exact placement of their baits are concerned except that the baiting should be undertaken safely. To achieve effective control as rapidly and safely as possible, bait placement must be dependent upon the nature of the infestation being treated.

If a restriction on baiting were essential, the available research data and personal observations and experience indicate that labels should not restrict baiting to less than 30 m from any building and even this will have a significant impact on the ability to control rats in some situations.

3. Good Practice

The restriction to lay baits only within 5 m of a building is contrary to all good practice recommendations and training programmes. Universally, the guidance requires that a thorough survey of the active area is necessary and that baits are laid as appropriate within the area of activity.

The HSE document quotes from the CSL Guide to Good Practice for Controlling Norway rats with rodenticides (CSL. 2002). To quote specifically from these guidelines:

Page 20. “Rats are more likely to eat the bait sooner if it is laid beside runs, in holes, along walls and in sheltered places”

Page 23. "Bait points should be sited close to fresh rat signs, such as by the side of, or on, well-used runs, near active burrows or gaps in vegetation. If rats are running along the inside or outside walls of a building, the containers should be placed so that their entrances are adjacent to the wall to allow rats running close to it to easily enter them. It is not advisable to site points immediately next to piles of stored grain or other edible commodities, as the baits may then be in direct competition with the animals' usual food source, as well as presenting a possible contamination risk. Points should be sited so that they intercept rats on their way to their normal feeding location. Suitable places for baits should be where rats might nest such as junk piles, dung heaps, under pallet stacks, beneath discarded machinery and rubbish tips. Bait points can also be laid around the bottom of straw stacks, along field boundaries (ditches, hedgerows) and around ponds"

Page 24. "In environments where food and harbourage are unevenly distributed, it is likely that the density of rats, and hence bait points, will also be distributed irregularly. As a rough guide, an average density of 2 points per 10 x 10 m square or 1 point every 5 m should be sufficient to treat most infestations, but in places where rats appear to be very numerous, baits can be laid as close as 1 m apart. Increasing the number of bait points above this average density does not appear to increase the speed or degree of control, but conversely the density cannot be reduced indefinitely without any effect on the treatment outcome. The location of the individual points and the willingness of rats that find them to take the bait are probably of more importance".

Page 37. "Depending on the urgency with which the infestation has to be controlled: Re-site bait containers as necessary to correct misplacements, but quicker results will be achieved by transferring bait from containers to active rat burrows. Use a loose-grain (e.g. whole wheat) or pelleted formulation in preference to other types and lightly block the burrows with grass or hay/straw or cover the entrances with material such as corrugated sheets or wooden boards. Do not stamp on the entrance as this may cover the bait with soil".

It is clear from these recommendations that effective Norway rat control is best achieved through safe application of rodenticide baits that will vary with the nature of the infestation. Artificial constraints on baiting patterns will simply reduce efficacy.

4. Additional Factors

In addition to factors relating to home ranges and good practice, the following factors should be taken into account.

Risk Assessment

Current normal and accepted HSE practice is to require that prior to the application of rodenticides a risk assessment is undertaken to assess the risks associated with the application. Subsequent application of the rodenticide would be based upon that assessment to ensure safe application.

The current proposal essentially undertakes a centralised risk assessment that has determined that all applications of SGARs further than 5 m from buildings present an unacceptable risk to non-target species and the environment.

This decision has clearly determined that such risks outweigh the benefits from effective Norway rat control in spite of the benefits that such applications might make as far as the health, safety and well-being of humans and livestock are concerned and the benefits with respect to property and industry.

No evidence has been presented to justify this assessment and the data on which it is based.

In and Around Buildings

It is important to note that in preferring the 5 m restriction to the use of SGARs the HSE have altered their position with respect to the accepted EU definition of "In and Around Buildings", where this additional restriction does not apply.

The EU definition, which has been agreed by all EU Competent Authorities, including the HSE, and which is the basis for Annex 1 listing for all SGARs is “the building itself, and the area around the building that needs to be treated in order to deal with the infestation of the building”.

It would be useful to see the evidence on which this proposed additional restriction is based.

Aluminium phosphide

Recent changes proposed by the manufacturer of the aluminium phosphide products approved for use in the UK will extend the distance within which the product may not be used from 3 m to 10 m from any buildings. This will bring the UK restrictions in line with other EU countries.

Should the 5 m restriction on the use of SGARs be approved, there will be no toxicant (apart from first generation anticoagulants) which could be used to control Norway rats in the United Kingdom in a 5 m to 10 m band around buildings.

The 5 m restriction would also inevitably encourage the extended and wide scale use of aluminium phosphide to control all rat activity outside the 10 m limit.

Registration and Approval

It is also worth noting that the approval of all the rodenticide baits is dependent upon the demonstration of efficacy based on field trials. These field trials would have been undertaken without any “within 5 m of any building” restriction. I think it very unlikely that similar or even acceptable levels of efficacy could be demonstrated if a 5 m restriction on bait placement had been applied.

5. Impact on Local Authorities

A brief questionnaire was circulated to a number of London Boroughs who are members of the Greater London Pest Liaison Group. Six of these Boroughs responded to the questionnaire.

The majority of those who responded are from the more central London boroughs, reflecting the environments in which they work.

The same questionnaire was also sent to other major cities and towns in northern, central and southern England. The responses are contained in a separate report, which shows that a 5 m restriction would pose significant problems and possibly prevent them from carrying out their legal obligations under the Prevention of Damage by Pests Act 1949.

Home ranges of Norway rats in these more heavily urban areas are probably at the lower range of estimates discussed earlier.

It is clear from these responses that:

A significant number of rat infestations that they are called in to control could not be effectively treated under a 5 m restriction.

Significant areas such as parks, public gardens, children’s play areas, canals, river banks, sports areas, swimming areas (the Serpentine is an example), Royal Parks and similar habitats might not be effectively treated under the 5 m restriction. The public health and safety implications of this are clear and some might have to be closed to access.

They all feel that they would not be able to fulfill their obligations under the Prevention of Damage by Pests Act, 1949.

Conclusions and Recommendations

The extension of use of all the SGARs so that they could be used out of doors (in and around buildings) has the benefit of providing a wider choice of both anticoagulants and formulations to users and is therefore to be welcomed.

A major benefit would be that infestations of Norway rats that are resistant to some or all of the anticoagulants currently available for outdoor use could be controlled.

An additional benefit would be that the current selective pressure for resistance, in which partially resistant populations continue to be exposed to anticoagulants to which some or all individuals are already resistant, can cease. This should help prevent the further selection for resistance and help prevent its spread and intensification.

A major environmental benefit would immediately accrue in areas of resistance. The current practice of using very large quantities of ineffective anticoagulant over many months and indeed years, in an attempt to achieve control of resistant populations, would cease. This would lead to a reduction in the high potential exposure to non-target species both through primary and secondary poisoning.

The proposed restriction on the use of any of the SGARs more than 5 m from any building is however not practicable and would lead to very high frequency of treatment failures, with all the consequent risks to health of both humans and livestock and to industry. The restriction would make it impossible to treat a very high percentage of infestations effectively.

The constraints imposed by a 5 m restriction would also prolong treatment times, result in the use of rodenticides in inappropriate situations and would increase costs. In addition the extended treatment times consequential from treatment failure would increase risk to non-target species and the environment.

The restriction on baiting patterns imposed by a labeled 5 metre rule restriction is also in direct contradiction of current good practice in which the distribution of baiting points is based upon the pattern of activity identified from survey of individual infestations. The enforced application of baits to areas within 5 m of a building may not be appropriate and may additionally place the baits in areas where maximum access and interference by humans and non-targets is likely.

The imposition of the 5 m rule, together with the recent extension of the prohibition zone for the use of aluminium phosphide to 10 m from buildings, would mean that in the United Kingdom there would be a 5 – 10 m band around all buildings within which only first generation anticoagulants could be used.

It is recommended that there should be no arbitrary restriction on the distances from buildings that rodenticides can be used. The current EU definition is sufficiently restrictive.

If restrictions have to be made then they should be based upon known activity patterns of Norway rats and the long term experience of those involved with Norway rat control, and should allow applications within at least 25 – 35 m of any building.

The restriction of the use of SGARs to around buildings has a major implication on the ability of the industry to control Norway rat infestations in such areas as public parks, playgrounds, canals, river banks, locks, amenity areas, and similar habitats. It is not acceptable that Norway rat control could not be undertaken in these very high risk and high profile areas.

An alternative restriction based upon “man-made structures”, as used in the US, might be appropriate here.

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