The research activity focuses on synthesis and characterization of bioinspired amphiphilic conjugates capable of providing self-assembling nano-materials with functionalities, structure, size, and morphology optimized for applications in the field of drug delivery.
Hybrids can be properly designed by exploiting the chemical and structural properties of synthetic or natural polymers, peptides, lipids and cholic acids. A bottom-up approach is adopted to obtain hybrid nanosystems having performances not occurring in the single components; moreover, structural features and functions can be tuned to achieve materials responsive to stimuli such as temperature, pH or ionic strength.

In particular, the following research lines can be identified:

1. Synthesis and characterization of peptide-polymer hybrids where pH- and thermo-sensitive polymers are conjugated to peptides with regular alternating enantiomeric sequences that are able to induce self-assembling nanoparticles with rod-like morphology;
2. Synthesis and characterization of peptide-fatty acid conjugates with pH and temperature dependent association properties;
3. Synthesis and characterization of temperature- and pH-sensitive cholic acid derivative-polymer conjugates. Such class of organic molecules, with a rigid and peculiar amphiphilic structure, are particularly prone to form tubular assemblies by self-assembly;
4. Functionalization of nanoparticles with groups (epitopes) capable of favoring the interaction with membrane receptors;
5. Preparation of hybrid self-assemblies formed by weak covalent bonds, which break and re-form in response to environmental stimuli, causing reversible assembling and disassembling of the aggregates.