

Strain Rate Impacts Biological Properties and Membrane Tension of Cells in *Xenopus laevis* Epithelia

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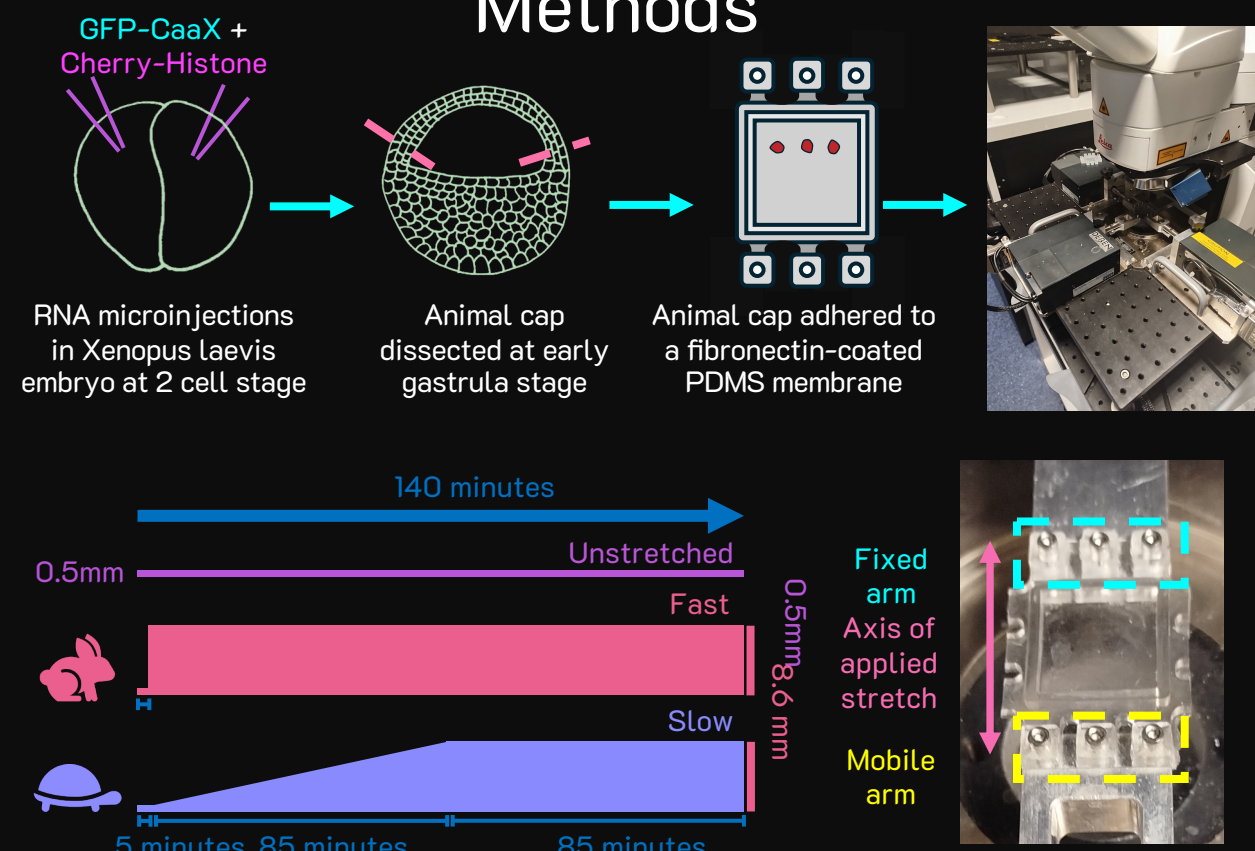
Background

- Cells and tissues are constantly subjected to different forces. Cells within tissues can detect and respond to **mechanical forces**, resulting in **physical, geometric, and behavioural** changes in the cells - such as changes in **division rate and division orientation**¹.
- These responses are likely to play a key role in maintaining tissue homeostasis, **morphogenesis** and the prognosis of diseases, such as cancer²⁻³.
- Most investigations have investigated the effects of **rapidly applied stretches** in monolayers or individual cells which only represents a subset of the strain rates seen in biological tissues, e.g. **slow** but high magnitude strains are common during **embryonic development**.
- Furthermore, the mechanisms by which cells **detect** external forces are yet to be fully characterised - one potential mechanism being through detecting changes in **membrane tension**⁴.

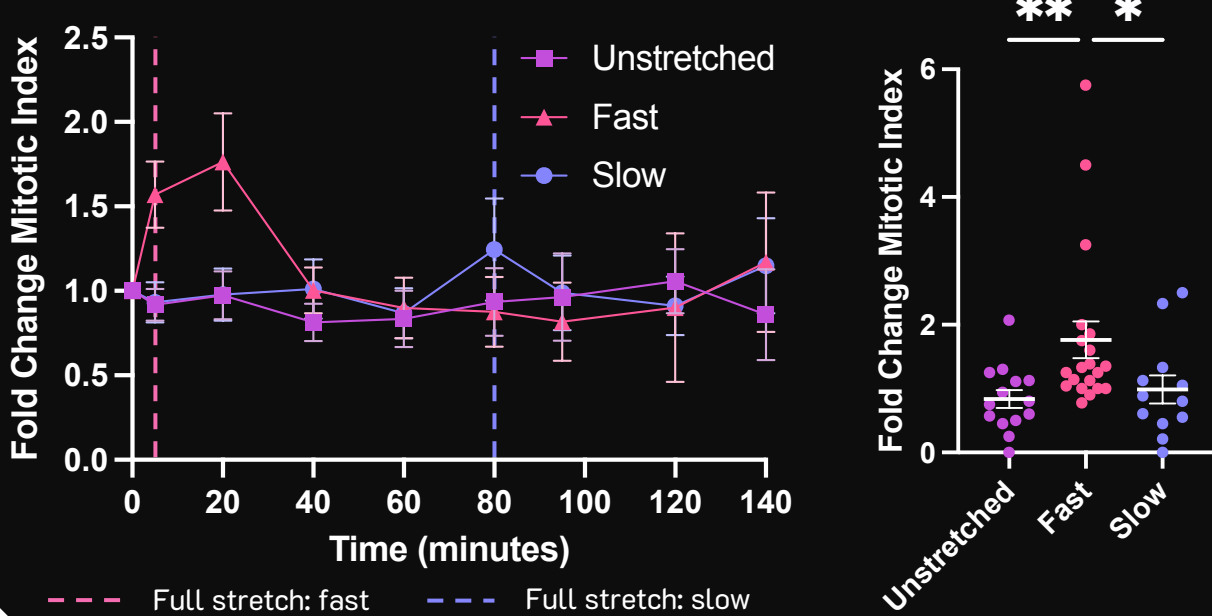
Aims

- How does the speed of stretch affect division rate and orientation?
- How can membrane tension be measured in live tissues?

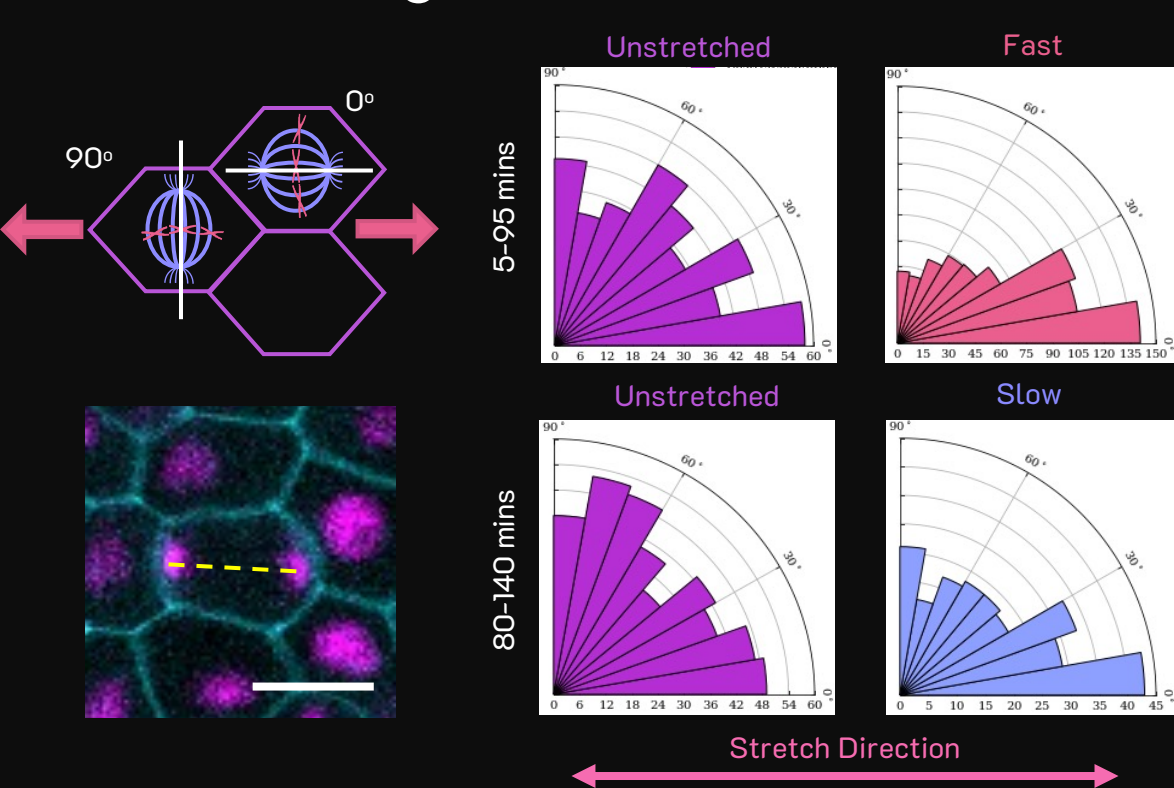
Methods



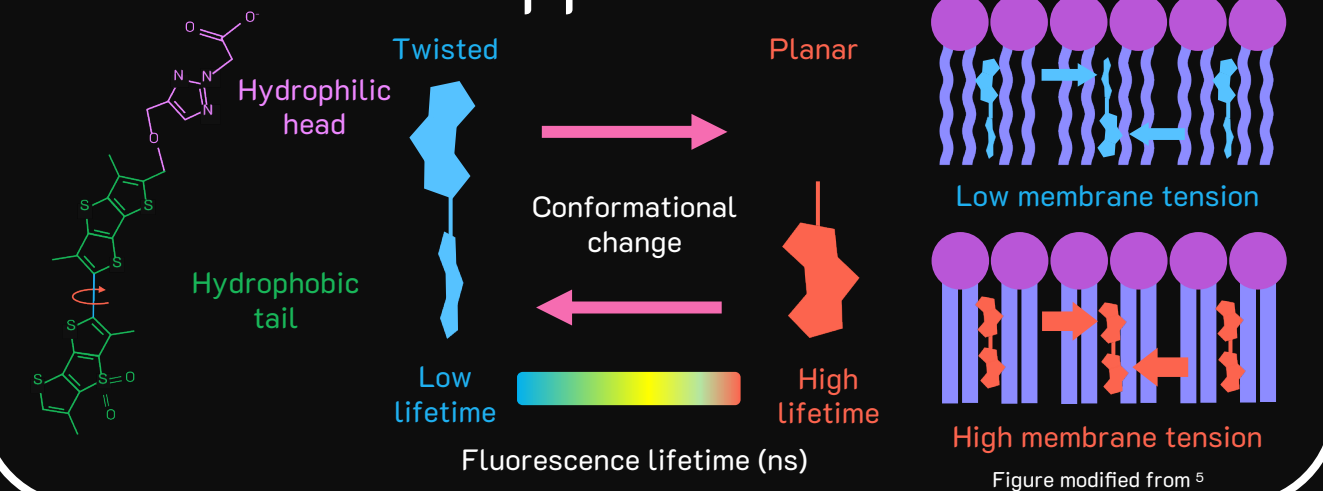
Stretch-induced increase in mitotic entry is influenced by strain rate



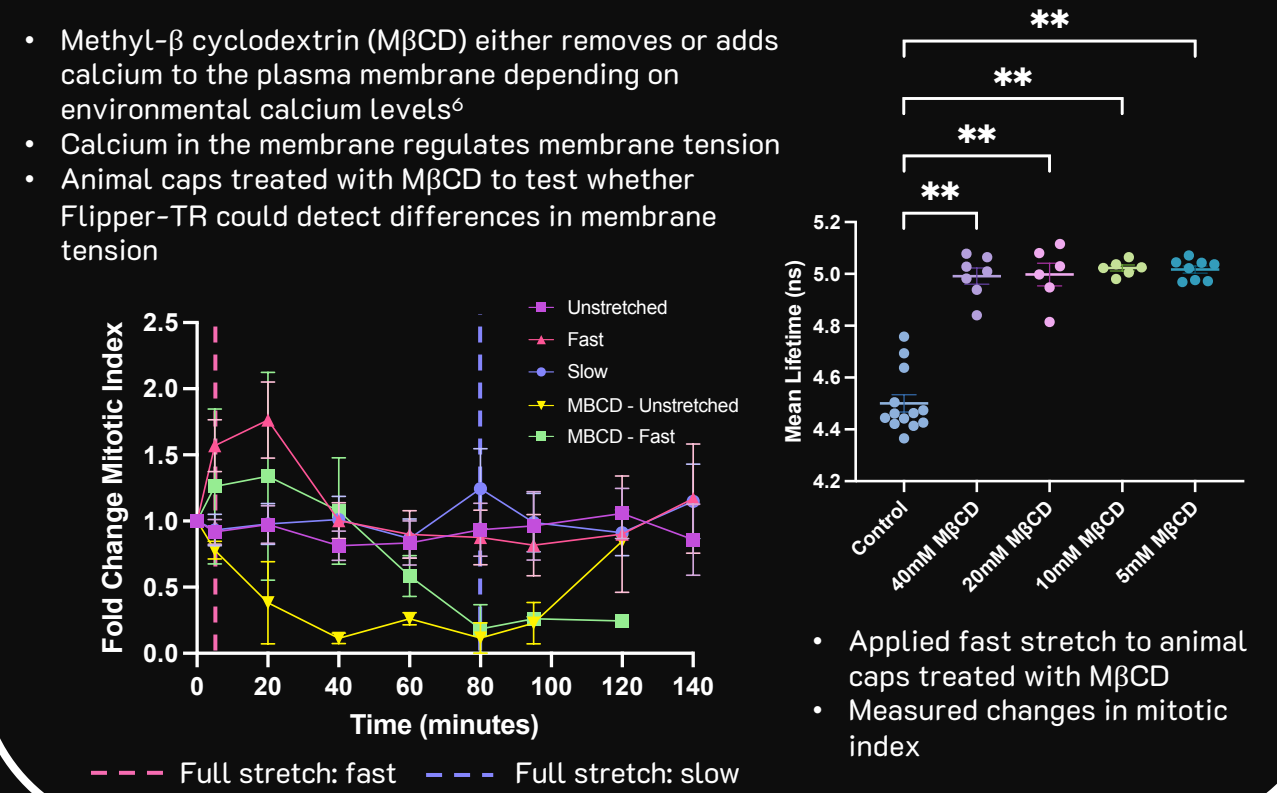
Divisions align with the direction of stretch regardless of strain rate



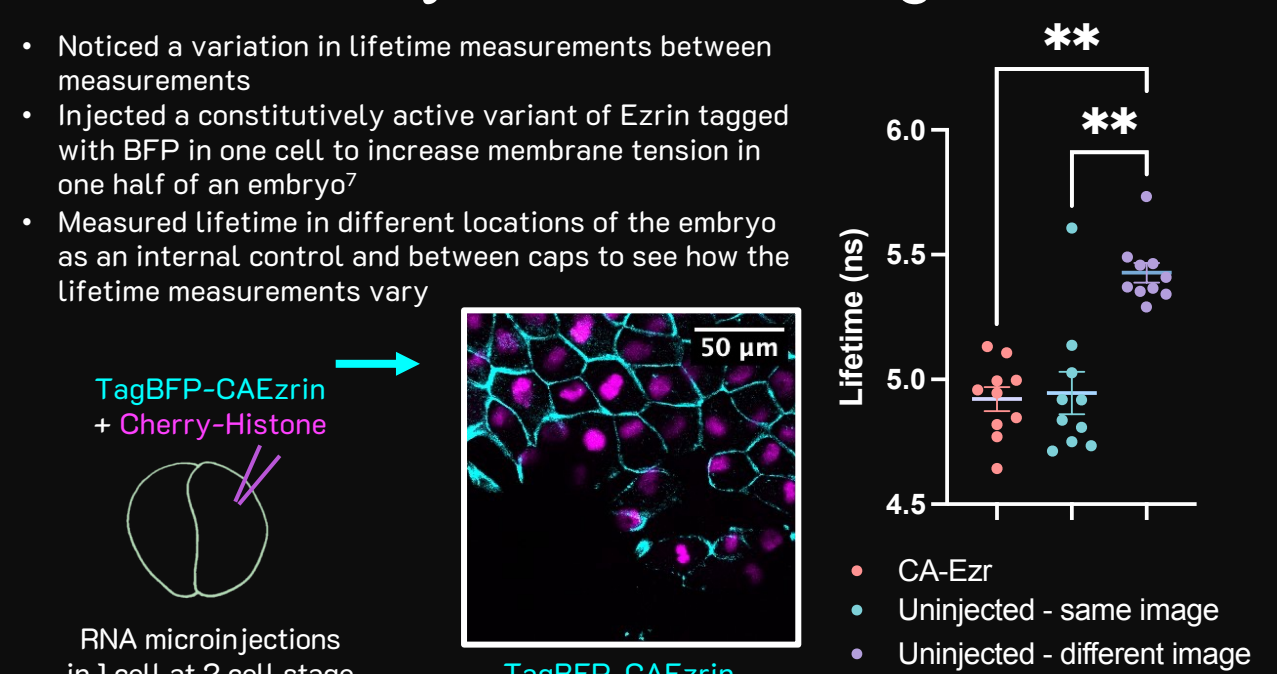
Flipper-TR



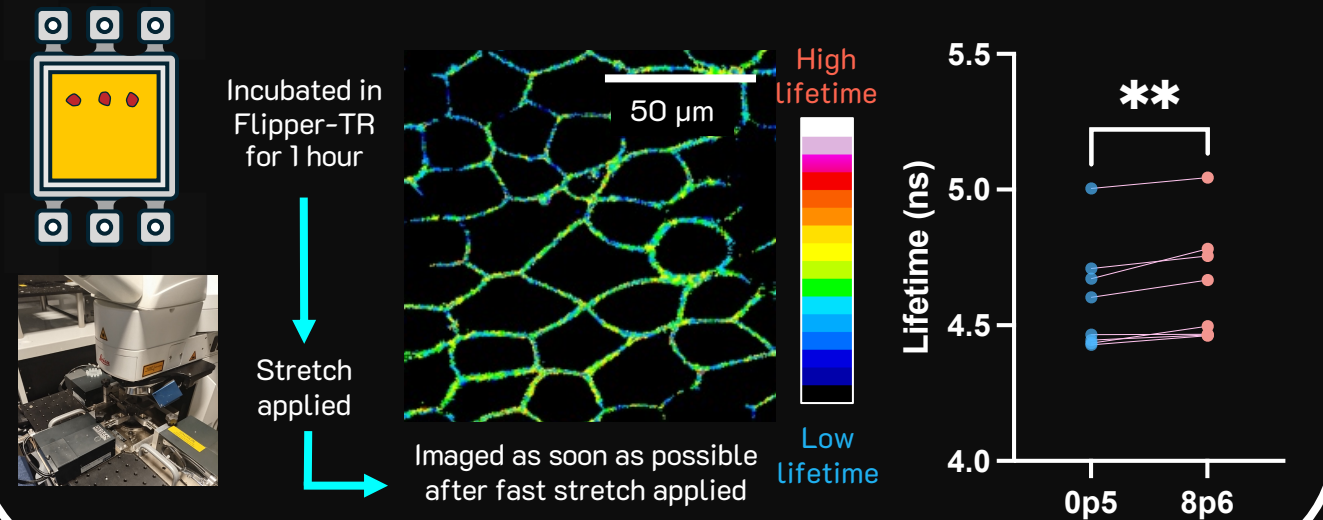
M β CD treatment increases fluorescence lifetime



Flipper-TR lifetime measurements vary between images



Stretch induces a small but significant increase in membrane tension



Conclusions and Future Work

- Strain rate impacts the stretch-induced mitotic response of cells in tissues
- Flipper-TR can indicate plasma membrane changes in epithelia
- Look at how strain rate impacts mitosis in tissues treated with M β CD and CA-Ezrin
- Look for potential molecular mechanisms to explain the strain-rate response

References

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