

Posudek na bakalářskou práci	
<input type="checkbox"/> školitelský posudek <input checked="" type="checkbox"/> oponentský posudek	Jméno posuzovatele: Teije Middelkoop <hr/> Datum: 24-5-2023
Autor: Vojtěch Šabata	
Název práce: Mechanical forces in asymmetric cell division	
<input checked="" type="checkbox"/> Práce je literární rešerší ve smyslu zveřejněných požadavků (pravidel). <input type="checkbox"/> Práce obsahuje navíc i vlastní výsledky.	
Cíle práce (předmět rešerše, pracovní hypotéza...) The aim of the thesis is to provide an extensive overview of the literature on asymmetric cell division of the <i>C. elegans</i> zygote, with a particular focus on the mechanical principles underlying symmetry breaking.	
Struktura (členění) práce: The structure of the thesis loosely follows the developmental sequence of events in chronological order: polarity establishment and maintenance, cytokinesis and chiral symmetry breaking. When appropriate deviations from the chronology were made, which served the clarity of the thesis.	
Jsou použité literární zdroje dostatečné a jsou v práci správně citovány? Použil(a) autor(ka) v rešerši relevantní údaje z literárních zdrojů? The author used a sufficient amount of relevant literature. Overall the literature is correctly cited and the author found the relevant literature. On a small number of occasions there were some erroneous statements, or references missing, but the overall impression is very good.	
Pokud práce obsahuje (nadstandardně) i vlastní výsledky, jsou tyto výsledky adekvátním způsobem získány, zhodnoceny a diskutovány?	
Formální úroveň práce (obrazová dokumentace, grafika, text, jazyková úroveň): The language in the thesis is of high quality. The thesis was easy to read and the messages came across clearly. One minor point of improvement on language is the usage of articles for singular nouns. Figures are adapted from research papers and are well-referenced in the figure legends.	
Splnění cílů práce a celkové hodnocení: The author provided a comprehensive overview of the literature on the asymmetric division of the <i>C. elegans</i> zygote. Although this may seem a narrow topic at first glance, studies on the <i>C. elegans</i> zygote division have revealed many of the fundamental principles underlying cell polarity and cytokinesis, known to date.	

Hence, this thesis covers various topics including polarity establishment, cytokinesis and chiral symmetry breaking, and in my opinion, the author finds the right balance between focus and overview.

Moreover, given that polarity establishment and asymmetric cell division are mechanical processes by nature, this thesis focussed on the mechanical underpinnings of asymmetric cell division. This means that much of the literature operates at the interface between developmental biology and biophysics, and the author did a good job in highlighting some of the physical mechanisms without going into too much unnecessary detail.

A minor point of criticism concerns the integration of the chiral symmetry breaking part with the cell polarity/asymmetric cell division part. Both processes are related because cell polarity gives rise to a gradient of active torque, which in turn, gives rise to either chiral counter-rotating cortical flow (zygote during polarizing flows, AB lineage) or chiral net-rotating cortical flow (zygote division, P/EMS lineage). The exact shape of the cellular torque gradient dictates which of the chiral movements take place, and this has major implications for cell skew and positioning. In my opinion the link between polarity and chirality could have been more explicitly explained.

Altogether, I find that the author managed to give a well-documented and clearly-written overview of a highly interdisciplinary research topic, which I know for a fact is not a trivial task. Therefore, in my opinion the author reached the aims and delivered a very good BSc thesis.

Otázky a připomínky oponenta:

- 1) At page 5: mitochondrial redox signaling is most likely acting in parallel with AIR-1 pathway, even though AIR-1 regulates certain mitochondrial functions. How would you test whether both act in parallel? And what would be the possible outcomes of such an experiment?
- 2) You say on page 6, last paragraph: '... par-2 defining the posterior pole is protected from the transportation by cortical flow and phosphorylation by aPKC through binding to centrosomal MT's.' Could you explain why binding to microtubules would protect from being transported by cortical flow? Are the microtubules themselves transported by cortical flow?
- 3) On page 6, second paragraph: '...according to Costache et al Cell reports, 2022, CYK-1 primarily elongates the already existing actin and thus create long polarised actin filaments with barbed ends pointed away from the RhoA pulse.' At the same time it is mentioned on page 25 that CYK-1 localizes within the RhoA pulse. Could you elaborate on this apparent discrepancy? E.g. what are the arguments for either hypothesis?
- 4) In the last section you discuss the spindle skew of the AB cell, and you say that one possible mechanism is that elongation of the spindle in combination with space constraints (egg shell and neighboring cell) facilitates the skew. You also mention that this is unlikely as the skew still occurs upon reduced pulling forces on astral microtubules (lin-5 RNAi). Given the earlier discussion on the various spindle positioning mechanisms, could you think of another experiment that could shine more light on this hypothesis?
- 5) The last sentence of the chirality section reads: 'Also, the embryo mounting method on the microscope slide is a methodological issue to be addressed because it seems that almost all cortical movements significantly depend on the used type of mounting medium and on the level of compression.' Which mounting method would you recommend and why?

Návrh hodnocení školitele nebo oponenta (bude zveřejněn)

velmi dobře

Podpis školitele/opponenta: