

METALLOTHIONEIN: A POSSIBLE NEW MARKER FOR HUMAN DENTAL PULP STEM CELLS

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INTRODUCTION: Human dental pulp stem cells (HDPSC's) is a term used for the remaining mesenchymal stem cell population in adult teeth. It has already been described that these cells exhibit odontogenic capacities when these cells are explanted into immunocompromised mice. They create a dentin-pulp like complex and in this way their use in tissue engineering and tooth regeneration seems very promising. However, there is still a lack of specific markers to identify this cell type. In this study, we investigated the immunoreactivity of HDPSC's for metallothionein (MT), a Cystein-rich, low molecular weight protein. MT has the capacity to bind both physiological (Zn, Cu, Se,...) and xenobiotic (Cd, Hg, Ag,...) heavy metals through the thiol group of its cysteine residues. Furthermore, the immunoreactivity for MT was tested in human pulp tissue and human bone-marrow derived mesenchymal stem cells.

METHODS: All teeth used in the experiments were extracted for orthodontic or therapeutic reasons. After extraction, the apical part of the teeth was removed with a scalpel and the dental pulps were removed with a forceps. HDPSC's were isolated as described by Gronthos et al. (2000)¹. Other dental pulps were prepared for immunohistochemistry using routine fixation (Unifix®) and embedding (paraffine sections) techniques. Mesenchymal stem cells were isolated from human adult bone marrow. Immunostaining for metallothionein was carried out using the DAB envision® kit.

RESULTS: HDPSC's isolated from human third molars were positive for MT (Fig.1a). When compared to mesenchymal stem cells derived from bone-marrow, only certain subsets of the latter were positive (Fig. 1b). These subsets were always showing mitotic figures or were located in an area surrounding these dividing cells. In normal human pulp tissue, only peri-vascular cell niches showed immunoreactivity for MT (Fig.2). This is in accordance with the current hypothesis of the localisation of HDPSC's in adult pulp tissue.

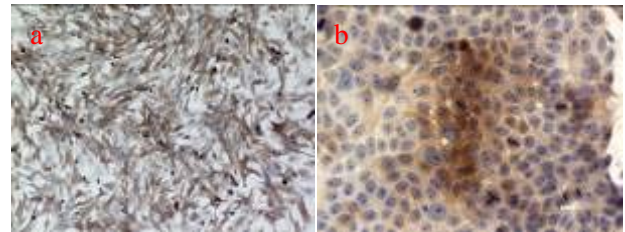


Fig. 1: (a) Human dental pulp stem cells showing immunoreactivity for metallothionein. (b) Bone-marrow derived mesenchymal stem cells are only found to be positive during mitosis or when neighbouring mitotic cells.

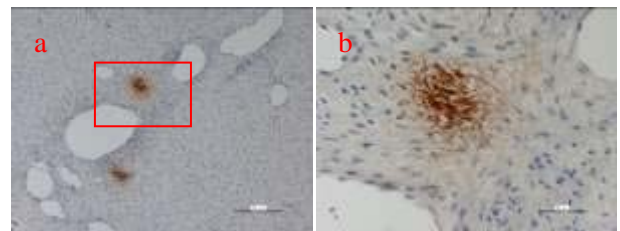


Fig. 2: (a) Presence of metallothionein-positive cell niches in healthy human dental pulp tissue. Note that these cell niches are only located in the peri-vascular area. (b) Higher magnification of boxed area in (a).

DISCUSSION & CONCLUSIONS: HDPSC's were found to be positive for MT. This suggests that MT can be used as a new marker that can distinguish HDPSC from other mesenchymal derived stem cells.

REFERENCES: ¹ S. Gronthos, M. Mankani, J. Brahimi et al (2000) Postnatal human dental pulp stem cells (DPSC'S) *in vitro* and *in vivo*, *Proc Natl Acad Sci USA*. Dec 5;97(25):13625-30.

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