

## Isolating stem cells from left-over material after surgeries – a nearly unlimited source

There are more than 100 ongoing clinical trials using bone marrow mesenchymal stem cells (BM-MSCs). Due to the limited access to stem cells we developed a new strategy of collecting bone marrow material for MSC isolation; instead of aspirating bone marrow from healthy volunteer donors, we collect it from waste material generated during routine surgeries of consenting patients.

The procedure starts at the Department of Orthopaedics and Traumatology, Odense University Hospital, where the specialist orthopaedic surgeon, Prof. Hagen Schmal collects bone marrow material from a variety of operations. The isolated material is immediately transported to the Department of Endocrinology & Stem Cell Research Unit directed by Prof. Moustapha Kassem, one of the leading experts in the field of stem cell research. Behind the laboratory door, the stem cells are isolated and prepared for further studies. Here, postdoc Justyna Kowal, who has scientific experience in molecular and cell biology, studies the biology of BM-MSC in depth. The main goal is to characterise stem cells that exhibit favoured properties for regenerative therapy. These parameters are investigated in the lab using classic cell and molecular biology techniques, including differentiation, proliferation, marker expression, and are combined with novel high-throughput next-generation sequencing technology. For the later, we have the postdoc Anders Haakonsson, a molecular biologist with the bioinformatics skillsets required to find the patterns in the sequencing data, which characterises the MSC most suited for therapy.

Since October 2016 we have collected bone marrow from more than 25 patients. We have cells from males and females between 26 and 97 years of age. With this great comprehensive material we are able to investigate stem cells from a broad cross section of the population. Our preliminary results indicate that the health status of the patient has an influence on the characteristics of the isolated MSCs. We want to go beyond the current knowledge by determining the influence of the health profile and daily lifestyle of the donors, and how this is reflected at molecular and cellular level of BM-MSCs. This will give us the key to select donors and cell types with the best clinical potential in bone healing.

Based on these pre-study results, the BONEBANK project partners will in the next step develop Standard Operating Procedures that describe an efficient way of sampling and transporting of bone marrow samples in high quality.

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