

SEPTINTOJI TARPTAUTINĖ KONFERENCIJA

THE 7th INTERNATIONAL CONFERENCE

2026 m. liepos mėn. 7-10 d., Vilniaus universitetas, LIETUVA

7th-10th of July, 2026, Vilnius University, LITHUANIA

**EVOLIUCINĖ MEDICINA:
ŽMOGAUS RAIDOS PERSPEKTYVOS IR SVEIKATA
BESIKEIČIANČIOJE APLINKOJE**

**EVOLUTIONARY MEDICINE:
PERSPECTIVES ON HUMAN DEVELOPMENT AND HEALTH
CONSEQUENCES IN A CHANGING ENVIRONMENT**

Rengėjas:

Vilniaus universiteto Medicinos ir sveikatos mokslų
Doktorantūros mokykla, VU Medicinos fakultetas

Organized by

the Doctoral School of Medicine and Health sciences
at Vilnius University, VU Faculty of Medicine

HUMAN–MICROBE CO-EVOLUTION IN THE INTENSIVE CARE: STOOL SURVEILLANCE AS A WINDOW INTO MULTIDRUG-RESISTANT COLONIZATION AND INFECTION RISK

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Background and Aim: Humans and microbes have co-evolved as interconnected ecological systems, with the intestinal microbiome acting as both a protective barrier and a reservoir for opportunistic pathogens. In intensive care units, this long-standing balance is disrupted by severe illness, antibiotics, invasive procedures, surgery, and environmental exposure to hospital-adapted organisms. We examined stool culture surveillance as a window into this changing host-microbe relationship.

Materials and Methods: We reviewed serial epidemiological stool cultures from patients admitted to four intensive care units at Vilnius University Hospital Santaros Klinikos between June and August 2023. Samples were collected on admission and every seven days during ICU stay. We described potentially pathogenic bacteria, multidrug-resistant Enterobacterales and Pseudomonadales, resistance markers, and subsequent infection caused by the same colonising organism.

Results: Among 228 patients, 367 stool samples were obtained. Potentially pathogenic organisms were frequently detected, including *Enterococcus faecium*, *Klebsiella* spp., *Candida* spp., *Pseudomonas* spp., *Escherichia coli*, *Enterobacter cloacae*, and *Acinetobacter baumannii*. Emergency admissions had more detections than planned admissions, suggesting that acute host stress may weaken ecological resistance within the gut. Thirty-six patients became colonised with multidrug-resistant Enterobacterales or Pseudomonadales, and ten developed infection attributed to the same organism. ESBL and VRE were the most frequent resistance markers, while OXA-48 was the leading carbapenemase marker.

Conclusions: These findings illustrate the evolutionary tension between human hosts and microbes in modern medicine. Critical illness reduces host defenses and alters microbial habitats, while antibiotics and hospital environments select for organisms able to persist, compete, and spread. Colonisation may therefore represent an intermediate evolutionary stage, where resistant microbes adapt to the patient before crossing the boundary into infection. Stool surveillance can help detect this transition early. Viewed through evolutionary medicine, ICU infection prevention is not only pathogen control, but management of a fragile human-microbial ecosystem shaped by selection, adaptation, and vulnerability.

Keywords: colonisation, evolution, resistance