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*MINI REVIEW*

# Rodents' use as bait for invertebrates: A possible pathway for insectivores to enter their diet

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Rodenticide baits are commonly used to control rodent populations, but their unintended effects on non-target species have raised concerns. One such concern is the potential consumption of rodenticide-contaminated invertebrates by insectivores, leading to secondary poisoning. This article explores the evidence and implications of this phenomenon, highlighting the ecological and conservation implications of rodenticide use in pest management practices.

**Keywords:** Rodenticides, Invertebrates, Insectivores, Secondary poisoning, Pest management.

## Introduction

Rodenticides come in various formulations, including anticoagulants, acute toxins and non-anticoagulants. Anticoagulant rodenticides, such as warfarin and brodifacoum, interfere with blood clotting mechanisms, leading to hemorrhaging and death in rodents. These chemicals are often slow-acting, allowing rodents to feed multiple times before succumbing to the poison. Acute toxins, such as zinc phosphide and bromethalin, act quickly to cause respiratory or neurological failure in rodents. Non-anticoagulant rodenticides, like cholecalciferol, disrupt calcium metabolism, resulting in systemic failure (Sainsbury, K. A., et al., 2018). While rodenticides are intended for rodents, their use can have unintended consequences for non-target species. Secondary poisoning occurs when predators or scavengers consume rodents or other prey items contaminated with rodenticides. This phenomenon has been well-documented in birds of prey, mammals and reptiles, leading to population declines and ecological disruptions. In addition to secondary poisoning, rodenticides can also affect non-target species through direct exposure or ingestion of bait pellets (Witmer, G. 2019).

## Literature Review

Although invertebrates are not the primary target of rodenticides, there is growing evidence that they can consume bait pellets or feed on rodents contaminated with rodenticides. Studies have reported the presence of rodenticide residues in various invertebrate taxa, including beetles, ants and earthworms. For example, research conducted in agricultural and urban environments has detected anticoagulant rodenticides in the bodies of beetles and ants, suggesting direct consumption or scavenging of poisoned rodents. Invertebrates serve as important prey items for many insectivorous species, including birds, mammals and amphibians (Geduhn, A., et al., 2014). Therefore, the consumption of rodenticide-contaminated invertebrates could serve as a potential route for the transfer of rodenticides to insectivores. Once ingested, rodenticides can accumulate in the tissues of insectivores, leading to toxic effects such as hemorrhaging, neurological damage and reproductive impairment. Furthermore, the bioaccumulation of rodenticides in insectivore populations could have cascading effects on higher trophic levels and ecosystem functioning.

Rodenticides are chemicals formulated to kill rodents and are widely used in pest management programs worldwide (Shore, R. F., et al., 2019). While effective in controlling rodent populations, the use of rodenticides has raised concerns due to their potential impacts on non-target species. Secondary poisoning, wherein predators or scavengers are exposed to rodenticides by consuming contaminated prey, has been extensively documented in vertebrates. However, the potential for invertebrates to serve as vectors of rodenticides to insectivores remains less understood. This article examines the evidence and implications of rodenticide consumption by invertebrates and its subsequent incorporation into the diet of insectivores.

## Discussion

The consumption of rodenticide-contaminated invertebrates by insectivores has significant ecological and conservation implications. Insectivores play important roles in regulating insect populations and maintaining ecosystem balance. Therefore, the loss of insectivore populations due to rodenticide exposure could disrupt trophic interactions and ecosystem dynamics. Additionally, the decline of insectivores could have indirect effects on plant communities and other wildlife populations, leading to cascading impacts throughout the food web. To mitigate the risks associated with rodenticide use, Integrated Pest Management (IPM) strategies should be employed. IPM emphasizes the use of multiple control methods, including sanitation, exclusion and non-chemical alternatives, to minimize reliance on rodenticides (Dowding, C. V., et al., 2010). When rodenticides are necessary, targeted application and bait station placement can reduce non-target exposure. Furthermore, the development and use of alternative rodent control methods, such as biological control agents and fertility control, can help reduce reliance on chemical pesticides.

## Conclusion

The consumption of rodenticide baits by invertebrates represents a potential route for the transfer of rodenticides to insectivores. While the direct effects of rodenticides on invertebrates may be minimal, their incorporation into the diet of insectivores can have cascading effects on ecosystem dynamics and wildlife populations. Therefore, it is essential to consider the unintended consequences of rodenticide use and implement strategies to minimize non-target exposure. By adopting integrated pest management practices and exploring alternative control methods, we can mitigate the ecological impacts of rodenticides and promote sustainable pest management solutions.

## Acknowledgement

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## Conflict of Interest

The authors declare no conflict of interest.

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