



# Coagulase-negative staphylococci: pathogens in blood cultures and catheter-related infections, species distribution and susceptibility to linezolid, teicoplanin and vancomycin

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**Objectives:** Nosocomial bloodstream infections originating from central venous catheters (CVC) continue to represent a significant problem for hospitalized patients. Although there is still debate whether these infections are independent risk factors for mortality, they are definitely causing significant morbidity, increase length of hospital stay and medical expenses. By definition, derived from clinical studies, catheter-related bloodstream infections (CRBSI) are characterized by the isolation of the same microorganism (determined by antibiogram or DNA typing) from both blood and CVC cultures without evidence of infection with the identical pathogen at a different site. Although the most frequent causative microorganisms for CRBSI are coagulase-negative staphylococci (CNS), their clinical relevance is usually questionable since, previously, these bacteria were mostly regarded as contaminants. However, during the last decades, CNS have emerged as important nosocomial pathogens exhibiting decreased susceptibility to antimicrobials. The aim of this study was to assess the incidence of CRBSI caused by CNS and to determine the susceptibility to linezolid, teicoplanin and vancomycin of these isolates.

**Methods:** All hospitalized surgical patients at the Aretaieio University Hospital receiving a CVC between January 1st 2008 and December 31st 2013 were included in this study. Catheters were inserted by anesthetists in the operating theatre or post-anesthesia care unit or by intensive care physicians in the ICU. The catheter tip (about 5 cm) was cultured using the Maki method, by rolling it across a blood agar plate. After a 24 hours incubation period at 37°C, results were reported for growth equal to or exceeding 15 CFU/mL. The isolated pathogens were compared to the blood cultures' isolates. Blood cultures were performed using the automated BACTEC Aerobic and BACTECTM Plus Aerobic/F Medium and BACTECTM Plus Anaerobic/F Medium bottles. The bottles were then incubated in the BD BACTEC 9240 System for up to 5 days. Positive blood cultures were inoculated onto appropriate plates while a gram-stained smear from each specimen was examined to obtain valuable information about the types of microorganisms present. The identification as well as the susceptibility testing to the different antimicrobials of the isolated pathogens was performed using the automated system VITEK 2 (BioMerieux, Marcy l'Etoile, France).

**Results:** A total of 4,383 blood cultures and 356 catheter tips were screened during the period studied. Positive cultures with the same CNS from both catheter and blood culture were obtained in 119 cases. The CNS isolates were as follows: 78 (65.5%) *Staphylococcus epidermidis*, 22 (18.5%) *S. haemolyticus*, 14 (11.8%) *S. hominis*, 3 (2.5%) *S. saprophyticus* and 2 (1.7%) *S. capitis*. All isolates were susceptible to linezolid, while 5 (6.4%) *S. epidermidis*, 1 (7.1%) *S. hominis* and 1 (4.5%) *S. haemolyticus* isolates were resistant to teicoplanin. Finally, 2 (2.6%) *S. epidermidis* isolates were resistant to vancomycin.

**Conclusion:** CNS are a group of microorganisms that are increasingly implicated in a plethora of infections, including device-related. The most frequent species of CNS isolates were *S. epidermidis*. All isolates were susceptible to linezolid and only few were resistant to glycopeptides. In order to reduce the incidence of CRBSI it is imperative to adhere to evidence-based practice when placing and maintaining CVC. The distinction between clinically significant and contaminating isolates is difficult while multi-drug resistant CNS remain a major problem since they can serve as a reservoir of resistance genes.