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Aims and Objectives

Polyvinyl alcohol-coated superparamagnetic iron oxide particles (PVA-SPIONs) were designed for biomedical applications in the context of rheumatoid diseases (RA/OA). Experiments on rats have shown that intravenous injected SPIONs accumulate in bone marrow. Since mesenchymal stromal cells (MSCs) are key players of tissue regeneration residing in bone marrow, where they also form the hematopoietic stem cell (HSC) niche, their health and functional status is of crucial importance. Therefore our aim is to perform a comprehensive analysis of the influence of PVA-SPIONs on MSCs: *in vitro* with human MSCs; *ex vivo* with rat MSC that were exposed to PVA-SPIONs *in vivo*.

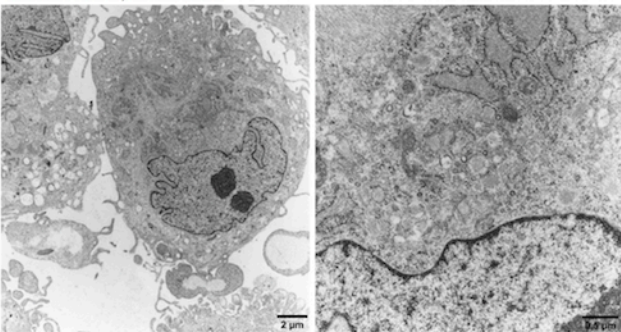
Materials & Methods

Cell culture assays for: metabolic activity (alamar blue), proliferation (cyquant), membrane integrity (CytotoxOne, LDH), migration (modified Boyden chamber), proof of endocytosis (transmission electron microscopy)

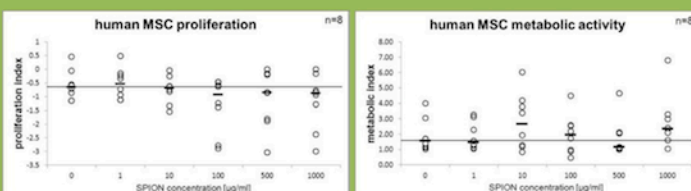
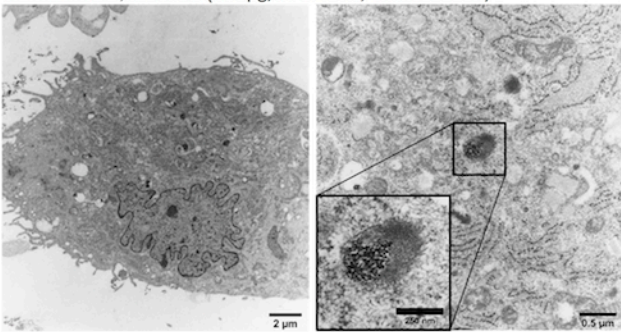
Results

in vitro

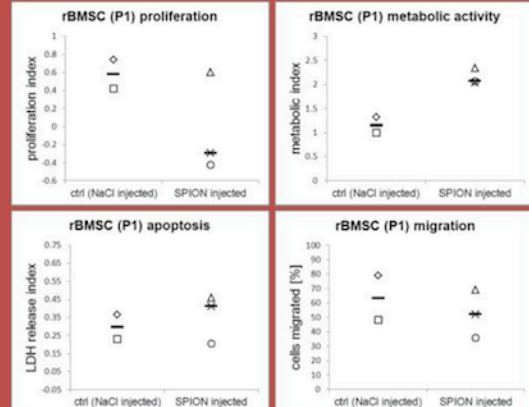
human MSC, unlabelled



human MSC, labelled (100µg/ml SPIONs, 4h incubation)



ex vivo



Animal donor
 ◇ rat 1
 □ rat 2
 △ rat 3
 × rat 4
 ○ rat 5
 — median

Conclusion

- in vitro*: PVA-SPIONs are endocytosed by MSCs and stored in vesicles; no influence on human MSC proliferation and metabolic activity
- ex vivo*: rat MSCs show signs of cellular stress in presence of PVA- SPIONs
- in vitro* models need support by *ex vivo* models for investigating nanoparticle toxicity

Outlook

- in vitro*: labeling protocol, functional tests (migration, differentiation)
- ex vivo*: confirming preliminary results, functional tests
- in vivo*: human MSC tracking

Acknowledgements

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