# Assembly of neocortical circuitry by *FoxG1*, a gene associated with neurocognitive disorders

Goichi Miyoshi
NYU Neuroscience Institute, New York University School of Medicine, New York, USA, Goichi.Miyoshi@gmail.com

The mammalian cerebral cortex is composed of a sophisticated neuronal network that processes higher order information such as perception, consciousness and memory. Thus, mutations in genes involved in the specification and migration of neurons as well as the formation of the correct synapses within the six-layered neocortex often lead to neurological diseases.

Recent discoveries of both gain- and loss-of-function mutations in the transcription factor *FoxG1* in patients with neurocognitive disorders strongly suggest that proper *FoxG1* gene dosage is essential for mental health. By taking advantage of mouse genetic strategies, I have revealed that *FoxG1* expression levels change dramatically during the course of embryonic brain development in a manner that is tightly correlated with the differentiation and maturation stage of neurons. I have demonstrated that these dynamic changes in *FoxG1* expression are critical in the determination of the laminar identity of pyramidal neurons. Furthermore, I have found that *FoxG1* is required at distinct developmental stages of GABAergic interneurons that play key inhibitory roles in the neocortical circuit.

These findings provide clarity as to the dose-dependent requirement for *FoxG1* and why even relatively minor changes in its expression during development result in severe neurological impairment.

**References**:

Miyoshi, G., and Fishell, G. (2012). Dynamic FoxG1 Expression Coordinates the Integration of Multipolar Pyramidal Neuron Precursors into the Cortical Plate. Neuron *74*, 1045-1058.