

Jury Member Report – Doctor of Philosophy thesis.

Name of Candidate: Viktor Mamontov

PhD Program: Life Sciences

Title of Thesis: Escape mechanisms of mobile genetic elements against CRISPR-Cas system and diversity in microbial communities

Supervisor: Professor Konstantin Severinov

Name of the Reviewer: Mikhail Gelfand

I confirm the absence of any conflict of interest

Date: 29-12-2023

Reviewer's Report

The thesis is formed by three unrelated chapters largely repeating the listed papers. Each chapter has its own introduction and methods section, position of the latter probably determined by the journal rules. The common introduction centers on one of the studied problems (CRISPR), briefly mentions another one (metagenomes), and says nothing about the third one (bacteriocins); on the other hand, it contains a paragraph on antibiotic resistance whose relevance is not obvious. The conclusions mainly repeat conclusions of chapters 2 and 3; the results of the bacteriocin study (chapter 4) are not mentioned.

At that, the author's contribution to the bacteriocin study has been rather technical (genome assembly and basic annotation), which is OK; the study itself is interesting. Similarly, the comparison of DNA extraction methods for marine microbiomes, while technical, is highly timely and useful, and the author's contribution to this chapter is considerable.

The main results are contained in chapter 2 where most experiments and analyses have been done by the author. The author demonstrates that colonies formed by ancestral cells carrying an essential multicopy plasmid and a CRISPR-Cas system targeting this plasmid are non-homogeneous, with most cells having few or no plasmids, and a minor fraction of cells having multiple copies of the plasmid. At that, the plasmidless cells survive by indirect resistance provided by plasmid-bearing cells. This result has interesting evolutionary implications related to a general question of the role of intrinsic noise in generation of inhomogeneity and thus increased robustness of species.

The methods, both computational and experimental, are diverse and modern.

The publication requirements are easily met, as the candidate is the first author of a PNAS paper and he has co-authored one more paper in

IJMS (satisfying the IF criterion), and one more paper under review somewhere. The results were reported at MCCMB and CRISPR, two good conferences. Hence all formal requirements are met.

While chapter 2 alone, based on experimental results from the first-author PNAS paper, would be sufficient to form a strong thesis, the candidate has decided to include two more studies where his role has been more limited. This required including published material from two co-authored papers for completeness and could lead to confusion as to what belongs to whom. Hence, I think that the author's contribution should be specified in more detail, not only in the Preface, as in the present version, but at the beginning of each paragraph.

Provisional Recommendation

I recommend that the candidate should defend the thesis by means of a formal thesis defense

~~I recommend that the candidate should defend the thesis by means of a formal thesis defense only after appropriate changes would be introduced in candidate's thesis according to the recommendations of the present report~~

~~The thesis is not acceptable and I recommend that the candidate be exempt from the formal thesis defense~~