Objective

"The scientific aim of this project is to develop and characterize a selected set of novel intelligent nanogels, designed to be able to cross the Stratum Corneum of the skin, and to study their suitability as drug delivery systems in inflammatory skin diseases. Ultrasmall nanogels will be synthesized using high dilution radical polymerization, a technique well established in the host’s laboratory, which allows the control of the particle size and polydispersity. Three different groups of nanogels will be prepared: 1) fluorescent nanogels 2) molecular imprinting nanogels 3) thermoresponsive nanogels. The first group will be used to study the distribution and localization of nanogels in
normal human skin model reproduced in vitro by organotype cell co-culture. The second group will be used to evaluate the molecular imprinting approach as a tool to obtain very selective delivery system with high recognition characteristics. This has not been studied before and will provide a unique approach, when coupled with high permeation characteristics. The last group, the thermoresponsive nanogels, will combine good permeation with ability to release the drug following a change in temperature and will be compared with more traditional systems.

The project will explore the use of each nanogels set to complex and deliver (a) small anti-inflammatory drugs, and (b) large molecules, in particular siRNA, given the strong expertise of the applicant in this area and the emerging interest for these new therapeutics in topical administration.

Penetration and pharmacological effects of the drug-nanogels complexes will be assessed in pathological skin in vitro model by the improvement of the disease phenotype.

The most significant novelty of the project will be the development of new organic polymeric nanogels able to cross the SC of the skin, providing a new non-invasive gene delivery technology system, that could bring very important applications in dermatology as well as in other fields."