Uptake of polystyrene nanoparticles in CD34-HSC and CD34-DC investigated by flow cytometry and confocal microscopy

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Although nanomaterials offer great opportunities for innovation and technological development, an increased human exposure implies that potential health impacts should be carefully addressed. The adjuvant activity of air pollution particles on allergic airway sensitization is well known, but a similar role of manufactured nanoparticles (NP) in allergic sensitization has not been clarified. Such mixed exposure situations may be relevant to daily life activities. During development, hematopoietic stem cells (HSC) develop into the different cells of the immune system, through subsequent steps of proliferation and differentiation. Manipulation of dendritic cell-differentiation can lead to a disturbed Th1/Th2 balance later in life [1]. However, to assess NP toxicity, it is important to understand whether and how NP are taken up by the cells.
In this study, the uptake of manufactured nanoparticles by cord blood-derived CD34-HSC and immature myeloid dendritic cells (CD34-DC), that were *in vitro* differentiated from the CD34-HSC, was evaluated. The cells were exposed to 40 nm sized monodisperse polystyrene NP stained with fluorescent dyes. Uptake kinetics were evaluated by monitoring NP-uptake every hour, during 6 hours, with flow cytometry. Futhermore,the intracellular fate of NP was explored with confocal microscopy.
CD34-DC and in CD34-HSC were shown to rapidly take up the majority of the NP within the first hour. Nevertheless, following one hour the total amount of NP inside the cell decreased. After 3 hours, an equilibrium was set. Future experiments will focus to unravel the uptake mechanisms in CD34-DC and CD34-HSC. Insights in NP uptake and their intracellular fate contribute to elucidate the possibile interference of NP with normal cell function.

References

[1] Koga Y, Matsuzaki A, Suminoe A, et al. Immunol Lett **116** (2008) 55-63.