genic role of KIPyV and WUPyV in immunocompromised patients.

Acknowledgments

We thank Tania Guenci, Amalia Mastrofrancesco, and Marzia Romani for collecting the clinical data used in this study.

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DOI: 10.3201/eid1508.090424

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Extreme Drug Resistance in *Acinetobacter baumannii* Infections in Intensive Care Units, South Korea

To the Editor: *Acinetobacter* spp. have emerged as a cause of nosocomial infections, especially in intensive care units (ICUs). In South Korea, *Acinetobacter* spp. was ranked as the third most frequently found pathogen in ICUs (*1*). With the emergence of multidrug-resistant (MDR) or pandrug-resistant (PDR) isolates, few drugs are now available to treat MDR or PDR *Acinetobacter* infections; polymyxins are the only therapeutic option in many cases (*2*). Current polymyxin resistance rates among *Acinetobacter* isolates are low worldwide (*3*). We report the emergence of extreme drug resistance (XDR) in *A. baumannii* isolates from patients in ICUs of Samsung Medical Center in Seoul, South Korea. These isolates were resistant to all tested antimicrobial drugs, including polymyxin B and colistin, to which PDR isolates are normally susceptible.

Sixty-three nonduplicate *Acinetobacter* spp. isolates were collected from the ICUs from April through November 2007. Species identification was performed based on partial RNA polymerase β-subunit gene sequences, amplified rDNA restriction analysis, and the gyrase B gene–based multiplex PCR method (*3*). Forty-four isolates were identified as *A. baumannii*: 9 as genomic species 3, six as genomic species 13TU, 2 as *A. baumannii*-like species, and 1 each as *A. junnii* and genomic species 10.

In vitro susceptibility testing was performed and interpreted by using the broth microdilution method according to the Clinical and Laboratory Standards Institute guidelines (*4*). Colistin and polymyxin B resistances were defined as MIC ≥4 mg/L (*4*). MDR was defined as characterized by resistance to ≥3 classes of antimicrobial drugs, and PDR was defined as characterized by resistance to all antimicrobial drugs, regardless of colistin and polymyxin B susceptibility. XDR was defined as resistance to all antimicrobial drugs. Multilocus sequence typing (MLST) and pulsed-field gel electrophoresis (PFGE) were performed for all PDR isolates according to previously described methods (*5,6*). Genes encoding oxacillinases, such as those classified as OXA-23-like, OXA-24/40-like, OXA-51-like, and OXA-58-like, were detected as previously described (*7*). PCR and sequence analyses were performed to detect and characterize the other antimicrobial resistance genes, according to methods reported (*8*).

Of 63 *Acinetobacter* isolates, 31.7% and 34.9% were resistant to imipenem and meropenem, respectively. Of the 63 isolates, 27.0% and 30.2% were resistant to polymyxin B and colistin, respectively. For the other antimicrobial drugs, *Acinetobacter* spp. isolates showed antimicrobial resistance rates >50%. Nineteen isolates (30.2%), all belonging to *A. baumannii*, were PDR. Most of these PDR isolates (16/19, 84.2%) were collected from endotracheal aspirate, and others were from peritoneal fluid and sputum. When characterized by PFGE and MLST, all PDR isolates belonged to a single clone, ST22, and all contained the $bla_{\text{OXA-23}}$ and $bla_{\text{OXA-66}}$ genes. IS*Aba1* was detected upstream of $bla_{\text{OXA-23}}$ and $bla_{\text{OXA-66}}$ in all PDR isolates. In addition, most PDR isolates contained $bla_{\text{TEM-116}}$, $bla_{\text{PER-1}}$, and $bla_{\text{ADC-29}}$ genes. TEM-116 is a point mutant derivative of TEM-1, Val84→Ile. All β-lactamase genes were located on a plasmid. Also, IS*Aba1* was located at the upstream of all the bla_{ADC}, which was shown by PCR. However, none of the isolates had $bla_{\text{CTX-M}}$, bla_{VEB}, bla_{IMP}, bla_{VIM}, or bla_{GIM}.

Of the PDR isolates, 8 were resistant even to colistin and polymyxin B. These 8 isolates also showed resistance to tigecycline (MICs 4 mg/L). Thus, they were resistant to all antimicrobial drugs tested in this study and were considered to have XDR. The underlying diseases of the patients whose isolates were examined varied (Table). Although 2 isolates with XDR were colonizers, 6 caused infections. All but 1 patient was treated with mechanical ventilation before isolation of the pathogen. Number of hospital days before isolation of *A. baumannii* was 13–256 days, and the number of ICU days before isolation was 2–38 days. Four patients were immunocompromised, and 3 had bacteremia. Among the patients with infections characterized by XDR, the overall 30-day mortality rate was 66.7%, and the infection-related 30-day mortality rate was 50.0%. All 8 isolates with XDR showed common characteristics: ST22 containing OXA-23, OXA-66, TEM-116, PER-1, and ADC-29.

We report the emergence of XDR in PDR *A. baumannii* isolates in South Korea. Characteristics of PDR *A. baumannii* isolates suggest that they spread from a single clone. A single *A. baumannii* strain with XDR might evolve from the prevailing PDR *A. baumannii* and could disseminate in the ICU, probably after contamination of the hospital environment and by nosocomial transmission. In South Korea, a high resistance rate to imipenem and meropenem in *Acinetobacter* spp. isolates may lead to extensive use of polymyxins (*3*). Thus, we can hypothesize that the most prevalent carbapenem-resistant, or MDR *A. baumannii* clone, became PDR and then evolved into clones with XDR by acquisition of polymyxin resistance caused by antimicrobial pressure. Our investigation showed a simultaneous emergence of resistance to all antimicrobial agents available, including colistin, polymyxin B, and tigecycline. XDR poses serious problems in the treatment of patients with *A. baumannii* infections, especially given the slow development of new antimicrobial agents.

Acknowledgments

We thank Ji Young Choi for technical assistance.

This study was supported by a grant from the Korea Healthcare Technology R&D Project, Ministry of Health, Welfare, and Family Affairs, Republic of Korea (A080330).

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Table. Clinical characteristics of 8 patients infected with extremely drug-resistant *Acinetobacter baumannii* isolates, South Korea*

Strain no.	Patient age/sex	Underlying disease	Infection†	Days before isolation: Hospitalized	Days before isolation: In ICU	Concurrent bacteremia	30-d outcome	Infection-related death
07AC–052	60 y/F	Acute myeloid leukemia	Pneumonia	15	8	No	Died	Yes
07AC–159	79 y/M	Lymphoma	Pneumonia	35	9	No	Died	No
07AC–192	50 y/M	Status postliver transplantation	Pneumonia	256	2	Yes	Survived	NA
07AC–204	55 y/F	Steven-Johnson syndrome	Pneumonia	13	13	Yes	Survived	NA
07AC–336	16 mo/M	Medulloblastoma	Pneumonia	32	13	Yes	Died	Yes
07AC–347	17 mo/M	Hepatoblastoma	Pneumonia	135	28	No	Died	Yes
07AC–329	1 mo/F	Edward syndrome	Colonization‡	33	33	NA	NA	NA
07AC–063	56 y/M	Lung cancer	Colonization‡	26	21	NA	NA	NA

*ICU, intensive care unit; NA, not applicable. All but 1 patient (with strain 07AC–192) had mechanical ventilators. Four patients (with strains 07AC–159, 07AC–192, 07AC–336, and 07AC–063) were immunocompromised hosts who had daily administration of corticosteroid (>20 mg/d of prednisolone or an equivalent drug) during >2 wk and treatment with chemotherapy for an underlying malignancy during 1 month before hospital admission.
†Infection is defined as invasion of the body tissues by microorganisms resulting in disease.
‡Colonization occurs when an agent's presence in a host does not cause a specific immune response or infection.

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DOI: 10.3201/eid1508.080772

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More Diseases Tracked by Using Google Trends

To the Editor: The idea that populations provide data on their influenza status through information-seeking behavior on the Web has been explored in the United States in recent years (*1*,*2*). Two reports showed that queries to the Internet search engines Yahoo and Google could be informative for influenza surveillance (*2*,*3*). Ginsberg et al. scanned the Google database and found that the sum of the results of 45 queries that most correlated with influenza incidences provided the best predictor of influenza trends (*3*). On the basis of trends of Google queries, these authors put their results into practice by creating a Web page dedicated to influenza surveillance. However, they did not develop the same approach for other diseases. To date, no studies have been published about the relationship of search engine query data with other diseases or in languages other than English.

We compared search trends based on a list of Google queries related to 3 infectious diseases (influenza-like illness, gastroenteritis, and chickenpox) with clinical surveillance data from the French Sentinel Network (*4*). Queries were constructed through team brainstorming. Each participant listed queries likely to be used for searching information about these diseases on the Web. The query time series from January 2004 through February 2009 for France were downloaded from Google Insights for Search, 1 of the 2 websites with Google Trends that enables downloading search trends from the Google database (*5*). Correlations with weekly incidence rates (no. cases/100,000 inhabitants) of the 3 diseases provided by the Sentinel Network were calculated for different lag periods (Pearson coefficient ρ).

The highest correlation with influenza-like illness was obtained with the query grippe –aviaire –vaccin, the French words for influenza, avian, and vaccine respectively ($\rho = 0.82$, $p<0.001$). The minus sign removed queries that contained the terms avian or vaccine. Use of the query word grippe alone resulted in a lower correlation ($\rho = 0.34$, $p<0.001$). The high double peak in 2005–2006 and the smaller peaks preceding annual epidemics observed with the query word grippe alone were decreased by this specification. However, the unusual double-peak shape of the 2005–2006 epidemic remained (online Appendix Figure, panel A, available from www.cdc.gov/EID/content/15/8/1327-appF.htm).

The highest correlation with acute diarrhea was obtained when we searched for the French word for gastroenteritis ($\rho = 0.90$, $p<0.001$). Various spellings were used to account for the presence/absence of an accent or a hyphen. The Google database was searched for gastro-enterite + gastro-entérite + gastroentérite + gastroenterite + (gastro enterite) + (gastro entérite). The + sign coded for or, enabling searches for queries containing ≥ 1 of the terms. The second highest correlation was obtained when the keyword gastro ($\rho = 0.88$, $p<0.001$) (online Appendix Figure, panel B) was used. The highest correlation with chickenpox was obtained with the French word for chickenpox (varicelle) ($\rho = 0.78$, $p<0.001$) (online Appendix Figure, panel C).

A time lag of 0 weeks gave the highest correlations between the best