SALMONELLA IN WILDLIFE

Joseph K. Gaydos, VMD, PhD
UC Davis Wildlife Health Center – Orcas Island Office
Eastsound, Washington

SALMONELLA NOMENCLATURE:
The genus Salmonella has over 2,463 recognized serovars with classification based on H (flagellar) and O (somatic) antigens. Historically Salmonella serovars were considered as species and serovar names were italicized (such as Salmonella typhimurium). A decision by the Judicial Commission of the International Committee for Systematics of Prokaryotes was issued making the type species of Salmonella now Salmonella enterica (not S. choleraesuis). Now for example, one would write Salmonella enterica subsp. enterica serovar Typhimurium instead of Salmonella typhimurium. To shorten this, people will often refer to Salmonella enterica subsp. enterica serovar Typhimurium or simply Salmonella Typhimurium as the preferred abbreviated name. This might be more information than you ever wanted to know but it does overturn generations of veterinary school training and has simplified international agreement on naming a complex and expanding genus.

ZOOONOSIS
An estimated 1.2 million cases of salmonellosis occur annually in the United States (approximately 42,000 are laboratory-confirmed and reported to the Centers for Disease Control; CDC). Transmission comes primarily from contaminated food, water or contact with infected animals only some of which are wild animals. Of the 50 Salmonella outbreaks reported by the CDC between 2006 and 2013, only 5 (10%) were related to wildlife. These included the 2013 outbreak related to small turtles (Salmonella Sandiego, Pomona and Poona), two 2012 events associated with hedgehogs (Salmonella Typhimurium) and small turtles (Salmonella Sandiego, Pomona and Poona), the 2011 outbreak connected to Africa dwarf frogs (Salmonella Typhimurium) and the 2010 water frog-related outbreak (Salmonella Typhimurium).

REPTILES AND AMPHIBIANS
While according to CDC outbreak records frogs and turtles (species unspecified) are responsible for the majority of the wildlife-related Salmonella outbreaks in the United States, numerous species of reptiles and amphibians can be asymptomatic carriers of Salmonella. Consequently the CDC provides the following advice to veterinarians:
- Veterinarians should provide education to amphibian and reptile owners about the risks of acquiring salmonellosis from these animals.
- Veterinarians should provide education to amphibian and reptile owners on how to properly clean the animal habitat.

Additionally, veterinarians working with wildlife biologists studying reptiles and amphibians should advise them of the occupational hazards associated with working with potential asymptomatic carriers of Salmonella.

BIRDS
Salmonella-infection in wild birds can be sub-clinical or clinical. Epornitics are frequently diagnosed in passerine birds at backyard feeders. Clinical signs in these songbirds can include difficulty swallowing, anorexia, intense thirst, ruffled feathers, listlessness, convulsions and death. Common postmortem lesions include yellow pinpoint necrotic areas in the liver, spleen or upper gastrointestinal tract mucosa; focal necrosis in the adrenal gland, testes and muscles, or abscesses in the lower esophagus. It also can cause mortality in raptors that prey on sick birds or scavenge dead birds. The population-level significance of salmonellosis in wild birds is unknown. Prevalence in wild birds is likely highly species time and space dependent. Wild birds have been implicated in Salmonella contamination of feed and in outbreaks of salmonellosis in domestic animals (such as the abortion epizootic in dairy ewes from Spain related to Salmonella Indiana in pigeons and doves) and livestock have been implicated as the source of Salmonella in wild birds (as with the positive association of Salmonella Typhimurium from wild birds collected in the proximity of pig farming operations in Spain).

MAMMALS
As with birds, Salmonella-infection in wild mammals can be sub-clinical or clinical. Also, like with birds, infection can be naturally occurring or be due to transmission from domestic animals. Disease (salmonellosis)
has been demonstrated in many wild mammal species including white-tailed deer (Odocoileus virginianus), raccoons (Procyon lotor) and river otters (Lontra canadensis). In Europe, it is considered a significant disease in European hedgehogs (Erinaceus europaeus). Clinical disease can be a direct result of stress, overcrowding, parturition or other concurrent diseases. This was likely the case in some river otters captured for translocation programs where the disease had a rapid course (2-3 days) and resulted in high mortality. Clinical signs can vary greatly depending on serotype, host and external stressors. Disease can range from peracute to chronic and can include listlessness, anorexia, dehydration, diarrhea and death. Gross lesions can range from catarhal to fibrinohemorrhagic enteritis with septicemic animals showing widespread hemorrhage on serous membranes, splenomegaly, lymphadenopathy and edema and congestion of organs. Note that bacterial isolation of Salmonella from the intestines is not sufficient to diagnose salmonellosis in dead animals as other evidence of disease compatible with salmonellosis must be present.

MARINE WILDLIFE

Relatively little is known about Salmonella in free-ranging marine mammals. It has been isolated from harbor porpoise (Phocoena phocoena), a killer whale (Orcinus orca), sea otters (Enhydra lutris nereis), northern elephant seals (Mirounga angustirostris), California sea lions (Zalophus californianus), Northern fur seals (Callorhinus ursinus), and harbor seals (Phoca vitulina). Far more isolations have been made than actual documentation of disease. Salmonella Newport-associated septicemia has been documented in a harbor porpoise and a killer whale. Salmonella also has been isolated from marine birds such as Western gulls (Larus occidentalis). While one study found prevalence of Salmonella in 40% of California sea lion pups and 33% of northern fur seal pups on San Miguel Island, the prevalence in most marine wildlife populations is unknown but probably highly variable.

TREATING SALMONELLA IN WILDLIFE BEING REHABILITATED

Due to concerns about antibiotic sensitivity and the release of rehabilitated animals that could potentially spread antibiotic resistance, antimicrobial treatment of animals infected with Salmonella spp. is controversial but is often attempted for animals with clinical disease. Proper sanitation and husbandry practices are important tools for preventing the in-treatment spread of Salmonella in rehabilitation centers. Salmonella is hardy and is capable of surviving for long periods in biological material and can infect new hosts if sanitation of the environment or the rehabilitation center does not adequately remove all organic material.

REFERENCES