THE SPECTRUM OF INFECTIONS AND
THE RESISTANCE TO ANTIBIOTICS
OF ENTEROBACTER SPECIES

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Abstract: The study was retrospective and included 112 Enterobacter strains isolated from the prelevates of the patients hospitalized in the Clinical County Emergency Hospital Braşov during 6 months (1.01.2010-31.06.2010). The aims of our study were to analyze the spectrum of infections caused by Enterobacter spp. and the assessment of the resistant strains isolated from the prelevates of the hospitalized patients. The etiological spectrum of infections produced by Enterobacter species was large, these germs being most frequent implicated in urinary tract infections (48%) and wound infections (27%). The resistance of Enterobacter spp. to beta-lactams was high, especially to ampicillin (94.92%). The level of resistance to quinolones was relatively high, but the role of these antibiotics is still important in the therapy of Enterobacter spp. infections. The resistance to aminoglycosides was different, being higher in case of gentamicin (51.56%). The sensitivity of Enterobacter spp. to carbapenems and colistin was very high, these antibiotics representing the therapeutical solution even in infections produced by Enterobacter ESBL-producing strains. The selection of resistant strains for these antibiotics is however worrying. The obtained results sustain the need of implementing coherent strategies for the monitoring of the occurrence and spread of the resistance phenomenon.

Key words: Enterobacter spp., antimicrobial resistance, infections.

1. Introduction

Enterobacteriaceae family includes Gram-negative bacilli with wide spread in nature, classified in 44 genres, from which 25 are of medical interest. The Enterobacter genre includes 14 species, the most implicated in pathology being E. cloacae, E. aerogenes, E. sakazakii and E. gergoviae. Species as E. hormaechei, E. cancerogenus, E. asburiae and E. taylorae may lead to human infection but in much smaller proportion [1]. Enterobacteriaceae are an important cause of nosocomial infections. These germs are also involved in community infections, especially in the urinary tract infections. [1], [5], [15], [18]. Enterobacter species can be the etiological agent of respiratory tract infections, skin and soft tissue infections, biliary tract infections, catheter infections, meningitis [1,2], [7,8],[10].

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More rarely, strains of Enterobacter spp. are isolated from patients with endocarditis, osteomyelitis, septic arthritis, bacteremia and meningitis [3], [9].

Enterobacter species are intrinsic resistant to aminopenicillins, cefazolin and cefoxitin due to the AmpC beta-lactamase production, typically encoded on the chromosome [4],[13]. The resistance of Enterobacter strains to the third generation of cephalosporins is usually caused by the production in excess of AmpC beta-lactamase [15].

ESBL (extended spectrum beta lactamases) are enzymes that hydrolyze the oximino group of the beta-lactamic ring having the ability to inactivate penicillins, oximino cephalosporins and monobactams [4],[15].

Studies showed that the administration of broad-spectrum cephalosporins represent an independent risk factors for resistance. [12]

The presence of ESBL producing strains is often associated with therapeutic difficulties because these germs are often resistant to various classes of antibiotics (e.g. cephems, quinolones, aminoglycosides, tetracyclines, trimethoprim-sulfamethoxazole) [5,6],[11].

Carbapenems still represent the best choice for the treatment of infections with ESBL producing strains but the increasing of the resistant strains number is a great concern. [5]

Colistin (polymyxin E) is also considered an effective and safe drug for the therapy of severe infections due to multidrug-resistant gram-negative bacteria [17].

During the last decade, the emergence and the dissemination of ESBL strains became a concerning problem worldwide [14],[16].

All the physicians should understand the importance of the problem and practice a rational prescribing of antibiotics [19].

Surveillance of antibiotic resistance must be performed in hospitals [20,21].

The aims of our study were to analyze the spectrum of infections caused by Enterobacter species and the assessment of the resistant strains isolated from the prelevates of the hospitalized patients.

2. Material and methods

Our study was retrospective and included 112 Enterobacter strains isolated from the prelevates of the patients hospitalized in the Clinical County Emergence Hospital Brăşov during 6 months (1.01.2010-31.06.2010).

From the prelevates samples, Gram smears and insemination in culture media (Columbia Blood Agar, McConkey Agar, U.T.I. Agar) were made. The calibrated loop method was used for the quantitative urine culture. The identification of Enterobacter strains were made using biochemical identification tests (Triple Sugar Iron Agar, SIM Medium, Simmons Citrate Agar) and the automated Vitek 2 Compact system. The testing of sensitivity to antibiotics was made by difusimetric method and automated Vitek 2 Compact system. The interpretation of the results of the antibiograms was made according to CLSI 2010 (Clinical Laboratory Standard Institute).

3. Results and discussions

The first objective of our study consisted in the evaluation of the spectrum of infections produced by Enterobacter spp.

The results are presented in Table 1.

Table 1

<table>
<thead>
<tr>
<th>Pathological products</th>
<th>No. of samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urine</td>
<td>54</td>
</tr>
<tr>
<td>Wound secretions</td>
<td>30</td>
</tr>
<tr>
<td>Sputum</td>
<td>13</td>
</tr>
<tr>
<td>Pus</td>
<td>8</td>
</tr>
<tr>
<td>Peritoneal fluid</td>
<td>5</td>
</tr>
<tr>
<td>Pleural fluid</td>
<td>1</td>
</tr>
<tr>
<td>Vaginal discharges</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>112</strong></td>
</tr>
</tbody>
</table>

The etiological spectrum of the infections produced by Enterobacter species was large. These germs were most frequent implicated in urinary tract infections (48%) and wound infections (27%).
More rarely, the Enterobacter strains were isolated from sputum, pus, peritoneal and pleural fluids and vaginal discharges in the case of our study.

The graphical representation of the data is illustrated in Figure 1.

The obtained results are illustrated in Figure 2. It can be observed the high level of resistance of Enterobacter strains to the tested beta-lactams antibiotics, especially to ampicillin.

It has been also analyzed the level of the resistance of Enterobacter spp. to the usual quinolones, as shown in figure 3.

During the study, according to the isolated germ, different antibiotics were tested: beta-lactams (ampicillin – Amp; amoxicillin – clavulanic acid – Amc; ceftriaxone – Cro; ceftazidime – Caz), quinolones (ciprofloxacin – Cip; norfloxacin – Nor; levofloxacin – Lev), aminoglycosides (gentamicin – G; amikacin – Ak), carbapenems (imipenem; Ipme, meropenem – Mem) and polymixines (colistin – Co).

Another objective of our study consisted in the evaluation of antimicrobial resistance of Enterobacter species strains isolated from different pathological products, during the studied period.

Initially, we have analyzed the level of resistance to beta-lactams of Enterobacter strains isolated from different pathological products.
The level of resistance is relatively high but these antibiotics can still be used with success in therapy. Further, we have evaluated the sensitivity to aminoglycosides of Enterobacter strains, as shown in figure 4.

![Fig. 4. The resistance to aminoglycosides of Enterobacter strains](image)

The level of resistance was different for the two tested antibiotics, probably due to the different using rate in therapy.

![Fig. 5. The resistance to carbapenems of Enterobacter strains](image)

As shown in the figure 5, the susceptibility to carbapenems was high, these antibiotics representing the therapeutic solutions even in infections caused by the ESBL-producing strains.

![Fig. 6. The resistance to polymyxines of Enterobacter strains](image)

The sensitivity in vitro to colistin of the isolated Enterobacter strains was also very high.

The levels of resistance resulted from the study have been high for the majority of the tested antimicrobial. The values were slightly higher than in previous studies carried out in the same medical facility, fact which is worrying although it could have been influenced by the lower duration of the study.

The resistance levels are comparable with those reported in many international studies for Enterobacter strains isolated in hospitals.

4. Conclusions

1. The etiological spectrum of infections produced by Enterobacter species was large, these germs being most frequent implicated in urinary tract infections (48%) and wound infections (27%).
2. Resistance of Enterobacter strains to beta-lactams was high, especially to ampicillin.
3. The level of resistance to quinolones was relatively high, but the role of these antibiotics must not be ignored since they could be still used with success in the therapy of Enterobacter infections.
4. The resistance to aminoglycosides was different, being a lot higher in case of gentamicin than for amikacin.
5. The sensitivity of Enterobacter spp. to carbapenems and colistin was very high, these antibiotics representing the therapeutical solution even in infections produced by ESBL-producing strains. The selection of nosocomial resistant Enterobacter strains for these antibiotics is however worrying.
6. The obtained results sustain the need of implementing coherent strategies for the discerning practice of antibiotic prescription and for the monitoring of the occurrence and spread of the resistance phenomenon.

References


