

LETTERS

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***Trichinella* Surveillance in Black Bears (*Ursus Americanus*) from Oregon, USA**

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ABSTRACT: We used serology and muscle digestion to test black bears (*Ursus americanus*) from western Oregon, USA, for *Trichinella*. Results indicate black bears in Oregon are not part of a sylvatic cycle for *Trichinella*, and risk of human exposure to *Trichinella* larvae from eating black bear meat from Oregon appears low.

Consumption of bear (*Ursus* spp.) meat by humans in North America has been associated with exposure to the nematode parasite *Trichinella spiralis* and potentially other newly recognized *Trichinella* spp. or genotypes (Pozio and Zarlenga 2005). Transmission of these organisms occurs by ingestion of raw or poorly cooked carcass meat that contains encysted *Trichinella* larvae. Hunters and trappers in Oregon, USA, harvest 1,000–1,500 black bears (*Ursus americanus*) annually, with most used for human consumption (Oregon Department of Fish and Wildlife 2012). Two studies on *Trichinella* spp. in black bears from Oregon found no larvae (Zimmerman 1977; Foreyt et al. 1999). Because trichinosis in humans associated with eating improperly prepared black bear meat has been documented in many states, we tested black bears from western Oregon for *Trichinella* spp. We collected serology data from 1993 to 1997 and tongue tissue data from 2005 to 2007.

From 1993 to 1997, we collected whole-blood samples from anesthetized black bears in Lane County (44°28′0.1″N, 122°35′53.2″W), and killed black bears in

Benton County (44°28′15.1″N, 123°22′11.6″W). Serum was stored at –18 C until analyzed. Samples were tested for *Trichinella* sp. antibodies using an enzyme-linked immunosorbent assay (ELISA; Chomel et al. 1998).

Tongues from black bears harvested in western Oregon during 2005–2007 were held at –18 C until muscle digestion testing was performed to determine presence or absence of *Trichinella* larvae. Five 1-g sections from different areas of each tongue were combined for a total of 5 g of sample per bear. The samples from five bears were pooled to form a 25-g sample for testing. Digestion of samples followed Gamble et al. (2000). *Trichinella*-infected rat (*Rattus rattus*) samples obtained from the US Department of Agriculture, Animal Research Service, Beltsville, Maryland, were used as controls. Test sensitivity allowed detection of one *Trichinella* larva per 25 g of black bear tissue. Black bears from both sampling periods had premolars extracted to estimate age using cementum layers (Stonenberg and Jonkel 1966).

Two black bears in Lane County ($n=93$) were antibody positive for *Trichinella* spp. All sampled black bears from Benton County ($n=10$) were antibody negative. Of the 103 black bears tested, 64 were males and 39 were females, with a mean age of 6 yr (range 1–20 yr).

Distribution of black bear samples for muscle digestion was dispersed across 11

counties with an average of 23 samples per county. Sampled black bears were from Benton ($n=4$), Clackamas ($n=4$), Clatsop ($n=20$), Coos ($n=55$), Curry ($n=66$), Lane ($n=22$), Lincoln ($n=10$), Linn ($n=58$), Marion ($n=4$), Polk ($n=5$), and Yamhill ($n=2$) counties. There were 161 males and 89 females sampled with a mean age of 4.6 yr (range 1–22 yr). No samples were positive for *Trichinella* larvae using muscle digestion testing.

On the basis of our 353 samples, it is unlikely that black bears in Oregon are part of a sylvatic cycle for *T. spiralis* or other *Trichinella* spp. Our finding of a prevalence of 2% (2 of 103, serology) and 0% (0 of 250, muscle digestion technique) are unexpectedly low given data from black bears in nearby states and Canadian provinces, but are consistent with the zero prevalence findings from two other black bear surveys in Oregon (Zimmerman 1977; Foreyt et al. 1999). Binninger et al. (1980) and Ruppanner et al. (1982) reported 13% prevalence of *T. spiralis* in black bears from Idaho and California, respectively, and Chomel et al. (1998) reported 27.5% prevalence in black bears from central interior Alaska, all much higher than our results. There are no published reports of *T. spiralis* prevalence in black bears from Washington State, but a paper based on sampling black bear populations in the Kootenay region of British Columbia showed 12% prevalence (Schmitt et al. 1978).

Validation of ELISA serology testing with high sensitivity for *Trichinella* has been described (Gamble et al. 1983), but it is possible that our positive *Trichinella* spp. serology was from other parasitic infections, especially caused by nematodes (Gómez-Morales et al. 2008). Although there are no published reports of muscle distribution patterns of *Trichinella* larvae in black bears, it has been demonstrated in domestic and wild mammals that predilection sites for *T. spiralis* are tongue, diaphragm, and masseter muscles (Kapell et al. 2005).

Because *Trichinella* is transmitted by consuming infected meat, Zarnke et al. (1997) reasoned that food availability and habits of bears are related to exposure to *Trichinella* spp. Sources of these infections in black bears are likely due to scavenging, ingestion of infected rodents, and cannibalism of other infected black bears, but transmission rates and species involved remain speculative. This hypothesis is supported by Schad et al. (1986), who found higher *T. spiralis* prevalence in carnivores from remote regions compared with urban or human-accessible areas. A likely cause of increased prevalence in remote areas is the presence of species maintaining sylvatic cycles of *Trichinella* spp. and the near nonexistence of *Trichinella* spp. in commercial swine and hence garbage and table scraps that bears in developed areas may consume. Further sampling of other Oregon mammals, especially small fur-bearing species, typically represented in sylvatic *Trichinella* cycles could potentially help explain the low prevalence of *Trichinella* in black bears found in this study.

On the basis of our results, the risk of human exposure to *Trichinella* larvae from consuming black bear meat from Oregon appears low. This may explain the absence of documented human trichinosis during the past decade in Oregon (Oregon Public Health Authority 2000–2011). As a precaution against infection, however, it is still recommended that all black bear meat be cooked following current recommendations relating to raw pork products.

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