

# ESKAPE Monitoring in Bronchoalveolar Lavage of ICU Patients with CNS Pathologies

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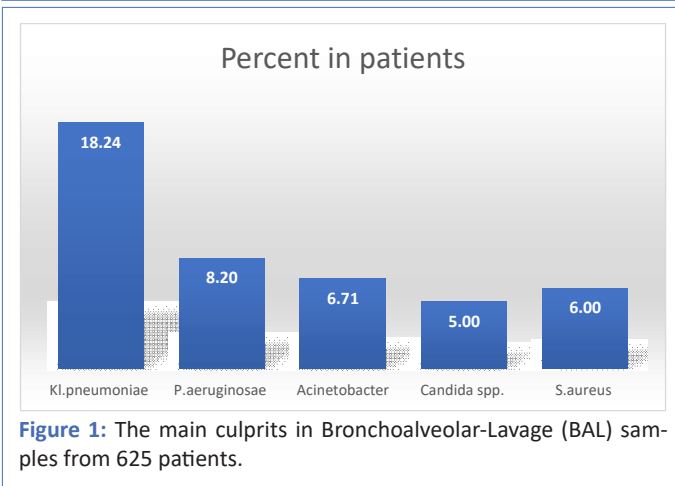
**Keywords:** Healthcare-associated infections; ESKAPE monitoring; WHONET.

## Introduction

Healthcare-Associated Infections (HAIs) have been an issue for decades [1]. Increasing microbial resistance to the antibiotics used for treatment of Ventilator-Associated Pneumonia (VAP) creates certain difficulties for clinicians in treating this pathology and increases the risk of lethal outcome, entailing economic losses for clinics and fostering the antibiotic resistance of the pathogens circulating in an ICU. The risks are associated with many invasive procedures; weakened immune status; decreased efficiency of barrier functions of respiratory-tract mucous membranes; impaired nutritional status (decreased blood-protein values), etc [2].

## Results and discussion

Between 2021 and 2023 at the Federal Center of Brain Research and Neurotechnologies of Federal Medical Biological Agency, the pathogens detected in ICU patients were investigated to establish an optimal protocol for empirical antibiotic VAP therapy. A total of 1074 Bronchoalveolar-Lavage (BAL) samples from 625 patients were examined to have identified the main culprits such as *Kl. pneumoniae*, *P. aeruginosae*, *Acinetobacter*, *Candida* spp. *Kl. pneumoniae* was isolated in 18.24% of patients on ventilator, *P. aeruginosae* in 8.2%, *Acinetobacter* in 6.71%, *Candida* spp. in 5%, and *S. aureus* in 6% (Figure 1). The antibiotic sensitivity profiles of all isolated pathogens were investigated, their phenotypes and antibiotic resistance classes were established. The data obtained enabled the clinical pharmacol-



ogist to develop a protocol for effective empirical antibacterial therapy to be administered to a VAP patient before their BAL examination results became available. Regular (once every 6 months) examination for BAL pathogens allowed one to adjust the empirical antibiotic therapy, amend a purchase order for the pharmacy, and timely withdraw the antibiotics the pathogens isolated from BAL were no longer sensitive. Having withdrawn the “ineffective” antibiotics, we did not stop monitoring the pathogens’ sensitivity for them, which led to the so-called antibiotic renaissance when the drugs restored their efficacy in affecting the main gram-negative pathogens.

The information on microbiological tests performed and antibiotic agents identified was collected using the WHONET software recommended by the WHO for microbiological monitoring in healthcare facilities.

### Conclusion

Analysis of obtained results has brought us to the conclusion that the main threat for the ICU patients on ventilator is gram-negative pathogens with *Kl. pneumoniae* being the main culprit in causing VAP. Rational use of the results of antibiotic sensitivity analysis enables one to start antibiotic therapy before the results of BAL examination become available; timely adjust the empirical antibiotic therapy, accounting for the isolated microflora; and withdraw the antibiotics that have exhausted their efficacy.

### Declarations

**Funding:** The work was completed without funding.

**Conflict of interest:** Authors declare no conflict of interest.

**Ethics approval:** The work was approved by the local ethics committee of Federal Center of Brain Research and Neurotechnologies of FMBA of Russia, Moscow, Russia. Approval #07/19-02-2024.

The work was performed without involving patients or laboratory animals.

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