

PREVALENCE OF MACROSCOPICALLY DETECTABLE *Sarcocystis* IN NORTH DAKOTA DUCKS

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Abstract: Hunter-killed ducks were examined in North Dakota from 1969 through 1972 for prevalence of macroscopically detectable cysts of *Sarcocystis*. Fifty-seven of 632 (9%) adult dabbling ducks and 1 of 420 (0.24%) juveniles were infected. *Sarcocystis* was not detected in 169 adult and 91 juvenile diving ducks.

INTRODUCTION

Macroscopically detectable *Sarcocystis* has been reported from 16 species of ducks on the North American Continent.^{1,3,4,5,9,12} Estimates of the prevalence of *Sarcocystis* in ducks range from one infection in 750 diving ducks⁴ to 78.3 percent infection in adult shovelers (*Anas clypeata*)², but only one report provided detailed information on prevalence of infection.² Moreover, adults are seldom separated from juveniles in these surveys. The purpose of this survey was to determine the prevalence of macroscopically detectable *Sarcocystis* in hunter-killed ducks examined in North Dakota. Prevalence was recorded by species, sex, age-group (adult or juvenile) and year.

MATERIALS AND METHODS

All ducks were hunter-killed during the 1969 through 1972 seasons. The majority were examined in Steele County, North Dakota, especially near Golden and Tobiason Lakes, but some were obtained near Fuller's Lake. A few were examined near Michigan, North Dakota. Most ducks were skinned and all exposed musculature examined for cysts. If hunters did not want their ducks skinned, the pectoral musculature was examined by elevating skin where the head, neck, and wings had been excised. Legs and lower

breast were examined through the skins. One wing from each bird was retained to confirm species, sex and age.

RESULTS AND DISCUSSION

Variation among species

The results are summarized by species and age-group in Table 1. No new species are added to the list of ducks previously known to host *Sarcocystis*. The total prevalence in adult dabbling ducks, 9%, is in general agreement with previous 10% estimates for the Anatini.⁴ No infected diving ducks were found. All percentages of infection in North Dakota ducks were considerably lower than those reported for corresponding species examined in Louisiana,² which may indicate locality and/or temporal differences in macroscopically detectable *Sarcocystis* in waterfowl. It should be noted that, while the ducks were shot in the study area described above, there is no way to distinguish the actual breeding areas utilized by individual ducks examined. Many of the early season dabbling ducks were undoubtedly local ducks, while most divers and late season dabblers were probably migrants.

The fact that cysts are common in dabbling ducks and rare in divers suggests fecal transmission of macroscopically detectable *Sarcocystis* in waterfowl, as reported for *Sarcocystis* transmission to

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TABLE 1. Prevalence of macroscopically detectable *Sarcocystis* in ducks examined from 1969 through 1972.

Species	Adults		Juveniles	
	Number examined	Percent infected	Number examined	Percent infected
Mallard (<i>Anas platyrhynchos</i>)	307	7.82	169	0
Black duck (<i>Anas rubripes</i>)	1	0	0	0
Shoveler (<i>Anas clypeata</i>)	49	30.61	40	0
Pintail (<i>Anas acuta</i>)	54	11.11	36	0
Gadwall (<i>Anas strepera</i>)	45	0	50	0
American widgeon (<i>Anas americana</i>)	49	6.12	28	0
Blue-winged teal (<i>Anas discors</i>)	85	8.24	82	1.22
Green-winged teal (<i>Anas crecca</i>)	42	4.76	15	0
Totals, dabbling ducks	632	9.02	420	0.24
Greater scaup (<i>Aythya marila</i>)	29	0	9	0
Lesser scaup (<i>Aythya affinis</i>)	46	0	32	0
Ring-necked duck (<i>Aythya collaris</i>)	13	0	6	0
Redhead (<i>Aythya americana</i>)	37	0	22	0
Common goldeneye (<i>Bucephala clangula</i>)	19	0	11	0
Bufflehead (<i>Bucephala albeola</i>)	12	0	4	0
Ruddy duck (<i>Oxyura jamaicensis</i>)	13	0	7	0
Totals, diving ducks	169	0	91	0

swine and cattle.^{6,7,13,14} By feeding in shallower wetlands and even upland regions, dabbling ducks would more likely ingest fecal material of other animals than would divers. In view of findings regarding *Sarcocystis* infection in other hosts, however, future investigators should examine tissues of subject animals microscopically as well as macroscopically. Sheep tissues may contain both macroscopic and microscopic cysts, the latter not apparently representing "young" stages of the former.¹¹ Cattle also may be infected with both macroscopic and microscopic species of *Sarcocystis*.^{10,18} If ducks also host species of *Sarcocystis* which form only microscopic cysts, it would be of interest to compare dabbling and diving ducks in this regard.

Variation between age-groups

Only one infected duck was found among 420 juvenile dabbling ducks examined (Table 1). The absence of macroscopically detectable cysts in juveniles can be explained on the basis of maturation and growth of the cyst, or absence of a cyst stage in juvenile birds.⁸

Variation between sexes

None of the individual species of ducks showed a significant difference in prevalence of cysts in drakes versus hens. The totals for all adult dabbling ducks showed that 8.35 percent of all drakes and 10.22 percent of all hens were infected, which is not a significant difference.

Variation among years

Small differences in year-to-year percent of infection in various species were seen, but chi-square tests of the four years' data collectively reveal no significant yearly changes in percent infected ducks of any species, or of all adult dabbling ducks considered together. However, since the chi-square value for all adult dabbling ducks (7.20) is close to the critical value at the 0.05 level of significance (7.82), it is conceivable that significant fluctuations might be observed in an inclusive duck sample, if adults and juveniles were not separated. Since the parasite is rarely detected in juveniles, a low production year, with a lower pro-

portion of juveniles in the hunters' kill, could seem to show a higher prevalence of infection than is actually present in the adult population. Reports of "measly" ducks in Canada reflect such a situation.⁴

In years of high levels of infection, the number of mallards thrown away by hunters due to *Sarcocystis* infection may be considerable. About 20 percent of the hunters surveyed in Louisiana were aware of *Sarcocystis* in ducks.² In the present study, 14 percent of the hunters surveyed indicated that they check for cysts, and discard infected ducks. The possibility for such waste warrants more thorough investigation of the prevalence, life cycle, and possible control of this parasite.

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LITERATURE CITED

1. BEAUDETTE, F. R. 1941. Sarcosporidiosis in a black duck. J. Am. vet. med. Ass. 99: 52-53.
2. CHABRECK, R. H. 1965. Sarcosporidiosis in ducks in Louisiana. La. Wildlife and Fisheries Comm., Grand Chenier, La. (mimeo).
3. CLARK, G. M. 1958. *Sarcocystis* in certain birds. J. Parasit. 44 (Suppl. 4): 41.
4. CORNWELL, G. 1963. New waterfowl host records for *Sarcocystis rileyi* and a review of Sarcosporidiosis in birds. Avian Dis. 7: 212-216.
5. ERICKSON, A. B. 1940. *Sarcocystis* in birds. Auk, 57: 514-519.
6. FAYER, R. and A. J. JOHNSON. 1973. Development of *Sarcocystis fusiformis* in calves infected with sporocysts from dogs. J. Parasit. 59: 1135-1137.
7. FAYER, R. and A. J. JOHNSON. 1974. *Sarcocystis fusiformis*: Development of cysts in calves infected with sporocysts from dogs. Proc. Helm. Soc. Wash. 41: 105-108.
8. FAYER, R. and R. M. KOCAN. 1971. Prevalence of *Sarcocystis* in grackles in Maryland. J. Protozool. 18: 547-548.
9. GOWER, C. 1938. A new host and locality record for *Sarcocystis rileyi* (Stiles 1893). J. Parasit. 24: 378.
10. HEYDORN, A. O. and M. ROMMEL. 1972. Beitrage zum Lebenszyklus der Sarkosporidien. II. Hund und Katze als Ubertrager der Sarkosporidien des Rindes. Berl. Munch. Tierarztl. Wschr. 85: 121-123.
11. MUNDAY, B. L. and M. D. RICKARD. 1974. Is *Sarcocystis tenella* two species. Australian Vet. J. 50: 558-559.
12. RILEY, W. A. 1931. Sarcosporidiosis in ducks. Parasit. 23: 282-285.
13. ROMMEL, M. and A. O. HEYDORN. 1972. Beitrage zum Lebenszyklus der Sarkosporidien. III. *Isoospora hominis* (Railliet und Lucet 1891) Wenyon 1923, eine Daureform Sarkosporidien des Rindes und des Schweins.
14. ROMMEL, M., A. O. HEYDORN and F. GRUBER. 1972. Beitrage zum Lebenszyklus der Sarkosporidien. I. Die Sporozyste von *S. tenella* in den Fazes der Katze.

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