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# Antibodies to Selected Disease Agents in Translocated Wild Turkeys in California

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ABSTRACT: Wild turkeys (*Meleagris gallopavo*) trapped within California ($n$ = 715) or imported into California from other states ($n$ = 381) from 1986 to 1996 were tested for exposure to certain disease agents. Prevalence of antibody to *Mycoplasma gallisepticum, Mycoplasma meleagridis, Salmonella pullorum, Salmonella typhimurium,* Newcastle disease virus, and avian influenza virus was low (0–4%) for wild turkeys trapped within California. With the exception of antibody prevalence to *M. meleagridis* of 33%, the same was true for wild turkeys imported into California from other states. Antibody prevalence to *Mycoplasma synoviae* was 8–10% for both groups.

*Key words:* Avian influenza, *Meleagris gallopavo, Mycoplasma* spp., Newcastle disease, *Salmonella* spp., serosurvey, wild turkey.

Wild turkeys (*Meleagris gallopavo*) were nearly hunted to extinction in the United States by market hunters during the 19th century. Today, due largely to successful trapping and restocking efforts, over 4 million wild turkeys are present in every state except Alaska (Kennamer and Kennamer, 1990). Restoration of the wild turkey is one of the greatest successes of modern wildlife management. Since recovery of the species, there has been a steady increase in the popularity of wild turkeys as game birds. As a result, many states, including California, have continued trapping and translocation programs to establish or augment wild turkey populations.

Over 8,000 wild turkeys have been released in California since 1900 [California Department of Fish and Game (CDFG), unpubl. data]. In 1986, the CDFG began routine testing of wild turkeys for evidence of exposure to *Mycoplasma gallisepticum* (MG), *M. synoviae* (MS), *M. meleagridis* (MM), *Salmonella pullorum* (SP), *S. typhimurium* (ST), Newcastle disease virus (NDV) and avian influenza virus (AI) prior to translocation. The results of serological testing of wild turkeys trapped in Kansas and imported into California were recently reported elsewhere (Veatch et al., 1998). This report summarizes the results of serologic testing of wild turkeys trapped within or imported into California (exclusive of birds from Kansas) from 1986 to 1996.

Wild turkeys were captured in the winter using rocket or drop nets. Blood samples were obtained from live birds via brachial or jugular venipuncture and placed in serum clot tubes. After clotting, samples were centrifuged to separate the serum from the clot and delivered to the California Veterinary Diagnostic Laboratory System (Davis, California, USA) for serologic testing. For some wild turkeys captured in states outside of California, serologic testing was completed at the respective state veterinary diagnostic laboratory and the results forwarded to the CDFG prior to the release of turkeys in California.

All serologic testing was done using standard methods (Swayne et al., 1998). Briefly, initial testing for exposure to MG, MM, and MS was achieved by the rapid plate agglutination (RPA) or hemagglutination inhibition (HI) procedure, with RPA titers of ≥1:5 and HI titers ≥1:20 considered positive. A small subset of samples with positive RPA reactions was retested with HI. The microagglutination test (MAT) was used to test for exposure to SP and ST, with titers ≥1:20 considered positive. The HI test was used to test for exposure to NDV, with titers ≥1:4 considered positive, and the agar gel immunodiffusion (AGID) test with undiluted serum was used to test for exposure to AI

virus. All HI and AGID antigens and controls were obtained from the National Veterinary Services Laboratory (Ames, Iowa USA). Antigens for MG, MM, and MS testing were obtained from Intervet, Inc. (Millsboro, Delaware, USA). Antigens for SP and ST testing were obtained from the University of Minnesota (St. Paul, Minnesota, USA).

From 1986 to 1996, serologic results were obtained from 381 wild turkeys imported into California from other states including South Dakota ($n$ = 292), Pennsylvania ($n$ = 57), and Colorado ($n$ = 32), as well as 715 wild turkeys trapped within California. Wild turkeys were sampled from 13 counties in California including Sacramento (38°28′N, 121°19′W) ($n$ = 387), Santa Clara (37°14′N, 121°46′W) ($n$ = 186), Shasta (40°46′N, 122°02′W) ($n$ = 50), San Luis Obispo (35°22′N, 120°32′W), Solano (38°14′N, 121°57′W), Alameda (37°36′N, 121°53′), Tehama (40°08′N, 122°18′W), San Benito (36°37′N, 121°05′W), Tulare (36°16′N, 118°48′W), Sonoma (38°45′N, 123°30′W), Calaveras (38°10′N, 120°35′W), Kern (35°20′N, 118°40′W), and Lake (39°06′N, 122°47′W) ($n$ < 20 each).

Of the wild turkeys imported into California from other states, 3/344 (<1%), 28/341 (8%), and 91/272 (33%) reacted positively to RPA tests for MG, MS, and MM, respectively. Subsequent retesting of the three MG reactors with HI failed to confirm the positive RPA reactions in these three cases. Twenty-three of 28 positive MS reactors also were positive by HI testing. None of the 91 wild turkeys with positive RPA reactions to MM were retested with HI. All of the positive MS and MM reactors were from South Dakota. None of the wild turkeys tested with only the HI procedure were positive for exposure to MG ($n$ = 37), MS ($n$ = 32), or MM ($n$ = 49).

Eight of 324 (2%) imported wild turkeys reacted positively to the MAT for SP while 6/324 (<2%) reacted positively for ST. All positive SP reactors were from South Dakota. Five of the positive ST reactors were from South Dakota and one was from Colorado. Seventy-five imported wild turkeys were negative for exposure to NDV. Testing for AI was not conducted on imported wild turkeys.

Of the wild turkeys trapped within California, 2/414 (<1%), 17/169 (10%) and 0/15 reacted positively to the RPA tests for MG, MS, and MM, respectively. Both of the wild turkeys with positive RPA reactions to MG were trapped in San Luis Obispo County in 1986, but neither was retested with HI. Two of the 17 positive MS reactors were retested with HI and found to be negative; none of the remaining 15 were retested. Of the 17 wild turkeys positive for MS using the RPA test, one from San Luis Obispo County was also a positive reactor to MG. The remaining 16 were from Sacramento County. None of the California wild turkeys that were tested with HI only were positive for MG or MS (300 and 318 turkeys, respectively). Four of the 492 (<1%) wild turkeys from California that were tested for MM with HI were positive. All four were from Shasta County.

Nineteen of 524 (4%) California wild turkeys reacted positively to the MAT for SP while 21/500 (4%) reacted positively for ST. Wild turkeys with positive reactions to SP were from Sacramento, Santa Clara, Shasta, Tulare, and Kern counties. Wild turkeys with positive reactions to ST were from Sacramento, Santa Clara, Tulare, and Kern counties.

One of 430 (<1%) California wild turkeys tested positive on the NDV HI test. This turkey was trapped in Santa Clara County in 1993. One of 383 (<1%) California wild turkeys tested weakly positive on the AGID test for AI. This turkey was trapped in Lake County in 1996.

Prevalence of antibody to MG, MM, SP, ST, NDV, and AI was low (0–4%) for wild turkeys trapped within California. With the exception of a moderate (33%) prevalence of MM antibody, the same was true for wild turkeys imported into California

from other states. Antibody prevalence to MS was 8–10% for both populations. Similarly, low antibody prevalence to the above disease agents has been reported for wild turkeys sampled in Texas (Hensley and Cain, 1979), Georgia, Kentucky, Louisiana, North Carolina, Tennessee, Missouri, Iowa (Davidson et al., 1988), and Kansas (Veatch et al., 1998). A highly variable (0 to 87%) antibody prevalence to MG, MM, and MS was found in wild turkey populations from six western states that were sampled on the basis of prior evidence of mycoplasmosis (Fritz et al., 1992).

Wild turkeys trapped within California had much lower antibody prevalence to MG, MM, SP, and NDV than backyard turkeys recently sampled in California. Wild turkeys had a higher prevalence of MS antibodies than backyard turkeys, while antibody prevalence to AI was similar for the two groups (McBride et al., 1991). When compared to commercial meat turkey flocks in California, wild turkeys had much lower antibody prevalence to MM, SP, and NDV. Antibody prevalence to AI, MG, and MS was similar for the two groups (Hird et al., 1991).

Comparison of imported wild turkeys with backyard and commercial meat turkeys in California revealed findings similar to those above, except that imported wild turkeys had antibody prevalence to MM similar to the two groups of domestic turkeys (Hird et al., 1991; McBride et al., 1991).

Overall, it appears that current wild turkey translocation practices pose little disease threat to domestic or wild birds in California. Indeed, the only documented case of clinical MG infection in a wild turkey in California is believed to have occurred as a result of wild turkeys intermingling with a backyard flock of domestic turkeys in Tehama County (Jessup et al., 1983).

Attempts to confirm positive serologic reactions by culture were not made. Thus, the significance of the positive reactors in this study is unknown. Agglutination tests such as the RPA and MAT are generally of low specificity (i.e., false positives are common). For example, commercially available RPA tests for MG have specificities of <96% (Avakian et al., 1988). Therefore, the MG seroprevalence of <1% observed in this report could be attributed to false positive reactions. Agglutination tests for MM are known to be particularly low in specificity (Snell and Cullen, 1978). The relatively high MM seroprevalence observed in this report could reflect the low specificity of the RPA, although it may also suggest true exposure in the California population. The low prevalence of reactors to SP and ST (<5%) and to AI and NDV (<1%) observed in this report may similarly be explained by non-specific reactions.

Agglutination tests such as the RPA and MAT are often considered screening tests and, if not confirmed with subsequent HI testing or culture, reactions are often considered false positives (Hird et al., 1991; Veatch et al., 1998). However, at least two studies have demonstrated that wild turkeys infected with MG and/or MS can react positively to RPA but negatively to HI, leading to recommendations that all wild turkeys be screened for MG with RPA prior to translocation and that only RPA-negative birds be released (Rocke and Yuill, 1988; Fritz et al., 1992).

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