MMPs and TIMPs

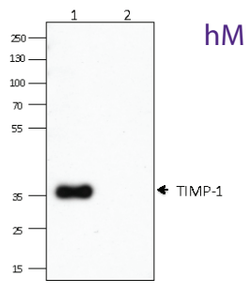
The Tissue Remodelers

Matrix metalloproteinases (MMPs) are calcium-dependent zinc endopeptidases, which are responsible for the degradation of extracellular matrix (ECM) and modeling of tissues. Other important physiological functions of MMPs include bone growth and modeling, angiogenesis and vascular development, regulation of innate and adaptive immunity, wound healing and cell migration, regulation of bioactive peptide release, inflammation, mammary involution and neurite growth. Consequently, aberrant MMP expression is linked to cardiovascular disease, cancer metastasis, neurodegenerative diseases such as Parkinson's and Alzheimer's, arthritis, inflammatory diseases, and periodontal disease. MMPs are numbered largely in the order of their discovery and are classified according to their substrates. The catalytic activity of MMPs is tightly controlled at the level of gene expression, MMP release, pro-enzyme activation, non-specific inhibition by α2-macroglobulin, and inhibition by specific inhibitors such as tissue inhibitors of matrix metalloproteinases (TIMPs).

The TIMPs family consists of four members, namely TIMP-1, TIMP-2, TIMP-3 and TIMP-4. In general, all TIMPs exhibit broad spectrum inhibition of MMPs, although there are differences in their specificity. TIMP-2 is constitutively expressed in contrast to other TIMPs, which are inducible. TIMP-3 is tightly bound to the ECM to promote MMP inhibition, unlike other TIMPs, which are soluble free molecules.

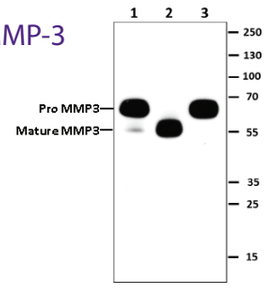
BioLegend offers a variety of research reagents for studying MMPs and TIMPs, including antibodies, recombinant proteins, and ELISA products.

hTIMP-1



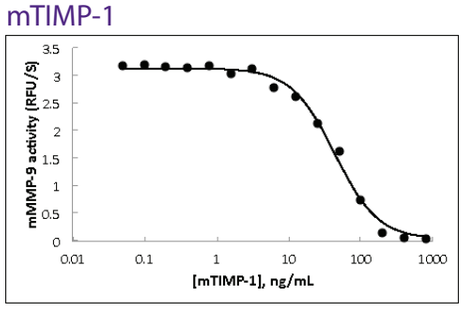
Western blot analysis of 50 ng recombinant human TIMP-1 (lane 1, Cat. No. 592402), and recombinant mouse TIMP-1 (lane 2, Cat. No. 593702) using anti-TIMP-1 antibody (clone M2004D03) and HRP anti-mouse IgG antibody (Cat. No. 405306).

hMMP-3



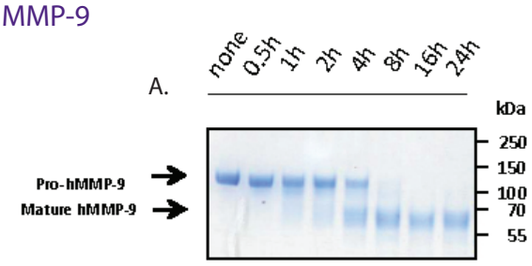
Western blot analysis of recombinant human MMP-3 (Cat. No. 594702) treated with (lane 2) and without (lane 1) 1 mM of p-aminophenylmercuric acetate (APMA), and recombinant mouse MMP-3 (Cat. No. 552702 lane 3) using anti-MMP-3 (clone M4405F10) antibody and HRP anti-mouse-IgG (Cat. No. 405306).

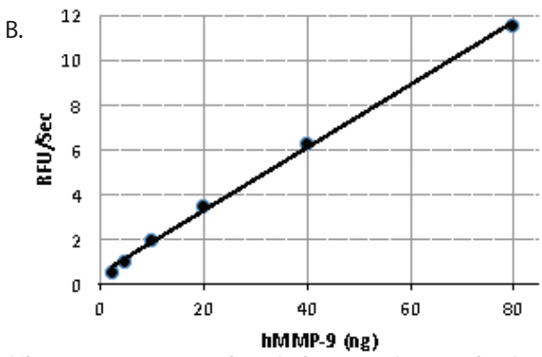
mTIMP-1



Activity of activated mouse MMP-9 (100 ng/mL) is inhibited by different concentrations of mTIMP-1.

hMMP-9





(A) hMMP-9 (~93 KDa) was activated by 1 mM of p-Aminophenylmercuric acetate (APMA) at different time points at 37°C. After 24 h of activation, the mature form hMMP-9 (~60 kDa) could be readily observed. Samples at reducing condition were resolved via SDS-PAGE. Protein per lane: 2.0 µg. (B) The activity of monomeric hMMP-9 was measured with 10 µM of fluorogenic MMP substrate, Mca-PLGL-Dpa-AR-NH2 , in the presence of 2.5, 5.0, 10, 20, 40, and 80 ng of activated hMMP-9. The activity of activated hMMP-9 is >800 pmole/min/µg.

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MMPs and TIMPs

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MMP subclass		Main substrates	Cell expression
Collagenases	MMP-1	Collagen (I-III, VII, X, XI), gelatin, casein, perlecan, entactin, aggregan, tenascin, laminin, proMMP-1, -2, and -9	Endothelial, fibroblasts, macrophages
	MMP-8	Collagen (I-III, VII, X), gelatin, entactin, aggrecan, tenascin, proMMP-8	Neutrophils, endothelial, fibroblasts
	MMP-13	Collagen (I-IV, VII, IX, XV, XVIII), gelatin, entactin, tenascin, aggrecan	Fibroblasts
Gelatinases	MMP-2	Gelatin, collagen (I, III, IV, V, VII, X, XI), elastin, fibrinogen, plasminogen, laminin, aggregan, vitronectin, decorin	Endothelial, fibroblasts, platelets, T lymphocytes
	MMP-9	Gelatin, collagen (I, IV, V, VII, X, XI, XVIII), elastin, vitronectin, fibronectin, laminin, proMMP-2 and -9	Neutrophils, endothelial, eosinophils, macrophages, T lymphocytes
Stromelysins	MMP-3	Aggregan, fibronectin, laminin, gelatin, collagen (III, IV, V, IX, X, XI, XVIII)	Endothelial, fibroblasts, macrophages, vascular smooth muscle
	MMP-10	Collagen (I, III, IV), gelatin, elastin, proMMP-1, -8, and -10	Fibroblasts, T lymphocytes
	MMP-11	Fibronectin, gelatin, laminin, aggregan	Fibroblasts
Matrilysins	MMP-7	Fibronectin, gelatin, laminin, aggregan, collagen (I, IV, V, IX, X, XI, XVIII), Fas ligand	Macrophages
	MMP-26	Collagen (IV), gelatin, proMMP-9	B lymphocytes
MT-MMPs	MMP-14	Collagen (I-III), gelatin, aggregan, laminin, proMMP-2 and -13	Fibroblasts, macrophages
	MMP-15	Proteoglycans, proMMP-2	Fibroblasts, macrophages
	MMP-16	Collagen (III), fibronectin, proMMP-2	Fibroblasts, macrophages, vascular smooth muscle
	MMP-17	Gelatin, fibrinogen, proMMP-2	Eosinophils, lymphocytes, monocytes
	MMP-24	Fibronectin, gelatin, proMMP-2	Brain
	MMP-25	Collagen (IV), gelatin, proMMP-2 and -9	Neutrophils, monocytes
Other MMPs	MMP-12	Collagen (I, IV), elastin, fibronectin, laminin, proteoglycans, fibrinogen	Macrophages, stromal cells
	MMP-19	Collagen (I, IV), laminin, gelatin, tenascin	Vascular smooth muscle, endothelial, monocytes
	MMP-20	Amelogenin, aggregan, laminin	Endothelial
	MMP-21	Gelatin	Keratinocytes, macrophages, neutrophils, fibroblasts
	MMP-23	Gelatin	Reproductive tissues
	MMP-27	Not known	Fibroblasts
	MMP-28	Casein	Cardiomyocytes, macrophages, T lymphocytes

Description	Functions	Cell expression
TIMP-1	Strong inhibitor of MMP9	Leukocytes, fibroblasts, mesenchymal stem cells, vascular smooth muscle
TIMP-2	Forms trimolecular complex with pro-MMP2 and MMP14 to activate MMP2.	Fibroblasts, macrophages, vascular smooth muscle
TIMP-3	Apoptosis, inhibits angiogenesis	Fibroblasts, pericytes
TIMP-4	Inhibits angiogenesis	Cardiomyocytes, lymphocytes, macrophages, mast cells, vascular smooth muscle

Product List

Antibodies

Description	Clone	Reactivity	Applications	Cat. No.
MMP-1	F15P3B6	Human	WB, IHC	634702
MMP-2	4D3 (F14P4D3)	Human	WB, IHC	821901
MMP-3	M4405F10	Human, Mouse	WB	679202
MMP-3	F36P1B4	Human	WB, IHC, ELISA	634902
MMP-9	F11P2C3	Human	WB, IHC	635002
MMP-9	L51/82	Human, Mouse, Rat	WB, IHC	819701
TIMP-1	F31P2A5	Human, Monkey	WB, IHC, ELISA	635302
TIMP-1	M2004D03	Human	WB	676002
TIMP-2	F27P3A4	Human, Mouse, Rabbit, Chicken, Zebrafish, Swine, Pig	WB, IHC, ELISA	635402
TIMP-2	3A4 (F27P3A4)	Human, Mouse, Rat	IHC, ICC	814101

Recombinant Proteins (Human)

Description	Cat. No.
MMP-1 (carrier-free)	592908
MMP-2 (carrier-free)	554308
MMP-3 (carrier-free)	594708
MMP-8 (carrier-free)	556106
MMP-9 (carrier-free)	550506
MMP-9 (dimer, carrier-free)	551106
TIMP-1 (carrier-free)	592408
TIMP-2 (carrier-free)	593608

Recombinant Proteins (Mouse)

Description	Cat. No.
MMP-2 (carrier-free)	554404
MMP-3 (carrier-free)	552708
MMP-9 (Gelatinase B) (carrier-free)	590502
TIMP-1 (carrier-free)	593702

ELISA

Description	Cat. No.
LEGEND MAX™ Human MMP-9 ELISA Kit with Pre-coated Plates	440708

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