GULLS AS VECTORS OF *SALMONELLA ENTERITIDIS* IN THE LOWER MOHAWK VALLEY REGION OF NEW YORK

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ABSTRACT - One hundred and twenty-five fecal samples were collected at Collins Lake, Village of Scotia, Schenectady County, and the Waterfield area, City of Cohoes, Albany County, from three different species of gulls: Herring Gull (*Larus argentatus*), Great Black-backed Gull (*L. marinus*) and Ring-Billed Gull (*L. delawarensis*). Out of 125 samples, one was positive, one of the first reports of *Salmonella enteritidis* in gull fecal matter in the northeastern United States. This study is important because it focuses on a potential public health hazard which occurs when increasing numbers of gulls in the Mohawk Valley feed at landfills and overnight in public water supply reservoirs.

INTRODUCTION

Gulls (*Larus* spp.) have been documented as vectors of salmonellae in Europe, Japan and Canada with carrier rates ranging from 7 to 31%; 1% is more typical in other bird species (Fenlon, 1981). Salmonellae are found in the gut of warm-blooded vertebrates, some reptiles and various insects; they also appear in sewage, river, and sea water. Outside the host, salmonellae survival rates vary: at 11.5 ^{o}C (55 ^{o}F) for 1 hour, at 14 ^{o}C (60 ^{o}F) for 15-20 minutes (Parker *et al.*, 1983). The main way gulls acquire salmonellae is through eating infected food and they may carry the pathogen for several weeks without symptoms (Parker *et al.*, 1983). Rates of avian digestion vary between 2.5 to 12 hours, depending on amount and type of food (Pettingill, 1985), thus passage of food through the gut does not necessarily displace the pathogen (Parker *et al.*, 1983).

Peak numbers of gulls in the lower Mohawk Valley of New York currently number in excess of ten thousand. Heavily dependent upon sanitary landfills, this number also appears to be increasing. Another feature of local gulls is that they overnight at public water supply reservoirs. Thus gulls may be a problem in the region (Levesque *et al.*, 1993).

Departments of Health and other health related agencies in Pennsylvania, New York, and all states in New England, were contacted to learn that studies on the role of gulls as vectors of salmonellae have not been published, thus motivating the study at hand (Table 3).

MATERIALS AND METHODS

Samples were collected at the Waterfield area, a broad and rocky expanse of the Mohawk River east of the Route 32 bridge, City of Cohoes, Albany County. This site is 100 meters from shore and on a flat, rocky island 40 x 25 meters in extent and usually 15 cm above water level. This island is regularly used as a perch for gulls and is about 3 km southeast of the Colonie Landfill, the largest in the region. A second collecting area was at Collins Lake, Village of Scotia Schenectady County, also in New York State. Samples were taken between the hours of 15:30 and 17:15 on February 2 and 17, April 3, 10, and 17, and May 5, 1995.

Fecal samples were collected from rock, snow, ice or sand surfaces, placed in sterile containers using sterile tongue blades and transported to the Microbiology Laboratory at Ellis Hospital, Schenectady, New York, in a cold chest with ice and/or snow. Samples were spaced at a minimum distance of one meter. HektoenEnteric Agar plates were used and incubated at 37 °C (98 °F) for 72 hours following *Bailey and Scott's Diagnostic Microbiology* (Baron and Finegold 1990). All work was done under the supervision of experienced medical technologists at Ellis Hospital. Several authors, e.g. D.R. Fenlon, C.R. Fricker, Benoit Levesque and Sylvain Quessy, suggest processing gull feces on brilliant green agar plates incubated initially at 43 °C (115 °F) for 18 hours and at 37 °C (98 °F) for 24 hours. However more conventional methods practiced in most medical pathology laboratories were used here because they are more readily available to the public.

Number of individuals of each species of gull was counted prior to sampling to estimate source of fecal material collected (Table 2). Air and water temperatures, percentage cloud cover (Table 1), wind direction and speed, and water level were also recorded.

RESULTS

One hundred and twenty-five samples were collected on six dates under diverse conditions (Table 1); one sample taken on April 3, 1995 proved positive for *Salmonella enteritidis*. On this date, there were 465 gulls perching on the rock surface: 55% Herring Gull, 35% Ring-Billed Gull and 5% Great Black-backed Gull; cloud cover was 100% and air temperature 12 °C (54 °F). After the one positive sample was collected, sixty-four additional samples were taken from the same rock area. Freshness of samples was assured through moist and glistening appearance, deposition on fresh snow and crushed ice, deposition on rock surface that are repeatedly swept with running water, and deposition on freshly wave washed sand.

DISCUSSION

Numbers of gulls roosting on public water reservoirs with resulting bacterial and nutrient contamination have been increasing (Perrins 1976); the Capital Region of New York has not escaped this phenomenon. Gulls in increasing numbers scavenge at the Colonie Landfill, 2.5 miles away from the Waterfield area, then overnight during the warmer months on Tomhannock Reservoir, 8 miles to the northeast, one of the region's more important public drinking water sources.

Less than one percent of the collected samples demonstrate salmonellae with the technique used and this poses three main questions about the results. If the study was done in spring and summer following C.R. Fricker and R.W.A. Girdwood (1984), S. Quessy and S. Messier (1992) and B. Levesque *et al.* (1993) would more samples have been positive? If the fecal samples were processed using the methods of these same authors would the number of positive samples be influenced? Are certain gull species more prone to be vectors of salmonellae than others? Further investigation of the water will be necessary to determine whether salmonellae are present in the ambient water. State Health departments and other health related agencies were contacted to determine how serious they believed the problem of gulls as vectors for salmonellae was and were asked the question, "Is there any research being done on this topic?". Answers were generally no, because they had not considered salmonellae transmitted by gulls a human health problem nor did they know of others studying this question. In my opinion, due to the increase of gulls around public water supplies, salmonellae should be considered harmful to humans. It is important to educate people about the potential transmission by gulls, even though most humans do not consider it a necessity because they do not eat gull meat or eggs. This study only touches the surface of an issue which needs further investigation.

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Table 1: Date, location, conditions and number for samples at the Waterfield, access from Clarke Ave., City of Cohoes, Albany County and Collins Lake, Village of Scotia, Schenectady County, New York. A single positive sample (+) was taken at the Waterfield on 3 Apr 95.

Date	Location	Conditions	N	+/N
10 Feb 95	Waterfield	Snow field 100% cloud cover Air temp. 9.5 °C (49 °F)	15	0/15
17 Feb 95	Waterfield	2 cm. snow on ice 0% cloud cover Air temp. 6 °C (42 °F)	20	0/20
3 Apr 95	Collins Lake	Sand beach 100% cloud cover Air temp. 11.5 °C (53 °F) Water temp. 9 °C (48 °F)	10	0/10
3 Apr 95	Waterfield	Rock surface 100 % cloud cover Air temp. 12 °C (54 °F) Water temp. 8 °C (46 °F)	16	1/16
10 Apr 95	Waterfield	Rock surface 80-90% cloud cover Air temp. 8.5 °C (47 °F) Water temp. 6.5 °C (43 °F)	19	0/19
17 Apr 95	Waterfield	Rock surface 5% cloud cover Air temp. 15 °C (60 °F) Water temp. 8.5 °C (47 °F)	20	0/20
5 May 95	Waterfield	Rock surface Light rain, 100% cloud cover Air temp. 13 °C (56 °F) Water temp. 15 °C (60 °F)	25	0/25
		Total	125	1/125

Table 2. Species of Gull and Waterfowl at Collecting Sites.

Date	Location	No. of Gulls	No. of Waterfowl
10 Feb 95	Waterfield	2,000 gulls 75%- Herring 25%- Great Black-backed	None
17 Feb 95	Waterfield	600 gulls 70% - Herring 30% - Great Black-backed	10 Am. Black Duck 1 Hooded Merganser
3 Apr 95	Collins Lake	50 Ring-Billed	None
3 Apr 95	Waterfield	65 gulls 55%- Herring 35%- Ring-Billed 5%- Great Black-backed	None
10 Apr 95	Waterfield	1100 gulls 50%- Herring 30%- Ring-Billed 10%- Great Black-backed	30 Mallard 7 Am. Black Duck 3 Double-crested Cormorant
17 Apr 95	Waterfield	350 gulls 85%- Herring 10%- Ring-Billed 5% - Great Black-backed	6 Am. Black Duck
5 May 95	Waterfield	225 gulls 80% - Herring 20% - Great Black-backed	None

Table 3. People contacted in Pennsylvania, New York and New England health agencies and status of research on role of gulls as vectors for *Salmonella enteritidis* (- = no research in process).

State	Agency	Respondent
PA	Dept. Health, Div. Epidemiology	Ms. Chris Wrick (-)
NY	Dept. Health, Div. Epidemiology	Mr. Peter Drabkin (-)
VT	Dept. Health, Div. Epidemiology	Dr. Robert Johnson (-)
RI	Dept. Health, Off. Food Protection	Mr. Ken Kohav (-)
NH	Dept. Agric., Div. Animal Ind.	Dr. Clifford McGinnis (-)
ME	Bur. Health, Dept. Human Services	Mr. Rob Taylor (-)
CT	Dept. Health, Div. Epidemiology	Mr. George Cooper (-)
MA	Dept. Health, Div. of Epidemiology	Dr. Pat Klude(-)

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