

DBT/ Institute for Stem Cell Science & Regenerative Medicine (inStem)

Disease modeling in-a-dish

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New Delhi, February 17: Diseases of the brain are a significant medical problem in India with about seven per cent of the population affected with some form of mental illness or other. Mental illness refers to altered behavior in a human being and this usually results from changes in the chemical make-up and electrical activity of cells that make up the human brain.

Diagnosing and treating these disorders is a challenge. There is a pressing need to come up with new ways of managing them. Brain function can be assessed using modern imaging technologies (such as MRI or CT scans). However, unlike other tissues of the human body, it is not possible to obtain a biopsy from a living patient and study the cellular changes in the brain that give rise to mental illness.

Recent advances in stem cell technology can be of some help. They have made it possible to obtain blood samples or a skin biopsy from an individual and generate stem cells. These stem cells can then be converted to brain tissue in the laboratory so that the cellular changes in the brain cells of that individual can be studied. Many advances in disease modeling have resulted from the ability to turn adult cells into embryonic stem cells - induced Pluripotent Stem Cells (iPSC) - in culture and differentiate these into diverse cell lineages.

Building on these advances, inStem NCBS and NIMHANS, funded by DBT and with catalytic support from the Pratiksha Trust, launched a major research program to harness this technology to study the cellular changes that might result in brain disorders in the Indian population.

As part of this effort, one of the teams in this program has developed a method to differentiate a cell type of the brain in culture and use these to study activity. Altered activity of brain cells is a key component of mental illness. This work undertaken in the laboratory of Raghu Padinjat at NCBS, also a lead investigator on the program was recently reported in Sharma, Saha, Joseph et al., *Wellcome Open Res* 2020. The availability of approaches such as these, brings us one step closer to studying brain disorders in the Indian population with its own unique genetic make-up and also explore therapeutic interventions for the treatment mental illness.

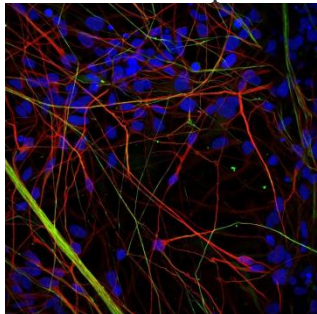


Figure: iPSC differentiated neurons in culture, stained for cellular components (Sharma, Saha, Joseph et al., 2020). Blue- nucleus, Red-neurofilaments, Green Tubulin 3