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Subject: Primary Amoebic Encephalitis in North Carolina Teen, August 2026

Background

This report describes the public health investigation of a fatal case of a *Naegleria fowleri* infection in a teenager from central North Carolina. On August 23, 2026, the North Carolina Communicable Disease Branch (NC CDB) was notified by health care providers via the 24/7 epidemiologist on-call phone line of a suspected *N. fowleri* infection. NC CDB initiated an investigation to identify possible sources of exposure in coordination with officials from local public health departments (LHDs), state environmental health partners, and subject matter experts from the U.S. Centers for Disease Control and Prevention (CDC).

Naegleria fowleri is a naturally occurring amoeba found in soil and freshwater ponds, lakes, and rivers, and sometimes in inadequately maintained splash pads and other aquatic, outdoor recreational areas. Although infection is rare, people can become infected with this when water contaminated with the amoeba enters the nose, which can allow it to travel to the brain¹. Infection with *N. fowleri* causes Primary Amoebic Meningoencephalitis (PAM), which involves symptoms that progress quickly from stiff neck and headache to coma and death². The incubation period for PAM ranges from 1-12 days, with an average of five days^{2,3}. Death from PAM typically occurs within 5 days after symptom onset².

Methods

Case Description

An NC teenager presented to the emergency room on August 21, 2026, with a two-day history of severe headache, then returned and was admitted on August 22 with worsening symptoms. Upon hospital admission, Naegleria infection was suspected due to reports of freshwater swimming exposure and neurological presentation. A cerebrospinal fluid sample (CSF) was collected from the patient on August 22 for microscopy and slides of CSF revealed numerous amoebic organisms morphologically consistent with *Naegleria* spp. Another CSF sample was collected on August 23, 2026, and submitted to CDC's Free-Living and Intestinal Amoebas (FLIA) Laboratory for molecular testing. *Naegleria fowleri* was identified via real-time polymerase chain reaction (PCR) on August 26, 2026. Unfortunately, the patient died on August 31, 2026.

Exposure Investigation

NC CDB worked with the health department in the patient's county of residence to determine possible exposure locations. Direct history could not be taken from the patient; therefore, the LHD communicable disease nurses interviewed the patient's family members to gather locations of possible swimming and freshwater exposure. The family reported that the patient had been swimming at an apartment complex pool in Orange County on August 11 and August 17, 2026, with family and friends. The patient's family also reported that the patient had made plans to visit two ponds in Alamance County on August 5 and 6, 2026. It was unclear if the patient actually visited or swam in these ponds. Upon follow up interview with the patient's family, an additional possible exposure site was identified at a community-based mental health care center (El Futuro) in Durham County, where the patient was reported to have had contact with a water feature in the garden on August 13, 2026, including splashing water on the face. No other potential

sources of exposure were identified. The family reported that the patient's home was on a municipal water system.

Environmental Investigation

CBD worked with LHDs and partners from CDC to visit the potential exposure sites and perform an environmental assessment and sample collection for testing. The pool and the water feature outside the community-based mental health center were immediately closed by local environmental health officials to prevent any possible exposures and to allow for investigation and sampling.

On August 24, 2026, Orange County Environmental Health visited the apartment complex pool for inspection and found low chlorine levels. The chlorine levels were recorded by the local environmental health specialist as between 0-1ppm, which is below the requirement of at least 1 ppm. The pool started chlorine remediation and was closed until August 25, 2026. On August 25, 2026, a follow up visit to the pool observed chlorine levels of 2 ppm; however, the pool was again closed pending further investigation.

On August 28, 2026, the Durham County Health Department contacted the community-based mental health center and advised them to close the water feature pending investigation. The water feature was subsequently drained to ensure it would not be used and remains closed to the public.

On August 28, subject matter experts from CDC arrived in NC to conduct an environmental investigation and complete sample collection at four potential exposure sites in Orange, Alamance, and Durham Counties.

Orange County

Records were reviewed of the pool chemical logs, and an inspection of the area was conducted with the certified pool operator. It was found that the chlorine levels were low due to no chlorine tabs being present in the chlorinator. A leak was also identified from the recirculation system that was causing water accumulation outside the pool fence behind the pump house (Figure 1). The back flush drain valve was not sealing and caused standing water and algal growth in the grass. The backwash water, which contained sand and organic material from the sand filter, and the standing water were sampled for *Naegleria*. Additionally, 100 liters of pool water and 100 liters of municipal source (fill) water were collected using dead-end ultra-filtration method according to the CDC and Environmental Protection Agency *Protocol for Collection of Water Samples for Detection of Pathogens and Biothreat Agents*⁵(Figure 2). Water quality measurements from the pool water were recorded for temperature, pH, total dissolved solids, conductivity, salinity and disinfectant residual (free and total chlorine). Lastly, the pool cleaning/scrubbing hose was collected.

Alamance County

Both ponds identified by the patient's family were visited and sampled. One pond was a previous golf course feature (pond 1) and the other was a retention pond for an apartment complex (pond 2) (Figure 3). Both ponds appeared to be ideal *Naegleria* habitat as they were stagnant, had cattails, and visible algae growth. Swab specimens were collected at the edge of each pond, as well as a one-liter free catch sample of pond water from each pond. Water quality measurements from the pond water were recorded including temperature, pH, total dissolved solids, conductivity, and salinity.

Durham County

At the community-based mental health center, the garden area was observed to include a water feature that resembled a manmade creek and had been closed by the Durham County Health Department on August 28. This area was inspected and sampled. This manmade creek was a recirculating system with a pump and multiple fountains. The design of this creek was interactive with a play water pump and fire hydrant fountain (Figure 4). The center reported that the feature was cleaned by power washing and hand-fed chlorination.

Algal growth was observed throughout the manmade creek with heavier growth at the top portion of the creek than the bottom. Organic material and debris were observed around the pump system and covered the filter.

For sample collection, a 75-liter dead-end ultra-filtered sample of water was collected at the bottom of the water feature from the sub pump. A one-liter free catch of water was collected from the fire hydrant fountain. Swab samples of the algal growth were collected at the top, middle, and bottom portion of the stream. Water quality measurements from the water were recorded including temperature, pH, total dissolved solids, conductivity, and salinity.

Laboratory Testing

CDC conducted temperature-selected culture and molecular confirmation of all the environmental samples for *N. fowleri* at CDC's Environmental Microbiology and Engineering Laboratory (Environmental sample test results table below). Upon receipt at CDC, bulk water samples were concentrated via centrifugation and the concentrated pellet was resuspended in sample liquid before being divided equally for nucleic acid extraction and culture. Swabs were processed by adding 0.1 mL of a 10% Tween 80 solution to 100 mL bottles containing cotton swabs. These bottles were then homogenized and the resuspension process was repeated and then pelleted in the same process as bulk water samples. Testing was done via direct real time PCR for *N. fowleri*, followed by culture for thermophilic amoebas visible by microscopy with confirmation with the *N. fowleri* PCR assay⁶.

Results

Water Quality Measurements

<u>Site</u>	<u>Temperature</u>	<u>pH</u>	<u>Total Dissolved Solids</u>	<u>Salinity</u>	<u>Conductivity</u>	<u>Disinfectant levels (ppm)</u>
Apartment complex pool ultrafilter	29.7C	7.5	862 ppm	0.61ppt	1214 µS/cm	Total chlorine = 0.18 Free chlorine < 0.04
Apartment complex pool source water	29.7C	8.86	181 ppm	0.13 ppt	255 µS/cm	Total chlorine = 3.8 Free chlorine < 0.04
Pond 1	33.1C	7.6	75 ppm	0.05 ppt	105.6 µS/cm	NA
Pond 2	33.0C	8.52	58 ppm	0.61 ppt	1214 µS/cm	NA
El Futuro water	33.0C	8.52	58 ppm	0.61 ppt	1214 µS/cm	NA

Environmental sample test results

<u>Sample</u>	<u><i>N. fowleri</i> result</u>
Bulk Pool Water 100L ultrafilter	Viable thermophilic amoebas detected; Naegleria spp. not detected
Pool filter backflush 1L grab	Viable thermophilic amoebas detected; Naegleria spp. not detected
Pool sand filter drain 1L grab	Viable thermophilic amoebas detected; Naegleria spp. not detected
Pool sand filter drain	Viable thermophilic amoebas detected; Naegleria spp. not detected

swab	
Pool backflush puddle swab	Viable thermophilic amoebas detected; Naegleria spp. not detected
Pool source water 100L ultrafilter	Not detected
Pond 1 1L grab	Viable thermophilic amoebas detected; Naegleria spp. not detected
Pond 2 1L grab	Viable thermophilic amoebas detected; Naegleria spp. not detected
El Futuro storage tank 75L ultrafilter	Viable thermophilic amoebas detected non-viable <i>Naegleria fowleri</i> detected
El Futuro fountain rocks swabs	Viable thermophilic amoebas detected; Naegleria spp. not detected
El Futuro Fountain Fire Hydrant 1L grab	Viable thermophilic amoebas detected; Naegleria spp. not detected

Non-viable *Naegleria fowleri* DNA was detected in the El Futuro fountain storage tank water. Viable *N. fowleri* were not detected in any collected environmental samples. Viable thermophilic amoebas were observed in the environmental samples collected from the apartment complex bulk pool water, the apartment complex backflush water, the apartment complex sand filter drain water, the sand filter drain swab, the apartment complex pool filter puddle, all environmental samples collected at both of the untreated ponds, and all of the environmental samples from El Futuro. Thermophilic amoeba growth was observed following culture, but *Naegleria* spp. genomic material was not detected in the cultures by real-time PCR. Viable thermophilic amoeba were not observed in the Orange County municipal source water supplying the apartment pool.

Conclusions

While this investigation does not allow us to conclusively determine the location of exposure, the epidemiologic, laboratory, and environmental findings suggest that the El Futuro water feature was the most likely source. The lack of effective disinfection, visible algal growth, and detection of non-viable *N. fowleri* from the water feature support this conclusion. This is also consistent with information shared by family members indicating that the patient had contact with the water feature during the likely exposure period, including splashing water on the face. Previous PAM cases have been documented due to inadequately disinfected water entering the nasal passages, including from improperly maintained splash pads and from ritual ablutions⁷⁻⁹. CDC recommends avoiding untreated water entering the nasal passages to avoid the risk of infection.

Although, the apartment complex pool was the only site where the family could confirm the patient had been swimming during the exposure period, the findings from the environmental assessment (including lack of visible algae growth) and the lack of *N. fowleri* detection suggest it was unlikely that exposure to *Naegleria* occurred in this location. No documented PAM cases have been reported from exposure to swimming in well-maintained swimming pools.¹⁰ Given the issues identified with pool filtration equipment, inadequate disinfection, and presence of viable thermophilic amoeba in the pool samples, remediation including full drainage and cleaning of the pool as well as maintenance and repair of the filtration and disinfection system has been recommended prior to reopening. The two ponds in Alamance County were also determined to be unlikely sources of exposure based on visual inspection suggesting they are unlikely sites for swimming and on the fact that *N. fowleri* was not detected in either of the ponds at the time of sampling. The presence of viable thermophilic amoeba from these samples suggests that conditions are favorable for growth if *Naegleria* is introduced, which is expected for warm, untreated freshwater ponds.

While infection with *Naegleria* remains extremely rare (less than 10 cases in the US per year), this investigation is a reminder that any untreated water in the nasal passage can pose a risk for *Naegleria* infection. Clearly identifying all potential sources of exposure can be challenging, given that patients are often unresponsive and unable to provide a detailed history of their freshwater exposures by the time the diagnosis is suspected. This is particularly challenging for older children and adults whose activities are generally less closely monitored than those of young children. Public health investigations of these cases are important both to identify and eliminate possible sources of exposure and to add to the body of knowledge regarding factors contributing to infection and recommendations to prevent infections from occurring.

Site pictures



Figure 1. Backflush from apartment complex pool filter behind pool pump house



Figure 2. Dead-end ultrafiltration system at apartment complex pool



Figure 3. Pond 1.



Figure 4. El Futuro water feature and fire hydrant fountain.

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