Enteric Viruses in Wading Pools

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ENTERIC viruses have been isolated routinely from sewage, but their isolation from less polluted sources such as streams (*1*) and well water (*2*) has been rare. Nor have they been detected in swimming pools. This report describes the isolation of two ECHO viruses from municipal outdoor wading pools operated by the city of Albany, N.Y., during July and August 1959.

Forty-nine samples of wading pool water were obtained as pressings from cheesecloth swabs exposed to the drainage from four wading pools for 1, 2, or 4 days of each week during July and August 1959. The drainage flowed through a pit at least 8 feet deep and was accessible through a manhole no more than 10 feet from each pool.

The cement-lined wading pools were filled with water from the municipal supply, which originated in the watershed of Hannacroix Creek in the Catskill Mountains and was treated by aeration, coagulation, settling, filtration, and chlorination to a nominal residual value customarily used for drinking water. In pools 1 and 3, the water was fed continuously through a central sprinkler during the 12 hours of operation. The water was not replenished in the other pools after the 8 a.m. filling. All four pools were emptied at 8 p.m., and each morning were swept, hosed, sprinkled with a chlorine disinfectant (HTH), and refilled. No residual chlorine from the disinfecting process was detected in the pools during use.

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Contamination of the drainage by backflow of sewage was not likely. The combined sewer to which connection was made from the drainage pit was 50 feet or more away; the conducting pipe was at least 18 inches higher at the sampling site than at the sewer; the coliform density of the drainage was similar to that of the pool samples; rainfall during the period was three-quarters normal, or less.

The water samples were concentrated and stored by methods previously described (*3*) and were tested for enteric viruses in monolayers of HeLa cells, human amnion and monkey kidney epithelium, and in 1-day-old mice. Mice were observed over a 14-day period. Subcultures were made if the tissue cultures degenerated within 10 days. Agents which were cytopathogenic through two or more subcultures were identified serologically. Attempts to obtain plaque counts of virus from the samples which were cytopathogenic were not successful.

Viral agents were isolated from six samples: three from pool 1, two from pool 2, and one

Table 1. Characteristics of agents cytopathogenic for human amnion tissue cultures isolated from wading pools, Albany, N.Y., 1959

Sample No.	Agent identified	Number of positive tubes in total of 5 tubes inoculated	Incubation period (days)
97	E_{11}	1	3
99	E_3	3	7
104	E_3	4	3, 6, 7
109	E_3	5	2, 7
118	E_3	1	3
119	E_{11}	2	6, 7

Table 2. Most probable number (MPN) of coliform bacteria per 100 ml. catch samples of wading pools, Albany, N.Y., 1959

Date	Pool 1			Pool 2 [1]		Pool 3			Pool 4		
	Morning	Afternoon	At draining	Morning	Afternoon	Morning	Afternoon	At draining	Morning	Afternoon	At draining
July 20	<30		<3, 000	9, 300		4, 300		<3, 000	230		<3, 000
Aug. 31		9, 300			930		930			730	
Sept. 1		9, 100			1, 400		2, 300			910	
Sept. 3											

[1] No samples taken at draining.

from pool 3. None was found in samples from pool 4. The isolated agents were cytopathogenic for amnion tissue cultures and were identified as ECHO viruses: type 3 from pools 1 and 3 and type 11 from pool 2. One agent was isolated from a 24-hour sample, three from 48-hour samples, and two from 4-day samples. Characteristics of the isolations are listed in table 1.

No agents were isolated in mice, monkey kidney epithelium, or HeLa cell cultures.

A measure of the fecal pollution of the wading pools was made by estimating the most probable number (MPN) of coliform bacteria per 100 ml. in catch samples of pool water (table 2). The MPN of samples from one pool ranged from <30/100 ml. in the morning (before use) to 9,300/100 ml. in the afternoon. The MPN was the same in both morning and afternoon samples from pools less well maintained.

That the two ECHO viruses isolated from the wading pools were from widespread infections in the community was apparent from a separate study of the viruses present in raw sewage sampled at the Albany treatment plant. Types 3 and 11 strains were predominant in 1958 and type 3 in 1959.

An indoor swimming pool which was chlorinated to a residual value of from 0.5 to 0.7 ppm free chlorine was tested for viruses during the period November 1958–August 1959. An outdoor swimming pool which was chlorinated at an average rate of 65 pounds per 24 hours (giving an average value of 0.2 ppm free residual chlorine) was similarly tested during July and August 1959. Both pools were operated by the city and were filled with water from the municipal supply. No agents were isolated from the 82 samples examined.

Conclusion

The isolation of viruses from urban wading pools indicates that a potential health hazard may exist. It may be significant that no virus was isolated from samples of the pool having the lowest coliform density. The failure to detect viruses in chlorinated swimming pools sampled during the same period and in the same area suggests that similar treatment of wading pools is needed.

REFERENCES

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