



## Workpackage 2

### WP 2: Inflammation and tissue damage detection by cell and tissue tracking and molecular MRI based imaging

**Leader:** University of Geneva, Cell Physiology and Metabolism

WP 2 will perform in-vivo validation of the SPION developed by partners during the project using rodent models of RA and OA.

In the first step, WP 2 will develop a macrophage-directed diagnostic in-vivo tool for inflammation detection based on the uptake of SPION by monocytes and macrophages and the increase of the residence time of the particles in the circulation, and, even more important, the tracking of these cells by MRI. The preferred movement of these types of cells to sites of inflammation will be used for their detection. The activation and proliferation of synovial cells of the macrophage lineage will be detected by this approach, and thus the pathological behavior of these cells in RA and OA can be monitored in-vivo by MRI and validated using multimodality imaging.

In a second step, when specific targeted (non-functionalized) nanoparticles that can recognize synovial alteration (in RA) and damaged cartilage epitopes (in OA) will be made available by the partners, specific imaging will be realized in rodent models of RA and OA respectively, showing different degrees of inflammation, cell influx and joint damage. We will determine the retention of such SPION in damaged joints using MRI, CT or IVIS technology and will quantify the degree of damage at various stages of the RA and OA process. We will validate the localization of such SPION by detailed histology on joint sections and compare the results of RA and OA.

Finally, this newly developed methodology will be applied to study anti-inflammatory treatment in animal models of RA first, and OA and diagnostic accuracy between functionalized and non-functionalized SPION will be compared in animal models of RA and OA.

### Participants

- University of Geneva, Cell Physiology and Metabolism
- University of Nijmegen, Rheumatology
- Paracelsus Medizinische Privatuniversität Salzburg, Institute of Anatomy & Musculoskeletal Research
- Ecole Polytechnique Fédérale de Lausanne, Institute of Materials, Powder Technology Laboratory
- Lund University, Department Experimental Medical Science
- Merck Chimie – Estapor Microspheres Division
- AnaMar AB
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[WP 1](#) | [WP 3a](#) | [WP 3b](#) | [WP 4](#) | [WP 5](#) | [WP 6](#) | [WP 7](#) | [WP 8](#) | [WP 9](#) |