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Repeatable Accumulation and Dispersion of Neural Stem Cells on Integer Topological Defects

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Monolayers of neural stem cells (NSCs) behave like active nematics, i.e. cells align along their long axis creating nematic order and each cell moves along its long axis with stochastic reversal of moving directions. In this study, we induced integer topological defects by micropatterning on the substrate and found that cells accumulate at the core of radial like integer topological defects and that the accumulated cells disperse outward the core upon chemical or physical stimuli. By analyzing dynamics of accumulation and dispersion process, the governing equations of active nematic systems consists of NSCs were clarified. Key parameters of the governing equation were evaluated from the individual dynamics of cells and their interactions. It was found that density profile and its dispersion/accumulation process are well reproduced by the decrease and increase of the extensile parameter during the repetition process of dispersion and re-accumulation.