Background: Nanotechnology has developed into a key technology of the 21st century. Over the recent years, the number of nanotechnological products has received an enormous boost. More and more efforts are being done to use this technology in human medicine for diagnostic and therapeutic purposes. Therefore, crucial questions concern the safety aspects. The focus of our work here was to identify possible effects of nanoparticles on human immune cell function.

Objectives: We analysed clinical relevant interactions between PVA coated nanoparticles (spions) and human immune cells.

Methods: 100µl of whole blood obtained from patients with rheumatoid arthritis (RA) or healthy donors were incubated with 100µl serum free RPMI 1640. Functionalised spions were added at varying concentrations, and cells were incubated for 24h. After lysis of erythrocytes, cells were stained for apoptosis and necrosis using Annexin V and 7AAD, respectively. Samples were analysed by flow cytometry. As a second approach, PBMCs were isolated from blood samples of healthy donors and RA patients, and CD4 positive T cells were separated via MACS. T cells were incubated with/without PHA and/or with/without PVA spions at different concentrations. Activation (CD25 expression) of cells was analysed by flow cytometry. Functionality was determined via proliferation measurements of CFSE (carboxyfluorescein diacetate succinimidyl ester) labeled T cells after 72h under normoxic (5% CO₂ and 18% O₂) or hypoxic (5% CO₂ and <1% O₂) conditions by flow cytometry.

Results: Altogether, blood samples from 18 healthy donors and 19 patients suffering from RA were analysed for induction of apoptosis and necrosis in different cell types (figure 1 & figure 2). The results on cell survival did not demonstrate any short-term general toxicity of PVA spions at concentrations less than 1000µg/ml on the several different blood cell subsets examined. Furthermore, T cells were isolated from 14 healthy donors and 19 RA patients for functional analysis (figure 3). There is no influence of PVA spions on T cell activation and proliferation at concentrations less than 1000µg/ml.

Conclusion: PVA coated nanoparticles at concentrations up to 1000µg/ml (i) do not increase the frequencies of apoptotic or necrotic human immune and (ii) do not impair crucial functional activities of human T cells such as activation and proliferation.