

# Hexadecane-induced stress response of hydrocarbon-oxidizing actinobacterial strain *Tsukamurella tyrosinosolvens* PS2

Romanova V.\*, Grigoryeva T., Laikov A.

*Institute of Fundamental Medicine and Biology, Kazan Federal University, Kazan, Russia*

\* *avonamora-94@mail.ru*

**Key words:** stress factors, alkane, quantitative proteomics

**Motivation and Aim:** Bacteria are often encounter to a wide range of stressful conditions in their environment; the most common in nature are nutrient restriction, temperature changes, exposure to various chemical compounds. Under such conditions, microorganisms develop regulatory networks that allow them to overcome adverse conditions. The use of proteomic and transcriptomic methods makes it possible to assess which genes are activated or suppressed in response to exposure to toxic substrates. In the case of biodegradation by alkane-oxidizing bacterial strains, stress may be associated with the chaotropic activity of alkanes. This study was devoted to the effect of hexadecane on the metabolic processes of the *Tsukamurella tyrosinosolvens* PS2 strain using omics approaches.

**Methods and Algorithms:** The *T. tyrosinosolvens* PS2 strain was isolated from petrochemical sludge as a potential degrader of linear alkanes [1]. Targeted quantitative proteomics (LC-MRM/MS) of PS2 strain proteins under different cultivation conditions (sucrose and hexadecane) was performed.

**Results:** A proteomic profile of the PS2 strain with different protein expression was obtained. General, universal stress proteins, as well as cold and heat shock proteins were increased on hexadecane in response to adverse environmental factors. Proteins belonging to the chaperone class had an increased expression on hexadecane, but the HspR protein- a repressor of the synthesis of heat shock proteins, had a reduced expression. Probably, the increased expression of stress proteins in the strain is the result of adaptation and may be an advantage in response to alkanes. In addition, an increased expression on hexadecane of proteins responsible for resistance to antimicrobial agents was found, which increases the tolerance of bacteria to xenobiotic contamination and the ability to biodegradation. The protein systems of resistance to copper, cadmium and arsenic were activated on hexadecane, which makes the strain potentially resistant to heavy metals.

**Conclusion:** Based on the results of quantitative proteomics, hexadecane in the culture medium is a stress factor for the *T. tyrosinosolvens* PS2 strain. Such stress is compensated by changes in the expression of shock proteins and resistance proteins. The observed adaptability of the strain can be useful in the selection of new effective alkane-degrading microorganisms.

**Acknowledgements:** This research was funded by the subsidy allocated to Kazan Federal University for the state assignment in the sphere of scientific activities (project No. 0671-2020-0058).

## References

1. Romanova V.A., Boulygina E.A., Siniagina M.N., Markelova M.I., Grigoryeva T.V., Laikov A.V. *Microbiol Resour Announc.* 2019;8:e00218-19.