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Challenge Infection as a Means of Determining the Rate of Disease Resistant *Trichomonas Gallinae*-Free Birds in a Population

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Abstract

Trichomonas gallinae-free pigeons and mourning doves were infected with the Jones' Barn strain of *T. gallinae* to determine the rate of disease resistant *T. gallinae*-free birds in each population. Although all birds became infected 88% of the pigeons were resistant to trichomoniasis while 82% of the mourning doves were resistant. It was concluded that these birds had been previously infected and spontaneously lost their trichomonad fauna while retaining their resistance to fatal infection.

The survey method most commonly used to determine the incidence of infection by *Trichomonas gallinae* in pigeons and doves is direct examination of throat swabs. Surveys made in this way give only the minimum incidence of infection and are unable to reveal the number of

T. gallinae-free, trichomoniasis-resistant birds. To determine the number of disease resistant birds overlooked by the throat swab method, pigeons and doves were collected, examined, and challenged with the highly pathogenic Jones' Barn (J. B.) strain of *T. gallinae*.

Materials and Methods

A total of 313 feral pigeons (*Columba livia*) were trapped at the Washington, D.C. Zoo from October 1968 to April 1969. During the same period 66 mourning doves (*Zenaidura macroura*) were trapped at the Patuxent Wildlife Research Center, Laurel, Maryland. All birds were throat swabbed and the swabs cultured in Diamond's medium¹ for 72 hours. Those birds found to be *T. gallinae*-free were isolated from the others and re-examined after two weeks in captivity.

Birds found to be *T. gallinae*-free after the second examination were orally infected with J.B. *T. gallinae* (1.5×10^8 organisms per bird), housed indoors, and fed a commercial pigeon chow and granite grit. One week following infection all birds were throat swabbed and cultured for *T. gallinae*. Observations continued for 8 weeks to determine the number of birds susceptible to trichomoniasis.

Results

Of the 313 pigeons examined, 151 (48.3%) were initially negative for *T. gallinae*. Direct examination of throat swabs produced 109 (31.6%) positives while cultures of the remaining negative swabs produced an additional 63 (20.1%) positives for a total of 51.7% positives. All 66 of the mourning doves examined by culture of throat swabs were negative for *T. gallinae*. No birds found to be negative following throat culture proved to be positive on subsequent examination.

Twenty-five *T. gallinae*-free pigeons randomly selected from the 151 negatives were challenged with J.B. *T. gallinae*

and were positive for the organisms when throat swabbed 2 weeks after infection. Three birds from this group (12%) died within 15 days; all three exhibiting typical liver lesions.⁹ *T. gallinae* was isolated from the lesions in each case.

All 66 of the *T. gallinae*-free mourning doves were challenged with the same organism, and became orally positive while only 12 (18%) succumbed to trichomoniasis. Eight deaths resulted from typical visceral trichomoniasis while 4 resulted from massive lesions in the head sinuses and throat. *T. gallinae* was cultured from all lesions.

Discussion

The additional 20.1% positive pigeons obtained after culturing swabs confirms that culture of throat swabs is far superior to direct throat swab examination for determining the incidence of infection by *T. gallinae*. Equally significant is the observation that 88% of the negative pigeons and 82% of the negative doves were resistant to fatal infection. Adding these figures to the number of birds carrying *T. gallinae* and known to be disease resistant^{8,7} it is obvious that most of the birds in both populations studied were trichomoniasis resistant.

The high rate of *T. gallinae*-free trichomoniasis-resistant birds from both populations is probably the result of birds having spontaneously lost a previous sublethal infection.⁴ Previous work indicates that resistance to trichomoniasis develops only if the birds survive an infection by one or more strains of *T. gallinae*.^{5,7} It is also possible that some of the birds classified as *T. gallinae*-free were actually infected at such a low level as to be undetectable and in a state of premunition. The birds which succumbed to trichomoniasis may have been raised by uninfected parents, thus being non-resistant, or lost their infection sufficiently long ago to have lost any resistance which they had. The duration

of disease resistance following loss of *T. gallinae* is unknown, but Stabler⁴ believes it to be a relatively short time before immunity is lost. Using wild-caught birds it is impossible to know whether one has a previously uninfected bird or one which had lost its infection at some previous time.

From an epizootological standpoint, one must consider that if a pair of *T. gallinae*-free pigeons or doves produces young, these will be uninfected and also non-resistant to trichomoniasis; transmission of *T. gallinae* to squabs of the next generation resulting only when one or both parents are carriers. Consequently, the greater the number of *T. gallinae*-free nesting adults, the higher the rate of production of non-resistant birds in the population. This situation could precede the type of epizootic described by Haugen & Keeler,³ and Haugen.²

It would be interesting to know if these results hold true in other geographic locations. Stabler,⁹ Stabler and Herman,¹⁰ and Haugen² have reported various infection rates for different areas. In addition, a nationwide survey by State wildlife agencies in cooperation with the Patuxent Wildlife Research Center during 1961, '62, '63 showed infection rates

ranging from 0% to 100% in various states. Whether the observed infection rate in each state can be related to the number of immune birds remains to be shown.

To summarize: 48.3% of the 313

pigeons examined were *T. gallinae*-free and 88% of these birds were resistant to trichomoniasis. One hundred percent of the 66 mourning doves were *T. gallinae*-free; 82% of which were also trichomoniasis-resistant.

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