

Selection Principles

1. **Stable expression** – The loading control should remain constant across samples and not change with experimental treatments (e.g., hypoxia, drug stimulation).
2. **Molecular weight difference** – Choose a loading control with a clearly different molecular weight from the target protein (≥ 5 kDa recommended) to avoid band overlap.
3. **Subcellular localization** – Match the loading control to the target protein's location. For example, do not use cytoplasmic controls for nuclear protein detection.

Selection reference criteria are listed below:

Table 1 Quick Reference Table for Loading Control Antibodies

MW	Whole cell/Cytoplasmic	Nuclear	Mitochondrial	Others
1-20 kDa	Cyclophilin A (~17 kDa)	Histone H3 (~17 kDa)	COX IV (~17 kDa)	Cytoskeleton: Cofilin (~18 kDa)
20-40 kDa	Cyclophilin B (~23 kDa)	Histone H1.0 (~21 kDa)	VDAC1/Porin (~30–35 kDa)	
	GAPDH (~36 kDa)	PCNA (~28 kDa)		
		TBP (~37–43 kDa)		
40-60 kDa	β -Actin (~42 kDa)			
	α -Tubulin (~55 kDa)			
	β -Tubulin (~55 kDa)			
60-80 kDa		HDAC1 (~65 kDa)	Hsp60 (~61 kDa)	Serum: Transferrin (~77 kDa)
		Lamin B1 (~66–70 kDa)		
80-120 kDa	Vinculin (~117 kDa)		Na ⁺ /K ⁺ -ATPase (~110 kDa)	IgG Isotype Control

Table 2 Loading Control Antibodies— Product Selection Guide

Category	Protein	Cat. No.	Product Name	MW/kDa	Target Species	Application
Whole cell/Cytoplasmic	Cyclophilin A	MA2125	Anti-Cyclophilin A Rabbit Monoclonal Antibody	~18	Human, Mouse, Rat	WB, IHC-P
	Cyclophilin B	MA2126	Anti-Cyclophilin B Mouse Monoclonal Antibody	~23	Human, Mouse, Rat	WB, IHC-P
		MA2128	Anti-Cyclophilin B Rabbit Monoclonal Antibody		Human, Mouse, Rat	WB
	GAPDH	MA5781	Anti-GAPDH Mouse Monoclonal Antibody	~36	Human, Monkey, Rat, Mouse, etc.	WB
		MA5798	Anti-GAPDH Rabbit Monoclonal Antibody		Human, Mouse, Rat, Hamster	WB, IHC-F, IHC-P, ICC/IF
		PA1393	Anti-GAPDH Rabbit Polyclonal Antibody		Human, Mouse, Rat	WB
	β -Actin	MA5780	Anti-Beta Actin Mouse Monoclonal Antibody	~42	Human, Mouse, Monkey, Goat, Rat, Rabbit, etc.	WB
		MA5796	Anti-Beta Actin Rabbit Monoclonal Antibody		Human, Mouse, Rat	WB, IHC-F, IHC-P, ICC/IF
	α -Tubulin	MA1187	Anti-alpha Tubulin Mouse Monoclonal Antibody	~55	Human, Rat, Mouse	WB, IHC-F, IHC-P, ICC/IF, IP
		MA1188	Anti-alpha Tubulin Rabbit Monoclonal Antibody		Human, Mouse, Rat	WB, IHC-P, ICC/IF, FC
	β -Tubulin	MA5782	Anti-Beta Tubulin Mouse Monoclonal Antibody		Human, Mouse, Monkey, Goat, Hamster, Rat, etc.	WB, ICC/IF
		MA5792	Anti-Beta Tubulin Rabbit Monoclonal Antibody		Human, Mouse, Rat	WB, IHC-F, IHC-P, ICC/IF
	Vinculin	MA5667	Anti-Vinculin Rabbit Monoclonal Antibody	~117	Human, Mouse, Rat	WB, ICC/IF, FC, IP

Nuclear	Histone H3	MA5788	Anti-Histone H3 Mouse Monoclonal Antibody	~17	Human, Mouse, Rat, Yeast	WB, IHC-F, IHC-P, ICC/IF, IP
	Histone H1.0	MA3013	Anti-Histone H1.0 Rabbit Monoclonal Antibody	~21	Human, Mouse, Rat	WB, IHC-P, ICC/IF
	PCNA	MA5787	Anti-PCNA Mouse Monoclonal Antibody	~28	Human, Mouse, Monkey, Rat, Hamster	WB, IHC-F, IHC-P, ICC/IF, IP
		MA5800	Anti-PCNA Rabbit Monoclonal Antibody		Human, Mouse, Rat	WB, ICC/IF, IP
	TBP	MA5359	Anti-TATA Binding Protein TBP Rabbit Monoclonal Antibody	~37-43	Human, Mouse, Rat	WB, IHC-F, IHC-P, ICC/IF, FC, IP
	HDAC1	MA2955	Anti-HDAC1 Mouse Monoclonal Antibody	~65	Human, Mouse, Rat	IHC-P
		MA2956	Anti-HDAC1 Rabbit Monoclonal Antibody	~65	Human, Mouse, Rat	WB, IHC-P, ICC/IF, FC, IP
Mitochondrial	Lamin B1	MA5766	Anti-Lamin B1 Mouse Monoclonal Antibody	~66-70	Human, Mouse, Monkey	WB, ICC/IF
		MA5793	Anti-Lamin B1 Rabbit Monoclonal Antibody		Human, Mouse, Rat	WB, IHC-P, IP
	COX IV	MA5786	Anti-COX IV Mouse Monoclonal Antibody	~17	Human, Mouse, Rat, Hamster, Goat, Monkey	WB, IHC-F, IHC-P, ICC/IF, FC, IP
	VDAC1/Porin	MA5650	Anti-VDAC1 Rabbit Monoclonal Antibody	~30-35	Human, Mouse, Rat	WB, IHC-P, ICC/IF
	Hsp60	MA3126	Anti-Hsp60 Mouse Monoclonal Antibody	~61	Human, Mouse, Rat	WB, ICC/IF, IP
Others	Hsp60	MA3128	Anti-Hsp60 Rabbit Monoclonal Antibody		Human, Mouse, Rat	WB, IHC-F, IHC-P, ICC/IF, FC, IP
Category	Protein	Cat. No.	Product Name	MW/kDa	Target Species	Application
Cytoskeleton	Cofilin	MA1986	Anti-Cofilin Rabbit Monoclonal Antibody	~18	Human, Mouse, Rat	WB, IHC-P, ICC/IF
Serum	Transferrin	MA5768	Anti-Transferrin Mouse Monoclonal Antibody	~77	Human	WB, IHC-P, ICC/IF
		MA5509	Anti-Transferrin Rabbit Monoclonal Antibody		Human, Mouse, Rat	WB, IHC-P, FC
Membrane	Na ⁺ /K ⁺ -ATPase	MA1155	Anti-alpha 1 Sodium Potassium ATPase Rabbit Monoclonal Antibody	~110	Human, Mouse, Rat	WB, IHC-P, ICC/IF, FC
IgG Isotype Control	-	PA1394	Mouse IgG Isotype Control	-	Isotype Control	FC, IP, ChIP
	-	PA1395	Rabbit IgG Isotype Control	-	Isotype Control	FC, IP, ChIP

Table 3 Loading Control Selection by Experimental Condition

Experimental Condition	Avoid Using	Recommended Alternative
Hypoxia/Metabolic stress/Diabetes model	GAPDH	β-Actin, Tubulin
Cell cycle/Anti-mitotic drug treatment	Tubulin	GAPDH, β-Actin
Cytoskeleton interference experiment	β-Actin, Tubulin	GAPDH, Vinculin
Adipose tissue samples	β-Actin	GAPDH, Tubulin
Muscle tissue samples	β-Actin	Actin isoform-specific antibodies