

## LEAD INGESTION BY SCAVENGING MAMMALIAN CARNIVORES IN THE YELLOWSTONE ECOSYSTEM

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EXTENDED ABSTRACT.—Ingestion of lead from spent ammunition is a potential challenge to the conservation of large carnivores and scavengers. Evidence suggests large carnivores such as Black Bears (*Ursus americanus*), Grizzly Bears (*U. arctos*), Wolves (*Canis lupis*), and Coyotes (*C. latrans*) scavenge to varying degrees on ungulate offal piles abandoned by hunters (Wilmsers et al. 2003). Other top carnivores, such as Cougars (*Puma concolor*), may be less attracted to offal piles and thus less dependent on them, but may periodically still be exposed to lead at biologically significant levels because of the tendency to occasionally scavenge. Grizzly Bears alter their movement patterns outside of Yellowstone National Park during the fall hunting season to take advantage of unrecovered offal and wounded Elk (*Cervus canadensis*) left by hunters (Ruth et al. 2003, Haroldson et al. 2004). The Southern Yellowstone Ecosystem is host to one of the densest Elk populations in North America as well as a complete large carnivore guild. An annual big game hunt results in an abundant harvest and provides an ideal situation to test for the occurrence among predators and scavengers of lead ingestion from spent rifle bullets.

We have begun collecting samples of liver, hair, blood, and feces from Black and Grizzly Bears, Wolves, Coyotes, and Cougars, and tested samples for the presence of lead using inductively coupled plasma mass spectroscopy to determine if there is a

seasonal correlation of lead ingestion during the hunting season. We also hope to determine if carnivores, such as Grizzly Bears, that scavenge to a greater extent on offal piles or on the unretrieved carcasses of animals mortally wounded by hunters, exhibit higher levels of lead ingestion than do species with lesser tendency to scavenge, such as Wolves and Cougars.

In a pilot study, blood samples from live captured Grizzly Bears were the most abundant sample type we were able to obtain, though limited samples of other material were also obtained. During the non-hunting season (March–August), no Grizzly Bear blood samples (n = 11) exhibited lead exposure (>10 µg/dL). However, during the hunting season (September–November), 46% of 13 samples showed exposure with blood lead levels >10 µg/dL. Of six liver samples collected from Wolves during the non-hunting season, none have shown signs of lead exposure. This preliminary evidence suggests mammalian carnivores in areas of high hunting density may exhibit the same temporal pattern of lead exposure from ingestion of rifle bullet fragments during the hunting season as avian scavengers (Cade 2007, Craighead and Bedrosian 2008, Parish et al. 2009, this volume). This study will continue as a master's thesis by Tom Rogers in the fall of 2008 at the University of Montana. *Received 12 June 2008, accepted 24 July 2008.*

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