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Cosimo Carfagna

Institute for Polymers, Composites and Biomaterials (IPCB CNR), Italy

POLYMER SCIENCE AND PHYTOTHERAPY: NATURAL REMEDY FOR MALARIA AND CANCER BASED ON ELECTROSPUN NANOFIBERS CONTAINING ARTEMISININ

The continuous search of new therapy is requested by a growing resistance to major antimalarials. The sesquiterpene endoperoxide Artemisinin (ART) is currently one of the most effective natural treatment against multidrug resistant Plasmodium species, and ART combination treatments (ACTs) can represent an useful approach to fight resistance, as recommended by the WHO. ART relevance is witnessed by the 2015 Nobel Prize in Physiology or Medicine awarded for one half by Professor Youyou Tu. Since seventies, Youyou Tu and her team focused their efforts to the development of new malarial therapies inspired by the traditional Chinese medicine; they discovered that Artemisinin appeared in several ancient recipes to treat the malarial disease. The mechanism of action of ART is ascribed to the presence of an endoperoxide group inside its molecule. On reacting with iron, the endoperoxide group breaks up, producing free radicals. When formed inside a malaria parasite, the radicals can lead to cellular damage and cell death. In a similar way, it has been found that ART is able to affect cancer cells due to their elevated iron concentration; derivatives of ART have shown promising anticancer effects against multiple cell lines derived from various types of cancers. Besides some evidence of the anticancer potential of ART, the exact mechanism of action of this drug in cancer still remains unclear. However, one of the most crucial and unsolved aspects of DDS containing ART is related to its high level of crystallinity which dramatically reduces its bioavailability due to low solubility. Therefore, inhibition of crystallinity of ART is mandatory to guarantee a proper concentration of drug. In a recent paper some of the authors developed an antinucleating strategy to prevent the crystallization of ART through its solubilization into core-shell nanofibers obtained trough the electrospinning technique. Electrospun nanofibers fibers were constituted by a shell of poly(vinylpyrrolidone) (PVP) and a core of ART dispersed in a hyperbranched poly(buthylene adipate) (HB), acting as crystal suppressant of ART thanks to its highly branched structure, (coded as HA-Pfibers). This communication deals with the use of electrospun nanofibers containing ART as DDS against malaria and prostate cancer. The investigation was carried out considering both the technological and biological aspects. First, the study was focused on the assessment of drug loading and release capability, then in vitro tests were carried out to evaluate the pharmacological activity of encapsulated ART against cancer cell proliferation and malarial parasites (P. falciparum) growth.

Biography

Cosimo Carfagna is full Professor of Chemistry at the University of Naples "Federico II". Since 2001 he is Director of the Institute of Polymers, Composites and Biomaterials of C.N.R. From 2008 to 2010 he has been President of Research Area NA3 of C.N.R. He is member of the International Society of Liquid Crystals, member of the Material Research Society, member of the Academy of Science of New York, member of the Italian Society of Liquid Crystals, member of the Italian Society of Macromolecules, member of Italian Chemical Society, member of the University Committee in the University of Study of Basilicata, member of the Department Council in the Department of Engineering of the Materials and the Production of the University of Napoli, referee of Ministry of Education of Portugal for evaluation of projects in the field of materials science, referee of Ministry of Education and Ministry of Industry of Italian Government for evaluation of research project on polymer technology. Currently Prof. Carfagna' research interest are focused on Polymer Chemistry and Technology, Polymer functionalization, Polymer synthesis, liquid crystalline polymers, composites and nanocomposites, functional and smart textiles, recycling and processing of plastics, advanced materials for packaging, use of natural products as additive of polymers, nutraceuticals for polymers.

carfagna@unina.it