

Nano-gold in time-of-flight mass spectrometry of biological samples

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The use of gold nano-particles (Au-NP) in science and technology is permanently increasing. Due to their unique physico-chemical properties, Au-NP are highly suitable for mass spectrometry (MS) of complex biomolecules or intact cells and tissues as both calibrants and matrices. Au-NP are generally produced mostly by reduction of Au (III) with a redox agent. In the current work we demonstrate and discuss our recent results on use of Au-NP in MS of cells and tissues. 1) *Internal/external calibration in MS*: precise calibration in MS is an essential prerequisite of standard measurements. The use of Au clusters generated from various Au-NP provides a reliable tool for calibration in time-of-flight MS. The Au is monoisotopic, thus the determination of accurate mass is straightforward and fast compared to common calibration standards like peptides/proteins etc. 2) *Use of Au-NP as matrix*: the Au-NP (e.g. in the form of flower-like Au-NP) enhance the ionization of complex biomolecules. This enhancement is presumably due to SALDI (Surface Assisted Laser Desorption Ionization) or NALDI (Nano-particles Assisted LDI) effects. Even the combination of classical MALDI matrix with Au-NP offers significant advantages as it was recently reported [1]. 3) *Au-NP in MS analysis of intact cells*: gold is highly biocompatible; Au-NP can be easily absorbed by endocytosis to cell cytoplasm and increase the signal intensity of peptides and proteins during MS analysis. 4) *Tissue imaging*: similarly to Au-NP-mediated intact-cell MS, treatment of tissue sections with Au-NP-enriched matrices positively affects the overall quality of mass spectra and improves the tissue MS analysis. Concluding, the use of Au-NP brings new and exciting possibilities in MS of biomolecules.

References: [1] L. Kolářová, L. Kučera, P. Vaňhara, A. Hampel, J. Havel, RCMS 29 (2015) 1585-1595.

