ESCMID EUROPEAN SOCIETY OF CLINICAL MICROBIOLOGY AND INFECTIOUS DISEASES

Multidrug-resistant Gram negative rods

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Summary
The increasing trend of antibiotic resistance in Enterobacteriaceae, *Acinetobacter baumannii* and *Pseudomonas aeruginosa* worldwide is worrisome since it limits drastically the therapeutic alternatives. In particular, resistance to ß-lactams and especially to carbapenems is increasing and panresistant strains are now often isolated, sometimes at the origin of outbreaks. Production of metallo-ß-lactamase (MBL) and extended-spectrum ß-lactamase (ESBL) production are enzymatic mechanisms responsible for high level resistance to carbapenems and expanded-spectrum cephalosporins, respectively. Production of ESBLs is of great concern in Enterobacteriaceae, and especially in *Escherichia coli* with a recent emergence of community-acquired isolates expressing that worrying phenotype. Dissemination of ESBL-producing *E. coli* is therefore more difficult to control and prevent. In addition, and since the selective pressure has been increased because of those ESBL determinants, we are now facing out an emergence of carbapenem-resistant Enterobacteriaceae. In particular, there are some MBL-producing *E. coli* and *Klebsiella pneumoniae* isolates for which a decreased susceptibility to carbapenems (sometimes difficult to evidence) is observed. But more threatening is the current global emergence of *K. pneumoniae* isolates producing the carbapenemase KPC, which confers resistance to expanded-spectrum cephalosporins and carbapenems, and is poorly inhibited by clavulanic acid. In *A. baumannii*, the current and dramatic problem is related to the emergence worldwide of carbapenem-resistant strains. Those strains often produce carbapenem-hydrolyzing class D ß-lactamases (CHDLs) that are mostly specific for *A. baumannii*. They belong to three unrelated groups of clavulanic-acid resistant ß-lactamases represented by OXA-23, OXA-24 and OXA-58 that can be either plasmid- or chromosome-encoded. Along with ß-lactamases, carbapenem resistance in *A. baumannii* and *P. aeruginosa* may be also the result of porin modifications.

Recommended reading

1) Emergence of Enterobacteriaceae producing extended-spectrum beta-lactamases (ESBLs) in the community. Johann D. D. Pitout, Patrice Nordmann, Kevin B. Laupland, and Laurent Poirel. **J Antimicrob Chemother.** 2005; 56: 52–59
2) Carbapenem resistance in *Acinetobacter baumannii*: mechanisms and epidemiology. L. Poirel and P. Nordmann. **Clin Microbiol Infect.** 2006 Sep;12(9):826-36
3) CTX-M: changing the face of ESBLs in Europe. David M. Livermore et al. **J Antimicrob Chemother.** 2007; 59(2):165-74
4) Carbapenemases: molecular diversity and clinical consequences. Poirel L, Pitout JD, Nordmann P. **Future Microbiol.** 2007; 2(5):501-12
5) Superbugs in the coming new decade; multidrug resistance and prospects for treatment of *Staphylococcus aureus*, *Enterococcus* spp. and *Pseudomonas aeruginosa* in 2010. Patrice Nordmann, Thierry Naas, Nicolas Fortineau and Laurent Poirel. **Current Opinion in Microbiology** 2007; 10:1–5