

Detection and isolation of viruses infecting *Halobacterium salinarum* from the community of extreme halophiles

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Abstract

This article contains the main provisions for the detection, accumulation and isolation of halobacterial viruses. A small list of data on the structure of already known non-cellular agents that affect the cells of archaea microorganisms (in particular, haloarchae cells) is provided as a reference material. The problems of the work as well as its relevance both from the point of view of scientific knowledge and from the practical application are indicated. A fairly simple scheme is proposed and given as a solution to the problems associated with the detection of viruses. A simple methodology for determining halobacterial viruses in the composition of the studied community has been prepared and implemented. It consists of the following stages: cultivation of microorganisms (both deep and solid phases), infection with haloviruses, sampling potentially containing virus particles, concentration and isolation of viruses, obtaining the necessary images using electron microscopy. The selection of the optimal conditions for carrying out the viral induction was held: thermal and pH effects, influence of cell population density, and exposure by ultraviolet radiation. The most promising samples containing the viruses were identified: samples taken from Lake Alykes, Lake Schott El Jerid. Lake El'ton. At the end of the article, a brief analysis of the effectiveness of the method is given, including both advantages and disadvantages. The most important merits are simplicity, relatively fast results and the ability to save samples for later testing. On the other hand, it is necessary to attribute the orientation to a more complex approach to the study of viral exposure, implying the study of the mechanisms of viral insertion into the cell. Moreover, the solutions of a number of side problems, for example, arising during the preparation of lysis zones are needed.

References

- [1] K.J. Wise, N.B. Gillespie, J.A. Stuart, M.P. Krebs, R.R. Birge. Optimization of bacteriorhodopsin for bioelectronic devices. *Trends Biotechnol.* **2002**. Vol.20. No.9. P.387-394. DOI: 10.1016/S0167-7799(02)00203-1
- [2] F. Santos, P. Yarza, V. Parro, I. Meseguer, R. Rossello-Mora, J. Anton. Culture-Independent Approaches for Studying Viruses from Hypersaline Environments. *Appl. Environ. Microbiol.* **2012**. Vol.78. No.6. P.1635-1643. DOI: 10.1128/AEM.07175-11
- [3] D.H. Bamford, J.J. Ravantti, Gunilla Ronnholm, Simonas Laurinavicius, Petra Kukkaro, Mike Dyall-Smith, Pentti Somerharju, Nisse Kalkkinen, Jaana K. H. Bamford. Constituents of SH1, a Novel Lipid-Containing Virus Infecting the Halophilic Euryarchaeon *Haloarcula hispanica*. *J. Virol.* **2005**. Vol.79. No.14. P.9097-9107. DOI: 10.1128/JVI.79.14.9097-9107.2005
- [4] S.V. Kalenov, M.M. Baurina, D.A. Skladnev, A.Y. Kuznetsov. High-effective cultivation of *Halobacterium salinarum* providing with bacteriorhodopsin production under controlled stress. *J. Biotechnol.* **2016**. Vol.233. P.211-218. DOI: 10.1016/j.jbiotec.2016.07.014
- [5] M. Dyall-Smith. The Halohandbook. Protocols for haloarchaeal genetics, version 7.2. **2009**. 144p.