

В. Пратеепкумар, Б.А. Фархан

**СРАВНИТЕЛЬНЫЙ АНАЛИЗ МИКРОБНОЙ ГИГИЕНЫ: ОЦЕНКА
ЗАГРЯЗНЕНИЯ У МЕЖДУНАРОДНЫХ И БЕЛОРУССКИХ СТУДЕНТОВ**

Научный руководитель: канд. мед. наук, доц. В.В. Кочубинский

Кафедра микробиологии, вирусологии, иммунологии

Белорусский государственный медицинский университет, Минск

V. Pratheepkumar, B.A. Farhan

**A COMPARATIVE ANALYSIS OF MICROBIAL HYGIENE: ASSESSING
CONTAMINATION IN INTERNATIONAL AND BELARUSIAN STUDENT
GROUPS**

Tutor: PhD, associate professor V.V. Kochubinski

Department of Microbiology, Virology, Immunology

Belarusian State Medical University, Minsk

Резюме. Настоящее исследование представляет собой сравнительный анализ микробной гигиены путем оценки бактериального загрязнения мобильных телефонов и рук международных и белорусских студентов. В исследовании особенно уделяется внимание выявлению наличия *Escherichia coli* с целью оценки и сравнения уровней загрязнения между двумя группами студентов. Полученные данные могут дать ценные сведения о гигиеническом поведении и помочь разработать стратегии по снижению микробной передачи.

Ключевые слова: *Escherichia coli*, Бактериальное загрязнение, Микробная передача, Уровни загрязнения, Микробная гигиена.

Resume. This study provides a comparative analysis of microbial hygiene by assessing bacterial contamination on the mobile phones and hands of international and Belarusian students. The research specifically focuses on identifying the presence of *Escherichia coli*, aiming to evaluate and compare contamination levels between the two student groups. The findings can provide valuable insights into hygiene behaviors and inform strategies to reduce microbial transmission

Keywords: *Escherichia coli*, Bacterial contamination, Microbial transmission, Contamination levels, Microbial hygiene.

Relevance. Understanding the prevalence of microbial contamination on personal devices and hands is crucial for raising hygiene awareness and mitigating potential health risks. This study offers valuable insights into the differences in hygiene practices among diverse student groups and underscores the role of external factors, such as phone cover material, in bacterial growth. These findings contribute to the development of targeted hygiene interventions and provide a foundation for further exploration of contamination risks in everyday environments.

Aim: to assess and compare bacterial contamination on mobile phones and hands of international and Belarusian students, with a specific focus on identifying *Escherichia coli* presence

Objectives:

1. To assess the level of *Escherichia coli* contamination on mobile phones and hands among Belarusian and international students.
2. To compare contamination patterns between students of different backgrounds, considering hygiene practices and environmental influences.

3. To highlight the need for improved sanitation measures

Materials and methods. Sterile Swabs used to collect swab samples from Mobile phones and Hands of 60 Students. Samples cultured in MacConkey agar for 22hrs at 37°C. Gram Staining was performed to Identify type of bacteria present. Kligler Iron media, Manitol and Maltose medias were used to fur ther confirm the type of bacteria.

Results and their discussion. The study involved collecting samples from the mobile phones and hands of two groups of students international students and Belarusian students in order to evaluate the extent of bacterial contamination and to gain insights into their hygiene practices.

This investigation aimed to understand how personal hygiene behaviors might influence the presence and types of bacteria on commonly used objects and on the skin. In the case of the international students, samples from 30 individuals' mobile phones revealed bacterial colonies on 16 of the tested devices. The number of colonies per dish ranged from a minimum of 1 to a maximum of 39, indicating varying levels of contamination. Most of these colonies appeared smooth in texture, which is characteristic of certain bacterial species, and their sizes ranged from 1.6 to 7.9 millimeters. Gram staining – a technique used to categorize bacteria based on cell wall properties – showed an equal distribution between Gram – positive and Gram–negative bacteria, with 8 samples each. Notably, among the Gram – negative bacteria, 6 exhibited rod – shaped (bacillus) morphology, which is typical for many pathogenic bacteria.

Further microbiological testing involved using Kligler Iron media, a specialized growth medium used to detect fermentation of sugars like glucose and lactose. All six samples tested for glucose and lactose fermentation showed positive results, indicating the bacteria could metabolize these sugars. Additional biochemical tests involving mannitol and maltose fermentation enabled the identification of *Escherichia coli* (*E. coli*) in some samples, confirming its presence on the mobile phones of international students. *E. coli* is an important indicator of fecal contamination and can pose health risks if transmitted or spread through contact with contaminated surfaces.

In contrast, bacterial contamination on the mobile phones of Belarusian students was significantly lower. Out of 30 samples examined, only 8 showed bacterial colonies, with each dish containing between 3 and 34 colonies. These colonies were mostly smooth and measured between 1.2 and 6.5 millimeters in size. Gram staining revealed that the predominant bacteria were Gram – positive, specifically *Staphylococcus* species, which are common skin flora and usually less harmful, although some strains can cause infections. Only 2 samples contained Gram – negative bacteria, and further biochemical testing revealed that these bacteria did not ferment glucose or lactose, indicating that *E. coli* was absent in this group's mobile phones.

Mobile Phones							
Group	Gram-Negative Colonies	Rod-Shaped			Other Shaped	Gram-Positive	Total with Colonies
		Lactose & Glucose Fermentation	Maltose & Mannitol Tests	E. coli Presence			
International Students	8	6	Yes (6)	Yes (6)	2	8	16
Belarusian Students	8	—	—	—	—	8	16

Fig. 1 – Contamination of mobile phones

The study also included an assessment of hand hygiene practices by collecting swabs from the hands of 20 students from each group. Among international students, bacterial colonies were found in 7 samples, with 2 of these showing shiny, reflective surfaces. These surfaces are often indicative of *E. coli*, which is known for its glossy appearance under certain conditions. Laboratory analyses confirmed fermentation of glucose and lactose in 4 samples, and *E. coli* was identified in 2 of these. This suggests that some international students' hands may harbor bacteria capable of causing infections, especially if proper handwashing practices are not consistently followed.

Meanwhile, among Belarusian students, bacterial presence on hands was more widespread, with colonies detected in 14 out of 20 samples. The number of bacterial colonies per sample ranged from 1 to 19. Testing revealed that 2 samples could ferment glucose and lactose, but no *E. coli* was detected, indicating a lower level of potentially pathogenic bacteria on their hands. This difference in contamination levels between the two groups suggests that Belarusian students might generally practice better personal hygiene, including more frequent or effective handwashing, which could reduce bacterial transfer and colonization.

The findings from this study highlight several important points. Firstly, the higher prevalence of bacteria, including potentially harmful strains like *E. coli*, on the phones and hands of international students suggests that their hygiene practices may need reinforcement. Conversely, the relatively lower contamination rates among Belarusian students indicate a possible correlation with better hygiene habits. Secondly, external factors such as the materials used in phone covers appear to influence bacterial growth. For example, certain materials may provide a more hospitable environment for bacteria to thrive, which underscores the importance of choosing easy-to-clean or antimicrobial phone covers.

These insights underscore the need for increased awareness about personal hygiene, especially regarding the cleaning and disinfecting of frequently used devices like mobile phones. Educational campaigns could emphasize proper handwashing techniques, regular cleaning of personal devices, and the selection of materials less conducive to bacterial growth. Furthermore, the study suggests avenues for further research, such as exploring specific factors that contribute to contamination, evaluating the effectiveness of different

cleaning agents, and developing guidelines to minimize bacterial transmission in communal or academic settings.

Hands							
Group	Gram-Negative Colonies	Rod-Shaped			Other Shaped	Gram-Positive	Total with Colonies
		Lactose & Glucose Fermentation	Maltose & Mannitol Tests	E. coli Presence			
International Students	4	2	Yes (2)	Yes (2)	2	3	7
Belarusian Students	2	2	No (2)	No (2)	—	12	14

Fig. 2 – Contamination of hands

Conclusions. Based on the results, it can be inferred that Belarusian students exhibited relatively better hygiene habits compared to their international counterparts, as indicated by the lower occurrence of bacterial colonies on both mobile phones and hand swabs. Importantly, *Escherichia coli* was found only in samples from international students, emphasizing the need for enhanced hygiene education. Moreover, the findings suggest that external factors, such as the materials used in phone covers, can impact bacterial growth, pointing to potential areas for further investigation and awareness initiatives. Overall, encouraging consistent hygiene practices across all groups is crucial for minimizing microbial contamination and reducing associated health risks.

Literature

1. Brady, R. R., Verran, J., & Sale, J. (2007). The bacterial contamination of mobile phones in a university setting. *Journal of Hospital Infection*, 66(2), 139–140. doi:10.1016/j.jhin.2007.02.021
2. Kim, M., & Kim, K. (2019). Bacterial contamination of mobile phones in health care settings and community settings. *Infection & Chemotherapy*, 51(4), 261–268. doi:10.3947/ic.2019.51.4.261
3. Hsu, L. Y., et al. (2008). Mobile phones as a source of nosocomial pathogens. *Annals of Clinical Microbiology and Antimicrobials*, 7, 1. doi:10.1186/1476-0711-7-1
4. World Health Organization. (2009). WHO guidelines on hand hygiene in health care: First edition. Geneva: World Health Organization. Available at: <https://www.who.int/publications/i/item/9789241597906>.