



Sustainable use of rodenticides as biocides in the EU

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The European Biocidal Products Forum – spokesman for the European biocides industry

Concerned with many aspects of the biocide regulatory regime currently in place in Europe, Cefic has set up an industry platform where all industry stakeholders involved in the biocides sector can exchange views and give input in the ongoing debates. The European Biocidal Products Forum (EBPF) currently comprises more than 60 companies plus affiliated trade associations representing the industry that places a wide range of biocidal products on the market for the benefit of EU citizens.

The objective of EBPF is primarily to act as a spokesman for the biocide business community at Union level. The Forum also provides an opportunity for its members to exchange views on regulatory and technical issues relating to active substances evaluation and biocidal product authorisation.

In 2010, EBPF established its Sustainable Use Working Group with the objective of identifying, promoting, and improving existing good practice initiatives across the biocides industry in Europe, and initiating further guidance to advocate the responsible use of biocidal products.

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Summary

1. Rodenticides are essential throughout the EU for the protection of human and animal health and well-being, for the protection of food stocks from consumption and soiling by rodents, for the prevention of damage to installations, structures and possessions and for the removal of invasive non-native species for the protection of vulnerable wildlife populations.
2. Because of their broad benefits rodenticides are applied as biocides in a wide range of use scenarios, including in and around buildings, in sewers, at waste dumps and in open areas, and by several different categories of users, including professional pest controllers and amateurs.
3. Two types of application are made: 1) 'clean out' or 'curative' treatments against existing rodent infestations, and 2) because any association of rodent pests and human activity is considered unacceptable, 'preventative' or 'maintenance' treatments.
4. A total of 14 active substances have been reviewed, or are in review, under BPD rules as Product Type 14. However, the nine anticoagulant rodenticides are the most widely used in the EU because of the limitations of the use of the non-anticoagulant compounds. Anticoagulants will remain the mainstay of rodent pest management for the foreseeable future.
5. Resistance to anticoagulants is a significant threat to sustainable use. More robust and practical resistance management strategies must be further developed and adopted.
6. A key concern about the use of rodenticides is their potential impact on non-target wildlife, especially on predatory birds. The rigorous application of label use instructions, best practice guidelines and a wide range of mitigation measures are required to ensure that non-target wildlife impacts are minimised and sustainable use is attained.
7. This document sets out a structured approach for the development of sustainable use of rodenticides in the EU. It contains a series of recommendations which when implemented by Member States, Competent Authorities and Industry will result in the sustainable use of rodenticides and consequent improvements in human and animal health and well-being and in the increased protection of the environment.
8. Recommendations include:
 - support of a network of laboratories to monitor risk indicators,
 - dissemination and adoption of anticoagulant resistance strategies,
 - development of new best practice guidelines, which will include Integrated Pest Management (IPM) approaches,
 - establishment of harmonised training and certification programmes for professional pest controllers,
 - training for other users, such as farmers and gamekeepers,
 - point-of-sale information, particularly for amateurs, to increase awareness of best practice and,
 - extension of sustainable use initiatives to promote best practice.



1. Sustainable Use of Biocides

The sustainable use of biocides embraces many different concepts. A general principle, however, is to establish practices and initiatives that support the long-term effectiveness of biocides, while reducing to a minimum any risk to human health and the environment entailed in their use. Sustainable use of biocides is to the benefit of all those involved with them, including manufacturers, distributors, users and the wider public.

The well-established concept of Integrated Pest Management (IPM) is a central pillar of sustainable use but other practices are also of great importance. These include, but are not restricted to, the development of harmonised risk indicators so that risks can be monitored, the use of alternative control measures to the use of biocides, an improved framework for the training and certification of those involved in professional biocide application, awareness programmes to promote sustainable use among non-professional users (amateurs) and the management of resistance to biocides.

The European Commission (EC) has published Directive 2009/128/EC establishing a framework for community action to achieve sustainable use of pesticides used in agriculture, known as the Sustainable Use Directive (SUD).¹ However biocides, as defined by the Biocidal Products Directive (BPD),² are presently outside the scope of the SUD. Rodenticides (Product Type 14 in the terminology of the BPD) are essential tools in the protection of human and animal health and the environment in the European Union (EU).

The purpose of this document is to explain the importance of rodenticides as biocides, to outline the scope of their patterns of use and to present an overview of the measures currently in place which promote the sustainable use of rodenticides.

2. The Need for Rodent Control Using Rodenticides (BPD PT 14) in the EU

The problems presented by rodents occur both in open field agriculture and in the built environment. The use of rodenticides in crop protection is within the scope of the Plant Protection Products Regulation (PPPR).^{3,4} It is essential to consider separately the uses of rodenticides in crop protection, which is within scope of the PPPR, and in the built environment, which is within scope of the BPD. The borderline between PPPR and BPD rodenticide uses has been fully resolved and may be shortly defined as the 'field gate', rather than the 'farm gate'.⁵ This document addresses only biocidal uses of rodenticides.

Rodents, mainly the Norway or brown rat (*Rattus norvegicus*), Ship or black rat (*Rattus rattus*) and House mouse (*Mus musculus/domesticus*), are serious pests of the built environment in all countries of the EU. Management of the populations of these animals is essential on a continuing basis. The principal reasons for the need to control rodents are as follows:

Transmission of diseases to humans. One of the most important uses of rodenticides is the prevention of disease transmission from rodents to humans.⁶ Rodents, both rats and mice, carry a very wide range of disease organisms that are transmissible to humans (Table 1). Often the proportion of rodent populations that carry disease organisms is high. Leptospirosis (Weil's disease) and salmonellosis are well-known rodent-borne diseases, but there are other lesser-known diseases which are equally infectious and debilitating, such as toxoplasmosis and listeriosis.

Transmission of diseases to animals. Modern humane systems of animal husbandry, which often rely on constant access of domestic stock to food, are highly prone to rodent infestation because it is impossible to prevent rodent access to them. Rodents carry a wide range of diseases that are transmitted to farm animals, some further transmissible to man; including cryptosporidiosis, campylobacter, salmonella, avian flu and Hantaan viruses. Therefore, rodent pest management with rodenticides is a crucial component of virtually all modern animal husbandry systems,⁷ whether they are intensive or extensive. It is a requirement of audit systems applied in animal husbandry across the EU that rodent infestations are absent from animal husbandry facilities.⁸

Consumption of foodstuffs intended for humans and animals. Rodents consume virtually all foodstuffs destined for the human and animal food chains. In particular, cereals, pulses, vegetables and meats, both

prior to processing and after processing, are taken by them. It was recently estimated in one Member State (UK), that rats consume 210 tonnes of food each day. This does not take into account food spoiled by rodents but not eaten, which normally occurs in far greater quantity. Rodent control is obligatory under livestock and crop assurance schemes and audit schemes for hygiene in food storage and processing facilities, such as those operated by AIB International.⁹

Soiling and spoilage of human and animal food and feedstuffs. In addition to losses caused by direct consumption, rodents soil with urine, faeces and hair much more than they actually consume. Produce and commodities contaminated with rodent filth in this way are not acceptable for sale, are costly to clean and may go to waste, incurring cost and environmental impact in their destruction.

Damage to property, products and infrastructure. Rodents damage property and installations wherever their populations occur. Damage to electrical cables causes power outages and fires and damage to water pipes and sewage conduits causes flooding and the requirement for costly reconstruction. In domestic properties, rodents damage heat insulation, electrical wiring, wooden fittings and personal possessions.¹⁰

Public abhorrence and social implications. Because of the diseases they carry, and their association with filth, rodents are generally regarded with abhorrence by the public. Studies have shown that the incidence of asthma and depression are higher in dwellings infested by mice.¹¹ The presence of rats in inner city areas signals neglect, affects trading in local shops and businesses and inhibits inward investment required for regeneration.

Protection of wildlife and endangered species. Rodents adversely impact indigenous wildlife, especially by taking the eggs and chicks of various bird species. Rodents have also been transported to many of Europe's offshore islands where they adversely impact fragile ecosystems, particularly by preying on the eggs and chicks of burrow-nesting seabirds. Many of the areas affected are afforded the highest level of protection under EU legislation, such as the EU Habitats Directive (Directive 92/43/EEC),¹² and many of the species impacted are protected under the conditions of Annex I of the Birds Directive (Directive 2009/147/EC).¹³ Rodent control with rodenticides is an essential element of the management of these areas and protection of their endangered species.¹⁴



3. Rodenticide Use Scenarios

One of the aims of the BPD is to ensure a 'high level of protection for humans, animals and the environment'. It does this by evaluating the active substances used in biocidal products and then assessing products that contain them. The evaluation of the active substance examines the hazards and risks associated with the substance itself. Whereas the evaluation of the product assesses the hazards and risks associated with using the product in accordance with the label instructions.

When considering the BPD uses of rodenticides in the EU, it is necessary to recognise that they are applied in two principal scenarios. The first involves the removal of existing rodent populations from infested areas. This type of application is often called a 'clean-out' or 'curative' treatment. However, the existence of rodent infestations in areas where humans or domestic stock are present, and where human or animal food is stored, processed or sold, presents an unacceptable risk to health and wellbeing. Established practice is that such situations must be prevented rather than cured. Due to the protocols of audit and accreditation schemes adopted throughout the EU¹⁵ aimed at the provision

of healthy and wholesome foods for the human population, and further as a requirement of Member State legislation, rodent infestations are considered unacceptable in these situations, and the work of professional pest controllers is therefore predominantly preventative rather than curative. The advantage of this approach is that it keeps to a minimum the risk posed to human and animal health by rodent-borne diseases and, importantly, uses smaller quantities of rodenticide than would be required to remove substantial, established rodent infestations. Both are important objectives of sustainable use.

It is equally important to understand the scope of rodenticide use in protecting human and animal health in terms of the areas that require rodenticide treatments in the EU. There is almost no aspect of human enterprise on which rodents may not have an adverse impact, in terms of disease transmission, consumption of foodstuffs, soiling and physical damage. It is generally accepted that, due to the diseases they carry and the damage that they cause, all areas where humans live and work should be kept



free from rodent infestation. Equally, and for the same reasons, rodents are unacceptable in areas where human food is produced, processed, stored and sold. Considerable potential for adverse rodent impact occurs in all animal-rearing facilities and areas where livestock is held. These include farms where milk, meat and eggs are produced.¹⁶ Consequently such areas are routinely treated with rodenticides, either curatively or preventatively. There are numerous other aspects of human activity that require continuing protection from rodent depredation and disease transmission. All these areas of use fall within the scope of the BPD.

During the BPD review of PT 14 active substances, risk assessments were conducted using four use scenarios.¹⁷ Authorisations for the use of PT 14 products will be dictated according to the outcome, either presumed or actual, of these assessments. These scenarios are:

In and around buildings. The vast majority of rodenticide applications rely on this risk assessment scenario because it applies to the circumstances of most rodent infestations in the EU. The area covered by this scenario is defined as “the area around the building that needs to be treated in order to deal with the infestation of the building”.¹⁸

Sewers. This scenario deals with applications below ground in sewer pipes, ducts, conduits and collecting areas. Such use of rodenticides, which involves possible release into sewer effluent and, from there to sewage filtration systems and effluent outfalls, requires a specialised risk assessment.

Open areas. This scenario deals with the additional risks to the environment that are presented when rodenticides are applied in open areas away from buildings and is applied, for example, to uses by gamekeepers in hedgerows and cover crops, for uses in other open areas, such as golf courses, airfields and dykes, and for uses in conservation.

Waste dumps. Rodenticide use at waste dumps is similar to the open area scenario but includes the incremental risk that such facilities, while attracting significant infestations of rodents, also attract scavenging animals and birds.



4. Types of Rodenticide Users

The wide extent of required use of rodenticides in the EU has the consequence that several different types of users apply them. No attempt is made here towards formal definition of user categories. These have been extensively discussed in other EC forums, including in the SUD.¹⁹

Professionals. These are people who are required to apply rodenticides as a part of their working duties. This category includes a wide range of user types. An important component of this category is the professional pest controller, whose job it is to conduct treatments against a range of different pests, including rodents. Such professionals might work in private companies, in local government or local authority structures, and in other types of commercial enterprises. Other professional users who apply rodenticides, such as the managers of warehouses and storage facilities, janitors of commercial and domestic premises, gamekeepers and others, may be required to conduct rodent control operations as a routine part of their job. Rodents cause problems across the wide spectrum of farming enterprises and farmers are defined as professionals under the SUD. The term farmer covers a broad range of user categories, from the owner of a large commercial animal-rearing facility housing thousands of animals to a smallholder producing food mainly for home consumption.

Professional users would normally be expected to have received some form of training to acquire competence in the use of rodenticides, but this training may fall short of a formal, professional qualification and consequent certification.

Amateurs. Amateurs deal with small rodent infestations in and around their own homes. It is the view of Industry and other relevant bodies, such as in the UK Chartered Institute of Environmental Health,²⁰ that it is unacceptable to deny the right of householders to protect their health and that of their families from using small quantities of rodenticides in an approved manner. This is because it is considered impossible that all rodent infestations in the EU, requiring control with rodenticides, can be treated by professional pest control technicians as this is presently impractical for logistical and financial reasons. Amateurs are usually not expected to have received any formal training in the use of biocides and to have no access to personal protective equipment.



5. Rodenticide Active Substances

Rodenticide active substances in review under the rules of the BPD are of two types, those used in baits and those applied as fumigants (Table 2). Among the former, the majority are anticoagulant rodenticides, which are used very widely in rodent control in the EU. Two other substances are less widely used as baits; these are alphachloralose and powdered corn cob. The specialised fumigant active substances, aluminium phosphide, carbon dioxide and hydrogen cyanide, require specific safety measures and/or apparatus for effective and safe use as biocides. Measures for their sustainable use are different in many respects to those applied to rodenticide baits and are not further discussed here.

The review of the PT 14 active substances carried out by the European Commission has resulted in the removal from the market of three non-anticoagulant rodenticides that were previously used, zinc phosphide, calciferol and bromethalin. This has resulted in a significant increase in reliance upon the anticoagulant rodenticides.

Sustainable use of biocides is supported by the availability of active substances with a range of different modes of action. However, only five non-anticoagulant PT 14 active substances have either completed BPD active substance review or remain in review. They are alphachloralose, aluminium phosphide, carbon dioxide, hydrogen cyanide and powdered corn cob (Table 2). Since concern about rodenticides has focussed on the anticoagulants it may be considered appropriate to replace them with non-anticoagulants. This is not a viable strategy because each of these active substances possesses specific characteristics which make it unsuitable as a general replacement for anticoagulants.

Alphachloralose. This substance is only used for mouse control indoors and is not approved for the control of rats.

Aluminium phosphide. This fumigant is used only by specially-trained professional pest control technicians. It cannot be used in proximity to buildings because it works by the evolution of a toxic gas which cannot be fully controlled when it has been produced. Although

valuable in some circumstances, this property makes aluminium phosphide inappropriate for most rodent control situations in the built environment.

Hydrogen cyanide. Like the previous active substance this is used only by specially-trained and equipped professionals as a fumigant in hermetically-closed structures.

Carbon dioxide. Once again, this substance is currently restricted for use only against mice indoors. It is dispensed using a special automatic application device which is appropriate only in limited practical use situations.

Powdered corn cob. In comparison with other PT 14 active substances, powdered corn is relatively new to the market. Practical experience of its use is limited and information from published literature on its efficacy is scarce.

As a result of these limitations, and because no novel rodenticide is close to market, the vast majority of rodent control operations in the EU are conducted using the anticoagulant rodenticides, and will be so for the foreseeable future.²¹ The anticoagulants are widely used because they are generally efficacious, practical in use and, in comparison with the acute rodenticides that preceded them, have valuable safety characteristics.²² They fall into two classes:

First-generation anticoagulants, namely chlorophacinone, coumatetralyl, sodium warfarin and warfarin, have the better environmental profile because they are less acutely toxic and persistent in the environment but they suffer from the fact that resistance to them is present in some populations of rats and mice in many EU Member States.

Second-generation anticoagulants, which include the active substances brodifacoum, bromadiolone, difenacoum, difethialone and flocoumafen, are capable of controlling rodents that are resistant to the first-generation anticoagulants but are more acutely toxic and persistent in the environment.



6. Environmental Impacts of Anticoagulant Rodenticides

Conventional environmental concern about exposure of soil, water and air is largely unwarranted because of the chemical and physical characteristics of rodenticides and their formulated products, and their patterns of use as biocides in the built environment. However, the potential for rodenticides to impact the environment adversely is proven, mainly through the exposure of wildlife.²³

Rodenticides may occasionally be chosen by those involved in illegal killing birds of prey because of their perceived high toxicity. Such criminal activities, widely condemned by those involved in the sale and regulation of biocides, are only adequately countered by legislation for the protection of wildlife, monitoring threatened wildlife populations for illegal activity and rigorously pursued enforcement action against wildlife crime.

However, rodenticides in conventional, rather than criminal, use may adversely affect wildlife by way of two exposure routes. Firstly, rodenticide baits may be attractive to a range of wildlife species, as well as to some companion animals (pets) and livestock, and may be consumed directly as food. This route is called *primary exposure*. Also, target rodents carrying potentially harmful residues of rodenticides may be taken for food by predators and scavengers. This route is called *secondary exposure*. All anticoagulant rodenticides may cause primary and secondary poisoning and for this reason many necessary mitigation measures are applied to all anticoagulant active substances.²⁴ However, the second-generation anticoagulants are more persistent in the environment than the first-generation compounds and therefore present greater risk of secondary poisoning.

An important element of sustainable use is the development and use of indicators that permit changes in risk brought about by the implementation of sustainable use initiatives to be quantified.²⁵ For example, schemes are operated in some EU Member States to monitor exposure of wildlife to chemicals by investigation of incidents of exposure and analysis of body residues. Such schemes provide useful risk indicators for rodenticides. Two schemes operated in the UK are examples. The first of these, the Wildlife Incident Investigation Scheme (WIIS) principally records and investigates wildlife and companion animal exposure to pesticides, via legal use, abuse and misuse.²⁶ The second, the Predatory Birds Monitoring Scheme (PBMS),²⁷ is concerned mainly with the intensity and scope of contamination of wildlife with chemicals in normal use. In France, a similar scheme (SAGIR) is in operation to monitor wildlife casualties of pesticides.²⁸ However, it will enhance the value of these schemes to relate the occurrence of wildlife exposure to the volumes of rodenticide active ingredients applied, the numbers of rodenticide applications carried out and overall health of populations of exposed non-target species. The occurrence of wildlife exposures should be also related to their specific circumstances, for example whether the rodenticide had been applied correctly or was misused. A variety of other indicators might also be envisaged such as the numbers of rodenticide users undertaking specific training and certification and the initiation of schemes for the promotion of best practice in the application of rodenticides.²⁹

7. Alternative rodent control techniques

Some alternative techniques to biocides exist for the management of rodent infestations, although none of these is currently as cost-effective as the use of an efficacious rodenticide. However, alternatives fall into two broad categories; those aimed at killing rodents (e.g. traps, glue-/sticky-boards) and those that aim to restrict either their population size (habitat modification) or access of populations to vulnerable areas (proofing/exclusion). The use of these methods is essential in IPM rodent control strategies and they provide useful complementary techniques to the use of biocides for controlling rodents but not replacements for them.³⁰

7.1 Rodent killing

Traps, either spring traps or break-back traps, designed to capture and kill rodents are useful in some circumstances. However, their effective and humane use requires a high degree of skill and they should be set in tunnels to avoid adverse impacts on non-target wildlife, pets and children. They may not kill cleanly and therefore must be checked regularly so that animals captured, but not killed, may be humanely despatched. Such traps may be effective in situations where infestations are small but are unlikely to be cost-effective against large and dispersed rodent infestations.

Glue- or sticky-boards are available in some countries. However, they are considered inhumane by some experts and are often recommended for use only if other methods are unviable. Like traps, they may capture non-target animals and birds and must be checked at least daily. Untrained users of glue-traps are unlikely to know how to despatch humanely the rodents caught on the adhesive surface.

7.2 Live-capture traps

Live-capture traps have the advantage that, if they are checked frequently, captured non-target animals can be released unharmed. Some authorities recommend that these traps are checked twice daily. Captured target animals must be despatched humanely, because in some Member States it is illegal to translocate and release them. Once again, these traps may provide effective control of small infestations, particularly of mice.

7.3 Habitat modification

Rodents require food, harbourage and, in the case of rats, water in order to establish troublesome infestations. Such infestations will either not establish at all, or will be limited in size, if any of these requirements is denied.³¹ A sustainable IPM rodent control strategy for any building or premise will always include the requirement to prevent access to food and water and to minimise areas where rodents may make burrows and take refuge.

7.4 Rodent proofing

Preventing the access of rodents to vulnerable buildings by proofing is an important requirement in IPM. Also, proofing techniques are used to store food securely in structures inaccessible to rodents. The use of biocides is minimised if proofing engineering solutions are utilised.³² They are, however, costly, require frequent maintenance and may be impractical in areas where there is frequent human and animal activity, particularly on livestock farms, where stock has *ad libitum* access to food and water.

8. Anticoagulant Resistance

The apparent increase in geographical areas where anticoagulant resistance is found in EU Member States, and increased severity of resistance at resistance foci, is of the highest concern and a significant threat to sustainable use of rodenticides. This is particularly the case because of our virtual complete reliance on anticoagulant active substances for rodent control in the EU, due to the limitations of alternatives. Therefore, anticoagulant resistance management is an essential part of sustainable use. Several guidelines are available which set out resistance management strategies, aimed both at preventing the development of resistance and the removal of resistant infestations once they are established.^{33,34} Two guiding principles emerge. The first is the requirement to monitor rodent infestations for resistance. The development of novel DNA sequencing techniques for resistance monitoring is a major breakthrough in this endeavour.³⁵ The second is that

use of anticoagulant active substances that are resisted by rodent infestations should cease at resistance foci and effective alternatives should be used.

The reasons for this are that continued use exacerbates the severity of resistance and promotes its spread. The use of resisted anticoagulants is also ineffective and therefore presents unnecessary risk to the environment.

The development of comprehensive resistance monitoring programmes in Member States where resistance occurs, the dissemination of information on the physiological nature and distribution of resistance and the adoption of robust resistance management strategies are essential to sustainable use of anticoagulants in the EU.



9. IPM in Rodent Pest Management

The adoption of IPM principles is fundamental in the sustainable use of rodenticides. Without exception, accredited training programmes for those who use rodenticides make clear the requirement for an IPM approach and explain the benefits of this strategy. In particular these programmes emphasise the role of initial site surveys in order to develop an integrated plan that involves a range of appropriate management tools. However, all too often those who conduct practical rodent control operations use chemical means as the principal, and sometimes only, method of rodent control. This approach may be justified in circumstances of existing and significant rodent infestations which present an immediate threat to human and animal health. However, when the immediate threat is relieved, it is essential to implement other measures to ensure that infestations do not recur.

First and foremost, rodent infestations can only occur where they have access to food, water and harbourage. Therefore, a fundamental requirement of IPM is that these requirements are denied as completely as possible wherever rodent infestations might become established. Part of this is, so far as possible, all buildings are proofed against the ingress of rodents, as are all structures that contain foods that may sustain them. Guidelines and specific engineering solutions are available for this purpose and it is essential that they are more widely adopted.³⁶ Many infestations would never become established, and other control methods would not be required, if these measures are thoroughly implemented.

Small infestations of rodents may be adequately controlled using traps and glue-boards (for mice). However, the level of skill required, and the amount of effort in terms of the number of traps/glue-boards set and the duration of the programme, should not be underestimated. Also, it must be borne in mind that rodent traps and glue-boards frequently capture non-target animals and therefore the use of these techniques is by no means free from non-target impacts. Effects on non-targets can be minimised by careful placement, frequent checking and the use of covers and tunnels.

Rodenticides are important tools in IPM for rodent pest management where rodent infestations are already established and where other measures, such as use of traps and glue-boards, proofing, exclusion and removal of harbourage are either impractical or ineffective. Twelve active substances have completed their process of BPD review and two remain in review (Table 2). No novel active substances are close to the market and, therefore, these active substances will provide the mainstay for the biocides element of rodent pest management for the foreseeable future. This situation makes sustainable use initiatives all the more essential.

10. Regulatory Review of Rodenticides and Label Instructions

The review of biocide active substances, and of the products containing them, conducted by the European Commission and EU Member States is an essential step in sustainable use. After review, the scope of permitted uses of an active substance takes into consideration likely risks on human health and the environment, and these are protected at a more refined level by specific requirements on product labels. The provision of easily-understood label use requirements, and of their rigorous adoption by rodenticide users, is essential to sustainable use. However, two further levels of regulation are also important. The first is that breaches of label instructions on safe use of biocides require conscientious

enforcement action on the part of Member States. Without this, regulation is useless. Also, it is essential to monitor all uses to ensure that label instructions are operating effectively to ensure the protection of human health and the environment. Once again, the WIIS in the UK is an example of such monitoring. Incidents involving pesticides and wildlife, stock and companion animals are investigated to determine whether they arise from approved use, misuse or abuse of pesticides. This permits the review of existing use instructions and limitations on the use of biocides, if those currently in place are ineffective.

11. Best Practice Guidelines

Best practice goes beyond the regulatory requirements for safe and effective use found on product labels, because these only apply to the labelled product. Best practice requires a more holistic approach and involves a range of solutions to deliver the required outcome of effective pest management. Therefore, the adoption of best practice in the application of rodenticides by all those who use them is essential to sustainable use. Poor practice results in risk to human and animal health and the environment, without the benefit of resulting effective rodent pest management and, when anticoagulants are improperly applied, increases the severity and spread of rodenticide resistance.

Useful guideline documents are currently available in a number of Member States which provide advice on correct application methods and on a range of mitigation measures. Some of these are shown in (Table 3) and are promoted by trade associations and other Industry groups. However, none of these documents was prepared after the completion of the BPD review programme. There is a requirement for a comprehensive new best practice document that takes into consideration additional information made available during the BPD review, and risk assessments, and the new status of authorisations for PT 14 active substances and products. It is therefore proposed that a working group should be set up, in consultation with appropriate experts from the European Commission, Member State Competent Authorities, universities and industry, to construct a new best practice guideline document for PT 14 use in the EU.

The new guideline will go beyond the description of mitigation measures contained in the document provided by the EC³⁷ and will cover, among other topics:

- IPM approaches to rodent pest management,
- methods for on-site risk assessments to be conducted prior to the use of rodenticides,
- specific mitigation measures for the active substances,
- data recording,
- simple methods for the recognition of resistant rodent infestations,
- use of personal protective equipment,
- disposal of contaminated rodent bodies, spent bait and contaminated application equipment,
- storage of rodenticide products,
- measures for the prevention of recovery of rodent infestations.

It is beyond the scope of this document to provide current best practice guidelines for all rodenticide active substances. However, more details are available in the documents and sources listed in Table 3.



12. Cross-over Products

The risks to the environment presented by rodenticides used in crop protection, and therefore within the scope of the PPPR, and those used in the built environment, and therefore within the scope of the BPD, are significantly different. These differences are reflected in the range of active substances that are either authorised or in review under the two Directives and in the nature of the risk assessments conducted by the EC and Member State Competent Authorities.

Some active substances and products will be authorised under the BPD and not under the PPPR. Products will carry labels which permit identification of the regulatory framework under which they are authorised. Rigorous enforcement of relevant regulations will be required to prevent products approved for biocidal uses crossing over into crop protection, which would constitute illegal use.

13. Training of Rodenticide Users

Application of best practice supports sustainable use and itself is reliant on adequate training of rodenticide users. Training schemes are widely offered in the EU, mainly to professional pest control technicians, but these schemes need to be extended to other user groups, such as farmers and gamekeepers, and should be harmonised.

13.1 Professional Pest Controllers

Professional Pest Control Technicians utilise significant volumes of rodenticides. Therefore, an important advance in sustainable use of rodenticides would be obtained by improved standards of training for technicians across the EU and in harmonisation of

training schemes for them. A project is in progress by the Confederation of European Pest Control Associations (CEPA) through its Roma Protocol, in collaboration with the European Committee for Standardisation (CEN), to set up a standard for professionalism, skills and knowledge of all pest control technicians. The implementation of this harmonised scheme for training and certification will be an important advance towards sustainable use of biocides. It will also support the necessary legislative framework for the authorisation of pest control products that are restricted to professional use only.

13.2 Farmers

Farmers also use considerable volumes of rodenticides and sustainable use requires that this user group should receive training and certification in the use of rodenticides because many are considered to be professional users under the definition used in the SUD. Such training and certification schemes are widely employed in the EU for farmers and farm workers who apply crop protection chemicals through spray machinery and in seed dressings.³⁸ Such schemes should be expanded to include rodenticides among the range of chemical applications that they certify.

13.3 Gamekeepers

Game-birds are reared for shooting in the countryside in some Member States and rodents negatively impact such enterprises by predated game-bird eggs and chicks and by taking foodstuffs put out for adult game-birds. Consequently, gamekeepers conduct rodent control operations, often using rodenticides. The rural location of such operations means that wildlife is frequently at risk. Therefore, gamekeepers should be included in the category of professional rodenticide users that require training and certification.

13.4 Amateurs

Specific training in rodenticide use for amateurs is unfeasible. However, the prominent promotion of specific 'point of sale' information should be conducted to raise awareness and to inform amateurs about integrated approaches to rodent pest management. Large retailers who distribute considerable quantities of biocides to amateurs, such as country supermarkets and DIY outlets, should have trained staff to promote IPM approaches and to provide balanced and accurate information about risks to non-target animals, companion animals and bystanders of rodenticide use around the home and garden.

14. Current PT 14 Sustainable/Responsible Use Initiatives

Few specific initiatives currently exist in the EU to foster the sustainable use of rodenticides. An important effort in this respect operates in the UK under the name Campaign for Responsible Rodenticide Use (CRRU).³⁹ This industry-funded organisation provides a simple code of practice aimed at the reduction of exposure of wildlife to rodenticides and promotes a series of key mitigation measures, the CRRU Code.⁴⁰

It also provides training courses and accreditation for those involved in rodenticide applications, particularly those conducting operations in rural areas where it is anticipated that the exposure of wildlife may occur. Although much CRRU material is internationally available via the internet, an extension of such campaigns to other EU Member States would be a significant benefit to sustainable use.



15. Recommendations for Sustainable Use of Rodenticides in the EU

Many ongoing initiatives in Member States are aimed at fostering sustainable use of PT 14 biocides in the EU. However, these fragmented efforts need to be intensified, harmonised and extended. The full implementation of sustainable use of PT 14 biocides will require collaborative efforts between the European Commission, Member State Competent Authorities, researchers in the government and university sectors, trade and professional organisations, manufacturers, distributors and users. This document is intended to provide a framework by which sustainable use of rodenticides in the EU may be promoted and intensified. It will be necessary to establish specific objectives and a series of measures and timetables. The European Biocidal Products Forum will play a prominent role in supporting implementation of the following recommendations:

- a. Collaboration between laboratories measuring risk indicators, such as the distribution of rodenticide residues in wildlife.
- b. Promotion of comprehensive resistance monitoring programmes in Member States, the dissemination of information on the physiological nature and distribution of resistance and the adoption of robust resistance management strategies.
- c. Dissemination of guidelines and specific engineering solutions relevant to the proofing of buildings and storage structures to prevent rodent ingress.
- d. Development and coordination of best practice guidelines, taking into consideration new information available in the review of PT 14 biocides under the BPD and the new framework for the authorisation of products containing them.
- e. Rigorous enforcement of relevant regulations is required to prevent products approved for biocidal uses crossing over into crop protection.
- f. Establishment of harmonised training schemes throughout the EU for professional pest control technicians: such schemes to include certification.
- g. Development of training schemes for farmers, and other professional users of rodenticides used as biocides, supported by initiatives, either voluntary or compulsory, for the certification of rodenticide users. Gamekeepers should be included in the category of professional rodenticide users that require training and certification.
- h. Provision of 'point-of-sale' information for amateur users and training support for workers at significant retail outlets supplying rodenticides to amateurs.
- i. Extension of schemes, such as the Campaign for Responsible Rodenticide Use, to other EU Member States to raise awareness of rodenticide risks to wildlife and promote best practice.

Table 1.

Diseases commonly transmitted to humans and animals by rodents. Source: Webster, J. P. and D. W. Macdonald (1995). Parasites of wild brown rats (*Rattus norvegicus*) on UK farms. Parasitology 109: 37-43.

Disease Agent	Disease of Man/Animals	% infected/infested rodents
Ectoparasites		
Fleas	-	100
Mites	-	67
Lice	-	38
Helminths		
<i>Capillaria spp</i>	Capillariasis	23
<i>Hymenolepis diminuta</i>	Rodent tapeworm	22
<i>Toxocara cati</i>	Toxocariasis	15
<i>Hymenolepis nana</i>	Rodent/human tapeworm	11
Rickettsia		
<i>Coxiella burnetti</i>	Q fever	34
Bacteria		
<i>Leptospira spp</i>	Weil's disease	14
<i>Listeria spp</i>	Listeriosis	11
<i>Yersinia enterocolitica</i>	Yersiniosis	11
<i>Pasteurella spp</i>	Pasteurellosis	6
<i>Pseudomonas spp</i>	several pathologies	4
Protozoa		
<i>Cryptosporidium parvum</i>	Cryptosporidiosis	63
<i>Toxoplasma gondii</i>	Toxoplasmosis	35
Viruses		
<i>Hanta virus</i>	Hantaan-fever	4

Table 2.

The current status of rodenticides (PT 14) in the BPD review programme

Active Substance (AS)	Date of Inclusion Directive	Date of Annex I inclusion	Date of Expiry
difethialone	29 Nov 2007	1 Nov 2009	31 Oct 2014
carbon dioxide	24 Jul 2008	1 Nov 2009	31 Oct 2019
difenacoum	29 Jul 2008	1 Apr 2010	31 Mar 2015
bromadiolone	31 Jul 2009	1 Jul 2011	30 Jun 2016
alphachloralose	31 Jul 2009	1 Jul 2011	31 Jun 2021
aluminium phosphide	31 Jul 2009	1 Sep 2011	31 Aug 2021
coumatetralyl	29 Jul 2009	1 Jul 2011	30 Jun 2016
chlorophacinone	4 Aug 2009	1 Jul 2011	30 Jun 2016
flocoumafen	27 Nov 2009	1 Oct 2011	30 Sep 2016
warfarin sodium	9 Feb 2010	1 Feb 2012	31 Jan 2017
warfarin	9 Feb 2010	1 Feb 2012	31 Jan 2017
brodifacoum	9 Feb 2010	1 Feb 2012	31 Jan 2017
powdered corn cob	to be done	to be done	-
hydrogen cyanide	to be done	to be done	-

Table 3.

Some best practice guidelines for PT 14 biocides currently available in the EU.

Issuing organisation	Title and date	Country
Defra, Welsh Assembly Government and The Scottish Government (UK)	Code of Practice for the prevention and control of rodent infestations on poultry farms	UK
British Pest Control Association (BPCA)	Guidelines for the Safe Use of Anticoagulant Rodenticides by Professional Users (2001)	UK
Chartered Institute of Environmental Health (CIEH)	Pest Control Procedures in the Food Industry (Jan-09). Pest control procedures in the housing sector (Jan. 2010). Pest control procedures in the social care sector (Sept. 2010)	UK
Chartered Institute of Environmental Health (CIEH)	Pest Control Procedures Manual: Rodents (May-08)	UK
World Health Organization	Pesticides and Their Application for the Control of Vectors and Pests of Public Health Importance (2006)	Worldwide
Natural England	Rats: Options for Controlling Infestations (Oct-09)	UK
Natural England	Rats: Control on Livestock Units	
Health and Safety Executive (HSE)	Safe use of Rodenticides on Farms and Holdings (Aug-99)	UK
Health and Safety Executive (HSE)	Urban Rodent Control and the Safe Use of Rodenticides by Professional Users (Nov-04)	UK
Campaign for Responsible Rodenticide Use Code	The Campaign for Responsible Rodenticide Use Code (2010)	UK
Food and Environment Research Agency (Fera) Central Science Laboratory (CSL)	The Control Of Rats With Rodenticides: A Complete Guide To Best Practice (Nov-02)	UK
Bodenschatz, W. Behr's Verlag	Manual - Pest Control Measures and Methods including Legal Requirements (2009)	DE
Industrieverband Agrar	IVA-Mustergebrauchsanweisungen für nichtagrarische Schädlingsbekämpfungsmittel für den privaten Gebrauch.	DE
European Commission	Risk Mitigation Measures for Anticoagulants used as Rodenticides CA-March07-Doc.6.3-final	EU
Pestcontrolmedia.com	Les ravageurs des bâtiments d'élevage, comment s'en protéger ?	FR
Pestcontrolmedia.com	Guide pratique de l'apporteur	FR
Ministry of Health, 2001	Guide of Best Practice for Pesticides Use in Public Health	ES
Valencia Local Government, 2004	Phytosanitary Applications/Official License Manual	ES
Pest Control Association. ANECPA, 2003	Manual of Procedures for Urban Pest Control	ES

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