Microbubbles conjugated with anti-matrix metalloproteinase 2 mouse monoclonal antibody sc-13595

MMP2-MBs

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Chemical name:	Microbubbles conjugated with anti-matrix metalloproteinase 2 mouse monoclonal antibody sc-13595	
Abbreviated name:	MMP2-MBs, TMB_2	
Synonym:		
Agent Category:	Antibody	
Target:	Matrix metalloproteinase 2 (MMP2)	
Target Category:	Enzyme	
Method of detection:	Ultrasound	
Source of signal / contrast:	Microbubbles (MBs)	
Activation:	No	
Studies:	• *In vitro* • Rodents	No structure is currently available in PubChem.

Background

[PubMed]

Ultrasound is the most widely used imaging modality (1), and its role in noninvasive molecular imaging is expanding with ligand-carrying microbubbles (MBs) (2). MBs are composed of spherical cavities filled with a gas encapsulated in a shell. The shells are made

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of phospholipids, surfactant, denatured human serum albumin, or synthetic polymer. Ligands and antibodies can be incorporated into the shell surface of MBs. MBs are usually 1–8 μm in diameter, and they provide a strongly reflective interface and resonate to ultrasound waves. MBs are used as ultrasound contrast agents in imaging of inflammation, angiogenesis, intravascular thrombus, and tumors (3-5). They also have the potential to be used for drug and gene delivery (6).

Extracellular matrix (ECM) adhesion molecules consist of a complex network of fibronectins, collagens, chondroitins, laminins, glycoproteins, heparin sulfate, tenascins, and proteoglycans that surround connective tissue cells, and they are mainly secreted by fibroblasts, chondroblasts, and osteoblasts (7). Cell substrate adhesion molecules are considered essential regulators of cell migration, differentiation, and tissue integrity and remodeling. These molecules play a role in inflammation and atherogenesis, but they also participate in the process of invasion and metastasis of malignant cells in the host tissue (8). Invasive tumor cells adhere to the ECM, which provides a matrix environment for permeation of tumor cells through the basal lamina and underlying interstitial stroma of the connective tissue. Overexpression of matrix metalloproteinases (MMPs) and other proteases by tumor cells allows intravasation of tumor cells into the circulatory system after degrading the basement membrane and ECM (9).

Several families of MMPs are involved in atherogenesis, myocardial infarction, angiogenesis, and tumor invasion and metastases (10-12). MMP expression in normal cells, such as trophoblasts, osteoclasts, neutrophils, and macrophages, is highly regulated. Elevated levels of MMPs have been found in tumors associated with a poor prognosis for cancer patients (13). MMP2 is one of the major enzymes involved in the remodeling of the left ventricle after ischemia and reperfusion (I/R) in the heart (14). Su et al. (15) conjugated anti-MMP2 mouse monoclonal antibody sc-13595 to microbubbles containing polyethylene glycol (PEG) (MMP2-MBs) for contrast-enhanced ultrasound imaging of MMP2 expression in a post-I/R remodeling rat model.

Related Resource Links:

- Chapters in MICAD (MMP)
- Gene information in NCBI (MMP2)
- Articles in Online Mendelian Inheritance in Man (OMIM) (MMP2)
- Clinical trials (MMP)
- Drug information in FDA (MMP)

Synthesis

[PubMed]

Su et al. (15) reported the preparation of MMP2-MBs. Hexafluoride gas was dispersed by sonication of an aqueous solution of PEG, sorbitan sterate, and Tween-80 to form a PEG contrast MB (MB_c). MMP2 monoclonal antibody sc-13595 (~1.4 nmol) was incubated with 1×10^7 MB_c for 10 min at 4°C. Unbounded antibody was removed from MMP2-

MBs by centrifugal washings. MMP2-MBs had a mean diameter of 3.36 ± 1.61 μm. Attachment of antibody to the MB shell was confirmed with flow cytometry and microscopy. The number of antibody molecules per MB was not reported.

In Vitro Studies: Testing in Cells and Tissues

[PubMed]

Su et al. (15) performed *in vitro* binding of MB_C and MMP2-Mbs to myocardial tissue sections from normal rats and 1-week post-I/R rats. MMP2-Mbs bound abundantly within the risk area of I/R myocardial sections with rare binding in the control area. Little binding was observed with MB_C in the risk area or control area. No binding was observed with MB_C and MMP2-MBs in the myocardial sections of control rats.

Animal Studies

Rodents

[PubMed]

Su et al. (15) performed ultrasound studies of MB_C and MMP2-MBs binding in normal rats (n = 3/group) and 1-week post-I/R rats (n = 3/group). Myocardial contrast echocardiography was first performed to induce microvascular permeability in the heart tissue. Ultrasound was then performed at 10 min after injection of MB_C or MMP2-MBs (2×10^6/rat). The mean myocardial video intensity in the risk area were 1.02 ± 0.19 and 1.76 ± 0.25 for MB_C and MMP2-MBs, respectively. The contrast enhancement of MMP2-MBs to the risk area was significantly higher than that of MB_C ($P < 0.01$). No retention of MB_C (1.01 ± 0.11) or MMP2-MBs (1.02 ± 0.14) was observed in the myocardial tissue of control rats. Histological and immunofluorescence staining confirmed the co-localization of MMP2-MBs to MMP2 in the risk area of 1-week post-I/R rats. No retention of MB_C was observed in the risk area, and no retention of MMP2-MBs was observed in the control area. No blocking studies were performed.

Other Non-Primate Mammals

[PubMed]

No references are currently available.

Non-Human Primates

[PubMed]

No references are currently available.

Human Studies

[PubMed]

No references are currently available.

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