Malicious animal intoxications: poisoned baits

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ABSTRACT: Data of toxicological analyses for baits carried out in the Laboratory of Toxicology of the Department of Veterinary Clinics (University of Pisa) over a 10-year period are summarized. The 508 lures have been grouped according to their preparation features. This classification has generated six classes: (1) baits prepared with discarded or out-of-date food; (2) laborious and original/particular baits; (3) baits containing more than one toxic substance; (4) baits containing non-toxic material; (5) baits prepared with non-food material and (6) *in vivo* baits. The most commonly detected toxic substances in baits were organophosphorus and carbamate pesticides (48%), anticoagulant rodenticides (18%), zinc phosphide (12%), strychnine (9%), metaldehyde (8%) and others (5%). This survey shows that in Italy, the deliberate misuse or abuse of toxic substances intended to kill domestic animals, is very common and still far from being eradicated. Elaboration of a complex strategy, involving authorities as well as veterinarians and citizens, is the first step to defeat this harmful practice.

Keywords: poisoned baits; veterinary toxicology; suspicious death; poisoning; lures

List of abbreviations

AR = anticoagulant rodenticides, **CI** = organophosphorus and carbamate pesticides, **MT** = metaldehyde, **ST** = strychnine, **ZP** = zinc phosphide

In Europe, malicious animal poisonings are nowadays of concern for both animal and human health (Berny et al., 2010; Guitart et al., 2010a,b). With regard to Italy, this problem was first tackled at the beginning of this century by two regions (Tuscany and Umbria), where this phenomenon was particularly widespread. In this frame, a law ruling/banning the preparation, possession, and employment of poisoned baits, was issued in 2001 (Regional law No. 27, August 16th 2001). Accordingly, it is illegal to use poisoned bait except to kill rats, mice and moles. Poisoned bait is a special threat to dogs and cats but it also kills birds of prey such as owls, kites and eagles, as well as foxes and badgers. If poisoned lures have been put down for rodents and moles near a public place warning notices should be posted and the authorities alerted (Brajon, 2004). Due to the continuous and frequent use of these baits to kill the animals, the above mentioned law (partially modified) has been extended to the entire nation according to the Directive 18/12/2008. Some recent Italian (Giorgi et al., 2002; Caloni et al., 2003; Amorena et al., 2004) and European (Berny et al., 2010; Guitart et al., 2010a,b) reports have revealed that poisonings in pets, horses and in wild animals are still a frequent veterinary problem. Poisoned baits have been reported to be one of the most important triggers of animal intoxications (Giorgi et al., 2002). Several studies report that lures can be prepared with diverse toxics (Frazier et al., 1999; Giorgi et al., 2002; Amorena et al., 2004; Berny et al., 2010). As a matter of fact, these substances are easily available in many formulations and it is possible to buy them without any particular restriction. Most people in general and many rural dwellers are scantily informed regarding wildlife poisoning. Although the use of poisoned baits has now become both more controlled and legislated against, an increase in their

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dangerousness and an enhancement in the ingeniousness of their preparation is a worrying trend. The present study reports an overview of the different types of poisoned "hand made" baits found in 10 years of toxicological analysis, emphasizing the importance of their development over the years.

MATERIAL AND METHODS

Data for this retrospective study were taken from 508 pesticide-based baits analyses ranging from January 1999 to December 2009. None of the baits considered in this study were commercially produced baits. Visual and chemical analyses were performed at the Laboratory of Toxicology of the Department of Veterinary Clinics, University of Pisa, using solid samples of baits. The presence or absence of a suspected pesticide was investigated by validated laboratory methods using a solid-phase or liquid-liquid extraction followed by separation and characterization by chromatographic techniques. These included gas-chromatography and high performance liquid chromatography. The analyses were carried out for organophosphorus and carbamate pesticides (Sharma et al., 1990), anticoagulant rodenticides (Rengel and Friedrich, 1993), zinc phosphide (Guale et al., 1994), strychnine (Duverneuil et al., 2004) and metaldehyde (Griffiths, 1984). In instances where the bait was not positive for the above-mentioned toxics, the sample was extracted using three different pH's (acid, basic and neutral) and subsequently underwent screening analysis in GC/MS (Graham, 2004).

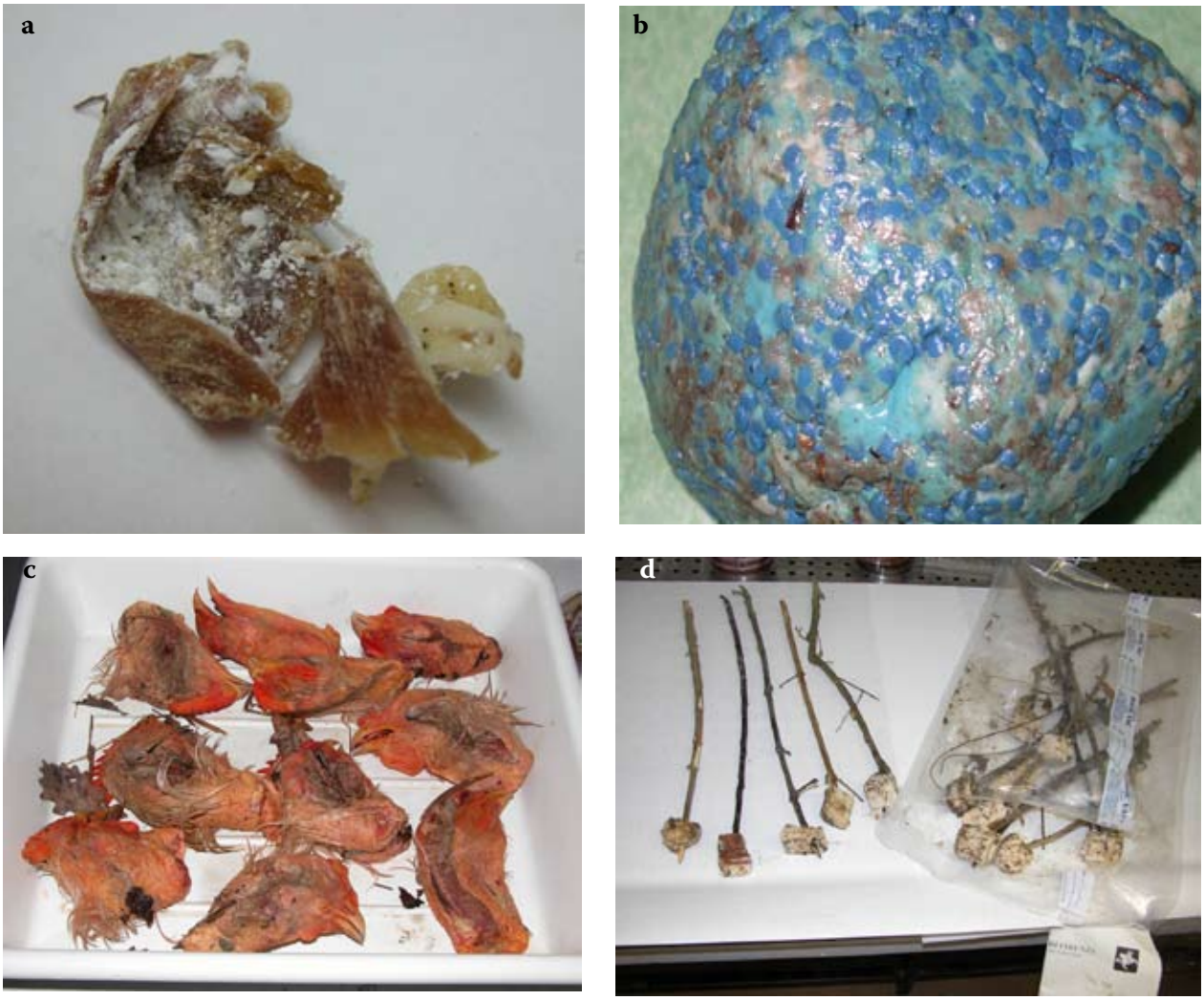

Figure 1. Baits prepared with discarded or out-of-date food. **a** = slice of ham laced with organophosphorus and carbamate pesticides; **b** = meat ball combined with anticoagulant rodenticides; **c** = chicken head soaked with organophosphorus and carbamate pesticides; **d** = lard cubes drenched with strychnine

RESULT AND DISCUSSION

None of the baits considered in this study were commercially produced. The baits found to be positive have been classified in six different classes according to their features: (1) baits prepared with discarded or out-of-date food; (2) laborious and original/particular baits; (3) baits containing more than one toxic substance; (4) baits containing non-toxic material; (5) baits prepared with non-food material and (6) *in vivo* baits.

Baits prepared with discarded or out-of-date food

Miscellaneous baits belong to this class which are the most frequent (n = 362, CI 52%, AR 19%, ZP 11%, ST 9%, MT 8%, other 1%). They can be considered the primordial homemade baits and are usually inexpensively and easily prepared. They are commonly based on food stuffs often in spoiled conditions, such as lard, ham, raw pale meat or fish, chicken necks, offal (very attractive for animals), laced with toxic substances. Generally, the venom is perceptible to the naked eye and directly in contact with the environment (Figure 1a,b,c,d). The use of food stuffs with a high amount of fat, such as lard blocks have been found often coupled with lipophylic chemicals (especially strychnine). This has been speculated to be due to two reasons: (i) thanks to their physical-chemical characteristics, lipophylic toxics can penetrate into the matrix and turn invisible; (ii) the lard protects the toxic from rain, sun, and other environmental factors, resulting in long-lasting hazardous bait (Figure 1 d). The main aim of this class of decoys is to increase their palatability and therefore attractiveness for the "target species". The matrix's smell and taste can hide the typically bitter taste of the toxic.

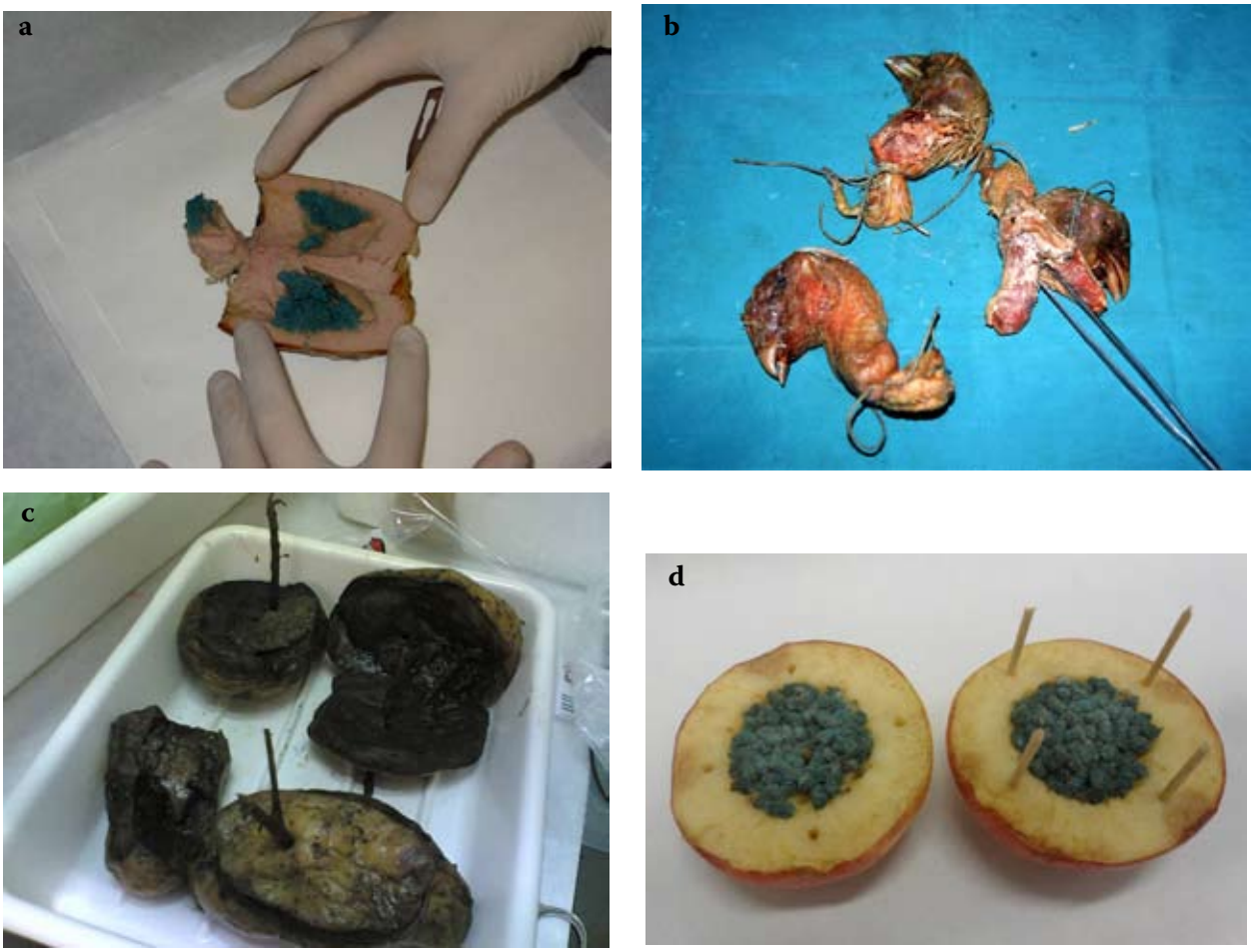

Figure 2. Laborious and original/particular baits. **a** = sausage filled with metaldehyde (in its original form it appeared as an uncontaminated piece of sausage); **b** = chicken necks filled with strychnine; **c** = potatoes filled with zinc phosphide; **d** = apple filled with metaldehyde slug pellets

Laborious and original or particular baits

This class groups baits that require particular work and time in preparation, making them original (n = 85, CI 49%, AR 10%, ZP 21%, ST 2%, MT 12%, other 4%). Usually they are arranged to hide the toxic substance, protecting the "toxic core" from environmental factors that may reduce its efficacy. These baits have been found directed against pets, large and wild animals. Baits for pets are usually constructed with dug cheeses, or soft small goods, fresh or dried meat filled up with the toxic, and plugged up with the same matrix (Figure 2a). Poultry necks have been found to be a popular matrix for hiding the toxic substance (Figure 2b). Original baits against wild animals, as potatoes filled with zinc phosphide (Figure 2c), have been found underground. They have been speculated be directed against wild boars or badgers (thought of as pests by the farmers), to alleviate their impact on the agriculture. For decades, the control of wild boars has been attempted using a variety of methods, including shooting, trapping and fencing, but this is the first instance of malicious poisoning being employed. These potatoes were buried at a depth of about 10 cm. If on the one hand they can be more readily detected by odour by the wild boards, on the other they could be easily excavated by non target species (Belcher, 1998). Just one event of bait for large animals features in our data: a case of suspicious deaths in horses which was solved after the discovery of some cut apples filled with metaldehyde and fixed with a wood bar (Figure 2d).

Baits containing more than one toxic substance

These baits are usually the most harmful for the animals (n = 39, CI 65%, AR 59%, ZP 20%, ST 35%, MT 12%, other 9%). The combination of two or more toxics in the matrix can result in a synergistic effect or in a variation in time of onset (immediate/delayed) of the different venoms. These intoxications may require intricate resolution by veterinarians. In fact, if the patient recovers from the first instantaneous symptoms (due to the immediate toxic), other unexpected symptoms, due to the second toxic, can arise after the lapse of some time. This second phase can take place when the animal seems to be better and has been discharged from veterinary care. Other circumstances that can mislead the veterinarians are when the symptoms stemming from combined intoxication are not known by him or her. The most encountered combination in these baits was organophosphorus and carbamate pesticides and anticoagulant rodenticides. The intoxications triggered by this class of lures are underestimated. In fact, the toxicological analysis is usually stopped when the first toxic is determined. The laboratory investigations proceed only if some other suspicious substance is noticed in the matrix (Figure 3a,b) or if the animal's symptoms are not consistent with the first toxic detected.

Baits containing non-toxic material

These baits could be on the edge of the classification reported in this manuscript because they do not contain toxics. The final intent to kill the animals is unfortunately still well achieved by these baits, and for this reason this class has been inserted in the study (n = 15). Their ingestion causes irreparable injuries to the animals, rendering most clinical interventions ineffective. Very often the animal's death is slow, painful and inexorable. The patient frequently must be put down because of a drastic turn for the worse. The most frequently encountered baits are, razor blades hidden in meat stuffs, fried sponges and ground raw meat mixed with shattered glass (Figure 4a,b,c).

Baits prepared with non-food material

This group is seldom used (n = 6, CI 50%, ST 50%), but according to officers reports it is a method apparently employed by gypsies or other unscrupulous people to kill guard dogs. These dishonest persons toss the poisoned baits into owners' yards and in a matter of minutes have free access to the house. Some guard dogs are trained to not eat anything that is not administered by the owner, but a tennis ball or a plastic puppet can catch a dog's attention. Usually they are filled up with the toxic (powders). As soon as the lure is taken into the mouth the venom is released into the oral cavity of the animal where absorption is almost immediate (Figure 5a,b). Guard dogs are often not checked on and frequently they are found dead.

In vivo baits

This class of lures has had only been reported in one case (Meucci et al., 2003). In 2002 bush police

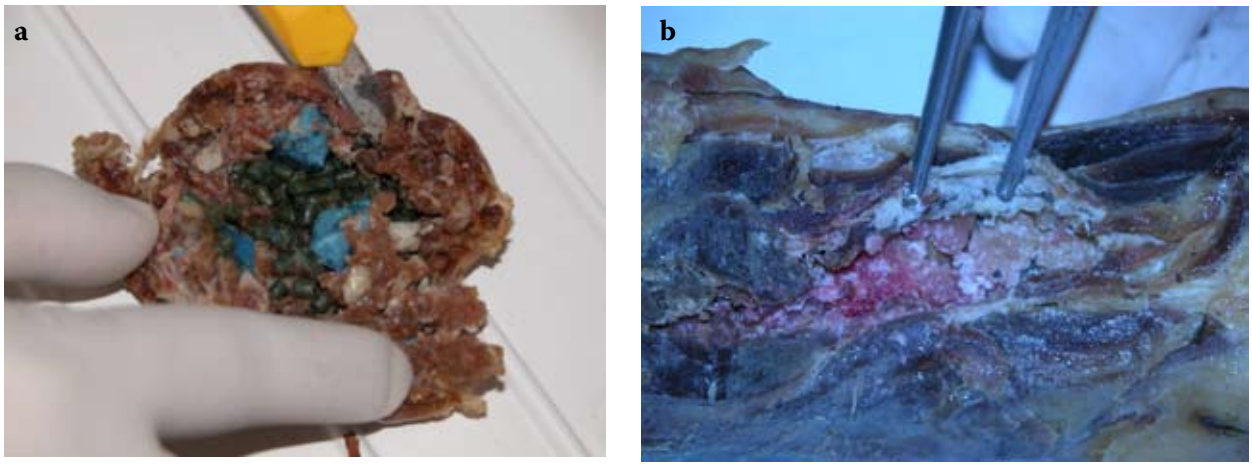

Figure 3. Baits containing more than one toxic substance. **a** = sausage filled with anticoagulant rodenticides (light blue spots) and organophosphorus and carbamate pesticides (red pellets); **b** = block of ham filled with anticoagulant rodenticides and metaldehyde

brought into our labs a female pheasant in critical health condition. She was found in the bush linked to a tree by iron wire. A few minutes after the bird arrived in our lab it died. At the visual inspection a swelling and necrotic area on the neck was detected. Four surgical stitches closed a flesh wound in this area. After the *post mortem* exam an implant of unknown material weighting 8 g was extracted. Toxicological analyses revealed it was a combination of endosulfan and pirimicarb. This original *in vivo* lure, suggests the involvement of one or more persons capable of handling anaesthetic drugs and the stitches involved in its preparation.

The most detected toxic substances in baits were organophosphorus and carbamate pesticides (48%), anticoagulant rodenticides (18%), zinc phosphide (12%), strychnine (9%), metaldehyde (8%) and other (5%).

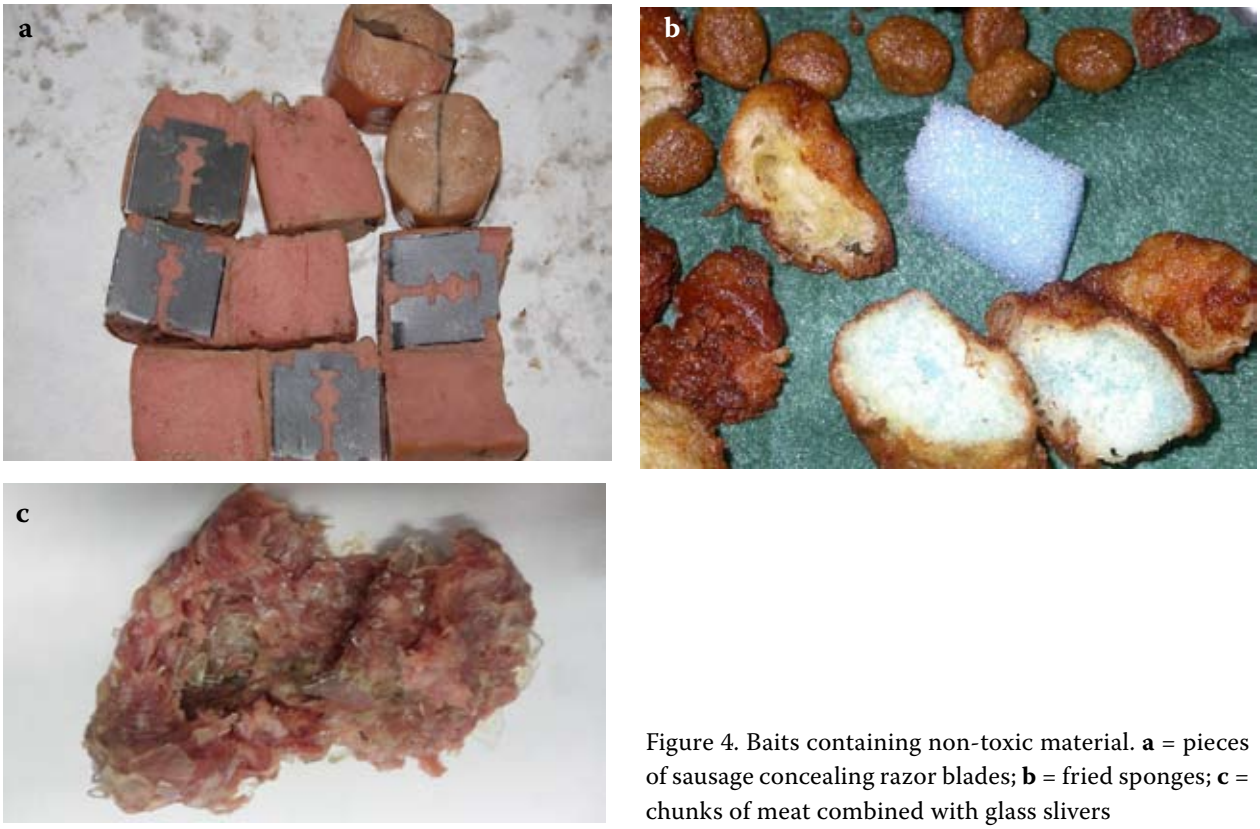

Figure 4. Baits containing non-toxic material. **a** = pieces of sausage concealing razor blades; **b** = fried sponges; **c** = chunks of meat combined with glass slivers

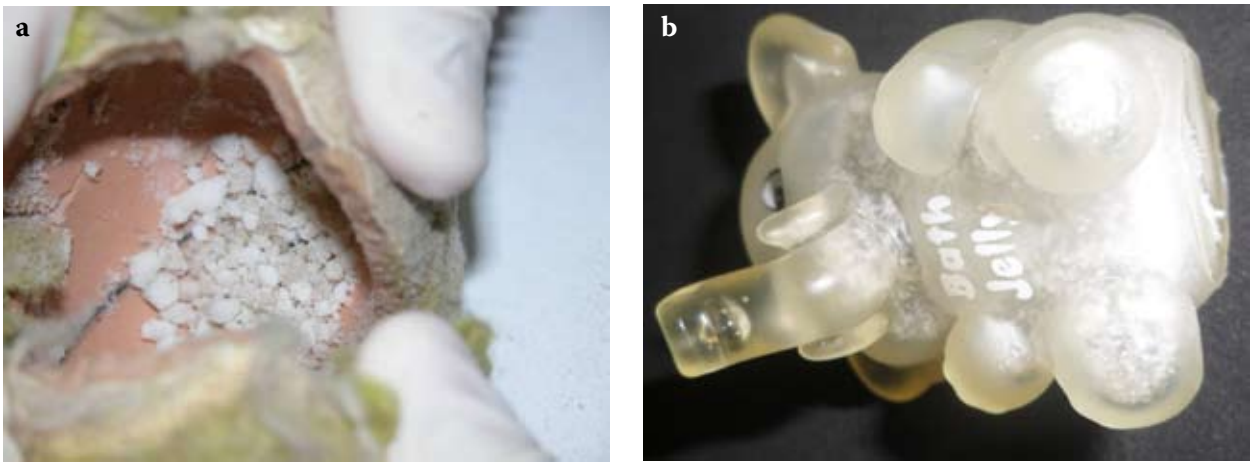

Figure 5. Baits prepared with non-food material. **a** = tennis ball filled with organophosphorus and carbamate pesticides; **b** = plastic toy filled with strychnine.

CONCLUSION

Accidental poisonings of domestic animals and wildlife with commercial formulations of pesticides has been documented worldwide (Berny et al., 2010; Guitart et al., 2010a,b). Casual episodes are difficult to prevent and control, but they account for a small proportion of cases compared to illegal and deliberate poisonings (Giorgi et al., 2007; Berny et al., 2010). Although some level of mortality may be acceptable in populations of non-target species, ethical pest control programmes are seeking increasingly to minimize mortality of non-target animals. Various modifications to baiting methods have been devised in order to reduce the potential risk to non-target species and these are dependent on a number of factors, including the type and amount of toxic used, the type of bait used, the density of baits and the way in which the bait is presented (Glen et al., 2007). Commercial preparations have sought to increase target specificity by increasing their attractiveness to target species and decreasing their attractiveness or palatability to non-target animals. To reduce the risk of ingestion of lethal amounts by non-target animals it is possible to add repellents and to use a lower percentage of the active ingredient (Martinez-Haro et al., 2008). The different types of poisoned baits, the elevated concentrations of toxics and the indiscriminate laying of baits reported in the present study prove that most of them have been prepared with criminal intent. Through the evaluation of the original lure preparations it appears that they have been produced against domestic animals, although by placing these in public and private areas even humans could come into contact with them. An innovative approach for the fight against the illegal use of poison has been adopted in Italy (Gran Sasso and Laga's mountains National Park), and Spain (Andalusia and Aragon Regions) (Anonymous, 2009). The project concerns the training and employment of anti-poison dog units. These units are comprised of dogs capable of locating different kinds of poison, by forest rangers, and by a pool of veterinarians, specialized in poisoned decoy and carcase diagnostic investigations. These units patrol the territory to locate the potential poisoned baits or corpses of wild or domestic animal where there is a suspicion of poisoning. This strategy is very expensive and can cover only a few areas. At the moment a scheme to fight the poisoned baits phenomenon is still far from being effective. Elaboration of a complex strategy (across several fronts), involving authorities (increasing prevention) as well as veterinarians and citizens (increasing awareness and instituting education campaigns), is the first step in fighting this harmful practice.

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