Myelin basic protein

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Myelin basic protein (**MBP**) is a protein believed to be important in the process of myelination of nerves in the nervous system. The myelin sheath is a multi-layered membrane, unique to the nervous system, that functions as an insulator to greatly increase the velocity of axonal impulse conduction.[1] MBP maintains the correct structure of myelin, interacting with the lipids in the myelin membrane.[2][3]

MBP was initially sequenced in 1971 after isolation from myelin membranes.[4] Since that time, knockout mice deficient in MBP that showed decreased amounts of CNS myelination and a progressive disorder characterized by tremors, seizures, and early death have been developed. The human gene for MBP is on chromosome 18;[5] the protein localizes to the CNS and to various cells of the hematopoietic system.

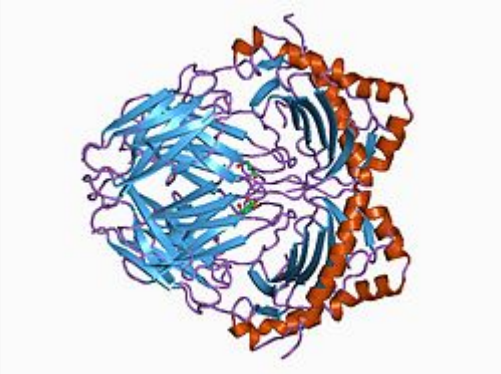
The pool of MBP in the central nervous system is very diverse, with several splice variants being expressed and a large number of post-translational modifications on the protein, which include phosphorylation, methylation, deamidation, and citrullination. These forms differ by the presence or the absence of short (10 to 20 residues) peptides in various internal locations in the sequence. In general, the major form of MBP is a protein of about 18.5 Kd (170 residues).

In melanocytic cell types, MBP gene expression may be regulated by MITF.[6]

Contents [hide]

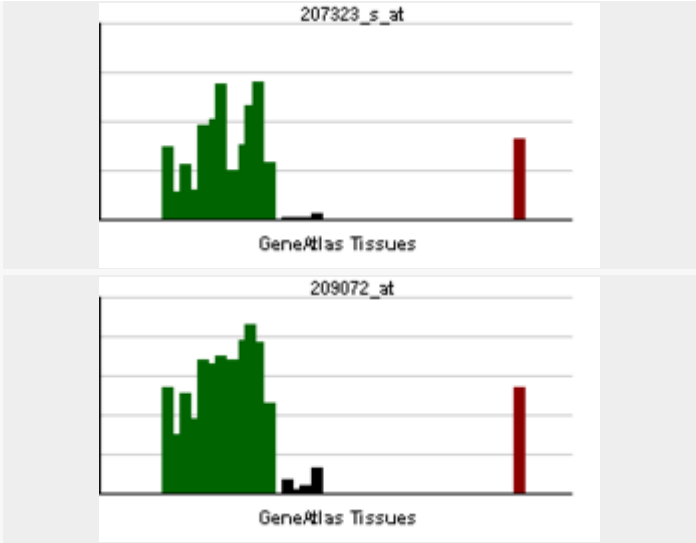
Myelin_MBP	
Identifiers	
Symbol	Myelin_MBP
Pfam	PF01669
InterPro	IPR000548
PROSITE	PDOC00492
SCOP	1bx2
SUPERFAMILY	1bx2
OPM superfamily	464
OPM protein	2lug
Available protein structures:	[show]

Myelin basic protein



Rendering of MBP from PDB 1BX2

Available structures	
PDB	Ortholog search: PDBe, RCSB
	List of PDB id codes [show]
Identifiers	
Symbols	MBP ; MGC99675
External IDs	OMIM: 159430 MGI: 96925 HomoloGene: 1788 GeneCards: MBP Gene
Gene ontology	[show]
RNA expression pattern	



More reference expression data

Orthologs

Species	Human	Mouse
Entrez	4155	17196
Ensembl	ENSG00000197971	ENSMUSG00000041607
UniProt	P02686	P04370
RefSeq (mRNA)	NM_001025081	NM_001025245
RefSeq (protein)	NP_001020252	NP_001020416
Location (UCSC)	Chr 18: 74.69 – 74.85 Mb	Chr 18: 82.48 – 82.59 Mb
PubMed search	[1]	[2]

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Function [edit]

The protein encoded by the classic MBP gene is a major constituent of the myelin sheath of oligodendrocytes and Schwann cells in the nervous system. However, MBP-related transcripts are also present in the bone marrow and the immune system. These mRNAs arise from the long MBP gene (otherwise called "Golli-MBP") that contains 3 additional exons located upstream of the classic MBP exons. Alternative splicing from the Golli and the MBP transcription start sites gives rise to 2 sets of MBP-related transcripts and gene products. The Golli mRNAs contain 3 exons unique to Golli-MBP, spliced in-frame to 1 or more MBP exons. They encode hybrid proteins that have N-terminal Golli aa sequence linked to MBP aa sequence. The second family of transcripts contain only MBP exons and produce the well-characterized myelin basic proteins. This complex gene structure is conserved among species, suggesting that the MBP transcription unit is an integral part of the Golli transcription unit and that this arrangement is important for the function and/or regulation of these genes.[7]

Role in disease [edit]

Interest in MBP has centered on its role in demyelinating diseases, in particular, multiple sclerosis (MS). Several studies have shown a role for antibodies against MBP in the pathogenesis of MS.[8] Some studies have linked a genetic predisposition to MS to the MBP gene, though a majority have not.

Some recent works have shown that inoculating an animal with MBP to generate an immune response against it increases blood–brain barrier permeability.[*citation needed*]

A targeted immune response to MBP has been researched in lethal rabies infection. The inoculation of MBP generates increases the permeability of the blood–brain barrier (BBB), allowing immune cells to enter the brain, the primary site of rabies virus replication. In a study of mice infected with Silver-haired bat rabies virus (SHBRV), the mortality rate of mice treated with MBP improved 20%-30% over the untreated control group. It is significant to note that healthy uninfected mice treated with MBP showed an increase in mortality rate between 0% and 40%.[9]

A "molecular mimicry" hypothesis of multiple sclerosis has been suggested, in which T cells are, in essence, confusing MBP with human herpesvirus-6. Researchers in the United States created a synthetic peptide with a sequence identical to that of an HHV-6 peptide. They were able to show that T cells were activated by this peptide. These activated T cells also recognized and initiated an immune response against a synthetically created peptide sequence that is identical to part of human MBP. During their research, they found that the levels of these cross-reactive T cells are significantly elevated in multiple sclerosis patients.[10]

Interactions [edit]

Myelin basic protein has been shown to interact *in vivo* with Proteolipid protein 1,[11][12] and *in vitro* with Calmodulin, Actin, Tropomyosin, Tubulin, Clathrin, 2',3'-Cyclic-nucleotide 3'-phosphodiesterase and multiple molecules of the Immune system.[13]

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