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Exposure of Urban Coyotes to Anticoagulant Rodenticides in Southern California: Sub-lethal Effects and Environmental Correlates (Abstract)

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ABSTRACT: Secondary exposure to anticoagulant rodenticides (ARs) remains a significant problem for wild carnivores living at the urban-wildland interface. Although direct mortality is the most obvious concern, AR exposure may also cause subtle, sub-lethal effects, such as reduced body condition and increased parasite loads, that ultimately contribute to poorer performance at the population level. However, relatively little is known about such effects on wild animals, or about the environmental factors that contribute to AR exposure. We examined relationships between levels of AR exposure, demographic factors, and landscape variables associated with urbanization, for coyotes (*Canis latrans*) from urban Los Angeles and Orange counties, California. AR exposure was estimated from residue assays of livers from 353 carcasses, collected opportunistically as road kills or euthanized nuisance animals from 2015 to 2018. We also conducted veterinary necropsies on a subset of 50 carcasses to investigate effects of AR exposure on body weight, overall condition, and parasite burdens. Nearly all coyotes (98%) contained residues of at least one AR, with second-generation ARs (SGARs) detected in 97%, first-generation ARs (FGARs) detected in 75%, and 66% exposed to both types. Individual coyotes had residues of 0-6 compounds (mode = 4), with three SGARs (bromadiolone, brodifacoum, difethialone) and one FGAR (diphacinone) detected often (≥ 65 coyotes). Adults were exposed to more ARs and had significantly higher residue concentrations than juveniles. Road-killed coyotes were over-represented among coyotes with high numbers of SGARs and had significantly higher SGAR residue levels than euthanized ones. Contrary to our expectations, landscape patterns suggested higher numbers and residue concentrations of SGARs in coyotes associated with less intensive urban development. Very few coyotes (6 of 353) showed any evidence of mange, and these animals had similar AR numbers and residue concentrations to those without mange. Of the 50 animals that we necropsied thoroughly, coyotes with obvious internal hemorrhage tended to have high residue concentrations of SGARs, while those exposed to multiple FGAR compounds and with high FGAR residue concentrations tended to be in poorer body condition. ARs are an important tool for managing rodent pests but given the ubiquitous exposure of coyotes to ARs and evidence of potential sub-lethal effects, notably from FGARs, we need more information on pathways of exposure and better strategies to reduce the total amount of ARs on the landscape.

KEY WORDS: anticoagulant rodenticides, *Canis latrans*, non-target exposure, sub-lethal effects, urban coyotes

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