

Geometry and mechanics in the embryo at the 8-cell stage

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Abstract

During the mitotic process from the 8-cells to the 16-cells stage, the mitotic spindle in the peripheral cell polarizes along the radial direction of the cellular aggregate [1]. We investigate the mechanical cues driving the three-dimensional packing by exploiting the maximization of the contact surface under the constraint of mass (volume) conservation. By enforcing the mechanical balance, we find that the surface tensions on the interfaces separating the peripheral cells are higher than the ones between the peripheral cells and the central one. We suggest that this mechanical cue is key for polarization of the cells, possibly determining the direction selected by the mitotic spindle.

References

- [1] E. Korotkevich, R. Niwayama, A. Courtois, S. Friese and N. Berger, F. Buchholz and T. Hiiragi; *The apical domain is required and sufficient for the first lineage segregation in the mouse embryo*, *Developmental cell*, 40(3): 235 – 247, 2017.