

Oponent's assessment of bachelor thesis

First name and surname of student : **Marek Tobiáš**

Thesis name: **Biophysical Conditions Triggering Depolarization Block in Excitatory Neurons**

A. Point assessment of individual aspects of the work (choose **only** one option)

1. Scale of BT and its structure	
<input checked="" type="radio"/> A - excellent	
<input type="radio"/> B – very good - it is however not balanced – scale of some parts does not reflect their importance	
<input type="radio"/> C – good, but some parts are not covered sufficiently	
<input type="radio"/> N - unacceptable	

2. Language level	
<input checked="" type="radio"/> A - excellent	
<input type="radio"/> B – very good, only a few minor errors or typos found	
<input type="radio"/> C - good, minor errors are common	
<input type="radio"/> N – unacceptable, many serious mistakes and errors	

3. Work with literature	
<input checked="" type="radio"/> A – excellent – citations are relevant and appear at relevant places	
<input type="radio"/> B – very good – minor objection to a number or a placement of citations	
<input type="radio"/> C – good, wrong format or missing citations do appear	
<input type="radio"/> N – unacceptable – a lot of missing citations	

4. Clarity of the work	
<input checked="" type="radio"/> A – excellent – the thoughts are well-formulated, it is a pleasure to read	
<input type="radio"/> B- very good – there are a few clumsy expressions or unclear formulations	
<input type="radio"/> C - good, clumsy expressions or unclear formulations are more common	
<input type="radio"/> N – unacceptable, the the work is difficult to understand	

5. Formal and graphical level of the work	
<input checked="" type="radio"/> A - excellent	
<input type="radio"/> B – very good, but individual missing links to figures, shortcuts etc. appear,	
<input type="radio"/> C - good, bigger errors like missing pages appear	
<input type="radio"/> N – unacceptable, many serious errors	

Please add any comment to the above (if you feel like doing so):

The bachelor thesis generally has very high standard in all aspects. In few paragraphs, readability could still be slightly improved, but generally the thesis is very well understandable and I enjoyed reading it. Marek Tobiáš put a lot of effort in providing necessary background knowledge to the reader in great detail and references were correctly cited, including licenses of reproduced material.

If the work contains results of the authors (it is not mandatory) please comment the following:

The goal of the thesis can be separated in 3 parts:

1. To develop automatic detection of the depolarization block.

The bachelor thesis provides a good method for classifying a depolarization block which is an important tool that was so far lacking. I believe that other research groups could use this methodology and that a unified approach to the definition of a depolarization block would greatly help the entire field.

2. Assess the influence of Na and K ion channel densities on susceptibility to depolarization block.

As correctly discussed in the thesis, understanding how different properties of neurons impact the response to optogenetic stimulation is important and has a lot of practical applications in both fundamental research and the development of brain-machine interfaces. The question was investigated by means of a simplified computational model. To make the results conclusive, one would need to extend the work to more complicated models and multiple stimulation paradigms, but the results of Marek Tobiáš provide an important first step and suggest a useful methodological approach to the problem.

3. Assess the impact of cellular size on the susceptibility to depolarization block.

It was suggested by Herman et al 2014 that fast-spiking interneurons are more susceptible to the depolarization block than regular-spiking interneurons due to their different size. Using the computational model, Marek Tobiáš came to the conclusion that, at least under the assumptions of the model, the size of the cell body does not influence susceptibility to depolarization block and that the observed difference likely has another explanation.

Are the aims of the work clearly stated? **Yes.**

Is the amount of the experimental work equivalent to the aims? **Yes (computational work)**

Are the results well documented? **Yes.**

Are the results discussed with existing literature? **Yes.**

B. Defence

Your questions to the author (please have at least one)

In your computational model that did not include neural morphology, the cellular size did not influence susceptibility to depolarization block. Would you expect that the level to which size influences the susceptibility to depolarization block depends on the morphology of the neuron? In other words, could it be that for some morphologies the size would matter and for some not?

Could you comment on how the background network activity could influence the depolarization block and how the depolarization block influences the network activity?

C. Final assessment

I do recommend this work to be accepted **Yes**

Suggested classification: Excellent (1)

Date: 14. 6. 2024

Name and signature: Karolína Korvasová



Instruction for filling and sending this form:

- Please use this form for your assesment.
- Please send the filled form to the following address : marian@natur.cuni.cz. We also need an original of signed document – either send it to the following address: sekretariát Katedry buněčné biologie PŘF UK (p. Růžičková), Viničná 7, 128 44 Praha 2, or bring it to the defence.
- Student shall get your assessment at least three days before the defence - you can send it yourself or we can do it for you.