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Evaluation of dopaminergic neurons using lightsheet microscopy

Evaluation of dopaminergic neurons using lightsheet microscopy

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Dopaminergic neurons in the midbrain play important roles in the brain function including learning and memory, reward and movement. Specially, the dopaminergic neurons in substantia nigra compose nigrostriatal tract that is a pathogenic neural circuit in Parkinson's disease (PD). In pre-clinical in vivo research, the precise quantitation of dopaminergic neurons in substantia nigra (SN) is essential to evaluate the defect in PD in vivo models as well as the effect of new treatment on it. However, the calculated number of neuronal fragments in the brain sections using manual counting would be different from the original number of neurons in the tissue. Thus, to make the most reasonable estimation of the total dopaminergic neuron number in SN, unbiased stereology method has been employed. The optical fractionator, one of the most common method to count dopaminergic neurons in SN, uses thick brain sections to estimate the total number of neurons from the number of neurons sampled. Since the sampling process usually takes significant time under the microscope, quenching would be a problem for the specimen labeled with fluorescence. Lightsheet microscopy is 100-1000 times faster than point-scanning methods and could minimize the modification of the original fluorescence signal. Stereological method using lightsheet microscopy would be beneficial for the quantification of dopaminergic neurons labeled with fluorescence

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