Emergence of a tigecycline-resistant clone among vancomycin-resistant enterococci isolates in Stockholm, Sweden

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Background

Vancomycin-resistant enterococci (VRE) are important pathogens associated with nosocomial infections worldwide. Tigecycline represents one of the last-line therapeutics to combat multi-resistant bacteria including VRE. Sweden is a country with a low prevalence in antibiotic resistance, but is still observing steadily increasing numbers of multi-resistant bacteria. The finding described in the present abstract was obtained in a study aimed to investigate the antimicrobial susceptibilities and molecular epidemiology of VRE isolates in Stockholm.

Materials and methods

In total, 246 consecutive non-duplicate VRE isolates recovered in Stockholm during January 2012 – December 2015 were included in the study. Antimicrobial susceptibility, the presence of *van*-genes and pulsed-field gel electrophoresis (PFGE) were investigated. The minimum inhibitory concentrations of the antimicrobial agents for each isolate were determined by broth microdilution following EUCAST guidelines.

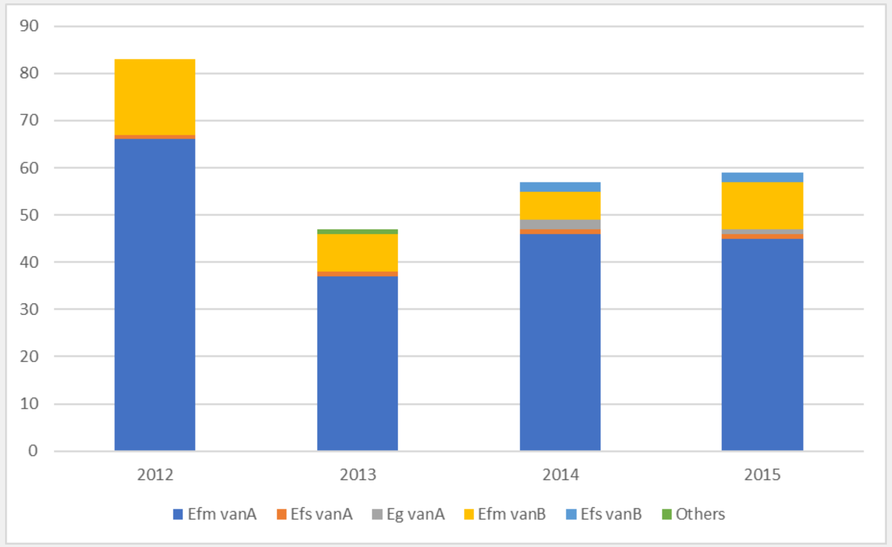

Figure 1. The number of new detected VRE isolates per year between 2012 and 2015 in Stockholm.

The following antimicrobial agents were included: ampicillin, ciprofloxacin, daptomycin, gentamicin, levofloxacin, linezolid, moxifloxacin, nitrofurantoin, quinupristin-dalfopristin, tigecycline, trimethoprim-sulfamethoxazole and vancomycin. Teicoplanin and vancomycin were also tested by Etest. Vancomycin-resistant genes were detected by PCR.

Results

The collection of VRE was composed of 194 *E. faecium van*A, 40 *E. faecium van*B isolates, one *E. faecium* isolate carrying both *van*A and *van*B genes, four *E. faecalis van*A, four *E. faecalis van*B and three *E. gallinarum van*A isolates (Fig 1).

Twenty (8.1%) *E. faecium van*A isolates demonstrated tigecycline resistance, and all were susceptible to linezolid and quinupristin-dalfopristin, but could not be inhibited by daptomycin at 4 mg/L.

Table 1. The epidemiological information of the 20 tigecycline-resistant VRE isolates

PFGE type	No. of isolates	When identified	Where identified
A	6	2013-12-18 - 2014-02-04	Healthcare unit Ia/Ib
B	3	2014-02-25 - 2014-04-23	Healthcare unit Ia/Ib
C	8	2014-03-18 - 2014-04-08	Hospital II
C	3	2014-04-17 - 2014-05-13	Hospital III

Figure 2. The three PFGE patterns of the tigecycline-resistant VRE isolates in Stockholm.

The tigecycline-resistant isolates were clustered within one exclusive PFGE group with three subtypes which had differences in one to two bands (Fig. 2). According to our documentation from 2007 up to now, this PFGE type was only presented by these 20 isolates. They were recovered between December 2013 and May 2014 from 20 hospitalized patients (Table 1), with a median age of 72 years (50-92 years old).

Conclusions

To our knowledge, this is the first report of tigecycline resistance in *Enterococcus* species in Sweden. Surveillance for emerging susceptibility changes in multi-resistant bacteria is important in preventing the spread of antibiotic resistance and guiding treatment strategies.

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