

# Thymosin $\beta$ 4 has tumor suppressive effects and its decreased expression results in poor prognosis and decreased survival in multiple myeloma

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**Online Supplementary Table S1.** Clinical data for patients undergoing high-dose chemotherapy and autologous stem cell transplantation. Clinical patient data for age, serum- $\beta$ 2-microglobulin, and plasma cell infiltration in the Heidelberg/Montpellier-group 1 (HM1) and -2 (HM2). Median value and range are given. NA, not available; ISS, International Staging System.

	Analysis	Details		n	Total
Gene expression profiling of T $\beta$ 4					
Myeloma samples	HM1	U133A+B	MMC	65	298
	HM2	U133 Plus 2.0	MMC	233	
Healthy donors and MGUS patients	HM1	U133A+B	BMPC	7	
			MGUS	7	
	HM2	U133 Plus 2.0	BMPC	7	
			MGUS	16	
Data available for survival studies after HDM					
MMC	HM1	U133A+B	48	161	209
	HM2	U133 Plus 2.0			

Online supplementary Table S2. Supervised gene analysis resulted in identification of differently expressed genes in myeloma cells from  $T\beta 4^{high}$  and  $T\beta 4^{low}$  patients from the validation group. After identification of the biological function of the gene, these were grouped into different classes.

Function	ID	Gene name	Function	ID	Gene name
APOPTOSIS	201302_at	Annexin A4 (Annexin IV)	ION TRANSPORT	217992_s_at	EF-hand domain family, member D2
	221666_s_at	apoptosis-associated speck-like protein containing a CARD		218474_s_at	potassium channel tetramerisation domain
	221478_at	BCL2/adenovirus E1B 19kDa interacting protein 3-like		212188_at	Potassium channel tetramerisation domain-containing protein 12 (Plelin)
	205681_at	Bcl-2-related protein A1		221584_s_at	potassium large conductance calcium-activated channel
	227143_s_at	BH3-interacting domain death agonist (BID)		227647_at	Potassium voltage-gated channel solute carrier family 12 (potassium/chloride transporters), member 6
	226032_at	Caspase-2 precursor		220740_s_at	solute carrier family 2 (facilitated glucose transporter), member 3
	204025_s_at	programmed cell death 2		202499_s_at	solute carrier family 7 (cationic amino acid transporter, y+ system),
CYTOSKELETON	201288_at	Rho GDP dissociation inhibitor (GDI) beta	212290_at	Solute carrier organic anion transporter family member 2B1	
	211983_x_at	actin, gamma 1	203473_at		
	212363_x_at	Actin-like protein	LIPID METABOLISM	200832_s_at	Acyl-CoA desaturase
	208736_at	Actin-related protein 2/3 complex subunit 3 (ARP2/3 complex 21 kDa subunit)		204416_x_at	apolipoprotein C-I
	215051_x_at	Allograft inflammatory factor 1 (AIF-1)		203382_s_at	apolipoprotein E
	208636_at	Alpha-actinin-1 (Alpha-actinin cytoskeletal isoform)		220753_s_at	crystallin, lambda 1
	200720_s_at	ARP1 actin-related protein 1 homolog A		1552398_s_at	C-type lectin domain family 12, member A CLL-1
	202391_at	Brain acid soluble protein 1 (BASP1 protein) capping protein (actin filament) muscle Z-line, beta		202345_s_at	Fatty acid-binding protein, epidermal (E-FABP)
	37012_at	Coactosin-like protein.		202854_at	hypoxanthine phosphoribosyltransferase 1
	224583_at	cytoskeleton-associated protein 4		201847_at	lipase A, lysosomal acid, cholesterol esterase
	200998_s_at	Eras/vasodilator stimulated phosphoprotein-like FYVE, RhoGEF and PH domain-containing protein 3		201963_at	Long-chain-fatty-acid-CoA ligase 1
	217838_s_at			201037_at	phosphofructokinase, platelet
	227811_at		206214_at	phospholipase A2, group VII	
	208868_s_at	GABA(A) receptor-associated protein like 1	211569_s_at	Short chain 3-hydroxyacyl-CoA dehydrogenase, mitochondrial precursor	
	201850_at	Macrophage capping protein (Actin-regulatory protein CAP-G)	MEMBRANE RECEPTOR	205098_at	C-C chemokine receptor type 1 (C-C CKR-1)
	213733_at	myosin IF		228771_at	Adrenergic, beta, receptor kinase 2 (CD183 antigen) (Hemoglobin scavenger receptor)
	209118_s_at	Tubulin alpha-3 chain (Alpha-tubulin 3) (Tubulin B-alpha-1)		203645_s_at	C5a anaphylatoxin chemotactic receptor
230690_at	Tubulin, beta 1	220088_at		CD163 antigen (Hemoglobin scavenger receptor)	
1555938_x_at	vimentin	215049_x_at		CD36 molecule (thrombospondin receptor)	
IMMUNOGLOBULIN	209312_x_at	HLA class II histocompatibility antigen HLA class II histocompatibility antigen, DM alpha chain precursor		209555_s_at	CD5 antigen-like (scavenger receptor cysteine rich family)
	219666_at	HLA class II histocompatibility antigen, DP alpha chain precursor (HLA-SB alpha chain)		206680_at	CD99 antigen precursor (T-cell surface glycoprotein E2)
	211990_at	HLA class II histocompatibility antigen, DP(W4) beta chain precursor		201029_s_at	complement component 1, q subcomponent, receptor 1
	201137_s_at	HLA class II histocompatibility antigen, DQ(S) alpha chain precursor (DC-1 alpha chain)		202878_s_at	Hepatitis A virus cellular receptor 2 precursor
	213831_at	HLA class II histocompatibility antigen, DOB1*0602 beta chain precursor		235458_at	High affinity immunoglobulin epsilon receptor gamma-subunit precursor
	212998_x_at	HLA class II histocompatibility antigen, DR-1 beta chain precursor	204232_at	Integral membrane protein 2B (Transmembrane protein BRI)	
	204670_x_at	HLA class II histocompatibility antigen, DRB1-9 beta chain precursor	217732_s_at	Integrin alpha-M precursor (Cell surface glycoprotein MAC-1 alpha subunit)	
	215193_x_at	HLA class II histocompatibility antigen, DRB1*9) beta chain precursor (MHC class I antigen DRB1*9)	205786_s_at	Integrin beta-2 precursor (Cell surface adhesion glycoproteins LFA- 1/CR3/p150,95 subunit beta)	
	228518_at	Ig alpha-1 chain C region	202803_s_at	Leukocyte immunoglobulin-like receptor subfamily B member 2 precursor	
	211634_x_at	IGHV1-69 protein	210148_x_at	leukocyte immunoglobulin-like receptor, subfamily A (with TM domain), member 2	
	211640_x_at	immunoglobulin heavy constant mu	207857_at	Prostaglandin E2 receptor, EP4 subtype	
	216853_x_at	immunoglobulin lambda joining 3	204897_at	purinergic receptor P2Y, G-protein coupled,	
	206420_at	immunoglobulin superfamily, member 6	220005_at		
	204007_at	Low affinity immunoglobulin gamma Fc region receptor 3I-B precursor	211796_s_at	T cell receptor beta locus	
	203932_at	major histocompatibility complex, class II, DM beta	229560_at	Toll-like receptor 8 precursor	
	213537_at	Major histocompatibility complex, class II, DP alpha 1	203868_s_at	Vascular cell adhesion protein 1 precursor (V-CAM 1) (CD106 antigen)	
	212999_x_at	major histocompatibility complex, class II, DQ beta 1	223376_s_at	Brain protein I3 (pRGR2).	
	210982_s_at	major histocompatibility complex, class II, DR alpha precursor	212681_at	erythrocyte membrane protein band 4.1-like 3	
	206306_x_at	major histocompatibility complex, class II, DR beta 4 DAMC-146E17.2	219574_at	membrane-associated ring finger (C3HC4) 1 DKFZp564M1682	
	221491_x_at	major histocompatibility complex, class II, DR beta 5	219607_s_at	Membrane-spanning 4-domains subfamily A member 4A (Four-span transmembrane protein 1)	
	217362_x_at	major histocompatibility complex, class II, DR beta 6 (pseudogene)	230550_at	Membrane-spanning 4-domains subfamily A member 6A (Four-span transmembrane protein 3) (CD20 antigen-like 3)	
	1552280_at	T-cell immunoglobulin and mucin domain-containing protein 4 precursor	223343_at	Membrane-spanning 4-domains subfamily A member 7	
	204787_at	V-set and immunoglobulin domain-containing protein 4 precursor (Z39g protein)	223344_s_at	Membrane-spanning 4-domains subfamily A member 7	
		201743_at	Monocyte differentiation antigen CD14 precursor		
		226818_at	MPS1 protein (Fragment), Myeloid-associated differentiation marker (SB135)		
		225673_at	225673_at		
		212646_at	raftlin, lipid raft linker 1		
		213716_s_at	Secreted and transmembrane protein 1 precursor (Protein K12).		
		203227_s_at	Tetraspanin-31		
		214168_s_at	tight junction protein 1 (zona occludens 1)		
		226050_at	Transmembrane and coiled-coil domains 3		
		223482_at	transmembrane protein induced by tumor necrosis factor alpha		

Function	ID	Gene name	Function	ID	Gene name	
TRANSCRIPTION FACTOR	31845_at	E74-like factor 4 (ets domain transcription factor)	PROLIFERATION	201938_at	CDK2-associated protein 1	
	201018_at	Eukaryotic translation initiation factor 1A,		1553113_s_at	Cell division protein kinase B	
	228737_at	Granulosa cell HMG box protein 1 (GCX-1).		221427_s_at	cyclin L2	
	204057_at	Interferon regulatory factor 8 (IRF-8)		202246_s_at	cyclin-dependent kinase 4	
	222438_at	Mediator complex subunit 4		241985_at	junction-mediating and regulatory protein	
	212761_at	Transcription factor 7-like 2 (HMG box transcription factor 4)		216237_s_at	MCM5 minichromosome maintenance deficient 5	
	212762_s_at	Transcription factor 7-like 2 (HMG box transcription factor 4)		218318_s_at	nemo-like kinase	
	222670_s_at	Transcription factor Matf8		223330_s_at	SGT1, suppressor of G2 allele of SKP1 CD81 antigen (26 kDa cell surface protein TAPA-1) (Target of the antiproliferative antibody 1) (Tetraspanin-28)	
	213400_s_at	transducin (beta)-like 1X-linked		200675_at	Replication factor C subunit 3	
	224718_at	YY1 transcription factor DELTA Ectonucleoside triphosphate diphosphohydrolase 1		204127_at	thymidine kinase 2, mitochondrial	
	209473_at			204276_at		
	202144_s_at	adenylosuccinate lyase		PROTEIN TRANSFERASE	225733_at	betaGal beta 1,3-galactosyltransferase polypeptide 6
	203575_at	casein kinase 2		227075_at	elongation protein 3 homolog	
	200762_at	Dihydropyrimidinase-related protein 2 (DRP-2) (Collapsin response mediator protein 2)		206892_at	fucosyltransferase 4 (alpha (1,3) fucosyltransferase, myeloid-specific)	
	225348_at	FUS-interacting serine-arginine-rich protein 1		235615_at	Geranylgeranyl transferase type-1 subunit beta UDP-glucose glycoprotein glucosyltransferase 2 precursor	
204112_s_at	Histamine N-methyltransferase	235749_at				
203401_at	Ribose-phosphate pyrophosphokinase II	PROTEOLYSIS	218387_s_at	5-phosphogluconolactonase		
225091_at	Zinc finger CCHC domain-containing protein 3	210873_x_at	apolipoprotein B mRNA editing enzyme, catalytic polypeptide-like 3A type 1 tumor necrosis factor receptor shedding aminopeptidase regulator			
DNA/RNA BINDING	205039_s_at	DNA-binding protein Ikaros	210385_s_at	catechol-O-methyltransferase		
	205436_s_at	H2A histone family, member X	208817_at	cathepsin B		
	239041_at	Histone H2A type 1 (H2A.1).	213274_s_at	cathepsin B precursor		
	41220_at	MLL septin-like fusion	227961_at	cathepsin C		
	228528_at	mmu-mi-29c	201487_at	cathepsin H precursor		
	212604_at	mitochondrial ribosomal protein S31	202295_s_at	kynureninase		
	224874_at	DNA-directed RNA polymerase I subunit D	217388_s_at	Legumain precursor (EC 3.4.22.34) (Asparaginyl endopeptidase)		
	212636_at	Quaking protein (Hqk), cytoplasmic polyadenylation element binding protein 2 isoform A	201212_at	mesoderm specific transcript isoform a		
	235479_at		202016_at	phosphoserine phosphatase		
	202556_s_at	Microspherule protein 1	205194_at	40S ribosomal protein S15a.		
NUCLEUS	231764_at	chromatin accessibility complex 1 CHARC1,	PROTEIN METABOLISM	235309_at	60S ribosomal protein L32	
	222504_s_at	COX4 neighbor C16orf4	225520_at	Alkaline phosphatase		
	222396_at	Hematologic and neurological expressed 1 protein	222688_at	Amyloid-like protein 2 precursor		
	211953_s_at	karyopherin (importin) beta 3	208248_x_at	biliverdin reductase A		
	1556321_s_at	Mesoderm development candidate 1	200773_x_at	DCP2 decapping enzyme homolog		
	202679_at	Niemann-Pick C1 protein precursor.	212919_at	Dipeptidyl-peptidase 1 precursor		
	225047_at	nucleoporin like 1	225646_at	dTDP-D-glucose 4,6-dehydrogenase		
	225470_at	Nucleoporin NUP53 (Nuclear pore complex protein Nup53)	208249_s_at	E3 ubiquitin-protein ligase HECTD1		
	235384_at	Nudix (nucleoside diphosphate linked moiety X)-type motif 19	241955_at	glucosamine (N-acetyl)-6-sulfatase (Sanfilippo disease IID)		
	216248_s_at	Orphan nuclear receptor NR4A2 (Orphan nuclear receptor NURR1)	212334_at	GTP cyclohydrolase I		
	218589_at	RB intron encoded G-protein coupled receptor	204234_s_at	hexokinase 1		
	219056_at	ribonuclease H2	200697_at	hexokinase 3 (white cell)		
	221827_at	RanBP-type and C3HC4-type zinc finger containing 1	205936_s_at	latent transforming growth factor beta binding protein 3		
			219922_s_at	Lysozyme C precursor		
			213975_s_at	malate dehydrogenase 2, NAD (mitochondrial)		
		213333_at	Peptidyl-prolyl cis-trans isomerase A			
		226336_at	presenilin 1 (Alzheimer disease 3)			
		203460_s_at	proteasome (prosome, macropain) subunit			
		202659_at	proteasome maturation protein C13orf12			
		222402_at	protein phosphatase 1, regulatory (inhibitor) subunit 3B			
		222662_at	Protein tyrosine phosphatase-like A domain containing 2			
		244050_at	Receptor-type tyrosine-protein phosphatase epsilon precursor			
		221840_at	serine (or cysteine) proteinase inhibitor,			
		211429_s_at	serine/threonine kinase 24			
		208854_s_at	ubiquitin carboxyl-terminal esterase L3 (ubiquitin thioesterase)			
		204616_at	Ubiquitin carboxyl-terminal hydrolase 3			
		226652_at	Ubiquitin domain-containing protein 2			
		224827_at	ubiquitin protein ligase			
		212403_at	ubiquitin-conjugating enzyme E2i (UBC9 homolog, yeast)			
		206760_at	UDP-GlcNAc 6-epimerase			
		222870_s_at	UDP-GlcNAc 6-epimerase			
		202437_s_at	Cytochrome P450 1B1			

Function	ID	Gene name	Function	ID	Gene name	
FUNCTIONAL PROTEIN	1729_at	collagen, type V, alpha 2	SIGNAL TRANSDUCTION	219889_at	Proto-oncogene FRAT1	
	205237_at	Ficolin-1 precursor (Collagen/fibrinogen domain-containing protein 1)		44120_at	AarF domain containing kinase 2	
	205239_at	Amphiregulin precursor (AR)		202686_s_at	AXL receptor tyrosine kinase	
	212588_at	Leukocyte common antigen precursor		200623_s_at	calmodulin 3 (phosphorylase kinase, delta)	
	212587_s_at	Leukocyte common antigen precursor		205419_at	EBV-induced G-protein coupled receptor 2	
	218718_at	platelet-derived growth factor C precursor		207691_x_at	Ectonucleoside triphosphate diphosphohydrolase 1	
	46665_at	Semaphorin-4C precursor		200393_s_at	eukaryotic translation initiation factor 4E-like 3	
	200665_s_at	SPARC precursor (Secreted protein acidic and rich in cysteine) (Osteonectin)		215000_s_at	fasciculation and elongation protein zeta 2 (zygin II)	
	210314_x_at	tumor necrosis factor (ligand) superfamily, member 13		211795_s_at	FYN binding protein (FYN-120/130)	
	223501_at	Tumor necrosis factor ligand superfamily member 13B (TNF- and APOL- related leukocyte expressed ligand 1)		227266_s_at	FYN-binding protein (FYN-T-binding protein)	
	203508_at	Tumor necrosis factor receptor superfamily member 1B precursor		214467_at	G protein-coupled receptor 65	
	221731_x_at	Vesican core protein precursor		219571_s_at	GIOT-3 for gonadotropin inducible transcription repressor-3	
	204620_s_at	Vesican core protein precursor (Large fibroblast proteoglycan)		232024_at	GTPase, IMAP family member 1 (Immunity-associated protein 1)	
	218232_at	Complement C1q subcomponent subunit A precursor		228071_at	GTPase, IMAP family member 7 (Immunity-associated nucleotide 7 protein)	
	202953_at	Complement C1q subcomponent subunit B precursor		235306_at	GTPase, IMAP family member 8	
	205382_s_at	Complement factor D precursor		206018_s_at	hemopoietic cell kinase	
	214146_s_at	(Leukocyte-derived growth factor) (LDGF)		203710_at	inositol 1,4,5-trisphosphate receptor	
	32128_at	(Macrophage-derived growth factor) (MDGF)		203332_s_at	inositol polyphosphate-5-phosphatase	
	223047_at	chemokine (C-C motif) ligand 18		226757_at	Interferon-induced protein with tetratricopeptide repeats 2	
	214038_at	CKLF-like MARVEL transmembrane domain-containing protein 6 (Chemokine-like factor superfamily member 6)		227678_at	Ku70-binding protein 3	
	206390_x_at	Monocyte chemoattractant protein 2		203320_at	lymphocyte adaptor protein	
	218454_at	platelet factor 4 (chemokine (C-X-C motif) ligand 4) CXCL4		225897_at	Myristoylated alanine-rich C-kinase substrate (MARCKS) Protein kinase C substrate	
	PROTEIN BINDING	217757_at		Laminin A	203269_at	neutral sphingomyelinase (N-SMase) activation associated factor
		212993_at		alpha-2-macroglobulin	203879_at	phosphoinositide-3-kinase
		210792_x_at		BTB (POZ) domain containing 14A	232149_s_at	Protein FAN (Factor associated with N-SMase activation)
		212180_s_at		C027-binding (Siva) protein	206438_s_at	Proto-oncogene tyrosine-protein kinase FGR
		218435_at		component of oligomeric golgi complex 4	210105_s_at	Proto-oncogene tyrosine-protein kinase Fyn
		200699_at		DNAJ domain-containing	227983_at	Rab interacting lysosomal protein-like 2
		214211_at		ER lumen protein retaining receptor 2	227167_s_at	Ras association domain-containing protein 3
		212509_s_at		Ferritin heavy chain	225585_at	Ras-related protein Rap-2a (RbBP-30)
		53968_at		FK506 binding protein 12-rapamycin associated protein 1	212590_at	Ras-related protein R-Ras2 (Ras-like protein TC21)
		1555476_at		integrator complex subunit 5	204319_s_at	Regulator of G-protein signaling 10 (RGS10)
		204249_s_at		iron-responsive element binding protein 2 ACO3	223809_at	Regulator of G-protein signaling 18 (RGS18)
		201720_s_at		LIM domain only 2 (rhombotin-like 1)	229590_at	Ribosomal protein L13
		214084_x_at		Lysosomal-associated multitransmembrane protein	219303_at	ring finger protein 219
		204285_s_at		neutrophil cytosolic factor 1	224947_at	Ring finger protein 26
		228521_s_at		Phorbol-12-myristate-13-acetate-induced protein 1 (PMA-induced protein 1)	235529_x_at	SAM domain and HD domain-containing protein
		212561_at		RAB4B, member RAS oncogene family	243213_at	Signal transducer and activator of transcription 3
		223044_at		RAB6 interacting protein 1	201331_s_at	signal transducer and activator of transcription 6, interleukin-4 induced
201463_s_at		Solute carrier family 40 member 1 (Ferroportin-1) (Iron-regulated transporter 1)	1568627_at	SMEK homolog 2, suppressor of mek1		
225483_at		transaldolase 1	218404_at	Sorting nexin-10		
212501_at		Vacuolar protein sorting 26 homolog	212321_at	sphingosine-1-phosphate lyase 1		
227265_at		CCAAT/enhancer binding protein (C/EBP), beta	223391_at	Sphingosine-1-phosphate phosphatase 1		
214574_x_at		Fibrinogen-like 2	209154_at	Tax interaction protein 1		
230466_s_at		leukocyte specific transcript 1	203386_at	TBC1 domain family member 4 (Akt substrate of 160 kDa) (AS160)		
205901_at		Mesenchymal stem cell protein DSC96	202393_s_at	TGFB inducible early growth response		
224596_at		prepronocleptin	227787_s_at	Thyroid hormone receptor-associated protein 6		
203665_at		Solute carrier family 44, member 1	227798_at	Transforming growth factor- beta signaling protein 1)		
		Heme oxygenase 1	201506_at	Transforming growth factor-beta-induced protein ig-h3 precursor		
			221044_s_at	Tripartite motif protein 34 (Interferon-responsive finger protein 1)		
			204122_at	TYRO protein tyrosine kinase-binding protein precursor		
			203603_s_at	Zinc finger homeobox protein 1b (Smad-interacting protein 1)		
		202625_at	v-src-1 Yamaguchi sarcoma viral related oncogene homolog			

Function	ID	Gene name	Function & Gene Name	ID	ID
UNKNOWN	202279_at	6.8 kDa mitochondrial proteolipid	UNIDENTIFIED	221973_at	1560156_at
	220055_at	Arrestin domain-containing protein 2		228582_x_at	227096_at
	216438_s_at	breast carcinoma amplified sequence		228706_at	222116_s_at
	228532_at	Chromosome 1 open reading frame 162		224566_at	228708_at
	225887_at	Chromosome 13 open reading frame 23		230192_at	231925_at
	218108_at	chromosome 14 open reading frame 130		213703_at	227049_at
	218431_at	chromosome 14 open reading frame 133		221796_s_at	232429_at
	219526_at	chromosome 14 open reading frame 169		225666_at	236283_x_at
	219700_x_at	chromosome 16 open reading frame 24		1555827_at	226608_at
	209285_s_at	Chromosome 3 open reading frame 63		228999_at	226795_at
	223204_at	chromosome 4 open reading frame 18		226810_at	224751_at
	225902_at	Chromosome 9 open reading frame 19		222098_s_at	235994_x_at
	225312_at	COMM domain-containing protein 6.		218145_at	226680_at
	221081_s_at	DENN domain-containing protein		228827_at	219544_at
	223228_at	leucine zipper, down-regulated in cancer 1-like		222315_at	238903_at
	204438_at	mannose receptor, C type 1		223254_s_at	212191_x_at
	203733_at	MYLE protein		225123_at	225493_at
	213375_s_at	NEDD4 binding protein 2-like 1		233506_at	201550_x_at
	228987_at	Protein FAM49B		AFFX-BioB-3_at	
	201560_s_at	Sorting and assembly machinery component 50		238766_at	
	203491_s_at	Centrosomal protein of 57 kDa		229628_s_at	
		Chromosome transmission fidelity factor 8 homolog		218417_s_at	
	224732_at			225108_at	
	212126_at	Homo sapiens cDNA FLJ31079 fs		228603_at	
		Homo sapiens mRNA; cDNA DKFZp586F2224 (from clone DKFZp586F2224)			
	213848_at	POZ and LIM domain 2 (mystique)			
	219165_at	kelch repeat and BTB (POZ) domain containing 7			
223412_at					
227168_at	Myocardial infarction associated transcript				