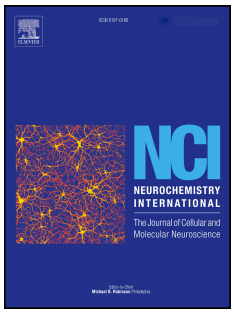
Accepted Manuscript



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PII: S0197-0186(17)30164-X

DOI: 10.1016/j.neuint.2017.07.003

Reference: NCI 4103

To appear in: *Neurochemistry International*

Received Date: 24 March 2017

Revised Date: 4 July 2017

Accepted Date: 10 July 2017

Please cite this article as: Covill-Cooke, C., Howden, J., Birsa, N., Kittler, J., Ubiquitination at the mitochondria in neuronal health and disease, *Neurochemistry International* (2017), doi: 10.1016/j.neuint.2017.07.003.

Ubiquitination at the Mitochondria in Neuronal Health and Disease

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Abstract

The preservation of mitochondrial function is of particular importance in neurons given the high energy requirements of action potential propagation and synaptic transmission. Indeed, disruptions in mitochondrial dynamics and quality control are linked to cellular pathology in neurodegenerative diseases, such as Alzheimer's and Parkinson's disease. Here, we will discuss the role of ubiquitination by the E3 ligases: Parkin, MARCH5 and Mul1, and how they regulate mitochondrial homeostasis. Furthermore, given the role of Parkin and Mul1 in the formation of mitochondria-derived vesicles we give an overview of this area of mitochondrial homeostasis. We highlight how through the activity of these enzymes and MDV formation, multiple facets of mitochondrial biology can be regulated, ensuring the functionality of the mitochondrial network thus preserving neuronal health.

Keywords: Mitochondria; Ubiquitin; Neurodegeneration; E3 ligase; Mitochondria-derived vesicles

Abbreviations: PD: Parkinson's disease, MDV: mitochondria-derived vesicle, DA: dopaminergic, SN: substantia nigra, GWAS: genome-wide association study, OMM: outer mitochondrial membrane, OMMAD: outer mitochondrial membrane protein associated degradation, DUB: deubiquitinase, KO: knockout, ER: endoplasmic reticulum, ALS: amyotrophic lateral sclerosis, MEFs: mouse embryonic fibroblasts, mtDNA: mitochondrially DNA.