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Severe Community-Acquired Pneumonia due to *Acinetobacter baumannii* in North America: Case Report and Review of the Literature

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*Acinetobacter baumannii* is a rare but emerging cause of fulminant community-acquired pneumonia (CAP-AB). We describe a patient from a rural area who developed acute respiratory distress syndrome and septic shock. We describe risk factors and characteristics of this syndrome and review published cases of CAP-AB from North America.

**Keywords.** *Acinetobacter baumannii*; community-acquired pneumonia.

**CASE PRESENTATION**

A 41-year-old man with severe alcohol use disorder was admitted to a hospital in Alabama in January with 2 days of productive cough, shortness of breath, and fever. He presented with septic shock, hypoxemic respiratory failure, and bilateral pulmonary infiltrates (Figure 1). Laboratory results were notable for neutropenia (absolute neutrophil count 450 cells/mcL), thrombocytopenia (58 000 cells/mcL), and acute kidney injury (creatinine 1.9 mg/dl). He had a history of alcohol use disorder with prior alcohol withdrawal seizures. His level of recent alcohol consumption was unknown, but he did not have evidence of alcohol withdrawal during the hospitalization. He lived with his father in rural Alabama and was unemployed. He smoked approximately 5 cigarettes per day and did not use illicit drugs. He had no travel outside the eastern United States, no recent health care exposures, and no sick contacts.

He was started on vancomycin, piperacillin-tazobactam, levofloxacin, and oseltamivir. Hypoxemia progressed rapidly, and within the first 24 hours of hospitalization he was intubated with high ventilatory support requirements (FiO₂ of 100% and positive-end expiratory pressure of 18 cm of water) despite paralysis with cisatracurium. Blood cultures from admission grew Gram-negative bacilli in both sets in the aerobic bottles after 12 hours of incubation. The organism was identified as *Acinetobacter baumannii* by matrix-assisted laser desorption ionization time of flight mass spectroscopy (MALDI-TOF). Drug resistance testing, performed by an automated biochemical testing system (MicroScan Walkaway, Beckman Coulter, Inc. Brea, CA), showed sensitivity to all antimicrobials tested, including ceftazidime, levofloxacin, ampicillin-sulbactam, and meropenem.

The patient was transferred to our institution for initiation of venovenous extracorporeal membrane oxygenation (ECMO). On arrival, he required norepinephrine and vasopressin for blood pressure support, and antimicrobials were changed to intravenous meropenem and levofloxacin. Bronchoalveolar lavage showed many Gram-negative coccobacilli on Gram stain with growth of *A. baumannii* in culture with similar sensitivity to the previously obtained blood cultures. Antimicrobials were changed to intravenous ampicillin-sulbactam and levofloxacin, and he completed a 14-day course of therapy. His ECMO was discontinued after 9 days of therapy. He continued to require ventilatory support, necessitating tracheostomy, and was transferred to a subacute rehabilitation facility with eventual recovery.

**DISCUSSION**

*Acinetobacter baumannii* is an aerobic, oxidase-negative non-fermenting Gram-negative coccobacillus most often associated...
with hospital-acquired infections, particularly ventilator-associated pneumonia (VAP). Hospital-acquired *A. baumannii* is associated with extended length of hospital stay and high mortality [1]. However, during the last 25 years, there has been a growing body of literature describing severe community-acquired pneumonia due to *A. baumannii* (CAP-AB) in patients without health care exposure or classic risk factors for this organism [2]. The majority of these cases come from Northern Australia and Asia, including Thailand, China, Taiwan, and are more common in tropical and subtropical areas during the summer months. Throat and skin carriage of *Acinetobacter* has been identified in areas of endemicity, and soil, livestock, and other animals have also been shown to serve as community reservoirs for *Acinetobacter* [3]. Based on pulse-field gel electrophoresis analyses, community-acquired isolates represent a distinct lineage from health care–associated *Acinetobacter* infections and often do not harbor the same resistance mechanisms [3]. Although less drug-resistant than hospital-acquired *A. baumannii* bacteremia, community-acquired infection has been associated with increased mortality (odds ratio, 5.72; 95% confidence interval, 1.02–32.00) [4].

Epidemiologic studies have linked the syndrome of severe CAP-AB with alcohol use disorder and recent alcohol binges prior to symptom onset [5]. Animal studies have shown that alcohol has wide-ranging effects on the innate immune system in relation to pulmonary *Acinetobacter* infection [6–8]. Gandhi et al. compared ethanol-exposed mice with unexposed mice after pulmonary inoculation of *Acinetobacter* [6]. They showed that ethanol-exposed mice demonstrated decreased neutrophil-mediated phagocytosis, increased lung inflammation, and higher mortality. Asplund et al. similarly showed decreased alveolar macrophage phagocytosis of *Acinetobacter* in the presence of alcohol [7]. Other significant risk factors include tobacco use, chronic pulmonary disease, and diabetes mellitus [2]. Onset of symptoms is typically rapid, with fulminant disease developing over 48–72 hours. Bilateral infiltrates, ARDS,

<table>
<thead>
<tr>
<th>Year (Reference)</th>
<th>Location</th>
<th>Age</th>
<th>Sex</th>
<th>Risk Factors</th>
<th>Mech. Vent.</th>
<th>Site of Positive Cultures</th>
<th>Final Antibiotics Used</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1959 [10]</td>
<td>Chicago, IL</td>
<td>50</td>
<td>M</td>
<td>None</td>
<td>No</td>
<td>Blood and sputum</td>
<td>Chloramphenicol and oxytetracycline</td>
<td>Survived</td>
</tr>
<tr>
<td>1973 [12]</td>
<td>Baltimore, MD</td>
<td>69</td>
<td>M</td>
<td>CKD</td>
<td>Yes</td>
<td>Tracheal aspirate and pleural fluid</td>
<td>Tetracycline</td>
<td>Died</td>
</tr>
<tr>
<td>1976 [13]</td>
<td>Houston, TX</td>
<td>50</td>
<td>M</td>
<td>Alcohol, tobacco</td>
<td>Yes</td>
<td>Blood and tracheal aspirate</td>
<td>Gentamicin and carbenicillin</td>
<td>Survived</td>
</tr>
<tr>
<td>1979 [15]</td>
<td>Dallas, TX</td>
<td>58</td>
<td>M</td>
<td>Alcohol, asthma</td>
<td>?</td>
<td>Blood</td>
<td>Cindamycin and gentamicin</td>
<td>Died</td>
</tr>
<tr>
<td></td>
<td></td>
<td>41</td>
<td>M</td>
<td>Alcohol, pancreatitis, hepatitis</td>
<td>Yes</td>
<td>Blood and tracheal aspirate</td>
<td>Penicillin, gentamicin, carbenicillin</td>
<td>Survived</td>
</tr>
<tr>
<td></td>
<td></td>
<td>35</td>
<td>F</td>
<td>Alcohol</td>
<td>Yes</td>
<td>Blood and tracheal aspirate</td>
<td>Penicillin and gentamicin</td>
<td>Died</td>
</tr>
<tr>
<td></td>
<td></td>
<td>51</td>
<td>M</td>
<td>Lymphoma</td>
<td>?</td>
<td>Blood and sputum</td>
<td>Gentamicin and carbenicillin</td>
<td>Survived</td>
</tr>
<tr>
<td></td>
<td></td>
<td>74</td>
<td>F</td>
<td>None</td>
<td>?</td>
<td>Blood and sputum</td>
<td>Penicillin and gentamicin</td>
<td>Survived</td>
</tr>
<tr>
<td></td>
<td></td>
<td>44</td>
<td>M</td>
<td>Alcohol, chronic bronchitis</td>
<td>?</td>
<td>Blood and sputum</td>
<td>Penicillin, gentamicin, and carbenicillin</td>
<td>Survived</td>
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<tr>
<td></td>
<td></td>
<td>63</td>
<td>M</td>
<td>Alcohol, tobacco</td>
<td>Yes</td>
<td>Blood and sputum</td>
<td>Gentamicin and carbenicillin</td>
<td>Survived</td>
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<tr>
<td></td>
<td></td>
<td>56</td>
<td>M</td>
<td>Pneumoconiosis</td>
<td>Yes</td>
<td>Blood and sputum</td>
<td>Ticarcillin and tobramycin</td>
<td>Died</td>
</tr>
<tr>
<td>1987 [17]</td>
<td>San Antonio, TX</td>
<td>56</td>
<td>M</td>
<td>Tobacco</td>
<td>Yes</td>
<td>Sputum</td>
<td>Gentamicin and cindamycin</td>
<td>Died</td>
</tr>
<tr>
<td>1993 [18]</td>
<td>Chicago, IL</td>
<td>74</td>
<td>F</td>
<td>None</td>
<td>Yes</td>
<td>Blood</td>
<td>Gentamicin, ticarcillin-clavulanate, erythromycin</td>
<td>Survived</td>
</tr>
<tr>
<td>1999 [19]</td>
<td>Tampa, FL</td>
<td>80</td>
<td>M</td>
<td>None</td>
<td>No</td>
<td>BAL</td>
<td>Trimethoprim-sulfamethoxazole</td>
<td>Survived</td>
</tr>
<tr>
<td>2017</td>
<td>Atlanta, GA</td>
<td>41</td>
<td>M</td>
<td>Alcohol</td>
<td>Yes</td>
<td>Blood and BAL</td>
<td>Amoxicillin-sulbactam and levofloxacin</td>
<td>Survived</td>
</tr>
</tbody>
</table>

Abbreviations: ?, unreported data; BAL, bronchoalveolar lavage; CKD, chronic kidney disease; F, female; M, male.
leukopenia, and bacteremia are all common. A right-lung pre-
dominance has been noted, which likely implicates an element of
aspiration to the pathogenesis of this condition [9]. Taking into
account characteristics from multiple series, a distinct clin-
ical syndrome of CAP-AB emerges (Box 1).

To date, 19 cases of CAP-AB have been reported in North
America (Table 1). While most cases of CAP-AB in Southeast
Asia and Australia have been reported since the late 1990s, most
North American cases were published between 1959 and 1981,
with the most recent report from 1999 [10–19]. Overall, these
North American cases conform to the typical presentation of
the “CAP-AB syndrome” described outside of North America.
Most patients were middle-aged (median age, 54 years), male
(15/19), and reported a history of alcohol use (10/19). All but
two patients presented with a rapid-onset of illness with ≤3 days
of symptoms and fulminant disease. Eleven of 15 patients with
reported information on respiratory support required mechan-
ical ventilation. Our patient was the only case with the use of
ECMO for cardiopulmonary support. Mortality was high
(42%), although many of the cases occurred prior to the advent
of modern diagnostic and therapeutic advances, which is exem-
plified by the frequent use of aminoglycosides as definitive ther-
apy (13/19 cases).

It is possible that CAP-AB in North America occurs more
frequently but is underreported because identification of
Acinetobacter is not noteworthy outside of the community-ac-
quired context. It is also possible that climate plays a role in
identification of only a small number of cases in the north-
ern hemisphere, as the majority of cases have been identified
in tropical locations [2]. Studies have demonstrated that even
health care–associated cases may have some seasonal variation.
For example, when surveillance data on Acinetobacter infec-
tions were collected at Yale–New Haven Hospital from 1990–
1992, the incidence during the summer months was more than
double the incidence during the remainder of the year [20]. The
fact that our patient became critically ill during the winter is
therefore unusual, although multiple cities in Alabama docu-
mented record high average temperatures throughout the year
of this patient’s illness [21]. The etiology of this association
of cases with warmer temperatures remains unknown and is a
potential area for further study, especially as it suggests that cli-
mate change could ultimately influence disease prevalence.

CONCLUSION
This case is a representative example of the CAP-AB syn-
drome in a patient in the Southeast United States in 2017. While
much focus is appropriately directed toward multidrug-
resistant nosocomial Acinetobacter infections, we pres-
ent this case to raise awareness of the presence of CAP-AB
and document its contemporary existence outside of its typ-
ical area of endemicity. Previous reported cases in North
America have been sporadic and infrequent since the 1950s,
but globalization, climate change, and increasing prevalence
of alcohol use disorder [22] could lead to emergence of this
syndrome in the United States.

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the content of the manuscript have been disclosed.

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