

ABSTRACT

Background: Substantia nigra pars compacta (SNpc) is a brain structure in the basal ganglia containing dopaminergic neurons which play a major role in motor control. Loss of dopaminergic neurons in SNpc is one of the major hallmark of Parkinson's disease. Mice models of Parkinson's disease are widely used to study the pathogenesis as well as treatments for this disorder. Accurate method to quantify the total of dopaminergic neurons of SNpc is needed as reference to further research.

Objective: To estimate the total number of dopaminergic neurons in substantia nigra pars compacta of BALB/c mice using physical fractionator method.

Method: A total of 5 BALB/c mice were sacrificed, perfused with fixative and the brains were dissected out. Rostral hippocampus to the anterior aspects of cerebellar-midbrain junction were embedded in paraffin. Serial 3 μ m thick coronal sections from rostral to caudal part of the brain were made. Every 8th sections were stained with Nissl staining. Sections in which the SNpc observed were identified. The number of neuron were counted from 1/16 fraction of the substantia nigra using disectors pairs (disector height 3 μ m) stained with Tyrosine Hydroxylase (TH) immunostaining. The counting unit was the nucleus of the immunopositive cells. Out of 5 brain samples, 4 brain samples were complete, unfolded, and sufficiently immunostained. The total number of neurons, coefficient of error (CE) and coefficient of variance (CV) were calculated.

Result: Number of sampling sections was 5-10 sections for each brains. It was found that the total neuron of SNpc (\pm SEM) of four BALB/c mice was 8351 \pm 274 bilaterally (n=4, range 7700-9030, CE 0.042, CV 0.066), unilateral count of SNpc was 4400 \pm 209 (n=4, range 3920-4802, CE 0.057, CV 0.095) for the left side of the brain and 3952 \pm 247 (n=4, range 3514-4508, CE 0.061, CV 0.042) for the right side of the brain.

Conclusion: Number of total dopaminergic neuron in bilateral SNpc of BALB/c mice was 8351 \pm 274 (n=4, range 7700-9030, CE 0.042, CV 0.066).

Keywords: substantia nigra pars compacta, dopaminergic neuron, stereology, total neuron number, mice model

ABSTRAK

Latar Belakang: Substantia nigra pars compacta (SNpc) adalah struktur otak di ganglia basal yang mengandung neuron dopaminergis yang memainkan peran utama dalam pengendalian motorik. Metode yang akurat untuk estimasi jumlah neuron dopaminergis di SNpc diperlukan sebagai referensi untuk penelitian lebih lanjut.

Tujuan: Memperkirakan jumlah total neuron dopaminergis pada substantia nigra pars compacta mencit BALB/c dengan menggunakan metode fraksionator fisik.

Metode: Sebanyak 4 ekor tikus BALB/c dikorbankan, diperfusi dengan fiksatif dan otaknya dibedah. Bagian rostral hippocampus hingga aspek anterior cerebellum-midbrain junction ditanam pada blok parafin. Blok dipotong koronal secara serial setebal 3 μ m. Setiap potongan ke-8 diwarnai dengan pewarnaan Nissl. Irisan yang mengandung SNpc diidentifikasi. Jumlah neuron kemudian dihitung dari 1/16 fraksi substantia nigra dengan menggunakan pasangan disektor yang diwarnai dengan immunohistokimia Tyrosine Hydroxylase (TH). Unit penghitungan adalah nukleus sel imunopositif. Jumlah total neuron, koefisien error (CE) dan koefisien varian (CV) dihitung.

Hasil: Didapatkan 5-10 potongan untuk masing-masing otak. Jumlah total neuron SNpc (\pm SEM) dari empat tikus BALB/c adalah 8351 ± 274 bilateral ($n = 4$, kisaran 7700-9030, CE 0,042, CV 0,066), jumlah SNpc unilateral adalah 4400 ± 209 ($N = 4$, kisaran 3920-4802, CE 0,057, CV 0,095) untuk sisi kiri otak dan 3952 ± 247 ($n = 4$, kisaran 3514-4508, CE 0,061, CV 0,042) untuk sisi kanan otak.

Kesimpulan: Jumlah neuron dopaminergik total pada SNpc bilateral pada tikus BALB /c adalah 8351 ± 274 ($n = 4$, kisaran 7700-9030, CE 0,042, CV 0,066)

Kata Kunci: substantia nigra pars compacta, neuron dopaminergis, stereologi, jumlah total neuron, model mencit