

PROJECT REPORT

Project Title: Assessment of toxicity and potential risk of the anticoagulant rodenticide diphacinone using Eastern screech-owls (*Megascops asio*)

Research Agency: U.S. Geological Survey

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Background:

The present study was conducted to evaluate overt toxicity, histopathology and blood clotting time responses, and tissue residue concentrations following DPN administration to Eastern screech-owls (*Megascops asio*), a member of the order *Stringiformes* that has been used extensively in raptor toxicological studies (Wiemeyer 2010). These data, in combination with similar information in Northern bobwhite and American kestrels are being used to develop a pharmacodynamic model and a more complete risk assessment of the toxicity of DPN in birds

Results:

Single-day acute oral exposure of adult Eastern screech-owls (*Megascops asio*) to DPN evoked overt signs of intoxication, coagulopathy, histopathological lesions (e.g., hemorrhage, hepatocellular vacuolation), and/ or lethality at doses as low as 130 mg/kg body weight, although there was no dose–response relation. However, this single-day exposure protocol does not mimic the multiple-day field exposures required to cause mortality in rodent pest species and non-target birds and mammals. In 7-day feeding trials, similar toxic effects were observed in owls fed diets containing 2.15, 9.55 or 22.6 ppm DPN, but at a small fraction ($\approx 5\%$) of the acute oral dose. In the dietary trial, the average lowest-observed-adverse-effect-level for prolonged clotting time was 1.68 mg DPN/kg owl/week (0.24 mg/kg owl/day; 0.049 mg/owl/day) and the lowest lethal dose was 5.75 mg DPN/kg owl/week (0.82 mg/kg owl/day). In this feeding trial, DPN concentration in liver ranged from 0.473 to 2.21 lg/g wet weight, and was directly related to the daily and cumulative dose consumed by each owl. A probabilistic risk assessment indicated that daily exposure to as little as 3–5 g of liver from DPN-poisoned rodents for 7 days could result in prolonged clotting time in the endangered Hawaiian short-eared owl (*Asio flammeus sandwichensis*) and Hawaiian hawk (*Buteo solitarius*), and daily exposure to greater quantities (9–13 g of liver) could result in low-level mortality. These findings can assist natural resource managers in weighing the costs and benefits of anticoagulant rodenticide use in pest control and eradication programs.