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Methicillin-Resistant *Staphylococcus aureus* USA300 and Vancomycin-Resistant *Enterococcus faecalis*: A United States-Colombian Microbial Connection?

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In the USA, dissemination of a major clone of community-associated methicillin-resistant *S. aureus* (CA-MRSA) designated USA300 and outbreaks of vancomycin-resistant *Enterococcus faecalis* (VREfs) have been described^{1,2}. CA-MRSA infections emerged in Colombia in 2005³ and 15 CA-MRSA infections were documented in four cities in 2006 to 2007, all of which presented with severe skin and soft tissue infections complicated by necrotizing fasciitis, bacteremia, paraspinal abscess, arthritis and meningitis with a mortality rate of 20%. The first known Colombian VREfs isolate was recovered in a hospital in Bogotá, 2001. Since then, 50 additional isolates have been identified in the following 6 years from different patients in seven hospitals in the same city.

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The Colombian MRSA isolates were susceptible to most of anti-staphylococcal antibiotics (although 40% were tetracycline-resistant). All isolates harbored SCCmec type IV, the PVL genes, at least one of the toxins associated with USA300⁴ but lacked *arcA*. PFGE and multi-locus-sequence-typing (MLST) revealed that all but one clinical isolate were ST8 and clonally related to USA300. The remaining isolate was a single locus variant of ST8 (ST923) (Fig. 1, panel A). The majority of isolates carried SCCmec subtypes other than IVa which suggests that a similar lineage of virulent, ST8 methicillin-susceptible *S. aureus* that independently acquired various SCCmec subtypes existed in both Colombia and the USA. To our knowledge, this is the first documentation of the establishment of the USA300 CA-MRSA lineage as the predominant (and exclusive) clone in a country other than the USA. No CA-MRSA isolates belonging to a different (MLST) clonal cluster have been documented in Colombia so far.

PFGE also indicated that a single clone of VanB-VREfs has disseminated in Bogota, Colombia (Fig. 1, panel B). This clone is genetically related to an MLST ST2 outbreak strain (HV1) of VREfs described in Houston in 1994⁵. Additionally, the allelic profile of the antigenic or resistance genes, *ace*, *salA*, and *Isa* (encoding an adhesin, a cell-wall antigen, and quinupristin-dalfopristin resistance, respectively) was also identical in both. Furthermore, both the Houston and Colombian isolates have the same pathogenicity island profile which has been suggested as an epidemiological marker of more virulent clones of *E. faecalis*⁵. To our knowledge, the only two epidemic strains of ST2 VanB-type *E. faecalis* described in the world are the Houston and Bogotá strains.

Our findings suggest that a close epidemiologic relationship has been established between Colombia and the USA in these two pathogenic and resistant species.

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Figure 1.

Panel A, Pulsed field gel electrophoresis (PFGE) (*Sma*I), origin, toxin profile, presence of *arcA* as a marker of the ACME (arginine catabolic mobile element) island and MLST of representative isolates of CA-MRSA from Colombia and the USA. SCC*mec*, staphylococcal chromosomal cassette *mec*; ST, sequence type; ND, not done. ^aUSA300-0114 strain, SCC*mec* IVa; ^bUSA300 strain carrying the SCC*mec* IVb; ^cthe presence of *arcA* has been associated with USA300 isolates carrying the SCC*mec* type IVa cassette but not others, consistent with the fact that ST-8 Colombian CA-MRSA may have acquired the SCC*mec* DNA independently from the US isolates; ^dSingle nucleotide variant (SNV) of ST8 in the *yqiL* gene.

Panel B, PFGE electrophoresis using *Apa*I enzyme of representative isolates of vancomycin-resistant *Enterococcus faecalis* (VREfs) ST2 from seven hospitals in Bogotá, DC, Colombia from 2001 to 2006 and isolate TX2486, the index isolate of strain HV1 (ST2) recovered from a Houston hospital in 1994. Lane 1, TX2486; lane 2 and 3, ERV-25 and ERV-31 which are representatives of the first Colombian VREfs isolates recovered in 2001. VREfs isolates from 2002 and 2003 had an identical PFGE pattern to that of isolate ERV-31 and are not shown in the figure. Lane 4, 5 and 6, isolates ERV-62, ERV-63 and ERV-65 recovered in 2004; lane 7, ERV-81 isolated in 2005; lane 8, ERV-116, recovered in 2006.