Cytotoxic evaluation and synthesis of silica particles with functionalized surface

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The use of spherical silica is growing in different areas, especially in medicine and farmacology[1,2] due to its low cytotoxity and high biocompatibility[3]. Silica based materials exhibit excellent chemical properties, easy synthesis, low cost, and functionalization versatility. This versatility came from the easy of its surface modification[4]. Each modification, though, a new hybrid material is formed, and silica toxicity can be modified. In this work, we have synthesized amino and iminofunctionalized (Schiff Base) silica particles and evaluated its toxicity to CHO-k1 ovary fibroblasts cells of hamsters. The aminofunctionalized silica particles were synthesized by hydrolyzes of TEOS followed by hydrolyses of APTES, through the sol-gel method, and the iminofunctionalized silica particles were obtained from the aminofunctionalized particles by reacting them with salicylaldehyde to form the Schiff Base. It was observed by SEM, and analysed with the software ImageJ[4] an average diameter of 220 ± 20 nm (Fig 1A). The aminofuctionalization of the particles was confirmed by ^{29}Si-NMR, by observing the peaks assigned to groups $Q^{2,3,4}$, and groups $T^{2,3}$. The amino groups were quantified through UV-Vis spectroscopy by reacting the amino groups with Ninidrine, and a calibration curve; the obtained value was of the order of 10^{-3} mol of NH_2 per gram of sample. Zeta potential measurements indicated a zero charge point at pH = 7.9. The Schiff Base formation was confirmed by observing a stretching band at 1637 cm^{-1} (Fig 1B) in the FTIR spectroscopy. The citotoxity of both functionalized samples were evaluated by the MTT method, that evaluates the cellular metabolic activity, and the results were expressed in terms of cellular viability; it was obtained values of 105.3 % and 96.5 %, for particles amino and iminofunctionalized, respectively (Fig 1C). This results indicate that neither amino nor iminofunctinalization of the silica particles results in a toxic material for these type of cells. So we conclude that these silica particles are promising materials as precursors for biomarkers and cellular imaging tests.

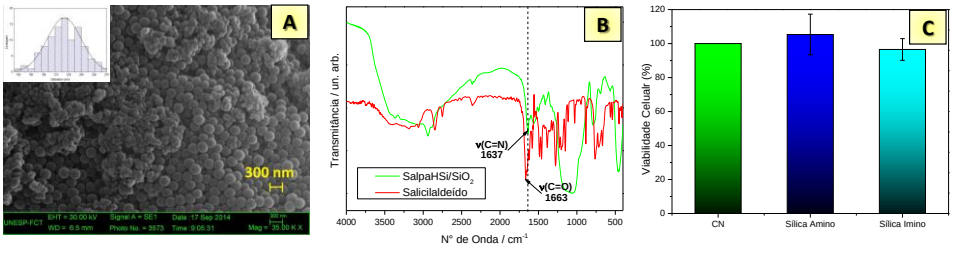

Figure 1 – (A) SEM images of particles aminofunctionalized (insert = histogram) **(B)** FTIR spectrum of iminofunctionalized particles **(C)** Cellular viability of amino and iminofunctionalized silica particles.

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