

## Jury Member Report – Doctor of Philosophy thesis.

**Name of Candidate:** Aleksandra Mitina

**PhD Program:** Life Sciences

**Title of Thesis:** Role of breast milk lipid composition in postnatal brain development

**Supervisor:** Professor Philipp Khaitovich

### Name of the Reviewer:

<p>I confirm the absence of any conflict of interest</p> <p>(Alternatively, Reviewer can formulate a possible conflict)</p>	<p><b>Signature:</b></p> <p><i>Christoph Borchers</i></p> <p><b>Date: 11-11-2020</b></p>
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*The purpose of this report is to obtain an independent review from the members of PhD defense Jury before the thesis defense. The members of PhD defense Jury are asked to submit signed copy of the report at least 30 days prior the thesis defense. The Reviewers are asked to bring a copy of the completed report to the thesis defense and to discuss the contents of each report with each other before the thesis defense.*

*If the reviewers have any queries about the thesis which they wish to raise in advance, please contact the Chair of the Jury.*

### Reviewer's Report

Reviewers report should contain the following items:

- Brief evaluation of the thesis quality and overall structure of the dissertation.
- The relevance of the topic of dissertation work to its actual content
- The relevance of the methods used in the dissertation
- The scientific significance of the results obtained and their compliance with the international level and current state of the art
- The relevance of the obtained results to applications (if applicable)
- The quality of publications

The summary of issues to be addressed before/during the thesis defense

The thesis is about the study of the lipid composition of human breast milk on the development of brain in human infants. The hypothesis of this study is that breast milk and brain compositions have co-evolved regarding the lipids, in particular fatty acids (FA) based lipids. The hypothesis is based on previous studies which demonstrated that the human brain lipidome composition is distinct compared to the brain lipidome of other species and is formed during the first year of life. In this study the candidate “tested whether these human-specific features of the brain lipidome composition are reflected in the main source of the lipids that the young brain uses - breast milk”. The primary goals of the research were 1) determine and compare the lipid content in breast milk of different species including human, monkey, pig, etc. and 2) determine and compare the lipid composition of infant brain with human breast milk. The study was performed using state-of-the-art mass spectrometric approaches which are capable to detect thousands of lipids within one experiment. The technology used is the most relevant technique for this project.

The candidate’s work revealed a first comprehensive description of breast milk lipid composition of different species and determined the correlation with the lipid composition of the postnatal brain of several mammalian species, including primates and in particular, humans. For example, the studies demonstrated that bovine milk is very similar in the lipid composition to human milk indicating that bovine milk is a suitable substitute for human milk. The work provides numerous new insights and correlations between the lipid compositions of milk and human brain like “the FAs that are present in both datasets (n = 31), intensities in milk correlate well with the intensities in prefrontal cortex (correlation coefficient = 0.71, p-value = 0.000008) and in cerebellum (correlation coefficient = 0.47, p-value = 0.008). Intensities in milk also correlate well with the intensity changes across age in prefrontal cortex.”

Although this thesis is a fountain of new data, results and insights of the lipids in biological specimens the candidate has just published one publication on this topic, however, I expect more papers will come out of this study.

In summary the study design is well-thought out, the experiments performed are rigorous and elegant using modern technologies, the results and statistical analyses are solid, the conclusions are adequate, and the thesis is well written and of great quality. This thesis should most definitely be accepted in partial fulfillment of the requirement for a degree of Doctor of Philosophy.

#### **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*