PRELIMINARY FINDINGS OF *SALMONELLA* spp. IN CAPTIVE GREEN IGUANAS, *Iguana iguana*, AND THEIR ENVIRONMENT

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Abstract: Captive reptiles are routinely identified as reservoirs of *Salmonella* spp. and reports of reptile-associated salmonellosis in humans are increasing in the United States. The United State's Centers for Disease Control estimates that there are over 90,000 cases of reptile-associated salmonellosis in the United States annually. In most documented cases, the strain of *Salmonella* sp. isolated from the patient was common to the reptile, confirming the source of the infection (Meehan, 1996).

The green iguana, *Iguana iguana*, is the most popular pet reptile as evidenced by the importation of over 640,000 immature animals in 1997. There have been no documented investigations to demonstrate how commercial green iguanas become infected with *Salmonella* spp. The purpose of this study was to identify potential sources of *Salmonella* spp. contamination in the commercial production of the iguana.

In March 1998, a pilot field investigation was conducted at a commercial iguana farm in El Salvador. Microbiological samples were collected from both the animals and their environment at the commercial operation. Mature breeding iguanas (10 male; 10 female) and 20 hatchling iguanas were humanely euthanized and specimens of blood, liver, colon, ovary and oviduct (adult females), and yolk-sac (hatchlings) collected for microbiologic testing. Eggs were excavated from nests and the egg surfaces and yolk sac of the embryos tested for salmonellae. Environmental samples were also collected and included soil, food, water, shelter surfaces, insects, and free-living wild lizards.

All microbiologic specimens were placed in selenite enrichment broth and held at 20°C (68°F) before and during transport by air to Louisiana State University School of Veterinary Medicine (LSU) for processing. Samples were received at the LSU within 24 hr of collection. Upon arrival, samples were incubated at 37°C (99°F) under aerobic conditions for 24 hr. An aliquot of enriched broth was transferred to the surface of a petri dish containing xylose-lysine-desoxycholate agar (XLD, Remel, Lenexa, KS, USA). Streaked plates were incubated at 37°C (99°F) under aerobic conditions for 24 hr. Presumptive *Salmonella* spp. colonies were further evaluated using biochemical indicator media, including lysine iron agar (LIA), triple iron agar (TSI), and urea. Samples that were TSI positive, LIA positive, and urea negative were further evaluated using API 20E test strips (bioMerieux Vitek, Hazelwood, MO, USA). Exact 95% binomial confidence intervals were calculated using Epi Info 6 version 6.04b (Centers for Disease Control, 1997).
Salmonella spp. subgroup 3 was isolated in 25 (13%) of 190 samples. Three of the 20 intestinal samples (15%; Confidence interval (CI):3.38) and 2 of the liver specimens (10%; CI:1, 32) from adult animals were Salmonella positive. There was no evidence of Salmonella spp. in the blood, ovaries, or oviducts of adult female iguanas (CI: 0, 31). Eight of 20 intestinal samples (40%; CI: 19, 64) and 1 of 20 internalized yolk-sacs (5%; CI: 0, 25) were Salmonella spp. positive. Salmonella spp. was isolated from the exterior of 7 of 16 egg shells (44%; CI: 20, 70). No salmonellae were isolated from the embryonic yolk sacs (0%; CI: 0, 21). There was no evidence of salmonellae in the food or water samples. Salmonella spp. was isolated from soil samples and from the pooled feces of wild lizards captured on the farm. Nineteen of the 25 Salmonella isolates were submitted for serotyping and 8 different serotypes were identified.

The presence of salmonellae in the intestinal contents of adult and hatchling iguanas is consistent with previous reports. The absence of Salmonella spp. in the feed and water suggests that the diet was not a source of infection on this farm on the days of sampling; however, a larger sample of feedstuffs is required to determine true status. The failure to recover salmonellae from the female reproductive tract and embryonic yolk-sacs might suggest that this organism is not transmitted vertically in the green iguana; however, a larger sample size would be required to confirm this. In other captive reptiles, including Trachemys scripta elegans, Salmonella spp. has been isolated from the ovaries and interior of the egg (Kaufman and Morrison, 1966).

Because of the high carriage rate of Salmonella spp. in green iguanas, owners should be informed of the potential risks associated with zoonotic infection. Washing of hands after handling iguanas is strongly recommended (Centers for Disease Control, 1999). Providing an appropriate environment and adequate nutrition for the pet iguana is also important to maintain health. Iguanas are inappropriate pets for immunocompromised owners and in households with young children (Centers for Disease Control, 1999).

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**REFERENCES**