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One of the key pathogenic events in the onset of Alzheimer's disease (AD) is the aggregation of beta-amyloid (Aβ) peptides into toxic aggregates. Molecules that interfere with this process might act as therapeutic agents for the treatment of AD. The peptide KLVFF (part of Aβ aminoacidic sequence) is known to be essential for the formation of these toxic aggregates. It was also shown that KLVFF binds to the homologous sequence in Aβ and prevents its aggregation. However, KLVFF peptide suffers from poor bioavailability and inability to cross the blood brain barrier (BBB). In this work, we study the possibility to adopt nanomedicine to overcome the above-mentioned limitations. A tailored nanoprecipitation procedure was set up by using mixture of organic solvents (DMSO/Acetone) to dissolve the polymer and the peptide and to create KLVFF loaded NPs (K-NPs) able to deliver a therapeutic dose of KLVFF peptide.
The K-NPs demonstrated to be safe and to restore cell health with a similar efficacy as free KLVFF peptide, significantly reducing the damage caused by Aβ aggregation (e.g. dendritic fragmentation and synaptic density). The K-NP exerted a strong disaggregation effect in the presence of existing Aβ aggregates, suggesting the possibility to exploit these NPs also during the late stage AD and not only in the initial phase of the pathology. Overall, these results indicate that K-NPs possess full therapeutic potential to advance KVLFF treatment as a therapeutic option for AD.

New decorated nanocarriers for biomedical applications.

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Biocompatible and biodegradable nanoparticles (NPs) are widely studied as an effective drug delivery device (1). Among candidates for a drug carrier system, chitosan represents a kind of natural cationic polymer showing nontoxic, biocompatible, biodegradable features. Chitosan represents a kind of natural cationic polymer showing nontoxic, biocompatible and biodegradable features. One of the main prerequisite of a therapeutic drug is to overcome a series of physiological barriers and it to be less toxic for the human. Recently, some peptides have been used to improve the specific targeting and topical absorption of biologically active substances such as peptides and other organic molecules through the epidermis. In the presented work we would like to design peptide decorated-chitosan nanoparticles in which active elements are associated with antifungal and anticancer properties. Therefore, this new decorated delivery system would have a synergistic and/or additive effect decreasing the drug resistance reactions.

References
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Serum miR-93, miR-223, and miR-532 as potential non-invasive biomarkers for diagnosis of laryngeal cancer.

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Laryngeal cancer (LCa) is the second most frequent head and neck malignancy. Despite the remarkable advancement in both diagnosis and treatment options, the disease morbidity and mortality have not been sufficiently decreased. The early detection is still a challenge because of its asymptomaticity until the advanced stage and the failure to detect micro-metastases by conventional imaging analyses. Consequently, there is an urgent need to identify non-invasive reliable molecular markers and to develop useful detection tools. Recently, microRNAs (miRNAs), small non-coding RNAs regulating mRNA translation, have been considered potential biomarkers and therapeutic targets for various diseases. In the present study, we aimed to characterize the serum miRNAs profile in LCa patients and to identify the biomarker candidates for LCa detection. Preliminary analysis showed 11 up-regulated and 5 down-regulated serum miRNAs in LCa patients, compared to healthy individuals. Then, we focused on three overexpressed candidates (miR-93, miR-223, miR-532) confirming their significant up-modulation ($p<0.0001$) by qRT-PCR validation tests. Moreover, the AUC values coming from ROC analysis (0.75 for miR-93, 0.74 for miR-223, and 0.78 for miR-532) suggested that these serum miRNAs are potential non-invasive biomarkers.
Our perspective is to realise high-sensitivity optical and electrochemical biosensors to improve an easily diagnostic of the LCa. We will bio-functionalise some innovative electrospun nanofibers (such as PAN/PEDOT, PU/P3ANA) by a proper chemistry for the immobilization of the probes. We will follow up the recognition hybridization between the ssDNA and the miRNA by different sensitive and reproducibly methodologies such as fluorescence and impedentiometric spectrometry.

Gold nanoparticles and nanorods in nuclear medicine: new tools in tumors treatment.

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