Hafnia alvei*

Respiratory Tract Isolates in a Community Hospital Over a Three-Year Period and a Literature Review

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In a retrospective review, a group of seven patients were found to have a sputum culture positive for Hafnia alvei. Hafnia alvei is a Gram-negative enteric and oropharyngeal bacillus and usually is nonpathogenic. All our patients had a chronic underlying illness and one of the patients was endotracheally intubated at the time of the isolation of this organism. Six of seven patients had other organisms isolated along with H. alvei, and only one patient had a pure growth of H. alvei confirmed by a culture obtained from a bronchoscopic protected brush specimen. All isolates displayed resistance to conventional antibiotics including cephalosporins and penicillins. Although rare, H. alvei may be a potential pathogen in a patient with a chronic underlying illness. (Chest 1994; 105:1099-1100)

Hafnia alvei is a facultative Gram-negative enteric bacillus belonging to the Enterobacteriaceae family. It is rarely considered a pathogenic organism. Although one of the enteric flora, H. alvei can be a colonizer of the oropharynx and may be a cause of pneumonia in the community or hospital setting. It has been reported as a cause of pulmonary infection in the literature in three patients.1,2 We describe a series of patients in whom H. alvei was isolated in respiratory secretions in both the community and hospital environment and review the most recent literature on this organism.

Materials and Methods

We reviewed the medical records and chest radiographs of seven patients who were found to have positive cultures of H. alvei in oropharyngeal or bronchial secretions. These patients had been admitted to a Midtown Manhattan teaching hospital from January 1989 to January 1992. Identification and sensitivity testing was performed in our microbiology laboratory. Isolation of the organism was performed on a trypticase soy agar plate supplemented with 5 percent CO₂ for 18 to 24 h following 24 h of incubation at 35°C (BBL Microbiology Systems, COC, Keysville, Md). Isolates were tested on the MicroScan Gram-negative MIC dry microdilution panel (MicroScan Division, Baxter Healthcare Corp., West Sacramento, Cal) by using the Autoscan-4 automated panel reader and computerized data management system. Sensitivity testing included 33 commonly used antibiotics. A computer-assisted review of the literature was done by Medline and additional databases.

Results

Seven patients were identified as having sputum cultures positive for H. alvei as shown in Table 1. There were 5 men and 2 women with a mean age of 60 years. All the isolates were in patients with a chronic underlying illness. Isolates from patients 1 to 4 were obtained within 48 h of admission and therefore presumed to be community-acquired isolates. The remaining patients were presumed to have nosocomial colonization. In six patients, H. alvei was isolated with other pathogens, and therefore none of the pulmonary findings could be definitely attributed to H. alvei alone. Clinical presentation and chest x-ray film findings on admission were not helpful because of concomitant infectious and noninfectious processes. For patient 7, fiberoptic bronchoscopy was performed with a protected sheath brush which on culture revealed pure colonies of H. alvei and confirmed the sputum culture of H. alvei as well.

Antibiotic sensitivities are summarized in Table 2. Five isolates were resistant to ampicillin. Five of seven isolates were resistant to a first-generation cephalosporin, and four of seven isolates were resistant to a second-generation cephalosporin. Two of seven isolates were resistant to a semisynthetic penicillin. All isolates were sensitive to the aminoglycosides, imipenem-cilastin, and the quinolones.

Discussion

In the past, Hafnia was considered a member of the genus Enterobacter and was called Enterobacter hafnia or “paracolon” bacterium.3 With DNA and biochemical studies, it has been defined as a separate genus of the Klebsiella family composed of bacteria motile at 25°C to 36°C and immotile at higher temperatures. Hafnia alvei is a small, plump bacillus.

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with a slight bipolar appearance on Gram staining.\(^4\) It is catalase- and lyse decarboxylase-positive and it does not hydrolyze arginine, thus differing from \(E\.\) cloacae.\(^5\)

\textit{Hafnia alvei} has been associated with a wide array of clinical infections. It has been reported as a cause of meningitis,\(^6\) diarrhea,\(^1,7\) necrotizing enterocolitis,\(^8\) pneumonia,\(^1,2\) urinary tract infection,\(^3\) endophthalmitis,\(^9\) and soft tissue infection.\(^10\) In addition, Dibb\(^11\) reported that \(H\) alvei was the only Gram-negative rod isolated from the outer ear canal in healthy Norwegian individuals.

Washington et al\(^1\) reported the isolation of \(H\) alvei from the respiratory tract in 5 patients from a total of 760 isolates of Enterobacter over a 3-year period. Three of the patients were described as having chronic respiratory disease. Four of these isolates were from sputum samples and one was from the trachea, and all were nosocomially acquired. Three isolates were considered commensals. Two isolates (one from sputum and one tracheal isolate) were the predominant organisms in two patients with fatal bronchopneumonia, one of which also was isolated from the lung postmortem. In addition, it was shown to be an uncommon colonizer, isolated in 19 of 760 isolates of Enterobacter found in stool, urine, the pharynx, oral ulcers, and wounds. As in our series, \(H\) alvei was isolated in mixed cultures and was a coisolate in 15 of those 19 isolates.

In addition, Frick et al\(^2\) reported a case of \(H\) alvei pneumonia diagnosed by pure culture from a bronchoscopic specimen in a patient receiving me-
Table 2—Antibiotic Sensitivities of Hafnia alvei Isolates

<table>
<thead>
<tr>
<th>Patient</th>
<th>Resistance to Cephalosporine</th>
<th>Additional Resistance</th>
<th>Sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>None</td>
<td>None</td>
<td>All others, including ampicillin</td>
</tr>
<tr>
<td>2</td>
<td>Cefalothin, cefuroxime (medium-sensitive)</td>
<td>Ampicillin, piperacillin</td>
<td>All others</td>
</tr>
<tr>
<td>3</td>
<td>Cefazolin, cefuroxime, ceftazidime</td>
<td>Ampicillin, piperacillin</td>
<td>Ceftriaxone, aminoglycosides, cefotetan, aztreonam</td>
</tr>
<tr>
<td>4</td>
<td>Cefazolin, cefuroxime, cefotetan</td>
<td>Aztreonam</td>
<td>Ampicillin, piperacillin, ciprofloxacin, aminoglycosides</td>
</tr>
<tr>
<td>5</td>
<td>Cefalothin, cefalothin</td>
<td>Ampicillin</td>
<td>All others</td>
</tr>
<tr>
<td>6</td>
<td>Cefalothin, cefuroxime, ceftriaxone, ceftazidime</td>
<td>Ampicillin</td>
<td>Cefotetan, all others including trimethoprim/sulfamethoxazole</td>
</tr>
<tr>
<td>7</td>
<td>None</td>
<td>Ampicillin</td>
<td>Aztreonam, all others</td>
</tr>
</tbody>
</table>

Mechanical ventilation for 12 days. Although it is unclear from this report whether the specimen was obtained via a protected brush or bronchoalveolar lavage, the pure growth of H alvei strongly suggests that this was the offending pathogen.

In our case series, H alvei was isolated from sputum at the time of admission in four of the seven cases (cases 1 to 3 and 6), suggesting that it is a community colonizer. In all of those patients, it was a coisolate with other organisms, and a clinical response was obtained without specific treatment for H alvei. Laboratory contamination was not suspected because there was no clustering of these isolates from a particular ward or over a specific period of time. In addition, three of the four community isolates were in patients with underlying pulmonary disease. Whether this predisposed those patients to colonization as in the study of Washington et al8 is not known. Of the nosocomial isolates, only patient 7 had a nosocomially acquired pneumonia in which H alvei was the offending pathogen. Although colony counts were not performed on the sterile brush specimen, subsequent clinical and radiographic improvement with an appropriate antibiotic strongly implied H alvei as the offending pathogen. Patient 4 had a nosocomially acquired isolate without evidence of disease. In patient 6, H alvei could have been a pathogen, but further diagnostic studies were not done.

There was a pattern observed regarding the sensitivity of these isolates, with the majority of them resistant to ampicillin and some first- and second-generation cephalosporins (Table 2). This pattern of resistance is consistent with other case reports reviewed in the literature.1,2,9,12 Six of seven patients had underlying chronic disease.

Although in the majority of our cases, there was no clinical importance in isolating H alvei other than colonization, it may occasionally be the primary cause of pneumonia. In the era of rapidly evolving resistant organisms, immunosuppression and prolonged ventilator management, one must be wary of the emergence of H alvei as a possible pulmonary pathogen.

REFERENCES
12 Qadi HSM, Belobraydic KA. In vitro activity of aztreonam against Gram-negative bacteria from clinical specimens and its comparison with other commonly used antibiotics. Meth Find Exp Clin Pharmacol 1986; 8:223-26