Plate reader spectroscopy as a possible substituent for atomic absorption spectroscopy in the quantification of the cellular uptake of the nanoparticles

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Interest in utilizing nanoparticles (NPs) for biomedical applications requires a correct assessment of their intracellular concentration. The concentration of internalized NPs by the cells is becoming crucial for cell targeting and drug delivery. The knowledge of the intracellular concentration of NPs is especially important as most of the biological effects manifest in a dose-dependent manner.

Ultrasensitive atomic absorption spectroscopy (AAS) is seen as one of the gold standard methods for quantifying internalized NPs. Besides its limitation to metal-based NPs, AAS also requires a specific expensive instrument. Despite being a sensitive method, the sample preparation and handling is tedious, which makes it time-consuming and cost-intensive in many cases.

In this study, we report a solid, fast, and accessible alternative to AAS – plate reader spectroscopy (PRS), which offers a susceptible option for daily laboratory use without the need for sophisticated equipment. We investigated the cellular uptake of magnetic iron oxide nanoparticles coated with sodium oleate and bovine serum albumin (BSA-SO-MNPs) in human alveolar epithelial cancer cells A549 assessed by PRS and AAS in parallel with a remarkable correlation coefficient of R = 0.9914.