

# Rostral intralaminar thalamic deep brain stimulation

Rostral [intralaminar thalamic deep brain stimulation](#) (ILN-DBS) has been shown to enhance attention and cognition through [neuronal activation](#) and [brain plasticity](#).

Tsai et al. examined whether rostral ILN-DBS can also attenuate [memory deficits](#) and impaired synaptic [plasticity](#) and protect the [glutamatergic transmission](#) in the rat intraventricular [Amyloid beta](#) (A $\beta$ ) infusion model of [Alzheimer's disease](#) (AD). Spatial memory was tested in the Morris water maze (MWM), while structural synaptic plasticity and glutamatergic transmission strength were estimated by measuring dendritic spine densities in dye-injected neurons and tissue expression levels of postsynaptic density protein 95 (PSD-95) in medial prefrontal cortex (mPFC) and hippocampus. All these assessments were compared among the naïve control rats, AD rats, and AD rats with ILN-DBS. We found that a single rostral ILN-DBS treatment significantly improved MWM performance and reversed PSD-95 expression reductions in the mPFC and hippocampal region of A $\beta$ -infused rats. In addition, ILN-DBS preserved dendritic spine densities on mPFC and hippocampal pyramidal neurons. In fact, MWM performance, PSD-95 expression levels, and dendritic spine densities did not differ between naïve control and rostral ILN-DBS treatment groups, indicating near complete amelioration of A $\beta$ -induced spatial memory impairments and dendritic regression. These findings suggest that the ILN is critical for modulating glutamatergic transmission, neural plasticity, and spatial memory functions through widespread effects on distributed brain regions. Further, these findings provide a rationale for examining the therapeutic efficacy of ILN-DBS in AD patients <sup>1)</sup>.

<sup>1)</sup>

Tsai ST, Chen SY, Lin SZ, Tseng GF. Rostral intralaminar thalamic deep brain stimulation ameliorates memory deficits and dendritic regression in  $\beta$ -amyloid-infused rats. *Brain Struct Funct*. 2020 Feb 8. doi: 10.1007/s00429-020-02033-6. [Epub ahead of print] PubMed PMID: 32036422.

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