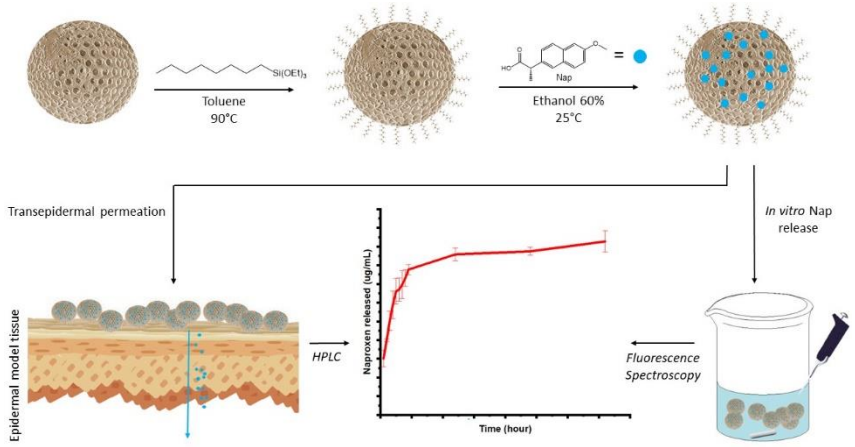
FUNCTIONALISED DIATOMS BIOSILICA FOR DRUG DELIVERY THROUGH ARTIFICIAL HUMAN EPIDERMIS

Annarita Flemma[1], Danilo vona[2], Francesca Piccapane[3], Pietro Cotugno[1], Stefania Roberta Cicco[4], Vincenza Armenise[1], Cesar Vicente Garcia[1], Giuseppe Procino[3], and Roberta Ragni[1]

[1]Department of Chemistry, University of Bari "Aldo Moro", via Orabona 4, Bari, 70126, Italy, annarita.flemma@uniba.it email; [2]Department of Soil, Plants and Food Science (Di.S.S.P.A.), University of Bari "Aldo Moro", via Orabona 4, Bari, 70126, Italy; [3]Bioscience, Biotechnology and Biopharmaceutics Department, University of Bari "Aldo Moro", via Orabona 4, Bari, 70126, Italy; [4]Institute for the Chemistry of Organometallic Compounds (ICCOM), CNR, via Orabona 4, Bari, 70126, Italy.

Abstract: Nanostructured silica-based materials are highly valued for their porosity, large surface area, biocompatibility, and potential for chemical modifications [1]. Diatom microalgae, both in their living form and as fossil sediments, serve as a natural source of nanostructured biosilica microparticles. Although biosilica has previously been explored for drug delivery systems [2], this study marks the first time it has been applied to skin treatments. Biosilica microparticles were chemically modified with n-octyl-triethoxysilyl groups to create a hydrophobic material that adheres to human skin by interacting with the lipid matrix. Following characterization, Naproxen was chosen as a model drug for testing. *In vitro* drug release experiments were conducted in artificial sweat solution and via transepidermal permeation through a 3D living skin tissue model. Assessments of cell viability and morphology after transepidermal permeation revealed no significant cytotoxic effects on human epidermis models across all tested treatments. The presence of octyl chains not only enhanced the microcarriers' adhesion to porcine skin tissues but also regulated the gradual release and transepidermal permeation of Naproxen over 24 hours. These results highlight the potential of this drug-delivery system for effective and sustained skin therapies.



Schematic representation of hydrophobic diatom-based microcarriers and in vitro release tests both with artificial human epidermis and artificial sweat solution.

Key words: *Topical drug delivery, diatomaceous earth, trans-epidermal drug permeation.*

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