RESEARCH BRIEFS

Lack of Seasonality in the Occurrence of Multidrug-Resistant *Acinectobacter baumannii* Complex

Increases in *Acinectobacter baumannii* infection rates in the summer months have been reported since the 1970s.[1] The reasons underlying this apparent seasonal variation have not been well understood. Meanwhile, rates of multidrug-resistant (MDR) *A. baumannii* infection have increased substantially in the past decade.[2] Higher rates of *A. baumannii* infection during the summer months have been acknowledged on the basis of more recent local and national surveillance data as well, but the differences observed between seasons were not as striking as those found in studies done during the previous era.[3,4] We therefore conducted this study to assess seasonal variation in the incidence of *A. baumannii* infection according to antimicrobial susceptibility.

The microbiology records were reviewed to document isolation of *A. baumannii* complex from both inpatients and outpatients at the University of Pittsburgh Medical Center (Presbyterian Campus; Pittsburgh, PA) for an 11-year period, from May 2000 through April 2011. Species identification was performed using conventional phenotypic testing through June 2007. After that, organisms were identified using the Micoscan Walk-Away instrument (Siemens). Susceptibility testing was performed using the disk diffusion method as defined by the Clinical and Laboratory Standards Institute.[5] Thus, the *A. baumannii* complex described here contains 4 closely related species that are not differentiated using biochemical methods: *A. baumannii*, *Acinetobacter nosocomialis*, *Acinetobacter pittii*, and *Acinetobacter calcoaceticus*. If multiple isolates were obtained from the same patient within a 90-day period, only the first isolate was used to define a case in the analysis. An MDR strain was defined as one with resistance to 3 or more groups of antimicrobial agents, whereas a non-MDR strain was defined as one with resistance to less than 3 groups of antimicrobial agents.[6] The number of cases associated with non-MDR or MDR strains in each month was obtained. The monthly mean high temperatures in Pittsburgh, Pennsylvania, were obtained from the National Weather Service Forecast Office (http://www.erh.noaa.gov/). As a result, we defined May to September (mean high temperature ≥21.1°C) as warm months and October to April (mean high temperature <21.1°C) as cold months. We also defined March to May as spring, June to August as summer, September to November as fall, and December to February as winter. Rank sum test (Mann-Whitney) was used to assess seasonality. The association of the number of *A. baumannii* complex cases per month with temperature was assessed by Spearman rank correlation coefficient. All statistical analyses were performed with Stata software, version 12.0. The study was approved by the local institutional review board.

During the 11-year study period, 2,958 *A. baumannii* complex isolates were recovered from unique clinical cultures. Of these, 1,476 isolates defined unique cases after excluding 1,482 isolates that were recovered from the same patients within a 90-day period. Of the 1,476 cases, 692 (46.9%) were due to non-MDR *A. baumannii* complex and 784 (53.1%) were due to MDR *A. baumannii* complex. Overall, the rates of MDR increased over the years, consistent with national trends. Figure 1 shows the monthly occurrence of non-MDR and MDR *A. baumannii* complex cases over the 11-year study period,

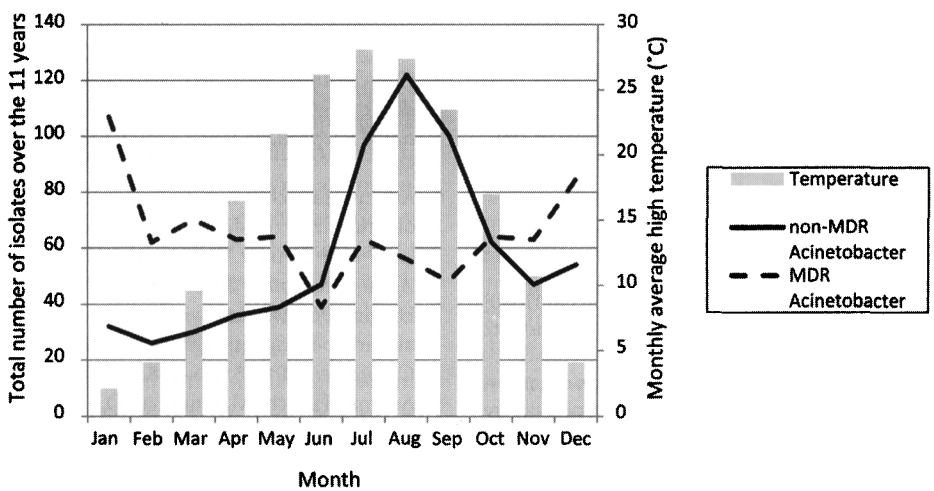

FIGURE 1. Incidence of multidrug-resistant (MDR) and non-MDR *Acinetobacter baumannii* complex cases by calendar month and mean monthly high temperatures over the 11-year study period.

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with the monthly mean high temperatures in our region superimposed. As can be seen, the non-MDR and MDR cases showed distinct trends. The number of cases in warm months (May to September) was then compared with the number of cases in cold months (October to April). The median number of isolates was 5 (interquartile range [IQR], 3–8) in warm months and was 4 (IQR, 2–7) in cold months ($P = .0067$). Stratified by susceptibility, the median number of non-MDR *A. baumannii* complex cases was 7 (IQR, 4–10) in warm months and was 3 (IQR, 2–5) in cold months ($P < .0001$). On the other hand, the median number of MDR cases was 4 (IQR, 3–7) in warm months and was 5 (IQR, 3–9) in cold months ($P = .1362$). There was a moderately positive correlation between non-MDR *A. baumannii* complex cases and temperature ($r_s = 0.5436$). MDR *A. baumannii* complex cases had a weakly negative correlation with temperature ($r_s = -0.1442$).

In this study, significantly more non-MDR *A. baumannii* complex cases were identified in warm months than in cold months, which is consistent with previous observations. However, this trend was not observed for MDR *A. baumannii* complex cases despite the large number of these cases during the study period. MDR *A. baumannii* has been recognized to be highly clonal in nature.[7] We have previously shown that isolates of clonal complex (CC) 92 were predominant among carbapenem-nonsusceptible *A. baumannii* in our hospital as well as in hospitals across the United States.[8] Although molecular analysis was not performed in this study, our surveillance data show that CC92 continues to predominate among MDR *A. baumannii* at our institution. Although information on the molecular epidemiology of non-MDR *A. baumannii* is scarce, it is possible that MDR *A. baumannii* complex, which largely consists of CC92, tends to lack the typical preference toward warmer environment compared with their more antimicrobial-susceptible counterparts. This study was performed in a single tertiary care facility in Pennsylvania, and thus it remains to be seen whether the same phenomenon is observed in more diverse clinical settings. The potential clinical implication of this observation is that a heightened activity of MDR *A. baumannii* complex during summer months, if it occurs, may not be attributable to natural seasonal variation but may indicate an outbreak situation that merits investigation.

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