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Quercetin loaded mesoporous silica nanoparticles to contrast gram positive and gram negative bacteria infections

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Nowadays antibiotic resistance is defined by the World Health Organization (WHO) as one of the biggest treat for human health. [1] In the absence of substantial new antibiotic discovery, drug delivery systems (DDS) can be used to transport and release a biologically active compound at the needed site. [2-3] Among several nanocarriers used for drug delivery, mesoporous silica nanoparticles (MSNs) present several advantages. For example, they present an high surface area (up to 1000 m2/g) and they can be easily functionalized with chemical groups which allow to increase, delay, and localize drug release at cell targets. [3] To date, to increase MSNs biocompatibility and increase their stability polymer coated nanoparticles are under study. [4-5]
In this work, MSNs were functionalized separately with two amine groups, triethylenetetramine (TETA) and 3-aminopropyltriethoxysilane (APTES) to give MSN-TETA and MSN-NH2 prior poly-L-lysine (PLL) modification. After functionalization, the flavonoid quercetin was loaded into MSNs. Structure and function were determined by a wide range of techniques such as TEM, SAXS, TGA, FTIR, N2-adsorption/desorption isotherms, DLS and ELS. Drug release was assayed at different conditions (pH and drug loadings) giving release values within the range of drug concentration (2-10 μg/mL) in plasma after an oral administration dose of 200-500 mg of quercetin. Preliminary microbiological assays were also performed indicating a better efficacy of the DDS against Gram positive bacteria.

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