

The involvement of Spinal Cord in MPTP-induced neurotoxicity: morphological evidence

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Parkinson Disease (PD) is the prototype of synucleinopathies, a group of neurodegenerative disorders characterized by the accumulation of alpha-synuclein (α -syn). The involvement of spinal cord (SC) in PD is described in human autopsies, clinical reports and experimental studies [1]. The neurotoxin MPTP reproduces to a remarkable extent neuropathology of PD [2]. Furthermore, recent studies have shown that MPTP, besides dopaminergic neurons, affects also spinal Motor Neurons (MNs) [3].

To detect the effects of different MPTP treatments on the neuropathology in the SC at different ages and in different animal species.

Following MPTP, neurotoxicity involves the whole thoraco-lumbar spinal cord. A model-dependent variation in the pattern of α -syn immunostaining has been detected. MNs, sympathetic pre-ganglionic neurons and calbindin immunoreactive (IR) cells of lamina VII are mostly affected, whereas TH positive fibers are spared. Alterations in α -syn positive fibers occur in the posterior laminae (I, II and III) and correlate with a significant loss of Met-Enk, SP and calbindin 28 kDa. A-syn accumulates in the affected neurons and in glial cells.

Our results indicate that the SC represents a target of the parkinsonism-inducing neurotoxin MPTP. These data suggest that altered α -syn distribution associates with MPTP-induced neurotoxicity.

References

[1] Vivacqua et al. (2011) *J Chem Neuroanat* 42: 327-340.

[2] Fornai et al. (2005) *Proc Natl Acad Sci USA* 102(9): 3413-3418.

[3] Vivacqua et al. (2012) *J Chem Neuroanat* 44: 76-85.

Key words

Parkinson disease, alpha-synuclein, motor neurons, cholinergic neurons, tyrosine hydroxylase.