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The fate of aerosol gold nanoparticles upon deposition into physiological fluids

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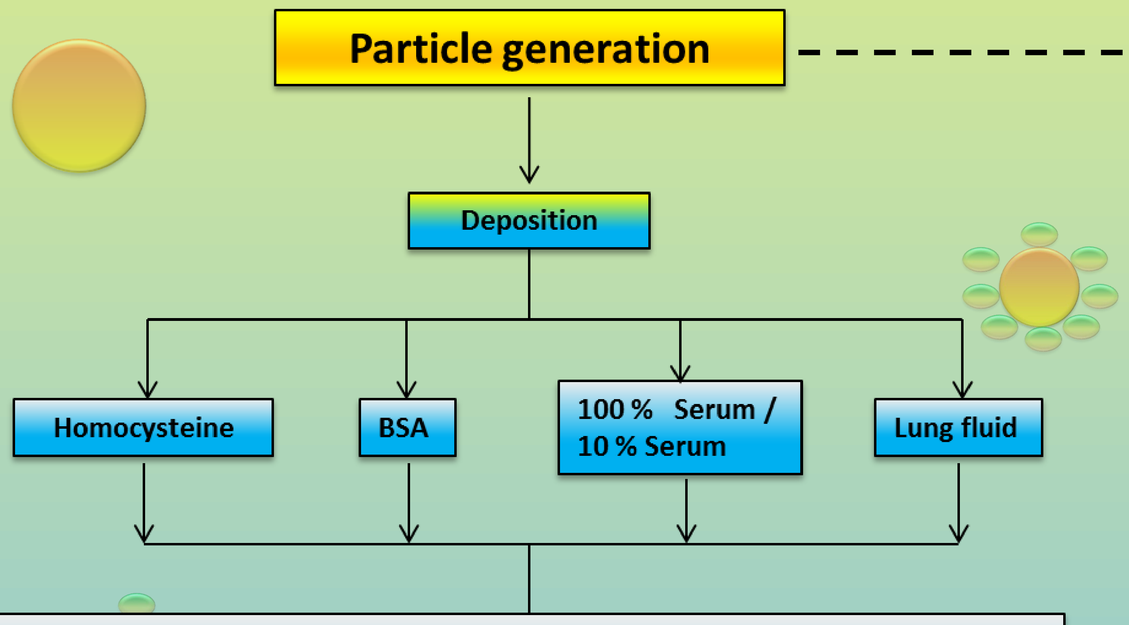
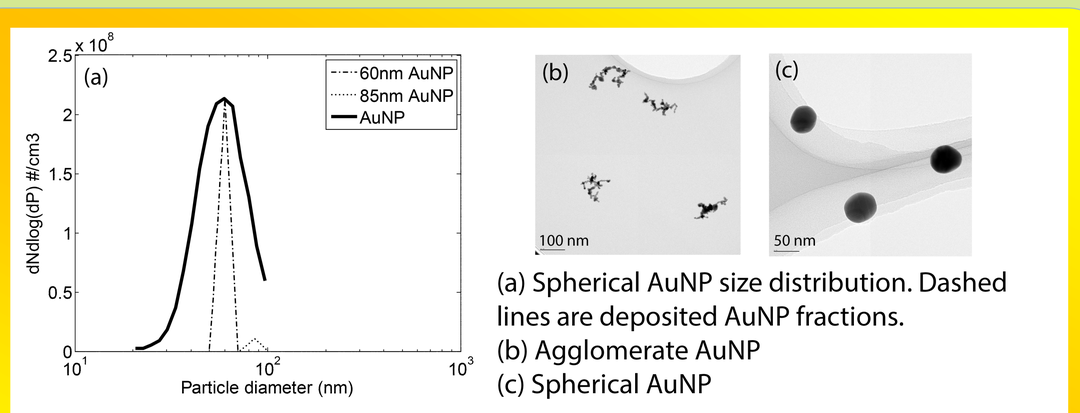
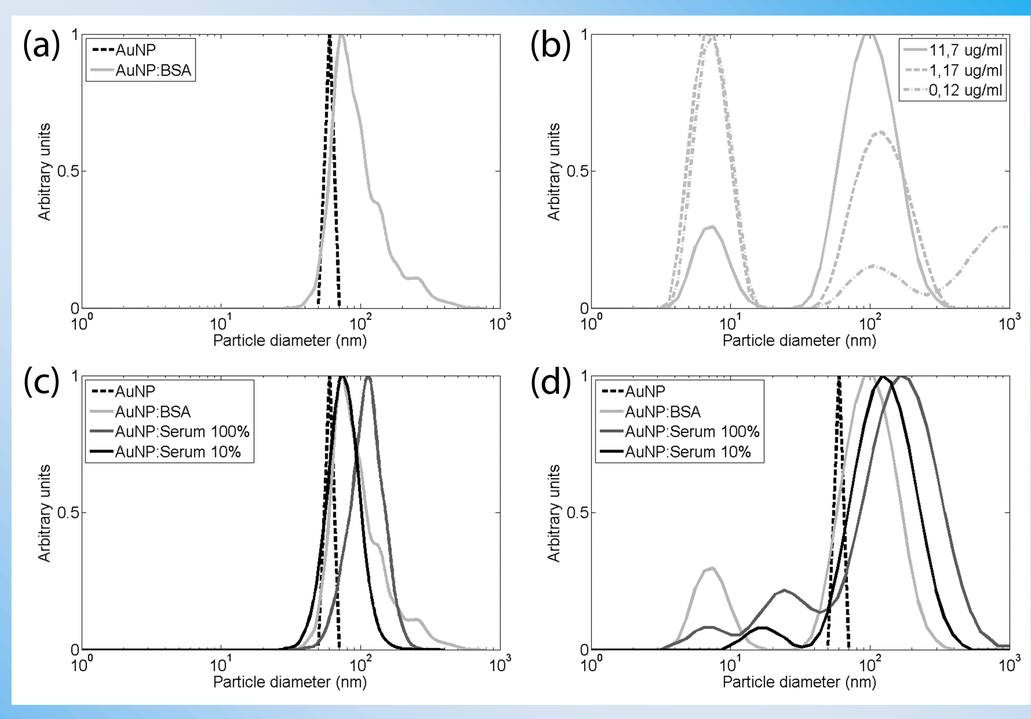
During the last decade traditional forms of toxicological methodology has been discussed with regards to nanoparticle toxicology. Deposition in the respiratory system represents one of the major intake routes for nanoparticles. Hence in order to move towards a more relevant and realistic toxicological situation it has been proposed that particles should be delivered from aerosol phase onto physiological media and cells (1,2). In this study we show that it is possible to deposit engineered nanoparticles from an aerosol phase into various physiological solutions. The gold nanoparticles (AuNP) were deposited in both agglomerate and spherical forms of 60 nm, classified by electrical mobility. The physiological solutions were selected based on increasing complexity with regards to the stabilizing agents, proteins and biomolecules.





(a) Spherical AuNP size distribution. Dashed lines are deposited AuNP fractions.
(b) Agglomerate AuNP
(c) Spherical AuNP

15-16 µg/ml AUNP was selected for deposition into the physiological solutions (a,dashed line). AuNP aersol mass characterisation was performed using an Aerosol Particle Mass Analyzer (3).



(a) AuNP-Albumin complex hydrodynamic size, measured by PTA.

(b) Intensity shift between albumin and the AuNP-Protein complex with incresing dilution ratio, measured by DLS.

(c) AuNP-Protein complex hydrodynamic size in albumin and serum solution, measured by PTA.

(d) AuNP-Protein complex hydrodynamic size in albumin and serum solution, measured by DLS.

! Dashed line represent AnNP selected for depostion (a,c,d) !

Conclusion and outlook

- **The major findings in this work are that AuNPs generated and deposited from gas phase into biological fluids are stabilized and dispersed in the fluids. AuNP-Protein complexes of distinct sizes are formed.**
- **A natural step would be to employ this complete method in a specially designed Air-Liquid Interface chamber (2) in combination with cell exposure to nanoparticles. This would further enhance the quantitative and qualitative understanding of nanoparticle toxicology.**

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