Proton Magnetic Resonance Spectroscopy (1H-MRS) evidence for metabolic effect of two different types of silver nanoparticles (AgNPs) upon exposed Rabbit Aortic Smooth Muscle Cells (RASM)

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The AgNPs intracellular distribution, toxicity, and triggered responses are reported to be determined by physicochemical properties like size, shape, composition, and surface chemistry. Indeed, the bioactivity of nanometric compounds is quite dependent on particle surface size and morphological characteristics, which may be very different in materials having the same chemical composition.

In this work, the commercially available AgNPs (Khemia®) were employed as raw material and also after hydrodynamic cavitation processing. This procedure reduced the particle size dispersion putatively influencing their bioactivity. The cytotoxicity towards Rabbit Aorta Smooth Muscle cells (RASM cells) was investigated in vitro. The raw and processed AgNPs (0.1 and 1.0 ppm) were added to the culture media. The cell growth was unaffected by the raw and the processed AgNPs in the time span of the assay. The metabolic targets were analyzed through metabolomics by 1H-MRS in harvested cells (metabolic extraction) and culture media samples (secretomics/secretome). Preliminary results demonstrated metabolic differences in the exposed groups, in relation to unexposed controls. Also, some metabolites were identified as group classifiers: cell Lactate and culture media Cadaverine showed reasonable statistic significance by univariate results. Multivariate results suggest some clustering tendencies: (i) AgNPs-cav 1.0 and 0.1 ppm, (ii) AgNPs 1.0 and 0.1 ppm, and (iii) untreated cells, which may refer to changes in cell metabolism, particularly, changes on mitochondrial metabolism.