Ambient Air Contamination with *Acinetobacter baumannii*: Longitudinal observations based on the anatomic source of colonization

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Background: *Acinetobacter baumannii* is a Gram-negative coccobacillus, currently considered as one of the most clinically significant multidrug-resistant organisms in intensive care units (ICUs) worldwide.[1-3] Previously we showed air contamination with *Acinetobacter baumannii* (AB) in a single ICU in 3 separate days.[4] Now we aimed to determine the persistence of air contamination in the rooms occupied by AB(+) patients while comparing them to the air contamination of their immediate neighboring rooms. We also evaluated the impact of the anatomic source of colonization (e.g. rectum, respiratory) on the degree of air contamination.

Methods:

This project was done between March and July 2013 in a large teaching hospital in Miami-FL, across 7 adult ICUs.

As standard practice, these ICUs perform active surveillance cultures on admission and weekly thereafter (rectum and -if intubated- respiratory tract).

Once a new AB(+) patient was identified, daily ambient air surveillances were performed for 10 consecutive days.

Open blood agar plates (2-ft from roof) were exchanged daily for the duration of surveillances. Control plates were obtained from adjacent rooms belonging to AB(-) patients. Plates were streaked using a sterile Q-tip, incubated overnight in TSB and plated on MacConkey. AB was determined based on colony color, morphology, and final identification by Vitek II. Air and pts isolates were typed using rep-PCR when available.

Results:

During 5-months, 30 AB (+) patients were identified: 17 respiratory (57%), 5 rectal (17%), and 8 (27%) from other sources. A total of 153 air-day samples were obtained. Patients colonized in the rectum had a mean proportion of days with AB in the air of 0.26 compared to 0.11 and 0.14 among respiratory and other sources, respectively (Figure 1). Thirty adjacent rooms occupied by AB(-) patients were cultured concomitantly (153 air-day samples). The proportion of days that these neighboring rooms were observed as having AB in the air was 0.11 (p=0.036)

There were six cases where both patient and air isolates were available, four of the matching isolates shared >95% similarity between each other, whereas none of the air isolates from the adjacent rooms were closely related with the patient isolates (Figure 2).

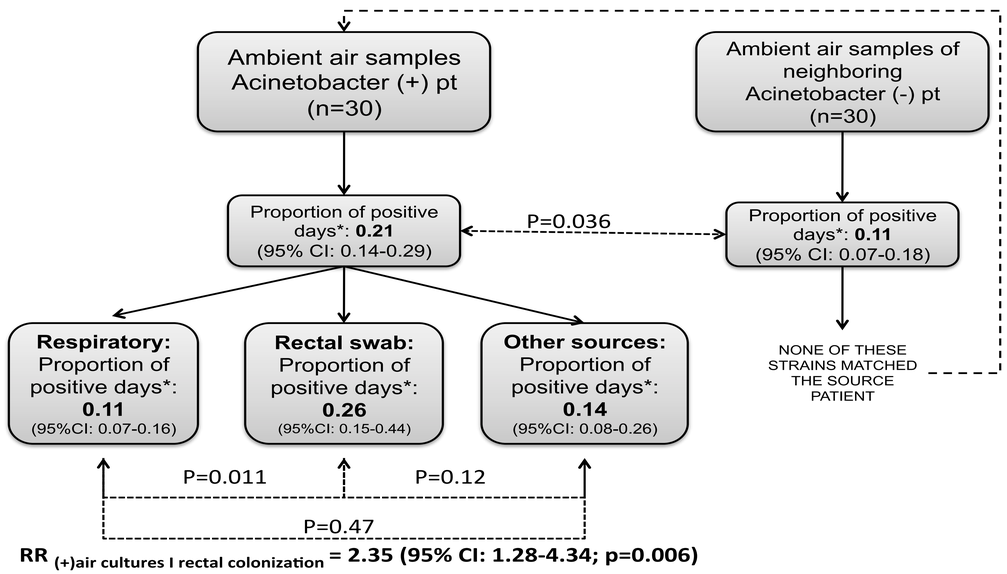

Figure 1: Least squared means and statistical differences of the proportions of days individual patients were detected to have *A. baumannii* in their ambient air based on their anatomic sources of colonization and the distance from the patient (ambient air of *Acinetobacter*-positive patient compared to neighboring room's air). RR: relative risk of having *A. baumannii* recovered from ambient air given a patient with rectal colonization compared to a patient with respiratory colonization.

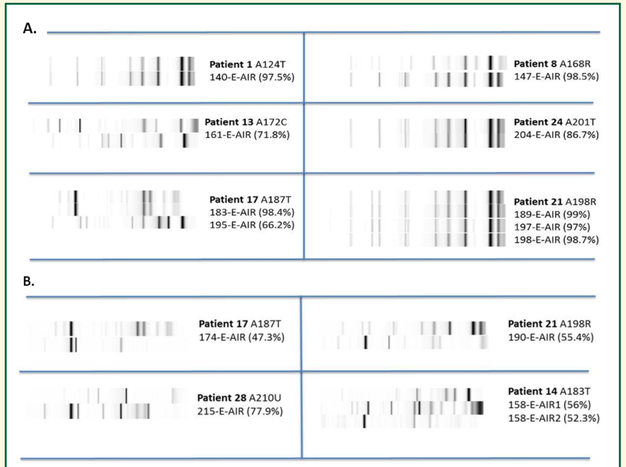

Figure 2: Results of rep-PCR for patient and ambient air isolates
A. Isolates from *Acinetobacter*-positive patients and their corresponding matching air
B. Isolates from *Acinetobacter*-positive patients and their neighboring ambient air belonging to *Acinetobacter*-negative patients

Discussion: Aerosolization of AB seems to be present throughout consecutive days among AB(+) patients and this aerosolization appears to be higher among rectally colonized patients.

Small, single-center study conducted in a hospital where *A. baumannii* has been endemic for two decades. Air sampling method used was qualitative with sensitivity that might not be optimal, especially for low bacterial loads.

References:

(1) Munoz-Price LS, Weinstein RA. Acinetobacter infection. N Engl J Med 2008;358:1271-1281.
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(4) Munoz-Price LS, Fajardo-Aquino Y, Arheart KL et al. Aerosolization of Acinetobacter baumannii in a Trauma ICU*. Crit Care Med 2013;41:1915-1918.