SUBCELLULAR LOCALISATION OF TESTIS FORMS OF MAP2 IS A PRODUCT OF COMPETING TARGETING SIGNALS/DOMAINS

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The process by which mitotic spermatogonia develop to form spermatozoa requires fine control of microtubule-based structures. Assembly, stabilization and disassembly of these structures are regulated by a heterogeneous group of proteins known as Microtubule Associated Proteins (MAPs). One of the best characterized MAPs is MAP2, which is found in both brain and testis. Different MAP2 isoforms arise from alternative splicing of the same gene. These have been categorized into high and low molecular weight (HMW and LMW), depending on the presence/absence of an extension arm encoded by exon 9. Exon 10 encodes for a nuclear localization signal (NLS), and in the brain, this exon is found exclusively on HMW isoforms, which localize to the cytoplasm of neurons. In the testis, however, exon 10 can be found on LMW isoforms, which localize within the nucleus of germ cells. Transfection of GFP-tagged MAP2 constructs containing exons 10 and 11 into mammalian cell lines (GC-1, GC-2 and COS-7) reveal that the NLS is capable of localizing the entire protein within the nucleus of transfected cells, and this effect is partially dependent on the presence of the protein's tubulin binding domains. Experiments utilizing an exon 10/11 specific probe to hybridise to MAP2 mRNA in mouse and rat testis sections show that mRNA containing exon 10/11 is present in both 15 day post partum (dpp) and adult testis in spermatogonia and spermatocytes. Expression of exon 10/11 MAP2 mRNAs were not detected at 5dpp, indicating that a switch in mRNA expression occurs sometime in the 5-15dpp interval. The expression pattern of exon 10/11 MAP2 mRNA and the NLS's ability to localize LMW MAP2 protein into the nucleus indicate a novel role for MAP2 in germ cell development.

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