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Risks and Hazards of Rodenticide to Non-raptor Birds

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ABSTRACT: Incident data can support risk assessments by providing evidence of adverse effects of rodenticides to birds following operational applications. Traditionally, field monitoring for rodenticide incidents has focused primarily on raptors. However, non-raptor birds may also be poisoned (rodenticide exposure resulting in adverse effects including mortality) by rodenticides through consumption of the rodenticide bait and contaminated prey. I conducted a literature search canvassing 12 government and scholarly databases for rodenticide incidents (evidence of exposure to a rodenticide, adverse effects, or exposure to placebo baits) involving non-raptor birds. I used the search terms ‘rodenticide’ and ‘birds’ and from these results, I excluded entries of raptor incidents, laboratory toxicology studies, duplicate records, and unpublished literature (except for entries in the US Environmental Protection Agency’s Incident Data System). I ended up with 641 non-raptor rodenticide incident records spanning the years 1931 to 2016. The incident records included 17 orders, 58 families, and 190 non-raptor bird species ranging from emus (*Dromaius novaehollandiae*) to songbirds (Order Passeriformes). Nineteen anticoagulant and non- anticoagulant rodenticide active ingredients were associated with the incidents. Rodenticide formulations including bait blocks, cereal based pellets, carrot baits, pastes and jams, liquids, and loose grain baits following above-ground, below-ground, in-bait stations, and in-meat applications have results in non-raptor incidents either through direct ingestion of the rodenticide or via contaminated invertebrate and vertebrate prey.

The availability of incident records affected the numbers of incidents in this review. The availability is in turn is affected by the infrastructure for monitoring and reporting incidents. For example, although rodenticides are used worldwide, I found non-raptor incident records from only 15 countries. I compared the number of incidents and species detected by surveillance method (passive vs. active surveillance) and by the purpose of application (for ecological restoration vs for human welfare). More incidents were reported from passive surveillance and following applications for human welfare but a significantly greater number of species were detected in proportion to the number of incidents found through active surveillance and following applications for ecological restoration.

In conclusion:1) A broad diversity of non-raptor species are affected by rodenticides with a variety of modes of action, formulations, and application methods; 2) Surveillance method and the purpose of application can influence the quantity and quality of incident data; 3) The lack of evidence does not imply the lack of hazard but signifies poor infrastructure for monitoring and reporting non-raptor avian incidents; 4) Awareness of the breadth of species diversity of non-raptor bird poisonings from rodenticides may increase the incentive for monitoring and reporting them and this in turn can strengthen the predictions of harm characterized by risk assessments.

KEY WORDS: anticoagulant rodenticide, birds, non-anticoagulant rodenticide, nontarget hazard, risk assessment, surveillance method

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