International Journal of Biomedicine | June 2021 - Volume 11, Issue Suppl_1: Abstracts from the Third Russian International Conference "Cryo-electron microscopy 2021: achievements and prospects"

ORAL ABSTRACT PRESENTATIONS

SESSION TITLE: STRUCTURE OF MEMBRANE PROTEINS

DOI: 10.21103/IJBM.11.Suppl_1.OR1

Abstract OR-1: Condensed DNA Architecture in a Nucleoid of *Escherichia coli*

Yurii Krupyanskii[1], Nataliya Loiko[2], Olga Sokolova[3]

[1]*Semenov Federal Research Center for Chemical Physics RAS, Moscow, Russia*
[2]*FR Center "Fundamentals of Biotechnology" RAS, Moscow, Russia*
[3]*Biological Faculty, Lomonosov Moscow State University, Moscow, Russia*

Background: Bacterial genomic DNA interacts with nucleoid-associated proteins (NAPs) and is located in a highly condensed and functional organized form in the nucleoid of the cell. The structure of the bacterial nucleoid is still awaiting its determination in high resolution. However, recent intensive research showed that condensed DNA in the bacterial nucleoid has a complex, hierarchically organized structure. Such architecture may only exist as a result of dynamic structural rearrangements, which characterize actively growing bacteria. Changes in environmental conditions are perceived by bacteria as stress. In the stationary phase caused by nutrient depletion, energy production processes become inefficient.

Bacteria in the stationary phase use an energy-independent mechanism for maintaining an order to protect the DNA: the creation of stable structures, like those in inanimate nature. Cells develop into dormant forms that differ significantly in the structural organization from growing cells.

Methods: Electron microscopy and synchrotron radiation diffraction studies were used to reveal distinct forms of DNA condensation in dormant E. coli cells.

Results: The study made it possible to find the intracellular nanocrystalline, liquid crystalline, and folded nucleosome-like DNA structures, which were observed and described for the first time.

Conclusion: The results of experiments made it possible to visualize the structures of the lower hierarchical tier of DNA compaction in the nucleoid of dormant cells. We hypothesized that the heterogeneity of bacterial cells allows for a flexible response to environmental changes and to surviving stress situations. Multiple types of DNA condensation in the same dormant E. coli cell

increase the chances for rapid resumption of growth when conditions turn back to favorable.

Key Words: stress • DNA • condensation • structure

Research was performed within frameworks of the state tasks for FRC CP RAS #AAAA-A20-120031490003-7 and #AAAA-A19-119021490112-1

**Corresponding author*: *Krupyanskii Yurii. E-mail: yuriifkru@gmail.com*

International Journal of Biomedicine. 2021;11 Suppl 1: S7.
doi: 10.21103/IJBM.11.Suppl_1.OR1