

Supplemental Table 1A – Accession numbers of MBP, MPZ, PLP1

Species	MBP	MPZ	PLP1
MAMMALS			
Alpaca	None	ENSVPAT00000008432	ENSVPAT00000000075
Armadillo	None	None	ENSDNOT00000017411
Baboon	None	None	None
Bovine	MBBOB+	NP_001072975	P04116
Bushbaby	ENSOGAT00000000456	ENSOGAT00000013747	ENSOGAT00000015082
Canine	XP_533367	XP_545771	P23294
Chimpanzee	P06906	XP_001173975	XP_001141168
Crab eating mac.	eCJ478697	None	BAC20603
Dolphin	ENSTTRT00000003287	ENSTTRP00000008755	ENSTTRT00000003943
Elephant, African	ENSLAFT00000007757	ENSLAFT00000021479	ENSLAFT00000014910
Feline	ENSFCAT00000008683	ENSFCAT00000000498	ENSFCAT00000013526
Gorilla	ENSGGOT00000009629	ENSGGOT00000008047	ENSGGOT00000016566
Guinea Pig	P25188	ENSCPOT00000023250	ENSCPOT00000015829
Hedgehog	None	None	ENSEEUT00000005304
Horse	P83487	ENSECAT00000009424	XP_001493124
Human	AAA59562	NP_000521	NP_000524
Hyrax	ENSPCAT00000011982	ENSPCAT00000014503	ENSPCAT00000012182
Kangaroo rat	ENSDORT00000010278	ENSDORT00000014970	ENSDORT00000006789
Lesser hedgehog	ENSETET00000015980	ENSETET00000015764	ENSETET00000006310
Megabat	ENSPVAT00000008208	ENSPVAT00000005542	ENSPVAT00000014591
Microbat	ENSMLUT00000011150	ENSMLUT00000007740	ENSMLUT00000011049
Mouse lemur	ENSMICT00000004039	ENSMICT00000007309	ENSMICT00000003054
Murine	AAA39496	NP_032649	NP_035253
Opossum, BT	eEC290610	None	None
Opossum, STG	ENSMODT00000015676	ENSMODT00000006336	ENSMODT00000014707
Orangutan, Born.	ENSPPYT00000010798	ENSPPYT00000000726	ENSPPYT00000024015
Orangutan, Sum.	NP_001127091	None	NP_001126498
Ovine	eEE795584	None	None
Pika	ENSOANT00000022363	None	None
Platypus	ENSOANT00000022363	None	ENSOANT00000006721
Porcine	NP_001001546	XP_001925038	CAB51809
Rabbit	P25274	eEB377394, 3EB378738	P47789
Rat	CAA10806	NP_058723	NP_112252
Rhesus macaque	eBQ807515	XP_001118030	XP_001089214
Shrew	None	None	ENSSART00000006859
Sloth	ENSCHOT00000007692	None	None
Squirrel	ENSSTOT00000007039	None	ENSSTOT00000004065
Tarsier	ENSTSYT00000005132	ENSTSYT00000001809	ENSTSYT00000012700
Tree shrew	None	ENSTBET00000008027	ENSTBET00000005959
#	19	19	24

AVES			
Chicken	NP_990611	P37301	NP_990608
Mallard duck	None	None	None
Turkey, wild	None	eEH285837	eEH285764
Zebra finch	ACH45448	None	AAB32825
#	2	2	2
REPTILES			
Anole lizard	eFG784361	ENSACAT00000001455	eFG692205, eFG692349, eFG649528
Jap. four-lined rat snake	eAU312318	None	None
Japanese gecko	AAW51381	None	AAW79015, AY880400
Soft shell turtle	None	None	AAL12850
#	3	1	2
AMPHIBIANS			
African clawed frog	NP_001089351	NP_001091356	P35801
Chinese newt	None	None	AAL12852
Rubber eel	None	None	AAL12851
Salamander	eCN042468	None	None
Western clawed frog	Xentr4_189083	NP_001072741	NP_001027507
#	2	2	2
TELEOSTS			
Channel catfish	eBE212918	eFD157275	None
Japanese Medaka	eBJ710447	ENSORL00000003190	DT981775
Flathead minnow	eDT249557	eDT208407	DT234670
Rainbow trout	eBX078034	AAB34399	eBX874999
Three-spine stickleback	eDW641394	eDN730737	eDT981775
Zebrafish	XP_001340316	CK360078, DT057389	NP_783166
#	5	6	5
ELASMOBRANCHS			
Horn shark	P20952	P20938	None
Little skate	eGD242657	eCV067604	None
Spiny dogfish	Q91439	None	P36963
Pacific electric ray	eEW692506	eEW691411	None
#	2	3	1
AGNATHANS			
Sea lamprey	None	GENSCAN00000126520	None

Supplemental Table 1B – Accession numbers of PMP2, PMP22, STMN1

Species	PMP2	PMP22	STMN1
MAMMALS			
Alpaca	ENSVPAT00000001141	ENSVPAT00000003889	ENSVPAT00000001226
Armadillo	ENSDNOT00000002173	ENSDNOT00000013994	None
Baboon	None	None	eFC161082
Bovine	ENSBTAT00000046521	NP_001094626	ENSBTAT00000018284
Bushbaby	ENSOGAT00000012167	None	ENSOGAT00000002111*
Canine	ENSCAFT00000013434	ENSCAFT00000028432	ENSCAFT00000020202
Chimpanzee	ENSPTRT00000037713	ENSPTRT00000016192	ENSPTRT00000000739
Crab eating mac.	BAE91065	None	eDK580985
Dolphin	ENSTTRT00000006950	ENSTTRT00000003678	ENSTTRT00000012491
Elephant, African	ENSLAFT00000000603	ENSLAFT00000013428	ENSLAFT00000006088*
Feline	ENSFCAT00000005245	None	ENSFCAT00000012801*
Gorilla	None	ENSGGOT00000003166	None
Guinea Pig	None	ENSCPOT00000002173	ENSCPOT00000011177
Hedgehog	ENSEEUT00000004002	ENSEEUT00000002837	ENSEEUT00000009338
Horse	XP_001489476	ENSECAT00000002719	ENSECAT00000023109
Human	NP_002668	NP_000295	NP_005554
Hyrax	ENSPCAT00000008901	None	ENSPCAT00000002461
Kangaroo rat	ENSDORT00000002228	ENSDORT00000008584	ENSDORT00000001797
Lesser hedgehog	ENSETET00000010172	ENSETET00000000152	ENSETET00000007729
Megabat	ENSPVAT00000014291	ENSPVAT00000014482	ENSPVAT00000006344
Microbat	ENSMLUT00000009522	ENSMICT00000001902	ENSMLUT00000010755
Mouse lemur	None	ENSMLUT00000002798	ENSMICT00000010221
Murine	NP_001025476	NP_032911	NP_062615
Opossum, BT	None	eEC375672	None
Opossum, STG	ENSMODT00000008242	ENSMODT00000009880	ENSMODT00000017863
Orangutan, Born.	ENSPPYT00000021816	ENSPPYT00000009363	ENSPPYT00000002026
Orangutan, Sum.	None	eCR764290	eCR854721
Ovine	None	eEE865051	eEE768170
Pika	ENSOPRT00000016926	ENSOPRT00000006270	ENSOPRT00000001342
Platypus	ENSOANT00000012628	None	XP_001514288
Porcine	XP_001927556	eDB804612	eEW495542
Rabbit	NP_001075699	eEB375621	ENSOCUT00000008008
Rat	NP_001102984	NP_058733	NP_058862149
Rhesus macaque	ENSMMUT00000028271	ENSMMUT00000003123	eCB390613
Shrew	ENSSART00000002053	ENSSART00000004903	ENSSART00000011044
Sloth	ENSCHOT00000004812	ENSCHOT00000008082	ENSCHOT00000000883
Squirrel	ENSSTOT00000008528	ENSSTOT00000013019	ENSSTOT00000002885
Tarsier	ENSTSYT00000004596	ENSTSYT00000010143	ENSTSYT00000007307
Tree shrew	None	ENSTBET00000004968	ENSTBET00000011358
#	27	25	28

AVES			
Chicken	XP_418309	None	NP_001026374
Mallard duck	None	CD766027	eDR764207
Turkey, wild	None	ENSTGUT00000005234	eEH293791
Zebra finch	ENSTGUT00000012154	ENSSTOT00000013019	eFE735052
#	2	3	4
REPTILES			
Anole lizard	eFG709926	eFG684496	eFG684496
Japanese gecko	eEB169393	eEB168047	eEB168047
#	2	2	2
AMPHIBIANS			
African clawed frog	NP_001083636	NP_001080285	NP_001080672
Salamander	None	None	eCN046082
Western clawed frog	NP_001107544	NP_001025552	NP_001007972
#	2	2	3
TELEOSTS			
Channel catfish	None	eFD309435	eBM494561
Japanese Medaka	None	eDT121114	eAM321464
Flathead minnow	None	eDK106651	eDT313958
Rainbow trout	None	eCA386240	eBX073275
Three-spine stickleback	None	eDN699299	ENSGACT00000009808
Zebrafish	None	NP_958468	ENS DART00000007906
#	0	6	6
ELASMOBRANCHS			
Little skate	None	None	eFF600814
Spiny dogfish	None	eEW691433	None
Pacific electric ray	None	None	eEW693188
#	0	1	2
AGNATHANS			
Sea lamprey	None	eFD700815	eDW022498

Legend: Accession numbers for vertebrate orthologs of the six genes evaluated in this study are included. Blue lettering is used to indicate incomplete sequences. The proteins are sorted into mammalian, aves, diapsids, amphibians, teleost and cartilaginous fishes and agnathans. Only proteins that identify mouse orthologs as best hits are included and when two teleost fish genes are identified the one closest to the mouse ortholog is included.

Supplemental Table 2– Pair-wise and group comparisons of full-length proteins of species from different vertebrate taxa

Classes	Mammals				Aves		Reptiles		Amphibians		Chondrichthyes		Teleosts			Agn.
Species/Prot	PT	BT	ET	Md ¹	GG	TG	GJ	AC	XL	XT	HF	SA	OM	GA	DR	PM
Human/MBP	97	90	92	86 ²	69	67	63	61	59	63	36	35	29	31	30	--
Mouse/MBP	92	90	90	86 ²	68	65	60	58	58	62	37	35	29	30	29	--
Intra-species	66				94		76		90		79 ³		46			
Human/MPZ	100	93	96	92 ⁴	77	76 ⁵	--	75	58	61	54	50 ⁶	53	51 ⁷	48	32 ⁸
Mouse/MPZ	93	92	96	94 ⁷	77	76 ⁵	--	78	59	63	54	50 ⁶	50	50 ⁷	48	30 ⁸
Intra-species	80				92				92		85		65 ⁹			
Human/PLP1	99	99	93	94 ⁹	94	90	88	86	70	70	--	58	58	58	58	--
Intra-species	83				94		93		96				79			
Human/PMP2	100	92	86	77 ¹⁰	80	77	77	78	59	58	--	--	--	--	--	--
Mouse/PMP2	87	86	84	73 ¹⁰	78	76	74	77	58	58	--	--	--	--	--	--
Intra-species	47.9				93		83		57							
Human/PMP22	100	93	91	83 ¹¹	78	76	76	79	74	78	62 ¹²	--	58	67	51	47
Mouse/PMP22	86	87	83	78 ¹¹	78	78	73	75	74	77	62	--	57	66	48	46
Intraspecies	63				97		78		91				43			
Human STMN1	100	100	100 ¹³	95 ¹⁴	93	93	93	89	79	78	76	82	69	73	74	63
Mouse STMN1	99	99	99 ¹³	95 ¹⁴	91	91	93	87	79	78	75	81	68	72	71	63
Intra-species	85				100				96		91		71			

¹Md – most disparate mammalian sequences (based on identity) compared with mouse are shown.

²Short-tailed gray opossum MBP was most different from mouse MBP.

³To calculate the identities among four shark MBP sequences, exon V (absent from the little skate and Pacific electric ray EST sequences) was removed from horn shark and spiny dogfish MBPs before all were aligned.

⁴Short-tailed gray opossum MPZ was most different from mouse MPZ.

⁵Wild turkey MPZ was used as no zebra finch MPZ was identified.

⁶Pacific electric ray MPZ was used as no spiny dogfish MPZ was identified.

⁷Stickleback MPZ (lacks exon 6) was aligned with exons 1-5 of human and mouse MPZ and only the smaller (lacking exon 6) teleost MPZ molecules were used for the intra-species comparison.

⁸Only the portion of the lamprey MPZ model (1-118, Fig. 5) that overlapped human and mouse MPZ was used.

⁹Besides lesser hedgehog (ET), which is already included, duckbill platypus PLP1 was most different from mouse PLP1.

¹⁰Duckbill platypus PMP2 sequence was most different from mouse.

¹¹Microbat PMP22 sequence was most different from mouse PMP22.

¹²Only a single elasmobranch, Pacific electric ray, PMP22 sequence was identified.

¹³Hedgehog STMN1 was used as no lesser hedgehog STMN1 was found.

¹⁴Squirrel STMN1 was most different from mouse PMP2 STMN1.

Legend: All full-length sequences that we obtained (Supplemental Tables 1A and 1B) were used in this table. The align program from Vector NTI versions 10 and 11 (Methods) was used to conduct the alignments. Values are percent identities between designated pair-wise comparisons and among (intra-specie) mammalian sequences. Background shading depicts

percent identities in the ranges of 90-100%, 80-89%, 70-79% and 60-69%. Abbreviations for species used in pair-wise alignments are based on scientific names: PT (chimpanzee), BT (bovine), ET (lesser hedgehog), GG (chicken), TG (zebra finch), AC (anole lizard), GJ (Japanese gecko), XL (African clawed frog), XT (Western clawed frog), HF (horn shark), SA (spiny dogfish), OM (rainbow trout), GA (three-spined stickleback), DR (zebrafish) and PM (sea lamprey).

Supplemental Table 3 – Distribution of fish ESTs among MBPs

#	Species	Isoform	Size (aa)	Exons Used	EST#	Sample EST
1	Zebrafish	i1	88	I-III-B-IV-VII	40	eBI842453
2	Zebrafish	i1	95	I-III-B-IV-V-VII	51	eDT072480
3	Zebrafish	i1	100	I-III-IV-VII	74	eBM026325
4	Zebrafish	i1	107	I-III-IV-V-VII	90	eBM185687
5	Zebrafish	i1	121	I-III-V-VIA-VII	1	eEB943432
6	Zebrafish	i1	125	I-III-B-IV-VI-VI-VII	1	eCN321167
7	Zebrafish	i1	130	I-III-IV-VI-VII	1	eEB943432
8	Zebrafish	i1	137	I-III-IV-V-VI-VII	2	eEE310986
9	Zebrafish	i2	121	I-III-IV-VI-VII	14, 6*	eEH585066
1	3SStickleback	i1	89	I-III-VII	0	ENSGACT ¹
2	3SStickleback	i1	98	I-III-IV-VII	30	eDW667184
3	3SStickleback	i1	105	I-III-IV-V-VII	3	eDN728055
4	3SStickleback	i1	110	I-III-IV-VI	26	eDN729137
5	3SStickleback	i1	117	I-III-IV-V-VI	17	eDW673630
6	3SStickleback	i1	126	I-III-IV-VI-VII	1	eDT990551
7	3SStickleback	i1	133	I-III-IV-V-VI-VII	14	eDW659603
8	3SStickleback	i2	103	I-III-VI	11	eDW672462
9	3SStickleback	i2	109	I-III-IV-VIB	50	eDW674726
10	3SStickleback	i2	112	I-III-IV-VI	35	eDW677337
11	3SStickleback	i2	113	I-III-VI-VII	23	eDW629894
12	3SStickleback	i2	122	I-III-IV-VIB-VII	60	eDW673311
13	3SStickleback	i2	132	I-III-IV-V-VI-VII	11	eDV001698
1	Japanese medaka	i1	88	I-III-VII	30	eDK007816
2	Japanese medaka	i1	97	I-III-IV-VII	4	eDK032516
3	Japanese medaka	i1	110	I-III-IV-VI	12	eDK136918
4	Japanese medaka	i1	116	I-III-IV-V-VI	2	eDK019076
5	Japanese medaka	i1	125	I-III-IV-VI-VII	1	eBJ704935
6	Japanese medaka	i1	132	I-III-IV-V-VI-VII	3	eBJ710656
7	Japanese medaka	i2	106	I-III-IV-VI	15	eDK019684
8	Japanese medaka	i2	116	I-III-IV-VI-VII	7	eDK018223
9	Japanese medaka	i2	119	I-III-IV-V-VI	28	eAU170757
10	Japanese medaka	i2	129	I-III-IV-V-VI-VII	10	eDK018383
1	Flathead minnow	i1	100	I-III-IV-VII	>100	eDT262403
2	Flathead minnow	i1	107	I-III-IV-V-VII	>100	eDT261883
3	Flathead minnow	i1	118	I-III-B-IV-VI-VII	1	eDT259066
4	Flathead minnow	i1	125	I-III-B-IV-V-VI-VII	2	eDT255738
5	Flathead minnow	i1	130	I-III-IV-VI-VII	2	eDT248986
6	Flathead minnow	i1	137	I-III-IV-V-VI-VII	4	eDT249557
7	Flathead minnow	i2	106	I-III-IV-VI	2	eDT204593
8	Flathead minnow	i2	119	I-III-IV-VI-VII	2, 1*	eDT248459

¹ A single 89 amino acid long stickleback MBP entry (ENSGACT00000003314), having no matching ESTs was obtained from Ensembl.

Legend: Sequences were almost entirely from the NCBI EST database and sample entries are designated with a small e in front to indicate that the accession number is an EST. Numbers of hits with matching sequence (includes hits with 12 sequencing errors) were identified. Sizes of translated products are indicated by the numbers of amino acids (aa). In some cases the ESTs covered only a portion of the sequence and was included only if there was enough sequence to determine which they represented (*).

Supplemental Table 4 – Accession numbers of orthologs and paralogs of genes encoding compact myelin proteins in invertebrate genomes

Gene	Species							
	Lancelet	Sea squirt	Sea urchin	Owl limpet	Polychaete worm	Fruit fly	Roundworm	Sea anemone
PLP1	EEA46102	298915	XP_799989	165539	228771	AAF71284	XP_001902103 ¹	--
PLP1-PFAM	14-249/250	2-234/259	3-270/300	3-242/262	2-219/237	3-232/248	275	--
PMP2	75082	298288	14303	150380	21682	NP_00102780	14426	--
Paralog	RBP2	FABP5	FABP5	FABP5	FABP3	FABP7	FABP4	--
PMP2-PFAM	7-133/134	6-136/136	5-134	9-138/138	6-135/135	4-130		--
STMN1	eBW736488	SINCSAVESTT00000003297	04713	118291	eEY544474	eFE195452	--	eFC263895
STMN1-PFAM	7-145/148	8-149/161	3-137/147	1-132/140	1-134/140	5-142/144	--	13-144/153

¹Roundworm (*Brugia malaya*) sequence was used as no *Caenorhabditis elegans* sequence was identified.

Legend: Proteins related to PLP1, PMP2 and STMN1 were either identified through BLASTP and TBLASTN searches of available databases (Methods). The PFAM domains for PLP1, PMP2 and STMN1 are myelin_PLP, lipocalin and stathmin, respectively (Table 2). The closest sea squirt hit to STMN1 was from *Ciona Savignyi* (Ensembl). Dashes indicate absence of invertebrate homologs.