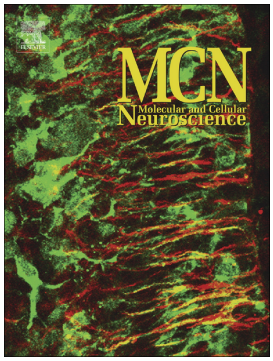

The third wave: Intermediate filaments in the maturing nervous system

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PII: S1044-7431(17)30062-3
DOI: doi: 10.1016/j.mcn.2017.05.010
Reference: YMCNE 3200

To appear in: *Molecular and Cellular Neuroscience*

Received date: 20 February 2017
Revised date: 10 May 2017
Accepted date: 25 May 2017

Please cite this article as: Matthew T.K. Kirkcaldie, Samuel T. Dwyer , The third wave: Intermediate filaments in the maturing nervous system, *Molecular and Cellular Neuroscience* (2017), doi: 10.1016/j.mcn.2017.05.010

The third wave: intermediate filaments in the maturing nervous system

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Abstract

Intermediate filaments are critical for the extreme structural specialisations of neurons, providing integrity in dynamic environments and efficient communication along axons a metre or more in length. As neurons mature, an initial expression of nestin and vimentin gives way to α-internexin and the neurofilament triplet proteins, substituted by peripherin in axons outside the CNS, physically consolidating axons as they elongate and find their targets. Once connection is established, these proteins are transported, assembled, stabilised and modified, structurally transforming axons and dendrites as they acquire their full function. The interaction between these neurons and myelinating glial cells optimises the structure of axons for peak functional efficiency, a property retained across their lifespan. This finely calibrated structural regulation allows the nervous system to maintain timing precision and efficient control across large distances throughout somatic growth and, in maturity, as a plasticity mechanism allowing functional adaptation.

Intermediate filaments (IFs) are cytoskeletal components of all eukaryotes, which in vertebrates and many invertebrates (Lasek et al., 1985; Parry, 2011; Hermann & Strelkov,