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Degeneration of the Thalamostriatal System: A Potential Source of Early Cognitive Impairments in Parkinson's Disease

The existence of the thalamostriatal projection has long been known, but, until recently, the functional role of this system in normal and diseased conditions remained poorly understood. The main source of the thalamostriatal system is the centromedian/parafascicular (CM/Pf) caudal intralaminar nuclear complex, although other non-CM/Pf nuclei also contribute to this neural system. In addition to their thalamic origin, these thalamostriatal systems differ in their pattern of striatal innervation, synaptic properties, physiologic effects upon striatal neurons activity, glutamate receptors expression and extent of degeneration in Parkinson's disease and other neurodegenerative disorders. Despite direct monosynaptic excitatory connections with striatal projection neurons and interneurons, the effects of CM/Pf activation upon striatal neurons activity in vivo are complex, and likely involve intrastriatal GABAergic networks. Behaviorally, the CM/Pf-striatal system regulates attention-related cognitive processes through regulation of striatal cholinergic interneuron responses to salient stimuli. It has been suggested that the CM/Pf-striatal system plays a key role in behavioral switching and response biases for reward-oriented actions and learning. Because the CM/Pf complex heavily degenerates in Parkinson's disease, this thalamic pathology may contribute to attention-related cognitive deficits frequently seen in PD patients. The CM/Pf complex is also considered as a promising neurosurgical target for Tourette's syndrome, and possibly Parkinson's disease.

Biography

Yoland Smith got his PhD in Neuroscience from Laval University (Quebec, Canada) in 1988. After postdoctoral trainings in Oxford and Johns Hopkins University, he became Assistant professor in the Department of Anatomy at Laval University. Since 1996, he holds a faculty position at the Yerkes Primate Center of Emory University (Atlanta, GA). He has published over 250 manuscripts on the anatomy of the basal ganglia and the pathophysiology of Parkinson's disease. He is editor of prestigious journals in the field of Neuroscience, serve on NIH study sections and sit on the Advisory board of the Dystonia Medical Research Foundation. He is deeply involved in graduate education as principal investigator of various NIH training grants and previous director of the graduate neuroscience program at Emory University.

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