ECA 2022

In vitro activity of ceftazidime-avibactam against ESBL producing and carbapenem-resistant Gram – negative bacteria recovered from blood and fecal samples of patients after hematopoietic stem-cell transplantation

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PROSPERITAS VESTRA FINIS NOSTRA!

INTRODUCTION

Patients, receiving hematopoietic stem-cell transplantation (HSCT) are prone to develop invasive infections due to disease and transplantation-related immunosuppression. The main causative agents often originate from the digestive tract and are multidrug resistant.

Our aim was to investigate the in vitro activity of ceftazidime-avibactam (CZA) against extended spectrum beta-lactamase (ESBL) - producing and carbapenem – resistant (CR) Gram – negative bacteria recovered from blood and fecal samples of patients following HSCT, hospitalized in University Hospital "Saint Marina" - Varna during 2019-2021.

MATERIALS & METHODS

A total of 48 isolates were studied (*E. coli*, n=20; *Enterobacter cloacae*, n=9; *Klebsiella pneumoniae*, n=6; *Serratia marcescens*, n=1; *Acinetobacter baumannii*, n=2; *Pseudomonas putida*, n=4; *Pseudomonas aeruginosa*, n=4; *Pseudomonas mendocina*, n=1; *Pseudomonas composti*, n=1).

MALDI Biotyper Sirius (Bruker, Germany) and the automated Phoenix system (BD, USA) were used for species identification and susceptibility testing.

Twenty four isolates, included in this study, were resistant to third and fourth generation cephalosporins and therefore identified as ESBL producers (*E. coli*, n=12; *E. cloacae*, n=7; *K. pneumoniae*, n=4; *S. marcescens*, n=1).

A multiplex PCR was used for genes detection, associated with carbapenem resistance (blaKPC, blaVIM, blaIMP, blaNDM, blaOXA-like).

RESULTS

In the studied group, eleven isolates (23%) were CR (*E. cloacae*, n=1; *Pseudomonas* spp., n=8; *A. baumannii*, n=2).

All 24 ESBL producing isolates were CZA susceptible.

In the group of CR isolates, only 1 *P. aeruginosa* (bla genes negative) was susceptible to CZA, while 10 CR isolates were resistant. The following genes were detected in the CZA resistant isolates: blaVIM (*E. cloacae*, n=1; *Pseudomonas* spp., n=6; *A. baumanii*, n=2), blaOXA-48 (*A. baumannii*, n=2), blaOXA-24/40 (*A. baumannii*, n=2), blaOXA-23 (*A. baumannii*, n=1). One CZA resistant *P. putida* isolate did not amplify any bla genes (Fig. 1).

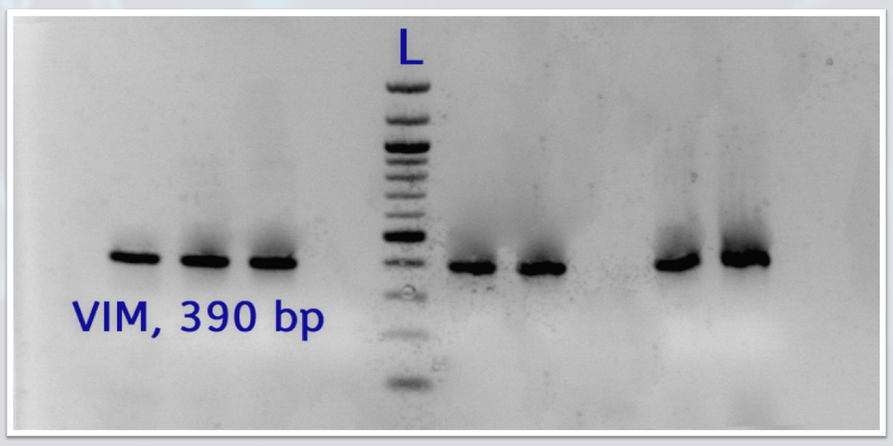

Figure 1. PCR for blaVIM and blaIMP carbapenemases.

CONCLUSIONS

Avibactam is a novel beta-lactamase inhibitor, with activity against class A ESBLs, AmpC beta-lactamases from class C and class A carbapenemases. Its spectrum of activity doesn't include metallo-carbapenemases and is with variable activity against class D beta-lactamases. In our study all ESBL producers were susceptible to CZA, but 91% of the CR isolates (all class B and class D carbapenemase producers) were resistant.

No conflict of interest.

This study is funded by Medical University of Varna (project № 19019).