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Biosynthesis of peptide hydrogels for biotechnological applications

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Abstract

Peptide applications are growing significantly in the field of biomedicine (e.g. immunology, cell signaling, etc.). Such a significant and rapid development is due to the major clinical value that peptides have been acknowledged. A growing number of applications in a wide range of treatments for such conditions as cancers, allergies, Parkinson's, multiple sclerosis, and heart failure is currently under development. Among peptides, peptide based hydrogelators represent an extremely interesting class because they can trigger hydrogel formation giving rise to the formation of biocompatible biomaterials of biological relevance. For example, applications include controlled drug release, tissue regeneration and tissue engineering. Moreover, self-assembling peptides could be used to develop injectable devices. Recently, relevant research efforts are being made in the field of the biofabrication of such self-assembling biomaterials. In particular, different classes of enzymes can be used to trigger the formation of peptide bonds between precursors that form peptide hydrogelators. Several enzymes derived from GRAS microorganisms can be employed to catalyze this reaction in aqueous medium, avoiding the use of organic solvents. Such novel, "green" synthetic procedures could have a strong impact on peptide production by introducing milder reaction conditions and limiting the use of harmful chemicals. Moreover, new hydrogel composites are being developed through the incorporation of nanofillers (e.g. polymeric nanoparticles, graphene), that offer the potential to tailor the mechanical strength of the native material, adding binding sites for further bio-functionalization with biological molecules, and supplying additional properties such as conductivity for regulating cell behaviors such as cell proliferation, differentiation or protein synthesis.

Biography

Laura Chronopoulou has completed her PhD in Materials Science at the University of Rome La Sapienza. She is currently working as a post-doc Researcher at the Department of Chemistry of the University of Rome La Sapienza, in the Industrial Chemistry group. She is a member of the Nanobiotechnology lab run by Prof. Cleofe Palocci. Her main research interests are the following: Synthesis and characterization of biopolymeric nanoparticles for drug delivery applications; Bioproduction of peptidic hydrogels for biotechnological applications; Structure-activity studies of lipolytic enzymes immobilized on nanocarriers; Microfuidic approaches to the synthesis of nanomaterials. She has authored 40 publications that have been cited over 600 times, and her publication H-index is 15.

Publications

1. Microfluidic synthesis of methyl jasmonate-loaded PLGA nanocarriers as a new strategy to improve natural defenses in Vitis vinifera
2. Noble metal nanoparticle-based networks as a new platform for lipase immobilization
3. Extraction of Carotenoids and Fat-Soluble Vitamins from Tetradesmus Obliquus Microalgae: An Optimized Approach by Using Supercritical CO2
4. PLGA based particles as "drug reservoir" for antitumor drug delivery: characterization and cytotoxicity studies
5. Effects of controlled release of 18-β-Glycyrrhetic Acid by nanoparticles, on cytotoxicity and intracellular concentration in HepG2
6. Controlled release of 18-β-Glycyrrhetic Acid by nanodelivery systems increases Cytotoxicity On Oral Carcinoma Cell Line
7. A physico-chemical approach to the study of genipin crosslinking of biofabricated peptide hydrogels
8. Evaluation of novel Fmoc-tripeptide based hydrogels as immobilization supports for electrochemical biosensors
9. Endocytic pathways involved in PLGA nanoparticle uptake by grapevine cells and role of cell wall and membrane in size selection
10. Biosynthesis and characterization of a novel Fmoc-tetrapeptide based hydrogel for biotechnological applications

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