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REQUIRED USE OF PROTECTIVE BAIT STATIONS IN THE U. S.

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ABSTRACT: Beginning in the 1960s, labels for federally registered commensal rodenticides have been required to bear a statement to the effect that the baits are to be contained in "tamper-proof bait boxes" when used in locations accessible to children and nontarget animals. Faced with ample evidence of noncompliance with the letter and spirit of this portion of the label, the U. S. Environmental Protection Agency (EPA) issued a policy statement (PR Notice 83-5) and scheduled public hearings on matters pertaining to bait stations and nontarget exposure incidents involving rodenticides. EPA's findings indicate that, while some clarifications of its policies might be helpful to rodenticide users and to bait and bait station manufacturers, the historical requirements for bait protection have been appropriate and necessary. Additional steps and incentives appear to be needed to increase the extent of compliance with label requirements for use of protective bait stations and thereby reduce the incidence of exposures of young children, dogs, and other nontarget organisms to commensal rodenticide baits.

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INTRODUCTION

For many years, publications related to rodent control have warned of the potential risks posed by toxic baits to nontarget species, especially vertebrates, and have suggested approaches for limiting such risks. If baits had to be used in areas from which nontarget species of concern could not be excluded, these publications have recommended use of special structures to keep nontarget species away from the bait. Such structures might incorporate into their designs building walls or other features already present at the use site; or they could be built as complete bait stations (cf. Elton and Ranson 1954, California Dept. Public Health 1955, Bjornson and Wright 1956).

The need for bait protection has been particularly acute in control operations involving commensal rodents which in the U. S. include Norway rats (Rattus norvegicus), roof rats (R. rattus), and house mice (Mus musculus). Commensal rodents live in close association with man, his pets, and domestic animals and are best controlled with slow-acting baits of high palatability. Such baits commonly are applied in substantial amounts for several weeks at a time. These baits are toxic and often are attractive to many types of nontarget organisms.

Whether following the recommendations of manuals, the dictates of "common sense," or their own consciences, some applicators probably always have taken sufficient steps to protect nontarget species from rodent baits. However, the continued occurrence of large numbers of nontarget poisoning incidents involving rodenticides suggests that adequate protection of baits never has been a universal practice in the U.S.

TAMPER-PROOF BAIT BOXES

Noting that prolonged exposure periods were needed for anticoagulant baits, the Pesticides Regulation Division of the U.S. Department of Agriculture (USDA) began requiring in the 1960s that labels of federally registered rodenticide baits direct users toward responsible baiting practices. Since inheriting authority to regulate pesticides in 1970, the U.S. Environmental Protection Agency (EPA) has continued this policy. Typical of the language initially required is the statement:

"Treated baits should be placed in locations not accessible to children, pets, wildlife and domestic animals or in tamper-proof bait boxes."

USDA felt that it could allow use of anticoagulant baits in certain areas where control of commensal rodents was needed (e.g., along buildings, along fence rows, in dumps) only if the baits were confined to containers that would exclude most nontarget species of concern while permitting access to bait by target species.^a USDA was especially concerned about anticoagulant baits because they must be applied in large amounts for several weeks at a time in order to provide opportunities for multiple feedings by all individuals in the target population. USDA felt that sturdy bait stations with small entrances, internal baffles, or great length could isolate bait from most nontarget species. USDA personnel also felt that applicators could build their own protective bait stations out of wood.

In recent years, EPA has modified the "tamper-proof bait boxes" statement by replacing "should be placed" with "must be placed."

In the 1970s, EPA received occasional requests to define "tamper-proof bait box" and to indicate whether EPA found particular bait station designs to be "tamper-proof." As "tamper-proof" implies an absoluteness that is almost self-defining, it has been easier for EPA to determine that particular units are not "tamper-proof" than to find designs to be fully deserving of such a designation. This situation notwithstanding, EPA drafted eight "proposed criteria" for "tamper-proof bait boxes." Initially, EPA provided these criteria only upon request. In 1983, EPA included these criteria in PR Notice 83-5 (Johnson 1983a), which was mailed to rodenticide registrants, user groups, and other affected parties.

^aIn 1983, I discussed the origins of the "tamper-proof bait boxes" statement with people who were involved in the regulation of rodenticides by USDA in the 1960s: William Gusey, James Lee, John Ludemann, Paul Ochs, and Galen Oederkirk. This paragraph summarizes the comments of these individuals.

Also beginning in the 1970s, parties desiring to build "tamper-proof bait stations claimed to EPA that the bait station market was dominated by easily-damaged, thin-plastic units and cardboard designs, along with sheet metal models with large entrances that permitted reach-in access to bait compartments. EPA's investigations verified these assertions. As a criterion for selecting bait stations, protection of nontarget species was well behind cost and convenience (e.g., lightness, "stackability"). With pest control companies and industrial pest control personnel using cheap stations and "private" citizens typically using no station at all, would-be builders of protective stations argued that there could be no market for such units unless EPA indicated what constituted compliance with label requirements and provided incentives for such compliance.

EPA informally evaluated the first bait station units submitted to the Agency. In the early 1980s, EPA formally tested those units along with certain others then on the market (Palmateer 1982). Stations were evaluated, depending upon their intended uses, for latency to and rate of feeding by Norway rats or house mice, and for ability to keep small passerine birds and raccoons away from food in bait compartments.

In 1983, EPA concluded that the level of noncompliance with the "tamperproof bait box" statement was intolerable and issued PR Notice 83-5 (Johnson 1983a). This notice outlined the history behind the "tamper-proof bait boxes" statement, listed the eight "proposed criteria" for such stations, stated EPA's position that failure to protect baits appropriately constitutes pesticide misuse, provided examples of bait stations that EPA felt were reasonably protective, and described the types of units felt not to be appropriate for use in areas accessible to children and nontarget animals.

PUBLIC HEARINGS

PR-Notice 83-5 also stated that EPA intended to hold public hearings on issues pertaining to the use of rodenticide bait stations. EPA announced the hearings in a Federal Register notice which identified four hearing issues:

1. practices and problems with the use of bait boxes;
2. attitudes regarding the Agency's 'Proposed Criteria' for tamper-proof bait boxes, including any suggested changes in the criteria, terminology, and/or in current label language;
3. ideas for developing standards and test protocols through existing standards-setting institutions; and
4. accidents, illnesses, deaths or nontarget exposures resulting from the use of commensal rodenticides."

(Johnson 1983b)

Two sessions of public hearings were held: the first in Arlington, VA, in November of 1983; and the second in Sacramento, CA, in March of 1984, on the eve of the Eleventh Vertebrate Pest Conference.

Many of the participants in the hearings intimated that the level of bait protection then practiced was adequate. Some suggested that EPA might cause problems if it were to make label and policy changes in the area of bait protection. Some stated that required use of protective bait stations would raise the cost of rodent control and lower its effectiveness because rodents were said to be reluctant to enter and feed from complex structures such as bait stations with internal baffles. It was suggested that the expense associated with protective stations and EPA's position that inadequate bait protection is pesticide misuse would limit the

extent to which baits would be used by professional applicators who were wary of citations (Marsh 1984).

Another grouping of witnesses testified that typical bait protection practices by professional and private rodenticide applicators were deplorable and that significant steps by EPA were needed to improve the situation. While persons from the "status quo" group tended to minimize the importance of then-available data on nontarget exposures to rodenticides, some from the "bait protection" group argued that reported nontarget exposure incidents were evidence of a significant problem.

Many participants from both camps suggested that EPA replace "tamperproof" with "tamper-resistant." The former term was thought to imply a degree of protection that no station would deliver under all circumstances.

NONTARGET EXPOSURES TO RODENTICIDES

Prior to 1983, the National Clearinghouse for Poison Control Centers (NCPCC) assembled records of incidents involving human exposures to various toxic substances including rodenticides. From 1970 to 1982, the NCPCC received an average of 1562 reports per year (range 1033 to 2019) related to human exposures to rodenticides (see Jacobs 1990). NCPCC personnel felt that the incidents reported through its network represented a very small fraction of those that actually were occurring (Fow, pers. comm.).

That NCPCC figures greatly understated actual numbers of incidents became obvious in 1983, when the American Association of Poison Control Centers (AAPCC) assumed the function of tabulating annual totals of reported human incidents involving toxic substances. Although the AAPCC ran only a pilot program in 1983, 2,103 incidents of human exposures to rodenticides were reported through the AAPCC's network in that year (Veltri and Litovitz 1984), more than had ever been reported through NCPCC's system in one year. With subsequent expansion of the AAPCC network, numbers of reported incidents have risen sharply (Table 1). In 1988, 10,626 human exposures to rodenticides were reported (Litovitz et al. 1989). This figure probably understates the actual annual total significantly. The AAPCC's cooperating centers "served" only 63% of the total U.S. population in 1988; and there is no assurance that all incidents that occurred within the regions served actually were reported. It is very likely, however, that larger numbers of incidents have been reported in recent years primarily because of improved reporting networks rather than because of large increases in the numbers of incidents that actually occur.

Most incidents of rodenticide exposure to humans involve victims less than 6 years of age and are classed as accidents (e.g., Litovitz et al. 1988, 1989). This trend is particularly evident for anticoagulants (Table 1), which often are used around the home. For strychnine, which seldom is used around the home, most victims were more than 6 years old. Nearly one-third of all human exposures to strychnine were believed to have been intentional. Most of the remaining two-thirds were classed as accidents. It is likely that nearly all rodenticide accidents could have been prevented by responsible use or storage of rodenticides.

Numbers of reported poisoning incidents involving nontarget animals also have risen sharply in recent years. As with the human incident data, these increases seem to be due primarily to improved reporting. Rodenticides typically are the class of toxicants for which most animal incidents are

reported through the animal poisoning incident hotline at the University of Illinois (Table 2). The victims in most reported animal incidents involving rodenticides are dogs. Most animal exposure incidents occur in or around the home (house, garage, yard, or garden, Buck et al. 1987).

There are thousands of animal incidents involving rodenticides reported each year (Table 2). As with human incidents, it is likely that many animal incidents that do occur are not reported. The proportion of animal incidents not reported may vary among rodenticides. For example, brodifacoum was associated with several times more reported animal incidents than was warfarin for each of the 5 years from 1983 through 1987, even though more warfarin than brodifacoum was used in the earlier years. The hotline number for the Animal Poison Control Center appeared on labels for many brodifacoum baits but did not appear on labels for warfarin baits. Because those who used brodifacoum were provided a number to call, the extent of underreporting for brodifacoum incidents probably was much less than that for warfarin and most other rodenticides. As labels for brodifacoum baits no longer bear the hotline number, the degree of underreporting of future brodifacoum incidents may approach that for those involving other compounds.

Most nontarget rodenticide exposure incidents involve anticoagulants. Generally, rodenticide calls made to hotlines

occur very early in the exposure history, before symptoms have had a chance to develop. Early reporting means that victims can be given appropriate and timely medical or veterinary attention. Early reporting also means that data on "outcomes" are lacking for many incidents reported to hotlines. Therefore, hotline data on numbers of serious incidents may understate the actual picture for the incidents reported. In 1986, for example, about 5% (212 of 4061) of brodifacoum calls to the hotline at the University of Illinois in 1987 were classed as "Toxic" or "Suspected" toxic (Trammel et al. 1989). About 81% of the brodifacoum calls that year were classed as "exposures," some of which involved considerable amounts of bait. Had the calls been made later in the exposure history, a greater incidence of toxic effects might have been reported. If calls are made soon after exposure, appropriate treatments may prevent appearance of symptoms—a major reason for having a hotline service.

Dogs are mentioned in about 80% of calls to the Illinois hotline, with cats being mentioned in about half of those not involving dogs (Table 2).

Prior to 1982, EPA had a Pesticide Incident Monitoring System (PIMS). Under PIMS, significant exposure incidents were reported "after the fact" by physicians and veterinarians. When compared to hotline reports, summaries of PIMS data for particular compounds show fewer numbers of incidents annually but much greater percentages of deaths and other serious effects (Frantz et al. 1984, Jacobs 1990).

Table 1. Rodenticide exposure incidents involving humans reported from 1983 through 1988 through the network of the American Association of Poison Control Centers.

	Year ^a					
	1983	1984	1985	1986	1987	1988
% of US population "served"	11%	42%	48%	55%	57%	63%
Total reported incidents	2,103	4,389	5,949	8,705	9,663	10,626
Estimated total No. incidents ^b	19,118	10,450	12,394	15,827	16,953	16,867
% Incident victims <6 years old ^c	85.2%	89.4%	90.0%	89.6%	90.4%	89.2%
Total anticoagulant incidents	1,724	3,703	5,098	7,723	8,579	9,323
% Anticoag. victims <6 years old ^c	87.9%	92.0%	92.7%	91.4%	92.4%	91.3%
Total strychnine incidents	69	119	126	103	87	178
% Strych. victims <6 years old ^c	52.0%	36.2%	36.0%	40.2%	32.6%	31.4%
Total other unknown incidents	310	567	725	879	997	1125
% Other/Unk. victims <6 years old ^c	76.7%	82.1%	79.4%	79.7%	78.4%	81.1%

^aData are from Veltri and Litovitz (1984), Litovitz and Veltri (1985), Litovitz et al. 1986, 1987, 1988, 1989).

^bThis estimate was derived by dividing the number of reported incidents by percentage of U.S. population "served" by AAPCC system.

^cCalculation is based only on incidents for which the age of the victim was reported. Therefore, the proportion of victims that were older than 6 years of age can be determined by subtracting the data in these rows from 100%.

Table 2. Rodenticide-related calls reported annually through hotline at the animal poison control center, University of Illinois.

	Year ^a				
	1983	1984	1985	1986	1987
Total No. rodenticide incidents	1418	1690	2333	4118	6272
Rank of rodenticides among agent classes ^b	1	1	2	1	1
% Incidents involving dogs	81%	78%	82%	81%	83%
% Incidents involving cats	9%	9%	9%	10%	10%
Calls for selected compounds					
Brodifacoum	935	1064	1297	2488	4061
Bromadiolone	2	25	52	133	225
Warfarin	199	266	383	472	484
Diphacinone	96	107	118	133	165
Chlorophacinone	7	18	19	34	41
Pindone	13	13	36	44	46
Bromethalin	0	0	2	38	148
Cholecalciferol ^c	--	0	46	184	361
Strychnine	33	43	46	52	52
Zinc phosphide	16	18	27	50	49

^aData are from Buck et al. 1984, 1985, 1986, 1987; Trammel et al. 1989. Some human incidents are reported through this network-<2% of all calls.

^bNumber shows rank of rodenticides among all toxicant classes in frequency of involvement in calls to hotline.

^cCholecalciferol was not registered in the U.S. until 1984.

The thousands of rodenticide exposure incidents involving humans and the thousands more involving nontarget animals are evidence that baits are not being used and handled safely by everyone. Discussions of the seriousness or the significance of documented exposure incidents are largely moot. Rodenticides are unlikely to benefit the nontarget organisms that are exposed to them. Appropriate bait protection can prevent most accidents. A person applying rodenticides is expected to protect baits, not because incidents have occurred in the past, but to prevent future incidents. Bait protection is essential to responsible use of rodenticides. If a bait point is accessible to nontarget species likely to be affected directly by the bait, the bait must be placed in a protective bait station. One who fails to protect baits properly violates the label even if no nontarget exposure incidents are documented or even occur.

REACTIONS TO PR NOTICE 83-5 AND PUBLIC HEARINGS

PR Notice 83-5 had several immediate noticeable effects. Some parties showed immediate interest in complying with the label. Others sought to design stations that would be consistent with the requirements for "tamperproof bait boxes." With such persons, EPA engaged in productive dialogue which has helped to make more types of protective bait stations available and to increase use of such stations.

PR Notice 83-5 and the subsequent hearings also appear to have promoted interest in developing ready-to-use protective bait stations. As such units would be sold with bait in them; they must be registered as pesticides. EPA has developed protocols for testing ready-to-use rodent bait stations for various features associated with safe use. Some of these protocols were patterned after methods developed by the Consumer Product Safety Commission for testing candidate "child-resistant packaging." The tests required to show that a ready-to-use bait station is "tamper-resistant" assess resistance to tampering by children, resistance to tampering by dogs, abilities of male and female adult humans to use stations appropriately, and the effectiveness of stations in baiting target species. EPA believes that passing these tests is essential if units are to have labeling which permits (and directs) use of stations in areas accessible to children and pets. Such products would serve an important need as protective bait stations seldom, if ever, are offered for sale at the establishments where nonprofessional users are most likely to buy rodenticides.

At this time, no candidate "tamper-resistant" ready-to-use rodent bait stations have passed all of these tests. Development of ready-to-use protective stations has been impeded by the costs of the tests required for federal registration, the uncertain outcomes of such tests, and the competitive price disadvantage that such units would face on

a market now dominated by loose baits, bait trays, and placepack products. If a design fails to pass all safety tests, the improvements needed to ensure subsequent passage are likely to increase development and production costs even more.

PR Notice 83-5 also elicited backlash, which was evident in some of the testimony at the hearings and in letters addressed to EPA. In particular, some pest control operators (PCOs) stated that PR Notice 83-5 imposed upon them new requirements and potential legal problems.

ATTITUDES

PR Notice 83-5 and the hearings notwithstanding, compliance with label requirements for bait protection remains far from absolute. Compliance by "private" users who apply rodenticide baits seems to be almost nonexistent. Although there has been much interest within the pest control industry in bait station requirements, compliance with the label has not been universal among PCOs and others for whom controlling rodents is a work assignment.

Noncompliance by nonprofessionals is a particularly serious problem as such persons typically apply rodenticides in or around their residences in areas where children or pets might encounter baits. "Owners" have been identified as the source of the material in most reported incidents of animal exposures to rodenticides (Trammel et al. 1989). Presumably, few (if any) of these owners poisoned their animals intentionally. Some noncompliance by nonprofessionals may be inevitable, however, as few private applicators have training in the use of pesticides or have protective bait stations readily available to them.

Noncompliance by professional applicators seems to betray attitudes of apathy and/or of preoccupation with aspects of pest control other than safety. No adequately trained technician should place bait above ground around the outside perimeter of a nonfenced building, or in any other sensitive area, unless the bait is housed in a locked and secured protective bait station, but it happens. The cover of the September 1988 issue of Pest Control magazine portrayed a person wearing the cap of a major pest control firm in the act of placing a cardboard bait station under an aisle shelf of a grocery store. In a subsequent letter to the editor, a reader noted the inappropriateness of such an application (Haines 1989.)

Apathy regarding safety and bait protection is not universal in the pest control industry. Many of the sturdy and ingenious designs of protective bait stations that have been submitted to EPA were designed by PCOs for use in their own operations. Some PCOs use methods other than baits to manage rodent problems in areas where they feel that they cannot limit the risks associated with bait applications. A PCO who, for a variety of reasons, was reluctant to use baits in residential accounts was interviewed in the same issue of Pest Control that depicted use of a cardboard bait station in a grocery store (Anon. 1988). In a Technical Release, the National Pest Control Association (NPCA) offers guidance regarding protection of rodenticide baits (NPCA 1985).

Although EPA receives questions from the pest control industry regarding aspects of the bait station requirements thought to be unclear, the main reasons for noncompliance in 1990 probably are the same as they were in 1980—apathy and unwillingness to make the added investment in protective bait stations. It is difficult to sympathize with those who ignore the responsibility to minimize risks to nontarget species,

ignore current label requirements, ignore the advice of the NPCA, and fail to employ the safe practices used by competitors who do apply baits responsibly.

Although protective bait stations tend to cost more than the less protective alternatives to them, such costs are the expenses of controlling rodents responsibly.

The attitudes of rodenticide users toward bait protection have influenced government agencies. The potential for rodenticides to kill or harm nontarget species has been known for many years. In the 1950s, the California Department of Health (1955) and the Communicable Disease Center (Bjornson and Wright, 1956) recommended ways to limit nontarget exposures to rodenticide baits. These methods included placing baits inside pipes, under boards nailed (or "leaned") at about 45° angles to buildings, and in wooden bait stations with internal baffles.

USDA's development of the "tamper-proof bait boxes" statement emerged from feelings that voluntary use of bait protection might be far from absolute and that some of the approaches adopted might be less than adequate. EPA issued PR Notice 83-5 after it became evident that there was little compliance with the "tamper-proof bait boxes" statement. Although some parties reacted as though PR Notice 83-5 imposed new, costly requirements on rodenticide users, the notice actually was issued to promote compliance with language that already was on most labels for commensal rodenticides and to encourage rodenticide users to assume an oft-neglected responsibility.

If the community of rodenticide users were to adopt, universally, an attitude that protecting rodenticide baits used in areas where nontarget organisms might be exposed to them is necessary and important, appropriate bait protection might occur even without label statements, PR Notices, enforcement efforts, technical releases, lawsuits, etc. As matters stand now, such actions and activities have not yet produced an adequate level of compliance.

FUTURE ACTIVITIES REGARDING PROTECTION OF RODENTICIDE BAITS

A paper (Jacobs 1990) summarizing the results of EPA's public hearings and other investigations regarding rodenticide bait stations is expected to become available in the near future, perhaps by the time that the proceedings of this conference are published.

EPA also expects to release a new PR Notice on rodenticide bait stations. While the Agency does not anticipate reversing direction from the policies outlined in PR Notice 83-5, the new notice is expected to include some clarifications and changes in terminology and required texts for labels of rodenticide baits and concentrates which are sold to users for mixing into baits. One terminology change expected is the replacement of "tamper-proof bait boxes" with "tamper-resistant bait stations." Much less self-defining than "tamper-proof," "tamper-resistant" will require a longer and more precise definition (and probably a longer label statement).

EPA has developed protocols for evaluating the performance of candidate ready-to-use bait stations in various areas associated with safe use and reduction of hazards to dogs and to young children. These protocols are available upon request from EPA. Interested parties should write to Product Management Team 16, Insecticide-Rodenticide Branch, Registration Division (H7505C), Office of Pesticides and Toxic Substances, U. S. Environmental Protection Agency, 401 M Street, SW, Washington, DC 20460.

EPA also has prepared draft protocols for similar testing of bait stations sold without bait in them. Differences between the two sets of methods result primarily from the facts that ready-to-use stations come with bait in them while "empty" stations do not. Although ready-to-use stations must be registered as pesticide products, units sold empty are considered to be "pesticide application equipment" and are not regulated directly under authority of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), as amended.

As part of the reregistration activities mandated for all registered pesticides by the 1988 amendments to FIFRA, EPA will evaluate the hazards posed by each rodenticide active ingredient. These evaluations are expected to require that new toxicological data be generated for most compounds. EPA will evaluate such data along with the use patterns which registrants seek to continue to determine under what conditions, if any, products may continue to be used. For commensal rodenticides, EPA will examine the risks associated with use according to label directions as well as use as generally practiced. If there continues to be a gulf between label directions and general practice in the area of bait protection, EPA may conclude, for some compounds at least, that uses to control commensal rodents should be prohibited entirely (Cancellation), limited to certified applicators ("Restricted Use Pesticide" classification), or limited to sites that are not accessible to children, pets, domestic animals, and/or wildlife ("Use Restriction"). Other options that might be considered for certain compounds or formulations would be to prohibit any use except in a "tamper-resistant" bait station or to require that baits be either classified as "Restricted Use Pesticides" or packaged in ready-to-use, "tamper-resistant" stations. It is too early in the reregistration process for most compounds to determine which of these options is likely to be selected for specific formulations.

OUTLOOK

As long as there are applicators who do not read labels or who believe that requirements can be ignored when inspectors are not looking, there will be many opportunities for humans and nontarget animals to be exposed to rodenticides. Reluctant and half-hearted attempts at compliance with the language currently on labels have led to use of thin-plastic bait stations outside of public buildings and shopping centers. It is inappropriate to characterize such baiting practices as appropriate or such stations as "tamper-proof." While it would be surprising if anyone were to read the "tamper-proof bait boxes" statement now on labels for commensal rodent baits and envision a cardboard or a thin-plastic unit, such stations (and no stations) still are used when rodent baits are applied in areas where there is more than a slight chance that children, pets, domestic animals, and/or nontarget wildlife might find them.

In the past, debates over the exact meanings of "tamper-proof" and "accessible" seem to have arisen, in part, from resistance to complying with the "spirit" of the label statement and a consequent desire to determine what minimum levels of protection might constitute compliance with the "letter" of the label statement. Just as applicators have obligations to minimize risks, EPA really has no choice but to require adequate bait protection. In fact, noncompliance and legal challenges can force regulatory agencies into making stipulations and requirements that are increasingly precise and

absolute. Future efforts by all concerned parties should be directed toward promoting safe and effective rodent control.

Reluctance of animals such as Norway rats to enter stations newly placed in the environment (Marsh 1984) is a problem appropriate for study. Many designs of protective bait stations are now available in the U. S. Among these designs, some seem to be entered far more readily by Norway rats than are others (Kaukeinen 1986). With more study of design and additional testing of bait stations, it is likely that many difficulties associated with protective units will be surmounted.

LITERATURE CITED

- ANONYMOUS. 1988. One tricky hombre. *Pest Control* 56(9):36-38.
- BJORNSON, B. F., and C. V. WRIGHT. 1956. Control of domestic rats and mice. Public Health Service Publication No. 563, U. S. Dept. Health, Education, and Welfare, Public Health Service, Communicable Disease Center. 25 pp.
- BUCK, W. B., V. R. BEASLEY, and C. R. CARLSON. 1984. 1983 Annual Report. Animal Poison Control Center, University of Illinois, College of Veterinary Medicine. 75 pp.
- BUCK, W. B., V. R. BEASLEY, H. L. TRAMMEL, and C. R. CARLSON-STARK. 1985. National Animal Poison Control Center Annual Progress Report 1984. National Animal Poison Control Center, University of Illinois, College of Veterinary Medicine. 181 pp.
- BUCK, W. B., V. R. BEASLEY, and H. L. TRAMMEL. 1986. National Animal Poison Control Center Annual Report 1985. National Animal Poison Control Center, University of Illinois, College of Veterinary Medicine. 353 pp.
- BUCK, W. B., V. R. BEASLEY, and H. L. TRAMMEL. 1987. National Animal Poison Control Center Annual Report 1985. National Animal Poison Control Center, University of Illinois, College of Veterinary Medicine. 415 pp.
- CALIFORNIA DEPARTMENT OF PUBLIC HEALTH. 1955. Control of domestic mice in California. Bureau of Vector Control. 8 pp.
- ELTON, C, and R. M. RANSON. 1954. Containers for baiting. Pages 148-159 *In*: Control of Rats and Mice (Chitty, D., ed.). Clarendon Press, Oxford.
- FRANTZ, S., W. J. DODDS, and S. KIM. 1984. A study of accidents, illnesses, and deaths resulting from the use of commensal rodenticides. Written supplement to oral testimony by S. Frantz at U. S. Environmental Protection Agency's Public Hearings on Rodenticide Bait Stations, Sacramento, CA, March 5. 14 pp.
- HAINES, R. 1989. Letter to editor. *Pest Control* 57(1):20.
- JACOBS, W. W. 1990. Rodenticide bait stations: major findings from public hearings and other investigations. Unpublished report. Office of Pesticide Programs, U. S. Environmental Protection Agency.
- JOHNSON, E. L. 1983a. Tamper-proof bait boxes. PR Notice 83-5, Office of Pesticide Programs, U. S. Environmental Protection Agency. 6 pp.
- JOHNSON, E. L. 1983b. Rodenticide bait stations; hearings. *Federal Register* 48(204):48711-48712.
- KAUKEINEN, D. E. 1987. Evaluations of rodent bait station use under controlled conditions. Pages 111-114 *In*: Vertebrate Pest Control and Management Materials:

- 5th volume (S. A. Shumake and R. W. Bullard eds.). ASTM STP 974. American Society for Testing and Materials, Philadelphia, PA.
- LITOVITZ, T. L., T. G. MARTIN, and B. SCHMITZ. 1987. 1986 Annual Report of the American Association of Poison Control Centers National Data Collection System. *Am. J. Emer. Med.* 5(5):405-445.
- LITOVITZ, T. L., S. A. NORMANN, and J. C. VELIRI. 1986. 1985 Annual Report of the American Association of Poison Control Centers National Data Collection System. *Am. J. Emer. Med.* 4(5):427-458.
- LITOVITZ, T. L., B. SCHMITZ, and K. C. HOLM. 1989. 1988 Annual Report of the American Association of Poison Control Centers National Data Collection System. *Am. J. Emer. Med.* 7(5):495-545.
- LITOVITZ, T. L., B. SCHMITZ, N. MATYUNAS, and T. G. MARTIN. 1988. 1987 Annual Report of the American Association of Poison Control Centers National Data Collection System. *Am. J. Emer. Med.* 6(5):479-515.
- LITOVITZ, T. L., and J. C. VELTRI. 1985. 1984 Annual Report of the American Association of Poison Control Centers National Data Collection System. *Am. J. Emer. Med.* 4(5):427-458.
- MARSH, R. E. 1984. Comments and concerns regarding PR Notice 83-5 on tamper-proof bait boxes. Written supplement to oral testimony at U. S. Environmental Protection Agency's Public Hearings on Rodenticide Bait Stations, Sacramento, CA. March 5, 1984. 14pp.
- NPCA. 1985. Tamper-resistant bait stations. Technical Release No. ESPC 041338. National Pest Control Association. 8 pp.
- PALMATEER, S. D. 1982. Tamperproof bait boxes. Unpublished Technical Report, Terrestrial and Aquatic Biology Unit, Office of Pesticide Programs, U. S. Environmental Protection Agency. 45 pp.
- TRAMMEL, H. L., D. C. DORMAN, V. R. BEASLEY, and W. B. BUCK. 1989. Ninth Annual Report of the Illinois Animal Poison Information Center, Volume I. Kendall/Hunt Pub. Co., Dubuque, IA. 486 pp.
- VELTRI, J. C, and T. L. LITOVITZ. 1985. 1984 Annual Report of the American Association of Poison Control Centers National Data Collection System. *Am. J. Emer. Med.* 4(5):427-458.

