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Inorganic nanoparticles interactions with dendritic cells

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Stimulation of the immune system may be of help for several diseases including cancer, for which the proposed vaccination strategies include the use of nanomaterials and dendritic cells (DCs) as adjuvants. Silica and gold nanoparticles (SiO_2NPs and AuNPs) are easy to produce and are endowed with high biocompatibility, tunable physicochemical properties and high adsorption power, which can lead to the formation of a protein corona. We have evaluated the interactions between human DCs and these types of NPs either alone or covered with a corona from cancer cell lysates.

AuNPs and SiO_2NPs were prepared [1-2] and exposed to lysates from two different cancer cell lines. Some SiO_2NPs were made fluorescent with rhodamine. The NPs and the protein corona were characterized by physico-chemical methods. DCs were generated in vitro from human monocytes [3], incubated up to 48 h with NPs at different concentrations and analyzed by phase contrast, fluorescence and electron microscopy, flow cytometry and mixed lymphocyte reaction.

When incubated with immature DCs, pure NPs were internalized and localized within vesicles and lysosomes. They did not cause cytotoxic nor stimulatory effects. The amount absorbed depended on NP concentration and did not increase appreciably between 4 and 24 h of incubation. Silica and gold NPs bound different pools of biomolecules from the same lysates. All lysate coated NPs promoted DC-mediated CD4+ cell proliferation. Lysate coated AuNPs also promoted DC maturation and DC-mediated CD8+ cell proliferation.

The results indicate that NPs are well tolerated by DCs and can represent a simple, cost-effective and versatile method to deliver antigens to DCs in view of cancer immunotherapy.

References

[1] Turkevich et al. (1951) J. Discussion Faraday Soc. 11,55.
[2] Stöber et al. (1968) Journal of colloid and interface science. 26, 62-69.
[3] Paccosi et al. (2014) PLoS One. 9:e99652.

Keywords
Silica, colloidal gold, protein corona, in vitro culture, microscopy, mixed lymphocyte reaction