



PRESS RELEASE (2019/1/10)

Direct reprogramming of microglia into functional neurons by a single transcription factor, NeuroD1

The research group led by Drs. Matsuda and Nakashima from the Graduate School of Medical Sciences, Kyushu University succeeded to convert neurons from mouse microglia by expression of a single transcription factor, NeuroD1.

Disruption of neuronal circuits by lesion such as stroke and spinal cord injury impairs neurotransmission and motor function. Reconstruction of disrupted neuronal circuits by provision of new neurons into lesion sites has been tested as a promising strategy to gain functional recovery from these nerve injuries. The research group focused on microglia which converge and accumulate at lesion sites for the clearance of dead cells as immune cells in the central nervous system after nerve injury, while they never differentiate into neurons physiologically. Here, the research group found that NeuroD1, known as an essential transcription factor for neuronal production in developing brain, converts microglia into induced neuronal (iN) cells accompanied by global remodeling of microglial epigenetic signature. Furthermore, iN cells were functionally integrated into brain circuits through synaptic connections with other neurons like endogenous neurons. These findings bring us one step closer to developing therapeutic strategies for nerve injury and disease by reprogramming microglia that accumulate at lesion sites into neurons.

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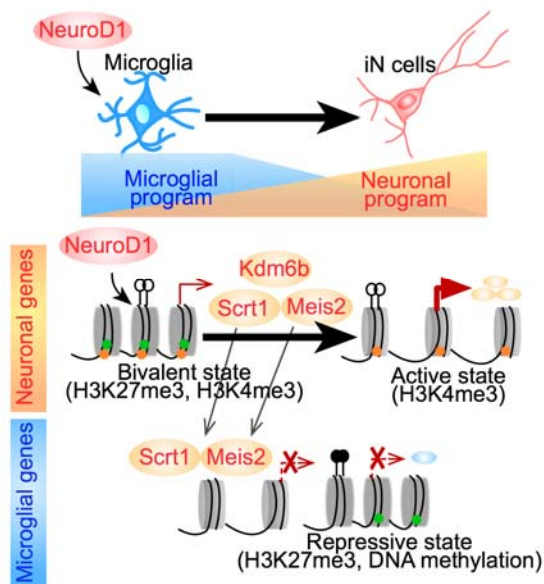


Fig. 1: Schematic representation of this research

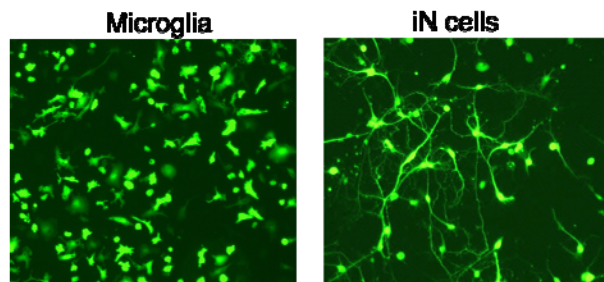
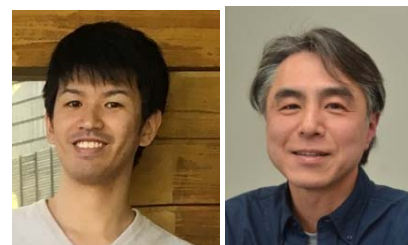


Fig. 2: Microglia (left) and iN cells (right). NeuroD1-transduced microglia exhibit neuronal morphology.



Assistant Professor Matsuda and Professor Nakashima (left)

Comments from authors :

In light of these findings, we want to develop direct conversion-mediated therapeutic strategies for neurological lesions such as stroke and spinal cord injury in the near future.

For more information about this research,

Pioneer factor NeuroD1 rearranges transcriptional and epigenetic profiles to execute microglia-neuron conversion. Taito Matsuda*, Takashi Irie, Shutaro Katsurabayashi#, Yoshinori Hayashi#, Tatsuya Nagai, Nobuhiko Hamazaki, Aliya Mari D Adefuin, Fumihito Miura, Takashi Ito, Hiroshi Kimura, Katsuhiko Shirahige, Tadayuki Takeda, Katsunori Iwasaki, Takuya Imamura and Kinichi Nakashima* (*Correspondence, #Equal contribution)

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