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Singapore scientists uncover how neural stem cells are activated intrinsically by spindle matrix proteins

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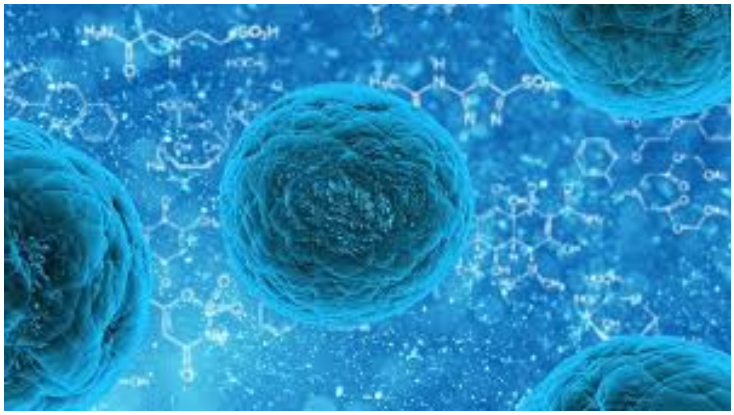
This discovery opens new avenues for research that could potentially lead to therapies for microcephaly, Alzheimer's disease.



Singapore – A multicentre research team led by Duke-NUS Medical School (Duke-NUS)'s Neuroscience and Behavioural Disorders Programme has uncovered that spindle matrix proteins can play an intrinsic role in regulating neural stem cell (NSC) reactivation and proliferation. This discovery is an early important step towards opening up avenues for further research that could lead to potential stem cell-based therapies for neurodevelopmental and neurodegenerative disorders such as microcephaly and Alzheimer's disease.

The study, published in Nature Communications, is a first of its kind conducted on fruit flies (Drosophila melanogaster) that demonstrates a critical role of the spindle matrix complex containing chromator (Chro) functioning as an essential nuclear factor for controlling gene expression during NSC reactivation. The study suggests that Chro plays an important role in maintaining the balance between NSC proliferation and quiescence, as it is not only critical for NSC reactivation (exit from quiescence), but also essential for preventing re-entry into inactivation.

"In this study, we have uncovered that spindle matrix proteins play a novel role in regulating reactivation of neural stem cells. It may be in its early stage, but this should help to open up avenues for further research and the development of potent therapies for neurodevelopmental disorders in the future," said lead author Hongyan Wang, an Associate Professor and Deputy Director of Duke-NUS' Neuroscience and BehaviouralDisorders Programme.

The team employed state-of-art genomic technique for transcriptome analysis in vivo and identified binding-sites of Chro in NSCs. The main findings from these experiments suggest that Chro is a master nuclear factor that reactivates NSCs through regulating gene expression of key transcription factors that either promote or repress the proliferation of NSCs. The study also suggests that Chro functions downstream of Insulin/PI3k pathway, which is known to promote NSC reactivation and mutations of which are found in microcephalic patients.