ATLAS ANTIBODIES

Mesenchymal Stem Cell Markers

In general, stem cells are specialized cells capable of self-renewal through cell division with the capability to differentiate into multi-lineage cells.

Mesenchymal stem cells (MSCs) are tissue stem cells. They are 'multipotent', implying that they can differentiate into more than one cell type in the body.

Friedenstein et al. first discovered MSCs in bone marrow[1]. Decades of studies have offered significant in-depth understanding of these cells.

Efficient population of MSCs has been reported from, but not limited to, bone marrow[2]. For example, cells which exhibits characteristics of MSCs have been isolated from adipose tissue[3,4], amniotic fluid[5,6], dental tissues[7], endometrium[8], menstrual blood[9], peripheral blood[10], placenta and fetal membrane[11].

Mesenchymal stem cells can be defined by the combination of different surface markers protein like NT5E/CD73, THY1/CD90 and, ENG/CD105 (Figure 2).

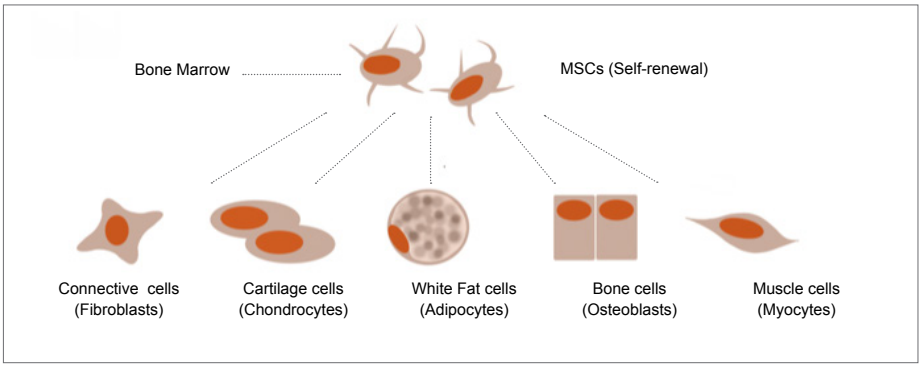

Figure 1.
Schematic representation of mesenchymal stem cells (MSCs) differentiation from bone marrow.

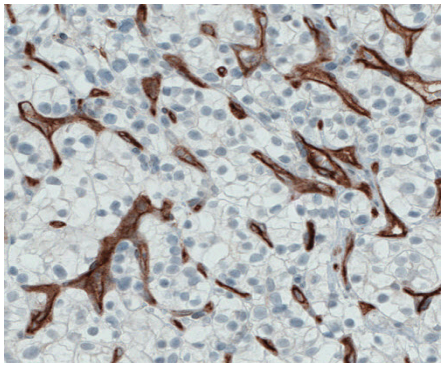

Figure 2.
Immunohistochemical staining of Endoglin/CD105 in the human blood vessels using Anti-ENG monoclonal antibody (AMAb90925).

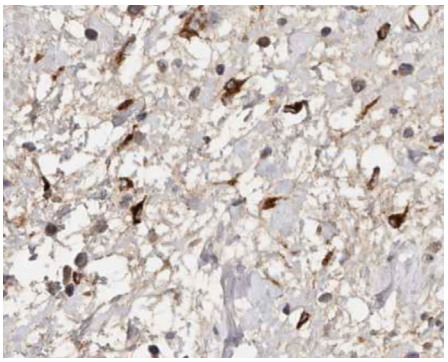

Figure 3.
Immunohistochemical staining of Serpin Peptidase Inhibitor, or Heat Shock Protein 47, in the human esophagus using Anti-SERPINH1 polyclonal antibody (HPA029198).

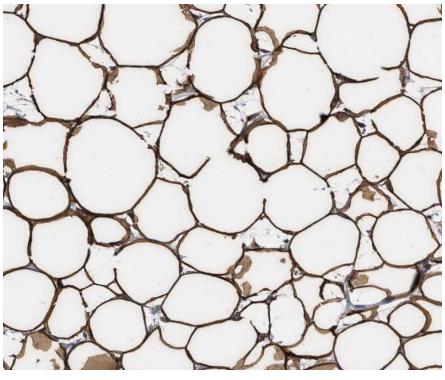

Figure 4.
Immunohistochemical staining of human breast for Perilipin-1 using Anti-PLIN1 polyclonal antibody (HPA024299).

Connective Tissue Cells (Fibroblasts)

Fibroblasts or connective tissue cells (also known as stromal cells) provide support and structure for the different organs. Among other things, they also play an essential role in the production, maintanance and remodeling of the extracellular matrix.

Figure 3 shows immunostaining for the fibroblasts marker HSP47/SerpinH1 in the human esophagus.

Cartilage Cells (Chondrocytes)

Chondrocytes are primarily mesodermal in origin and are the sole cellular constituents of normal cartilaginous tissue. Chondrocytes are responsible for the synthesis of the two major constituents of the matrix (collagens and proteoglycans) and enzymes that degrade matrix components. Hence the chondrocyte plays a key role in the regulation of cartilage synthesis and degradation.

Differentiation of MSCs into chondrocytes is regulated by transcription factors like SOX9.

White Fat Tissue Cells (Adipocytes)

Adipocytes are highly specialized cells that play an essential role in the energy expenditure of most vertebrates. Adipocytes convert excess energy to fat and deposit it during feeding in preparation for periods of food deprivation. They have a distinct "signet-ring" morphology containing one or more large triglyceride (fat) droplets, which distinguish them from the lipid-deficient stromal/vascular cells.

Figure 4 shows immunohistochemical staining for PLN1 (perilipin 1) which is a marker for adipocytes.

Bone Cells (Osteoblasts)

Osteoblasts are the cells responsible for bone tissue formation and remodelling. The bone formation (osteogenesis) either occurs from a cartilage precursor or from a layer of osteoblasts on the bone surface like in the long bones of the skeleton.

The main function of osteoblasts is to synthesize collagen type I and other specialized matrix proteins that serve as a template for the subsequent calcium deposition.

Osteoblasts differentiation is regulated for example by the master gene regulatory factor OX/SP7.

Muscle Cells
(Smooth, Cardiac, Skeletal)

A myocyte is the functional cell type of muscle tissue. There are three different types of myocytes with distinct properties. These are restricted to smooth, cardiac and skeletal muscle cells.

Smooth muscle cells (SMC) build up involuntarily controlled, non-striated muscles occuring in the walls of visceral tissues and blood vessels. The master regulation of smooth muscle gene expression is mediated by myocardin.

Cardiomyocytes or heart muscle cells are involuntarily controlled striated cells confined to the heart. Cardiomyocytes are among other factors regulated by GATA4 and myocardin.

Skeletal muscle cells are striated muscle cells under voluntary control and are attached to the skeleton by tendons. MyoD1 is a key regulator of skeletal (striatal) muscle cell differentiation.

Figures 5-7 show immunostainings examplifying specific antibody markers for each type of muscle cell.

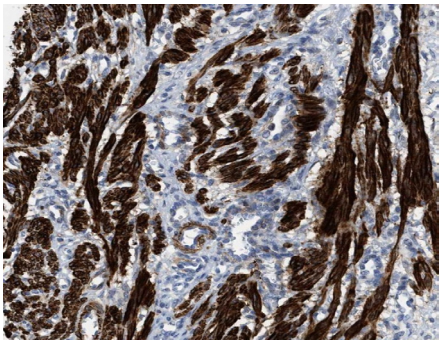

Figure 5.
Immunohistochemical staining of smooth muscle cell (SMC) showing high expression of Transgelin using Anti-TAGLN polyclonal antibody (HPA019467).

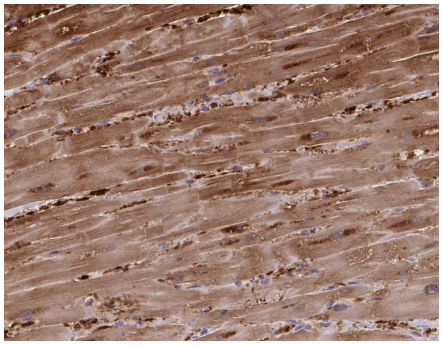

Figure 6.
Immunohistochemical staining of cardiac muscle cell showing high expression of Fatty Acid Binding Protein 3 in human heart muscle using Anti-FABP3 polyclonal antibody (HPA055754).

References

1. Friedenstein AJ. et al. (1970) *Cell Tiss Kinet.* 3(4):393-403.
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Enhanced Validation

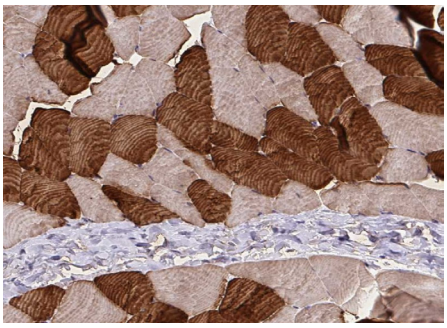

Figure 7.
Immunohistochemical staining of skeletal muscle cell (SMC) showing high expression of Troponin t type 1 using Anti-TNNT1 polyclonal Antibody (HPA058448).

Table 1.
Mesenchymal Stem Cells Markers antibodies available from Atlas Antibodies.

Target	Catalog No	Clonality	Validated Application	Sequence Identity Mouse/Rat
CD29/ITGB1	HPA059297	Polyclonal	IHC*, WB	91%/91%
CD105/ENG	HPA011868	Polyclonal	IHC, WB*, ICC-IF	83%/81%
CD106/VCAM1	HPA034796	Polyclonal	IHC*	72%/75%
CD117/KIT	HPA004471	Polyclonal	IHC*	66%/72%
CD146/MCAM	HPA008848	Polyclonal	IHC*, WB*	75%/73%
CD166/ALCAM	HPA010926	Polyclonal	IHC*	94%/93%
CD44	HPA005785	Polyclonal	IHC, WB*, ICC-IF	51%/47%
CD54/ICAM1	HPA002126	Polyclonal	IHC*, WB*	55%/49%
CD56/NCAM1	HPA039835	Polyclonal	IHC*, WB, ICC-IF*	93%/94%
CD73/NT5E	HPA017357	Polyclonal	IHC, WB, ICC-IF	90%/92%
CD90/Thy-1	HPA003733	Polyclonal	IHC*, ICC-IF	64%/68%
CSPG4/NG2	HPA002951	Polyclonal	IHC, WB*	87%/83%
GDF-5	HPA015648	Polyclonal	IHC, WB	93%/93%
ITGA2B	HPA031168	Polyclonal	IHC*	81%/77%
MYOG	HPA028336	Polyclonal	ICC-IF	94%/92%
OSX/SP7	HPA063202	Polyclonal	IHC	99%/99%
RUNX2	HPA022040	Polyclonal	IHC*, WB*, ICC-IF	100%/81%
RUNX3	HPA059006	Polyclonal	IHC*, WB	87%/87%
SOX11	HPA000536	Polyclonal	IHC, WB	82%/82%
SOX6	HPA003908	Polyclonal	IHC*, WB*	97%/95%
SOX9	HPA001758	Polyclonal	IHC*, WB*, ICC-IF	97%/96%

* Products with enhanced validation for indicated application

AAA POLYCLONALS — Designed by researchers, for researchers

Triple A Polyclonals are rabbit polyclonal primary antibodies developed within the Human Protein Atlas project. IHC characterization data from 44 normal tissues and 20 cancers is available on the Human Protein Atlas portal.

PrecisA MONOCLONALS — DESIGNED BY RESEARCHERS FOR RESEARCHERS

PrecisA Monoclonals are mouse monoclonal primary antibodies developed against a number of carefully selected targets. Clones are selected to recognize only unique non-overlapping epitopes and isotypes.

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