

# Recurrent *Aeromonas* Bacteremia Due to Contaminated Well Water

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**Although they are ubiquitous to aquatic environments, *Aeromonas* species have traditionally been considered nonvirulent; however, in the past 30 years, they have emerged as important human pathogens that can cause a wide spectrum of disease. In this study, we describe a case of recurrent *Aeromonas* bacteremia in an immunocompetent patient, and this exposure was linked to the patient's home well water supply.**

**Keywords.** *Aeromonas*; bacteremia; immunocompetent; recurrent; water.

## CASE REPORT

A 91-year-old man with a history of colonic polyps and benign prostatic hyperplasia transferred to Johns Hopkins Hospital (JHH) from a community hospital in Maryland with recurrent episodes of acute onset chills, rigors, and hypotension that occurred intermittently for 2 years prior.

The patient presented to the emergency department with complaints of rigors and fever on 10 separate occasions. Each episode occurred acutely without localizing symptoms. Review of systems were negative, including lack of diarrhea, any antecedent trauma, surgical procedures, travel, or medication changes before each presentation. Blood and urine cultures were drawn, and empiric antibiotics and acetaminophen were administered on each presentation; each time, the patient defervesced rapidly.

On initial presentation in 2013, blood cultures were positive for *Aeromonas hydrophila* (for culture summary, see Table 1). Subsequent admissions revealed cultures positive for *Aeromonas* species on 3 separate occasions (December 2013, October 2014, and December 2014). Because of this unusual organism, the community hospital infectious disease (ID) service was consulted. The patient had an extensive workup that included several contrasted computed tomography (CT) scans of his abdomen and pelvis, magnetic resonance imaging of the spine, colonoscopy, upper endoscopy, transesophageal echocardiogram, indium scan, and magnetic resonance cholangiopancreatography. None of the test results revealed the possibility of infection. Between episodes, the patient felt well. He lived in a rural area with his wife, and he was active on a daily basis. He had no significant travel history or animal exposures.

The patient was ultimately placed on prophylactic amoxicillin-clavulanate and discharged home in March 2015 after an admission earlier that month with similar symptoms (culture negative). He again experienced rigors that prompted his presentation and transferred to our hospital in April 2015.

On presentation to JHH, the patient was febrile to 38.8, tachycardic (112), and hypotensive (98/57 mmHg). He was a well appearing older man in no acute distress. He had upper dentures with no oral lesions or lymphadenopathy, no heart murmurs, and clear lung fields. His abdominal exam was benign. He had no evidence of skin breakdown, rashes, or tears. Laboratory results were notable for leukocytosis, with a white blood cell count of 14 000 (87% neutrophils), hemoglobin of 12.3, and platelet count of 234. Chemistry panel and coagulation studies were unremarkable. Urinalysis showed no pyuria, and blood, stool, and urine cultures were negative.

He was started on vancomycin and cefepime, which were discontinued once cultures finalized as negative. The symptoms and leukocytosis resolved after 12 hours of antibiotic therapy. The ID department was consulted to evaluate etiology of these recurrent episodes. Given his history, the patient underwent additional imaging, including a CT angiogram of his abdomen and pelvis to evaluate for an aortoenteric fistula; this again showed no evidence of disease.

Under more extensive questioning, the patient revealed that his primary water source was from a personal home well; he used this water for drinking, cooking, and soaking his dentures. His wife denied similar symptoms or complaints. She did not have dentures and reportedly preferred to drink bottled water.

Due to the distinct qualities of *Aeromonas* as a water-dwelling organism and the patient's history of well water consumption, the ID microbiology specialist traveled to the patient's

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**Table 1. Microbiologic Culture Results on Each Hospital Presentation, 2013–2015**

Date	Blood Culture Results
4/20/15	No growth
3/23/15	No growth
3/02/15	No growth
2/11/15	No growth
2/6/15	<i>Klebsiella oxytoca</i> (1 of 2 sets)
12/10/14	<i>Aeromonas caviae</i> (2 of 2 sets)
10/9/14	No growth
10/3/14	<i>Aeromonas hydrophila</i> (2 of 2 sets)
8/8/14	No growth
6/28/14	No growth
3/25/14	No growth
12/18/13	<i>Aeromonas hydrophila</i> (2 of 2 sets)

house to test his water for this species. Twelve samples of water were collected in sterile containers from several household locations supplied by his well.

Culture results revealed significant overgrowth of *A hydrophila* from his master bathroom sink; he used this water supply to soak his dentures nightly. This organism, as well as several other enteric Gram-negative bacteria, including *Klebsiella oxytoca*, were also recovered from the other sampled locations.

Based on these results, the patient was advised (1) to undergo water purification via the addition of an ultraviolet filter and chlorination of his well water and (2) soak his dentures in and drink bottled water until the purification process was complete. He has had no further symptomatic episodes or cultures positive for *Aeromonas* for 4 months since this intervention.

## DISCUSSION

*Aeromonas* organisms are Gram-negative rods ubiquitous to the environment, and they thrive particularly in regions rich with water. This species has been cultured from 92% of natural aquatic habitats sampled throughout the United States and Puerto Rico, and studies have shown a higher burden of *Aeromonas* in warmer habitats [1]. Peaks in the bacterial burdens in warmer waters coincide with higher incidence of infection during warmer months, with 42%–67% of clinical infection occurring in the summer months [2, 3].

It is interesting to note that this patient's documented episodes of bacteremia occurred in the cooler fall and winter months, which is inconsistent with typical peaks in prevalence. It is possible that this species caused his symptoms on his summer admissions as well, but it was not captured in bacterial culture due to early administration of antibiotics or flawed culture techniques.

The exact incidence of *Aeromonas* infections on a global basis is unknown because *Aeromonas* is no longer a reportable

condition in many countries. From 1988 to 1991, California made *Aeromonas* infection reportable. During a 12-month period in 1988, 219 people in California had clinical cultures positive for the organism, yielding an incidence of 10.6 cases per million [4]. Studies in Europe report much lower rates of clinical infection; 78 cases were reported over 6 months in 2006, yielding a prevalence of 1.62 cases per million [5].

*Aeromonas hydrophila* is the most commonly identified human pathogen of this species, particularly in the aging population [6]. More than 95% of blood-borne infections have been attributed to 3 species: *A hydrophila*, *Aeromonas caviae*, and *Aeromonas veronii* [6]. *Aeromonas caviae*, recovered in the patient's blood on his hospital admission December 2014, is typically only seen in the setting of polymicrobial infection, and it is generally regarded as less virulent than other strains. The presence of *K oxytoca* from his blood cultures in February 2015 was most likely secondary to concurrent water contamination, because this was isolated in small quantities from his cultured well water along with the *Aeromonas*.

The presentation of *Aeromonas* septicemia appears not unlike that of typical Gram-negative bacteremia. Clinical symptoms include fever (74%–89%), hypotension (61%), jaundice (57%), and chills (46%) [7]. A Taiwan study of 59 cases of *Aeromonas* bacteremia over 5 years showed that 32% of cases were polymicrobial; only 1 case showed recurrent disease with *A hydrophila*, and this was in an immunocompromised individual [7]. Mortality rates in this study were 36%; however, reports of *Aeromonas* bacteremia after trauma have endorsed rates as high as 67% [8].

The majority of patients presenting with *Aeromonas* septicemia are highly immunocompromised. Malignancy and cirrhosis are the most common underlying risk factors in individuals with no clear precipitating source [9]. Trauma patients are at higher risk for *Aeromonas* septicemia after near-drowning events or crush injuries with infected water or soil [6]. There are a few sporadic case reports of immunocompetent individuals with *Aeromonas* septicemia, but no common precipitating event or portal of entry has been defined in these cases.

*Aeromonas* has been recovered from drinking water sporadically [10]. Unlike other waterborne pathogens, no clear evidence of drinking water contaminated with *Aeromonas* has been linked to outbreaks of gastroenteritis, and it has been hypothesized that chronic exposure of immunocompromised patients may lead to invasive disease [6]. This is suggested by reports of outbreaks of clinical disease in hospitals with a high burden of *Aeromonas* in the water supply [3]. Given its pathogenic qualities in immunocompromised individuals, the World Health Organization guidelines for drinking water quality recently added *Aeromonas* to the list of potential human pathogens, and public water systems are now required to report the presence of *Aeromonas* through the Consumer Confidence Report Rule [11]. Most drinking water is monitored by the US

Environmental Protection Agency, but owners of private wells must ensure their own drinking water is safe. The Centers for Disease Control and Prevention (CDC) recommends checking private wells yearly for the presence of bacteria or other contaminants, and the CDC recommends checking more frequently in cases of recurrent gastrointestinal illness in a household member [9]. There are no clear guidelines regarding retesting the water after the purification process; the patient in the present case was advised to repeat testing 3 months after purification and before resuming consumption of his well water.

Although *Aeromonas* is typically susceptible to fluoroquinolones, 3rd- and 4th-generation cephalosporins, and trimethoprim-sulfamethoxazole, this species has inducible  $\beta$ -lactamase activity, rendering it resistant to most penicillins and some cephalosporins [6]. For initial empiric therapy in septic patients with a history of water exposure, narrow-spectrum  $\beta$ -lactams should be avoided; the addition of a fluoroquinolone or doxycycline is recommended for coverage of *Aeromonas* as well as other potential waterborne pathogens, such as *Vibrio vulnificus*, *Pseudomonas*, and *Edwardsiella* [6].

## CONCLUSIONS

Although *Aeromonas* has been regarded as a general “nuisance” with low virulence potential, reported mortality rates as high as 67% reflect quite the opposite. This case should prompt the clinician to consider evaluation of water exposures in a patient presenting with this bacterium on clinical culture. Thorough questioning of exposure history and clinical knowledge of the origin and pathogenicity of this organism may help prevent unnecessary and invasive clinical workup. Without clinical knowledge of *Aeromonas* as a water-dwelling entity, identifiable

interventions (such as water purification) could be missed, which may result in fatal consequences, particularly in immunocompromised populations.

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