FTIR-ATR ANALYSIS FOR THE OPPORTUNISTIC YEASTS GROWN IN SIMULATED MICROGRAVITY AND RESISTANCE TO PHYSICAL AGENTS

Irmantas Čiužas[1], Gerda Anužienė[2], Justina Versockienė[1], Eglė Lastauskienė[1]

[1]Institute of Biosciences, Life Sciences Center, Vilnius University, Saulėtekio Av. 7, LT-10257 Vilnius, Lithuania
[2]Chemical Physics Institute, Faculty of Physics, Vilnius University, Saulėtekio Av. 3, LT-10257 Vilnius, Lithuania
irmantas.ciuzas@gmc.stud.vu.lt

Yeasts grown in space experience a unique physiological response, starting from modified cell morphology and growth dynamics to increased resistance for antimicrobial compounds [1] Yeast morphogenic changes have been observed, which occur in response to a cellś environmental stressors and contributes to the virulence of an opportunistic pathogen [2]. In this work, the effect of microgravity on the resistance of *Candida guiliermondii* to physical agents was measured by comparing cells grown under normal gravity and simulated microgravity.

The study attempted to evaluate physical factors such as resistance to electric shock. Microgravity was simulated using a rotary cell culture system, cells were exposed to an electric shock by a pulsed electric field generator. The method of an attenuated total reflection of infrared radiation (ATR IR) spectroscopy was applied for the analysis. ATR IR absorption spectra of 14 samples of 7 grown in gravity and 7 in simulated microgravity were analyzed.

The obtained results show a significant difference between *C. guiliermondii* grown under normal gravity and microgravity treated with electric shock. Cells grown in microgravity showed a 16.2-fold increase in resistance to electric shock. The main difference between ATR IR absorbance spectra of *C. guilliermondii* yeast grown in gravity and microgravity were observed at 1374 cm^{-1} (nucleobases ν(C-N)) and 1744 $^{-1}$ (lipid ν(C=O)) spectral bands [3-4]. Both mentioned spectral bands are more intense in the ATR IR absorbance spectra of *C. guilliermondii* yeast grown in gravity.

To conclude, yeast cells grown in microgravity can be differently effected by physical agents. For better understanding of microgravity's effects, it is important to carry out more studies with different types of cells and prolonged exposure to microgravity.

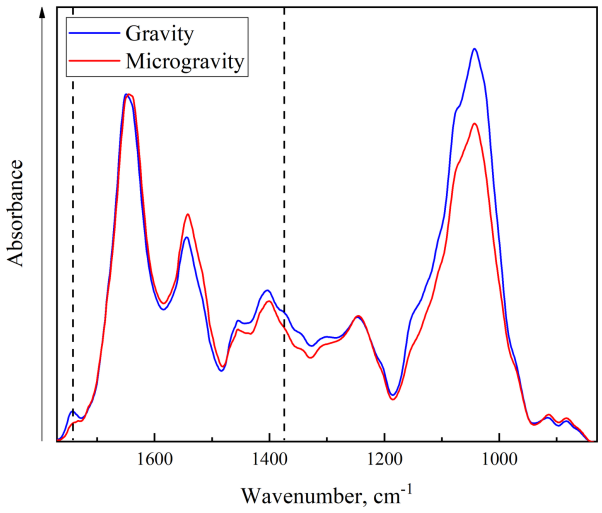

Fig. 1. ATR IR absorbance spectra of *C. guiliermondii* grown in gravity and microgravity

[1] Milojevic, T., & Weckwerth, W. (2020). Molecular Mechanisms of Microbial Survivability in Outer Space: A Systems Biology Approach. Frontiers in Microbiology, 11

[2] Altenburg, S., Nielsen-Preiss, S. M., & Hyman, L. E. (2008). Increased Filamentous Growth of Candida albicans in Simulated Microgravity. ScienceDirect, 6(1), 42–50

[3] A. Salman, L. Tsror, A. Pomerantz, R. Morehc, S. Mordechai, M. Huleihel. (2010). FTIR spectroscopy for detection and identification of fungal phytopathogenes, Spectroscopy 24, 261–267

[4] Z. Movasaghi, S. Rehman, and I. Rehman. (2008).) Fourier Transform Infrared (FTIR) Spectroscopy of Biological Tissues, Applied Spectroscopy Reviews 43, 134–179 (2008)