

## An Outbreak of Pool Associated Cryptosporidiosis in New Mexico

Cryptosporidiosis (commonly referred to as 'crypto') is a diarrheal illness caused by chlorine-resistant protozoa from the genus *Cryptosporidium*. The organism is transmitted by ingestion of oocysts excreted in the feces of infected humans or animals. Many species of *Cryptosporidium* exist, but *Cryptosporidium hominis* is the most common species causing disease in humans.

Symptoms of cryptosporidiosis generally begin 1 to 12 days (average 7 days) after becoming infected with the parasite. The most common symptom of cryptosporidiosis is watery diarrhea. Other symptoms include abdominal cramps, dehydration, nausea, vomiting, fever and weight loss, though infection can be asymptomatic. Symptoms usually last about 1 to 2 weeks, with a range of a few days to 4 or more weeks, in persons with healthy immune systems. Occasionally, people may experience a recurrence of symptoms after a brief period of recovery before the illness ends. Symptoms can come and go for up to 30 days. Immunocompromised individuals may develop serious, chronic, and sometimes fatal illness.

### Epidemiology

Fecal-oral transmission of *Cryptosporidium* occurs via ingestion of contaminated food, person-to person spread (e.g., day care settings), through contact with infected animals and via contaminated water, especially recreational water associated with swimming pools, water parks and interactive fountains. The incidence of reported infection tends to peak in the summer during the height of the traditional swimming season.

In 2005, New Mexico received report of 17 confirmed or probable cases of cryptosporidiosis. In 2007, New Mexico received report of 125 confirmed and probable cases. During the first 9 months of 2008, New Mexico received report of 192 confirmed and probable cases (figure on back page).

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The large increase in cases for 2008 in New Mexico is the result of an outbreak associated with an aquatic center in Albuquerque. This outbreak in the summer of 2008 centered in Bernalillo County mirrors the national trend of increased recognition of recreational water associated outbreaks. New Mexico's recent outbreak represents the first time a cryptosporidiosis outbreak associated with recreational water has been identified in the state.

### New Mexico's 2008 Outbreak

On August 13<sup>th</sup>, 2008, the Albuquerque Environmental Health Department was notified of 6 children from 2 separate families who all became ill with diarrhea, vomiting and fever after swimming at the City of Albuquerque's West Mesa Aquatics Center. The only time the families were together was at the pool on August 2<sup>nd</sup>, during which time all the children swam in the same pool and shared a common meal. The mothers from the 2 families also swam at the pool and ate the same meal, but neither mother became ill. Through interview it was determined that neither mother had submerged her head while swimming. The City of Albuquerque Environmental Health Department (EHD) promptly notified the New Mexico Department of Health (NMDOH) about the situation.

On August 14<sup>th</sup>, NMDOH identified a confirmed cryptosporidiosis case in a 17-year old competitive swimmer who had competed and practiced since early July at the West Mesa Aquatics Center. An interview of the competitive swimmer revealed that the youth

had started experiencing diarrheal symptoms around mid-July, but continued to practice, and ultimately competed, at the same aquatic center in a statewide swimming meet the weekend of July 26<sup>th</sup>. Fourteen other teams, comprising 370 participants from around the state also competed in this 3-day meet. In accordance with City of Albuquerque ordinance, free chlorine levels for the center's pools were maintained at 0.4 parts per million (ppm). On the same day, another confirmed case in a swimmer with similar onset date was identified by NMDOH.

The evidence suggested an outbreak associated with the West Mesa Pool Aquatics Center and prompted NMDOH to coordinate communication and response between the City of Albuquerque, the New Mexico Environment Department's (NMED) Pool Program, the Bernalillo County Environment Department, Kirtland Air Force Base public health staff and the Parasitic Diseases Branch at CDC. CDC provided guidance on water testing and enhanced surveillance. A multiagency press release and a health alert network (HAN) message were issued about the outbreak on August 19<sup>th</sup>, 2008.

The City of Albuquerque operates 3 pools at the West Mesa Aquatic Center: an indoor pool, an outdoor pool and an Olympic pool in which competitive swimming events occur regularly. Water samples collected on August 15<sup>th</sup> at the 3 West Mesa Aquatic Center pools were submitted to CDC for testing. On August 25<sup>th</sup>, CDC notified NMDOH that the sample from the Olympic pool tested positive for *Cryptosporidium hominis*. In accordance with CDC recommendations, hyperchlorination of all three pools had been initiated by City of Albuquerque on August 15<sup>th</sup>. NMED subsequently recommended hyperchlorination of any pool associated with an infected swimmer statewide.

Active surveillance by NMDOH and City of Albuquerque of swim team members who competed at the state swim meet, and at a separate City of Albuquerque swim meet during the weekend of August 2<sup>nd</sup>, was initiated on August 19<sup>th</sup> and identified several cases among competitive swimmers, some of whom also worked as lifeguards at other pools.

Between August 15<sup>th</sup> and September 22<sup>nd</sup>, hyperchlorination of 25 pools and one water park statewide where infected individuals swam during their incubation and

infectious period's occurred. In addition, the City of Albuquerque implemented weekly hyperchlorination of all year-round city pools during the outbreak. Several outbreak-related fecal specimens were submitted to CDC for genotype testing and revealed an identical genetic pattern of *Cryptosporidium hominis* among the samples submitted.

By September 22, 2008, 29 confirmed and 60 probable outbreak-related cases had been identified by NMDOH and case reporting had returned to non-outbreak levels. Of the 89 outbreak associated cases identified, 38 (43%) were female and 51(57%) were male. The age of infected individuals ranged from 5 months to 62 years of age. Fifty-four (61%) of the cases were less than 18 years of age and 17 (19%) were less than 5 years of age at the time of onset. Thirty (34%) reported recreational water activity while ill or during the 2 weeks after symptoms resolved. Thirteen cases (15%) were competitive swimmers, lifeguards or swim team coaches. Three children associated with 3 different day care centers were identified during the outbreak; secondary transmission to other children and staff occurred in one of these centers. There were no known deaths or hospitalizations associated with the outbreak.

## Discussion

*Cryptosporidium* are chlorine-resistant parasites that are not killed at chlorine levels typically maintained at recreational water venues (e.g., CDC recommends 1-3ppm). Hyperchlorination at levels 20 times the minimum level required by New Mexico Administrative Code for 13 hours is required to achieve a 99.9% reduction in cryptosporidium oocysts<sup>1</sup>. Once hyperchlorinated, pools cannot be reopened until pH and free chlorine levels have returned to levels that are safe for swimming. This usually requires temporary pool closure, disruption of normal operations and may result in loss of income.

Swimmers with diarrhea, particularly competitive swimmers, may continue to participate in normal practice and competitive activities despite illness. Swimmers may have trained rigorously for years in order to compete and may be hesitant to suspend practice or forego a meet because they have diarrhea. This situation creates a risk for anyone entering the pool because infected swimmers shed oocysts during illness and for up to 2 weeks after diarrhea resolves.

The public perception of pool water conflicts with the reality. People may assume that pool water is ‘sterile’ because it is chlorinated. As the table below illustrates, even if chlorine levels are maintained within acceptable ranges as mandated by regulation, it is no guarantee that the water is free of contamination.

### Recommendations

Because of the recent outbreak, NMDOH, NMED, the City of Albuquerque and Bernalillo County Environment Department have implemented the following steps and recommendations to prevent outbreaks of cryptosporidiosis in the future:

- NMDOH will notify the appropriate regulating environmental agency anytime it learns of a cryptosporidiosis case that swam in a public pool in the agency’s jurisdiction from 2 weeks before onset of diarrhea until 2 weeks after the patient’s last diarrheal episode. The environmental agency will coordinate hyperchlorination of the pool with the pool operator.
- NMDOH and NMED will coordinate recreational water safety education and outreach prior to the 2009 recreational water season targeted at pool operators statewide.
- Public education about healthy swimming is critical. NMDOH is committed to working with its partners to educate the public about how to prevent waterborne outbreaks of cryptosporidiosis and other recreational water illnesses. Information for the public about healthy swimming is available at [http://www.cdc.gov/healthyswimming/general\\_pub.htm](http://www.cdc.gov/healthyswimming/general_pub.htm)
- NMDOH and CDC will complete a swimmers survey to investigate swimmer attitudes and perceptions surrounding swimming while ill. The results will help guide development of targeted educational messages,

particularly for competitive swimmers.

- The City of Albuquerque will require maintenance of city pool free chlorine levels at the state minimum required level of 1.0 ppm.
- Clinicians should maintain a high index of suspicion for cryptosporidiosis when a patient presents with watery diarrhea of 3 or more days duration. Health-care providers need to remember to specify *Cryptosporidium* testing on the laboratory order form when the disease is suspected.
- An FDA approved treatment with nitazoxinide (Alinia®) is available and should be considered for treatment of cryptosporidium positive patients  $\geq 1$  year of age with healthy immune systems. Any patient with diarrhea should be counseled not to swim while ill and for 2 weeks after resolution of symptoms. It is critical that this recommendation is followed to prevent future recreational water associated outbreaks.

1. Centers for Disease Control and Prevention. Hyperchlorination to kill cryptosporidium. <http://www.cdc.gov/healthyswimming/>
2. Centers for Disease Control and Prevention. Chlorine disinfection time table. [http://www.cdc.gov/healthyswimming/chlorine\\_timetable.htm](http://www.cdc.gov/healthyswimming/chlorine_timetable.htm)

Table. Chlorine Disinfection Times<sup>2</sup>

Agent	Disinfectant Times for Fecal Contaminants in Chlorinated Water*
<i>E coli</i> 0157:H7	< < 1 minute
Hepatitis A virus	approximately 16 minutes
<i>Giardia</i>	approximately 45 minutes
<i>Cryptosporidium</i>	approximately 15300 minutes (10.6 days)
<ul style="list-style-type: none"> <li>• 1 mg/L (1ppm) free chlorine at pH 7.5 and 25° C (77° F)</li> <li>• These disinfectant times are only for pools that do not use chlorine stabilizers such as cyanuric acid. Disinfection times would be expected to be longer in the presence of a chlorine stabilizer.</li> </ul>	

The New Mexico Epidemiology Report

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The New Mexico Epidemiology Report  
(ISSN No. 87504642) is published monthly

by the

Epidemiology and Response Division  
New Mexico Department of Health

1190 St. Francis Dr.

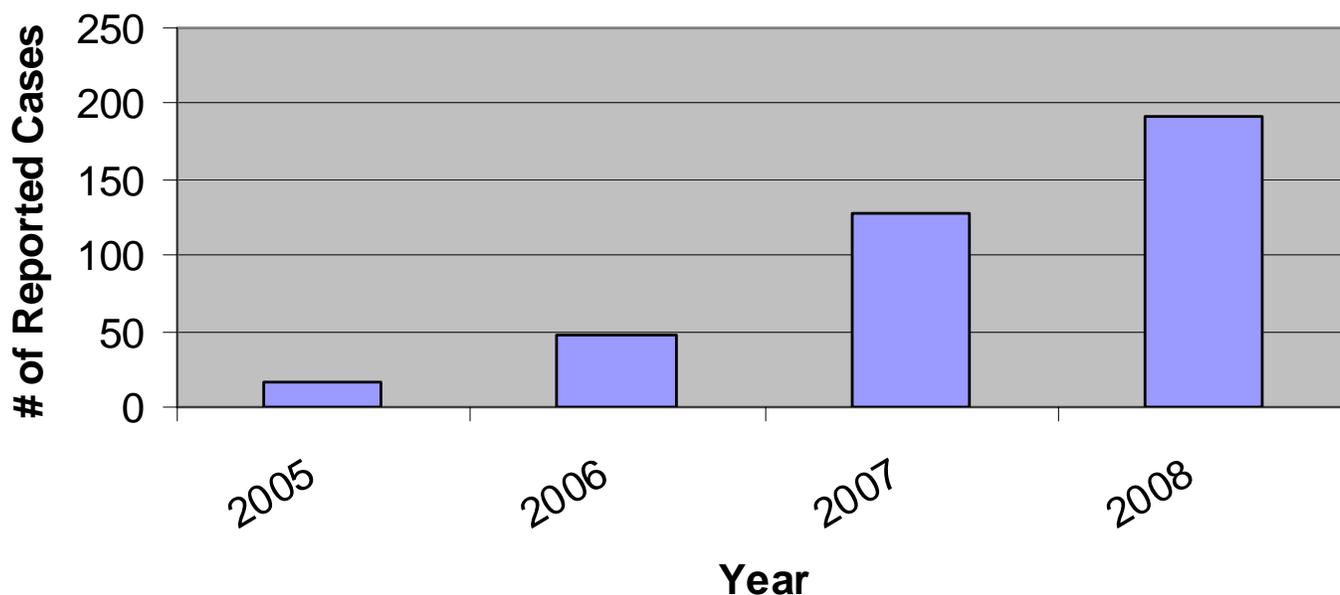
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## Cryptosporidiosis Cases by Year, 2005-2008\*, New Mexico



\*Data for 2008 are provisional and only reflect the period of January 1<sup>st</sup> to September 22<sup>nd</sup>, 2008