



Lung colonization with *Aeromonas hydrophila* in cystic fibrosis believed to have come from a tropical fish tank

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Introduction

People with cystic fibrosis (CF) are at risk of contracting *Pseudomonas aeruginosa* and other potentially harmful organisms from the environment.¹ The Cystic Fibrosis Trust consider tropical fish tanks to be a risk only if the patient is in direct contact with the water.¹ We report a boy with CF who at 11 months isolated *Pseudomonas* species identified as mucoid *Aeromonas hydrophila*, non-mucoid *Aeromonas hydrophila* and *Pseudomonas aeruginosa* from cough swabs. We believe he became infected by aerosol spread of the bacterium secondary to the aeration process in fish tanks in his home. Isolations only ceased on removal of the tanks from the home.

The patient was born at term after antenatal detection of echogenic bowel at 20 weeks gestation. There were no neonatal concerns and genetic testing confirmed the diagnosis of CF (homozygous $\Delta F508$). He was started on routine CF treatment including flucloxacillin. He has had numerous microbiological isolations, all from cough swabs (Table 1).

Before six months of age he had two episodes of symptomatic cough and he grew two different organisms. He was asymptomatic at seven months when a fully sensitive, non-mucoid *Pseudomonas* species was isolated from a cough swab. Despite treatment with ciprofloxacin and colomycin nebulizers, the same organisms were identified three weeks later (asymptomatic). Treatment was stopped at 10 months after two clear cough swabs.

At 11 months of age he developed a productive cough and this time grew a fully sensitive mucoid *Pseudomonas* species. He was restarted on ciprofloxacin and colomycin and an extended microbiological identification was requested. This revealed three different bacteria: a mucoid *A. hydrophila* type 1, a non-mucoid *A. hydrophila* type 2 and a non-mucoid *P. aeruginosa*. Chest X ray was normal and symptoms responded promptly to treatment but a *Pseudomonas* species grew again after one month. His home environment was reviewed as he

had isolated a type of organism that usually inhabits aquatic environments. Our CF nurse had visited his home on several occasions: she reported that the family had four large fish tanks in their living room, and had expressed concerns that these may be the cause of the patient's infections. The tanks had oxygen pumps and appeared poorly maintained (the tank water was very cloudy). The family were advised to have the tanks removed, and after discussion they were removed when the patient was 15 months old. At the time of writing, nine months after the tanks were removed, repeated cough swabs have been clear.

Discussion

Our case highlights the risk associated with fish tanks in the home environment. We believe the risk is greater than previously described.¹ *A. hydrophila* infection has not been described as a cause of symptoms in CF. It is a facultative anaerobic Gram-negative bacillus and is a member of the same family as *P. aeruginosa*. The natural habitat is fresh or brackish water and it has been implicated in the aetiology of various diseases in fish. In adults it can cause gastroenteritis if swallowed, wound infection if the penetrating injury has occurred in freshwater and septicaemia.² It is also a recognized cause of pneumonia and lung abscess in patients who have aspirated contaminated water associated with near-drowning.³

Other Gram-negative bacteria can spread to humans by droplet inhalation, notably *Legionella pneumophila*. Patient-to-patient transmission of *P. aeruginosa* is well recognized in the CF population. Home nebulizers may also play a role in transmitting potential pathogens and home inhalation equipment can harbour *P. aeruginosa*.⁴ One important study looking at risk factors for early acquisition of *P. aeruginosa* found that early use of nebulizers was one of the most significant risk factors for early infection.⁵

The aerosol pathway of *Aeromonas salmonicida* has been investigated.⁶ The source was an infected

Table 1
A summary of the child's microbiological isolations from cough swabs

Age (months)	Symptoms (Yes / No)	Organism	Treatment at time of swab	New treatment
2	Yes	<i>Haemophilus influenzae</i>	Nil	Augmentin
5	Yes	<i>Klebsiella</i> species	Nil	Ciprofloxacin
6	No	URT flora	Nil	Nil
7	No	Non-mucoid <i>Pseudomonas</i> species	Nil	Ciprofloxacin + Colomycin
8	No	Non-mucoid <i>Pseudomonas</i> species	Ciprofloxacin + Colomycin	Continued
9	No	URT flora	Ciprofloxacin + Colomycin	Colomycin only
10	No	URT flora	Colomycin	Stopped
11	Yes	Mucoid <i>Pseudomonas</i> species*	Nil	Ciprofloxacin + Colomycin
12	No	Non-mucoid <i>Pseudomonas</i> species, <i>E. coli</i>	Ciprofloxacin + Colomycin	Continued
13	No	URT flora	Colomycin	Continued
14	No	Non-mucoid <i>Pseudomonas</i> species	Colomycin	Ciprofloxacin + Colomycin
15	No	URT flora	Colomycin	Continued
16	No	URT flora	Colomycin	Stopped
18	No	URT flora	Nil	Nil
20	No	URT flora	Nil	Nil
24	No	URT flora	Nil	Nil

* Three bacteria identified on culture: Mucoid + non-mucoid *Aeromonas hydrophila*, and non-mucoid *Pseudomonas aeruginosa*
 URT, upper respiratory tract

tank of water containing an air diffuser and *A. salmonicida* was shown to travel over one metre from its source and remain viable. *A. salmonicida* has been isolated from sputum of adult patients with CF.⁷

The oxygen pump at the bottom of a commercial tank produces bubbles that rise up through the water. If this water is infected with *A. hydrophila*, aerosols released at the water surface contain these bacteria. These droplets could be inhaled directly or settle on surfaces. At seven months of age our infant spent most of his day in the family living room. The most likely explanation of infection is that he inhaled viable bacteria that had been transmitted from the tank to his immediate environment.

In conclusion, fish tanks are a more significant risk in CF than currently acknowledged. It is important to ask about fish tanks at clinic appointments, especially if there is recurrent isolation of a Gram-negative species. We feel families should be made aware that fish tanks can be a source of organisms including *P. aeruginosa*, and that anyone with CF may be at increased risk. If families choose to keep fish, the tank should be maintained

and cleaned regularly and kept covered at all times, and all unhealthy fish should be removed promptly.

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