Integrated process of design, synthesis and physicochemical characterization of nanovectors for active drug delivery: the cyclodextrin-folate-bioconjugate example

Alessandro Coslanich, Maurizio Fermeglia, **Marco Ferrone, Maria Silvia Paneni and Sabrina Pricl**
University of Trieste
Computer Aided Systems Laboratory (Cas-Lab), Department of Chemical, Environmental and Raw Materials Engineering
Piazzale Europa 1, 34127 Trieste, Italy
paneni@dicamp.units.it
www.caslab.units.it

Paolo Caliceti, Tommaso Carofiglio, Roberto Fornasier, Stefano Salmaso and Alessandra Semenzato
University of Padua
Department of Pharmaceutical Science
Via Marzolo 5, 35131 Padua, Italy

In order to design a drug delivery system, various high-performance, nanocarrier materials are being developed to deliver the necessary amount of drug to the targeted site both efficiently and precisely. Cyclodextrins (CDs) are potential candidates for such a role, because of their ability to alter physical, chemical and biological properties of guest molecules through the formation of inclusion complexes. Recently, CDs have been modified by conjugation of water-soluble polymers to obtain derivatives with peculiar biopharmaceutical properties.
Aimed at exploiting cyclodextrin bioconjugates for active drug targeting, integrated approach to the design, synthesis and physicochemical characterization of a beta-cyclodextrin derivative (CD-PEG-FA), in which folic acid was conjugated to the carbohydrate macrocycle via a PEG spacer, has been developed. The experimental data obtained from the incapsulation in CD-PEG-FA of several anticancer drugs (e.g., estradiol, chlorambucil and taxol) were rationalized and explained in terms of extensive molecular dynamics simulations.