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SALMONELLA SPP. IN NESTLING COMMON BARN-OWLS (*TYTO ALBA*) FROM SOUTHWESTERN NEW JERSEY

Carl E. Kirkpatrick[1] and Bruce A. Colvin[2]

ABSTRACT: The prevalence of *Salmonella* spp. in nestling common barn-owls was investigated in southwestern New Jersey during the summer of 1985. Of 94 owls sampled by swabbing the cloaca, eight (8.5%) were found to harbor *Salmonella* spp. Three serotypes—*S. thompson*, *S. tuindorp*, and *S. typhimurium*—were identified. Five (20%) of the 25 nest sites examined (all of them in or near farm buildings or dwellings) contained *Salmonella*-positive owls.

INTRODUCTION

Although *Salmonella* spp. have been isolated from several orders of birds, particularly Charadriiformes and Passeriformes, few surveys have included members of the Strigiformes (Steele and Galton, 1971). In Britain, Wilson and MacDonald (1967) isolated *S. gallinarum* from a tawny owl (*Strix aluco*). *Salmonella* spp. were not detected in the following owls: 10 little owls (*Athene noctua*) from Britain and Italy (Goodchild and Tucker, 1968; Di Modugno et al., 1983); a long-eared owl (*Asio otus*) and 20 common barn-owls (*Tyto alba*) from Britain (Goodchild and Tucker, 1968); and 12 Tengmalm's owls (*Aegolius funereus*) and two Ural owls (*Strix uralensis*) from Norway (Kapperud and Rosef, 1983). In the Western Hemisphere, we are aware of only one report of a *Salmonella*-infected owl (Locke and Newman, 1970). This was a case report of a common barn-owl in Pennsylvania, USA from which *S. typhimurium* was isolated at postmortem examination; the owl's death was attributed to salmonellosis. Among other raptors from the Western Hemisphere, *Salmonella* spp. have been detected in black vultures (*Coragyps atratus*) from Trinidad, West Indies (Everard et al., 1979); turkey vultures (*Cathartes aura*) from Texas, USA (Winsor et al., 1981); and a captive peregrine falcon (*Falco peregrinus*) in New York, USA (Sykes et al., 1981). We report here on the isolation of *Salmonella* spp. from common barn-owls from New Jersey, USA.

MATERIALS AND METHODS

The study area was located in southwestern New Jersey and included parts of Salem and Cumberland counties (Fig. 1); it is predominantly agricultural in character (Hegdal and Blaskiewicz, 1984). Owls were sampled from June to August 1985. Ages of the 94 birds sampled, all nestlings (including two in their first week of fledging), ranged from approximately 3 to 9 wk (mean ± SD = 5.1 ± 1.2). Of the 25 nests examined, 23 were in nest boxes placed in man-made structures on farmsteads (18 barns, four silos, one water tower); two others were in tree cavities next to dwellings. Only two nests were inland; all others were near tidal marshes. The mean (±SD) number of nestlings per nest was 4.1 (±1.5) (range = two to seven); and the mean number sampled per nest was 3.8 (±1.5) (range = two to six).

Owls were sampled by swabbing the cloaca with a sterile, calcium alginate-tipped swab (Spectrum Diagnostics, Glenwood, Illinois 60425, USA). Swabs were cultured for 48 hr at 37 C in filter-sterilized selenite F broth (BBL Microbiology Systems, Cockeysville, Maryland 21030, USA), after which plates of bismuth sulfite agar (BBL) were streaked and incubated for 48 hr at 37 C (Martin and Washington, 1980). Plates of brilliant green agar (BBL) also were streaked using 20 of the broth cultures and incubated for 24 hr, but no additional *Salmonella* were detected; therefore, bismuth sulfate agar was used exclusively for the remainder of the cultures. Representative colonies were picked to Trypticase soy agar (BBL) slants at 37 C;

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and, 24 hr later, bacteria were biochemically typed using the Roche Enterotube II (Roche Diagnostic Systems, Nutley, New Jersey 07110, USA). Putative *Salmonella* isolates were tested in a slide agglutination assay with polyvalent *Salmonella* antisera (somatic antigen groups A–D, GIBCO, Grand Island, New York 14071, USA) and also were sent to the National Veterinary Services Laboratory (USDA, Ames, Iowa 50010, USA) for serotyping. In addition, *Salmonella* isolates were tested for antimicrobial resistance in a standard disc assay (Barry and Thornsberry, 1980). Sensitivity to the following antimicrobial agents was determined: penicillin (10 U); ampicillin (10 μg); carbenicillin (100 μg); cephalothin (30 μg); tetracycline (30 μg); chloramphenicol (30 μg); gentamycin (10 μg); neomycin (30 μg); trimethoprim-sulfamethoxazole (1.25/23.75 μg); polymyxin B (300 U); amikacin (30 μg); and cefoxitin (30 μg).

RESULTS AND DISCUSSION

Eight (8.5%) of the 94 nestling barn-owls harbored *Salmonella* spp. Of the 25 nest sites examined, five (20%) contained *Salmonella*-positive birds (Fig. 1); all of the positive nests were located in nest boxes (four in barns, one in a silo). *Salmonella typhimurium* was isolated from five birds (three sites), *S. thompson* from two birds (one site), and *S. tuindorp* from one bird. All of these isolates, except for the *S. tunindorp*, agglutinated with the polyvalent antisera; and all of them exhibited identical antimicrobial resistance profiles: resistance was expressed only against penicillin.

This study was undertaken in view of three considerations: (i) *Salmonella* spp. are known to produce clinical illness and even death in birds (Steele and Galton, 1971; Sykes et al., 1981); (ii) barn-owls, because of their propensity to nest and roost near human activity (Hegdal and Blaskiewicz, 1984), may serve to harbor and disseminate *Salmonella* infective for humans and domestic animals; and (iii) salmonellosis is an important disease among domestic animals in the Delaware Valley region (Benson et al., 1985).

The prevalence of *Salmonella* infection in owls that we observed may be understated, since the likelihood of detection can vary depending on the number and type of enrichment/selective media used and on the age of the host as well as on the tissue sampled; for example, Linton et al. (1985) found cecal contents of chickens to yield a higher prevalence of *Salmonella* detection than cloacal swabs.

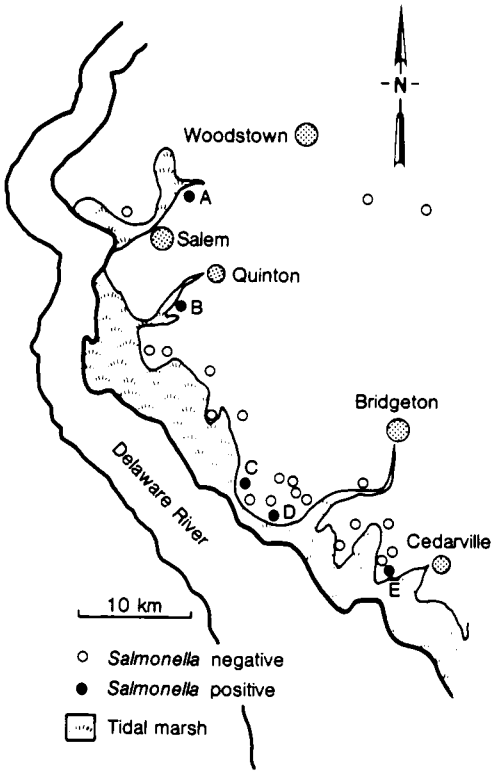

FIGURE 1. Localities of common barn-owl nest sites in southwestern New Jersey where nestlings were sampled for *Salmonella* spp. *Salmonella thompson* was detected at site A, *S. tuindorp* at site B, and *S. typhimurium* at sites C, D, and E.

Although none of the owls from which *Salmonella* spp. were isolated appeared ill, and all apparently fledged, salmonellosis remains a potentially serious avian disease. The report of Sykes et al. (1981) indicates that prolonged, asymptomatic carriage of *Salmonella* can occur and that disease may be precipitated by stress.

Several factors have been suggested as limiting barn-owl populations, including

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winter mortality, nest-site availability, prey-cycle variations, and availability of foraging habitat (Colvin, 1985; Marti and Wagner, 1985). It may be that the stresses associated with overwintering in northern latitudes and circumstances of decreased prey availability may precipitate disease in barn-owls harboring *Salmonella*. Thus, salmonellosis may be yet another factor which affects common barn-owl survival and reproduction.

All of the *Salmonella* spp. isolated from the owls of this study are capable of infecting humans. *Salmonella typhimurium*, the serotype found in the majority of infected owls, was also the serotype most commonly isolated from human and nonhuman sources from the United States in 1981, the most recent year for which data are available (Centers for Disease Control [CDC], 1985). Another barn-owl isolate, *S. thompson*, is the isolate most commonly found in food made from animal sources for human consumption (CDC, 1985). In contrast, *S. tuindorp*, isolated from a single barn-owl, is an uncommon serotype, reported from just four humans in the United States between 1975 and 1981 (CDC, 1985).

Although multiply antimicrobial-resistant serotypes of *Salmonella* are being isolated from both humans and domestic animals at an increasing and alarming rate (Holmberg et al., 1984; Benson et al., 1985), no such isolates were made from the birds of the present study. However, the possibility of transfer of *Salmonella* spp. from barn-owls to the environment and thence to domestic (food) animals and to humans cannot be dismissed. For example, an epizootic of salmonellosis (caused by *S. anatum*) in a herd of dairy cattle was attributed to haylage contaminated by feces of wild birds (Glickman et al., 1981). We do not intend to suggest, though, that barn-owls should be discouraged from nesting in barns. The benefit of these birds in preying on rodents is widely appreciated. A rational approach would be to encourage the installation of completely enclosed nest boxes mounted within a barn but provided with a separate and direct portal through the barn wall (Colvin, 1983); the barn could then be enclosed to prevent the entry of barn-owls (and other birds).

Regardless of the potential of common barn-owls to serve as vectors of *Salmonella* spp., these birds, by virtue of their position atop the food chain and the numbers of small-mammal prey they consume, may be regarded as sentinels of the presence of *Salmonella* in the environment. The owls in our study area are known to feed almost entirely on rodents. Meadow voles (*Microtus pennsylvanicus*) constitute approximately 96% and 68% of the diet of barn-owls nesting near tidal marshes and inland areas, respectively, in the study area (Colvin, 1984); therefore, these might be the source of *Salmonella* for the owls. However, other rodent prey in the area can include Norway rats (*Rattus norvegicus*), rice rats (*Oryzomys palustris*), white-footed mice (*Peromyscus leucopus*), and house mice (*Mus musculus*) (Colvin, 1984).

Several types of *Salmonella* have been documented in commensal rodents (e.g., Norway rats and house mice) (McKiel et al., 1970; Jones and Twigg, 1976; Shimi et al., 1979); and rodents on, or once associated with, farmsteads might be a source of contamination for owls. However, in a preliminary investigation, we failed to detect *Salmonella* in livers, intestinal tissue, and feces of 27 rodents (14 *P. leucopus*, seven *M. musculus*, and six *R. norvegicus*) trapped in and around buildings on six farmsteads (sites C and D, Fig. 1, and four sites between them). Furthermore, extensive radiotelemetry studies within the study area have shown that barn-owls principally forage in grassland, wet meadow, and salt marsh (vole) habitats rather than on or about farmsteads; adults may range 2 to 3 km from nest sites to foraging areas (Hegdal and Blaskiewicz, 1984). Be-

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sides meadow voles, Norway rats and rice rats occur in salt marshes, particularly in or bordering the tidal portions (Colvin, 1984). Further investigation will be required to establish the source of *Salmonella* spp. for the owls.

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LITERATURE CITED

BARRY, A. L., AND C. THORNSBERRY. 1980. Susceptibility testing: Diffusion test procedures. *In* Manual of Clinical Microbiology, 3rd Ed., E. H. Lennette et al. (eds.). Am. Soc. Microbiol., Washington, D.C., pp. 463–474.

BENSON, C. E., J. E. PALMER, AND M. F. BANNISTER. 1985. Antibiotic susceptibilities of *Salmonella* species isolated at a large animal veterinary medical center: A three-year study. Can. J. Comp. Med. 49: 125–128.

CENTERS FOR DISEASE CONTROL. 1985. 1981 *Salmonella* surveillance data [memorandum]. Atlanta, Georgia, 26 pp.

COLVIN, B. A. 1983. Nest boxes for barn owls. Publ. No. 346 (183), Ohio Dept. Nat. Res., Columbus, Ohio, 2 pp.

———. 1984. Barn owl foraging behavior and secondary poisoning hazard from rodenticide use on farms. Ph.D. Dissertation. Bowling Green State Univ., Bowling Green, Ohio, 326 pp.

———. 1985. Common barn-owl population decline in Ohio and the relationship to agricultural trends. J. Field Ornithol. 56: 224–235.

DI MODUGNO, G., A. IANERI, AND G. CRINGOLI. 1983. Richerche sulla presenza di salmonelle in volati selvatici catturati nell'Italia meridionale. Acta Med. Vet. 29: 231–239.

EVERARD, C. O. R., B. TOTA, D. BASSETT, AND C. ALI. 1979. *Salmonella* in wildlife from Trinidad and Grenada, W.I. J. Wildl. Dis. 15: 213–219.

GLICKMAN, L. T., P. L. MCDONOUGH, S. J. SHIN, J. M. FAIRBROTHER, R. L. LADUE, AND S. E. KING. 1981. Bovine salmonellosis attributed to *Salmonella anatum*-contaminated haylage and dietary stress. J. Am. Vet. Med. Assoc. 178: 1268–1272.

GOODCHILD, W. M., AND J. F. TUCKER. 1968. Salmonellae in British wild birds and their transfer to domestic fowl. Br. Vet. J. 124: 95–101.

HEGDAL, P. L., AND R. W. BLASKIEWICZ. 1984. Evaluation of the potential hazard to barn owls of Talon (brodifacoum bait) used to control rats and house mice. Environ. Toxicol. Chem. 3: 167–179.

HOLMBERG, S. D., J. G. WELLS, AND M. L. COHEN. 1984. Animal-to-man transmission of antimicrobial-resistant *Salmonella*: Investigations of U.S. outbreaks, 1971–1983. Science 225: 833–835.

JONES, P. W., AND G. I. TWIGG. 1976. Salmonellosis in wild mammals. J. Hyg. (Camb.) 77: 51–54.

KAPPERUD, G., AND O. ROSEF. 1983. Avian wildlife reservoir of *Campylobacter fetus* subsp. *jejuni*, *Yersinia* spp., and *Salmonella* spp. in Norway. Appl. Environ. Microbiol. 45: 375–380.

LINTON, A. H., Z. A. M. AL-CHALABY, AND M. H. HINTON. 1985. Natural subclinical salmonella infection in chickens: A potential model for testing the effects of various procedures on salmonella shedding. Vet. Rec. 116: 361–364.

LOCKE, L. N., AND J. A. NEWMAN. 1970. Paratyphoid in a barn owl. Chesapeake Sci. 11: 67–68.

MARTI, C. D., AND P. W. WAGNER. 1985. Winter mortality in common barn-owls and its effect on population density and reproduction. Condor 87: 111–115.

MARTIN, W. J., AND J. A. WASHINGTON II. 1980. Enterobacteriaceae. *In* Manual of Clinical Microbiology, 3rd Ed., E. H. Lennette et al. (eds.). Am. Soc. Microbiol., Washington, D.C., pp. 195–219.

MCKIEL, J. A., D. E. RAPPAY, J. G. COUSINEAU, R. R. HALL, AND H. E. MCKENNA. 1970. Domestic rats as carriers of leptospires and salmonellae in eastern Canada. Can. J. Public Health 61: 336–340.

SHIMI, A., M. KEYHANI, AND K. HEDAYATI. 1979. Studies on salmonellosis in the house mouse, *Mus musculus*. Lab. Anim. 13: 33–34.

STEELE, J. H., AND M. M. GALTON. 1971. Salmonellosis. *In* Infectious and Parasitic Diseases of Wild Birds, J. W. Davis et al. (eds.). Iowa State University Press, Ames, Iowa, pp. 51–58.

SYKES, G. P., C. MURPHY, AND V. HARDASWICK. 1981. *Salmonella* infection in a captive peregrine falcon. J. Am. Vet. Med. Assoc. 179: 1269–1271.

WILSON, J. E., AND J. W. MACDONALD. 1967. *Salmonella* infection in wild birds. Br. Vet. J. 123: 212–219.

WINSOR, D. K., A. P. BLOEBAUM, AND J. J. MATHEWSON. 1981. Gram-negative, aerobic, enteric pathogens among intestinal microflora of wild turkey vultures (*Cathartes aura*) in west central Texas. Appl. Environ. Microbiol. 42: 1123–1124.

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