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Cryptosporidiosis Outbreaks Associated with Interactive Water Fountains: Texas 2008

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ABSTRACT

Background: Interactive water fountains have been known to be associated with transmission of enteric illnesses. During a community wide outbreak of Cryptosporidiosis occurring in Dallas in 2008, a subset of cases occurring with onset of illness within a 2 week interval was epidemiologically linked to two neighborhood interactive water fountain parks.

Methods: A case control study was conducted to evaluate risk factors associated with developing illness with Cryptosporidiosis from the fountain parks. Cases were selected from a line list from the epidemiological study. The selection for the controls was either healthy family members or a daycare center nearby. Cases and controls were not matched. All data was analyzed using SAS 9.1.

Results: Interviews were completed for 44 fountain park attendees who met case definition and 54 community controls. The median age of cases was 6 years (range: 1 to 59 years) and 47.7% of the cases were male. Fountain park attendees who reported having been splashed in the face with water were 10 times more likely to become ill than controls (OR = 10, 95% CI = 2.8 – 35.1). Persons who reported having swallowed water from the interactive fountains were 34 times more likely to become ill than controls (OR = 34.3, 95% CI = 9.3 – 125.7)

Conclusions: This investigation underscores the potential for Cryptosporidiosis outbreaks to occur in interactive fountain parks, and the need for enhanced preventive measures in these settings. Prompt reporting of cases, identification of outbreak sources, and immediate implementation of remediation measures were critical in curtailing further transmission from these particular sites through the remainder of the season. Education of the public regarding avoidance of behaviors such as drinking water from interactive fountains is also an important component of public health prevention efforts.

BACKGROUND

- In 2008, Texas experienced its largest recorded outbreak of Cryptosporidiosis with 2,238 cases. The majority of cases were associated with exposure to recreational water facilities.
- Dallas County had 526 confirmed Cryptosporidiosis cases. About 10% of cases were associated with interactive fountain parks early during the course of the outbreak.
- A case-control study was performed to investigate risk factors associated with illness in interactive fountain parks.

METHODS

- Cases were ill persons who met CSTE definitions as confirmed or probable Cryptosporidiosis cases and visited one of two fountain parks, fountain park “A” and “B”.
- Controls were well household members of cases and neighborhood convenience samples.
- A standardized questionnaire was created and used to interview both cases and controls.
- All data were analyzed using SAS 9.1

RESULTS

Figure 1: Interactive fountain park A

Figure 1. One of the interactive fountain parks in this case-control study

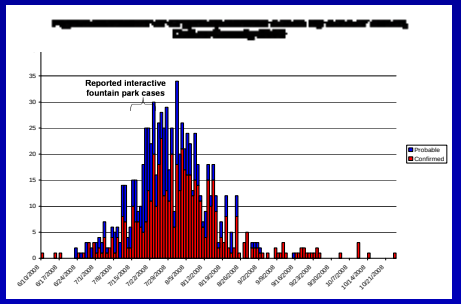

Figure 2. The epidemiological curve representing confirmed and probable cases from Dallas County. A total of 838 Cryptosporidiosis cases were reported between July-October 2008: 546 (65%) were laboratory confirmed cases and 292 (34.8%) were probable cases.

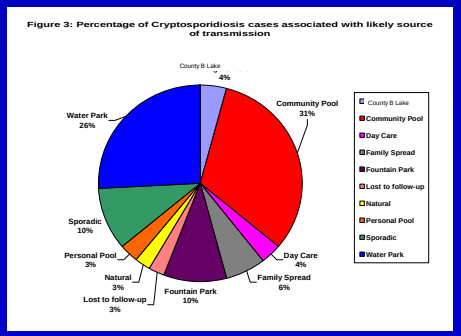

Figure 3. The percentage of probable and confirmed Cryptosporidiosis cases in Dallas County associated with the likely source of exposure. Water parks were implicated as a source of exposure in 57% of the cases and interactive fountain parks were implicated in 10% of the cases.

Figure 4: Behavioral water interactions, Interactive fountain park A

Table 1. Demographics of persons included in case control study

Demographics	Cases (n = 44)		Controls (n = 54)		Odds Ratio (95% CI)	P-value
Female	23 (52.3%)		31 (57.4%)		.81 (.36 - 1.81)	0.611
Age (years)						0.018
0 - 4	12 (27.3%)		7 (13%)		1.00 (referent)	
5 - 13	17 (38.6%)		13 (24.1%)		.55 (.15 - 1.94)	0.348
14 - 31	6 (13.6%)		18 (33.3%)		.14 (.03 - .56)	0.005
32 - 63	9 (20.5%)		16 (29.6%)		.23 (.06 - .88)	0.032
Caucasian	27 (61.4%)		15 (27.8%)		.24 (.10 - .57)	0.001
Estimated Annual Income	(n =38)*		(n = 51)*			0.048
	Mean	Std dev	Mean	Std dev		
	38.74	11.88	44.17	5.06		

*Total varies due to missing information
Red OR's indicate statistical significance (P<0.05)

Table 2. Individual behavioral water interactions

	Cases (n = 44)	Controls (n = 54)	Odds Ratio (95% CI)	P-value
Water interactions				0.0001
No water interaction	8 (18.2%)	44 (81.5%)	1.00 (referent)	
Face splashed with water	11 (25.0%)	6 (11.1%)	10.08 (2.895 -35.116)	
Swallowed water	25 (56.8%)	4 (7.4%)	34.38 (9.399 - 125.720)	

Table 3. Common community exposures

		Cases (n = 44)	Controls (n = 54)	Odds Ratio (95% CI)	P-value
Community Interactions	Drinks bottled water	12 (27.3%)	13 (24.1%)	1.18 (.48 - 2.94)	0.718
	Restaurant/picnic visit	20 (45.5%)	24 (44.4%)	1.04 (.468 - 2.32)	0.9203
	Pet contact	13 (29.5%)	21 (38.9%)	0.66 (.28 - 1.54)	0.335
	Daycare *	17 (38.6%)	21 (38.9%)	0.99 (.44 - 2.24)	0.9796

Red OR's indicate statistical significance (P<0.05)

- The mean total time spent in the water was 2.14 hours for cases and .76 hours for controls

Table 4. Multiple logistic regression model for cryptosporidiosis illness

		Bivariate Odds Ratio (95% CI)	Adjusted for predictors Odds Ratio (95% CI)
Age	0-4 years	Referent	Referent
	5-13 years	0.55 (.15 - 1.94)	0.23 (.02 - 2.33)
	14-31 years	0.149 (.03 - .56)	0.04 (.002 - .65)
	32-63 years	0.23 (.062 - .882)	0.28 (.029 - 2.78)
Race	White	0.24 (.10 - .57)	0.09 (.01- .56)
Income/1000		0.93 (.88 - .98)	0.94 (.86 - 1.03)
Water Interaction	No water interaction	Referent	Referent
	Face splashed w/water	10.08 (2.89 - 5.12)	72.12 (3.41 - >999.99)
	Swallowed water	34.38 (9.40 - 125.72)	94.98 (8.47 - >999.99)
Number of people		1.08 (1.05 - 1.11)	1.01 (.94 - 1.08)
Total time spent		2.46 (1.59 - 3.79)	0.74 (.32 - 1.69)
Pet Contact (No vs. Yes)		0.66 (.28 - 1.54)	1.32 (.22 - 7.94)
Daycare*(No vs. Yes)		0.99 (.44 - 2.24)	0.94 (.22 - 4.07)

*Worked or had child in daycare
Red OR's indicate statistical significance (P<0.05)

- Fountain park attendees who reported having been splashed in the face with water were 10 times more likely to become ill than controls. Persons who swallowed water were 34 times more likely to become ill than controls.

CONCLUSIONS

- This study underscores the potential for Cryptosporidiosis outbreaks to occur in interactive fountain parks. Such facilities can be significant transmission venues for amplification of disease outbreaks.
- Public education regarding healthy water play habits, legislation to facilitate regulation of such facilities, and implementation of improved disinfection measures are all critical components for the prevention of future outbreaks from these types of facilities.
- Senate Bill 968 was passed in 2009 in Texas to extend the same level of standards currently required for pools to interactive water features.

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