Project code: PN-III-P2-2.1-PED-2019-2553, contract no. 525PED/2020

Project title: *Nanoplatform for natural and synthetic compounds with synergistic cytotoxic effect*

Acronim: CYTOSIN

Funding Agency: UEFISCDI

Contractor: University "Politehnica" of Bucharest (UPB)

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Project scope

The scope of this project is the development and testing at laboratory scale of a new complex targeted nanoplatform containing functionalized mesoporous silica nanoparticles coated by fucoidan, a natural sulphated polysaccharide with anticancer and immunotherapeutic activity, for Irinotecan that integrates at least 3 functionalities (TRL4): carrier, targeting and intracellular delivery.

Project duration (in months) – 24 months

Project start date: 26 October 2020

Project end date: 25 October 2022

Total budget: 600000 lei

Public budget: 600000 lei

Own budget: 0 lei

Budget for UPB: 300000 lei

Budget for IFIN-HH: 300000 lei

Project team - UPB

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Abstract

This project is an interdisciplinary research that integrates the expertise of chemists, physicists and physicians, involving three research groups, two from UPB and the other from UMF that have already collaborated. The scope of this project is the development and testing at laboratory scale of a new complex targeted nanoplatform containing functionalized mesoporous silica nanoparticles (MSN) coated by fucoidan, a natural sulfated polysaccharide with anticancer and immunotherapeutic activity, for Irinotecan that integrates at least 3 functionalities (TRL4): carrier, targeting and intracellular delivery. The development of the new platform is based on the concept that an oral administration of the Irinotecan, a cytostatic agent, commonly used for colon cancer, combined with fucoidan, could increase its therapeutic efficiency and reduce side effects and its gathers the most advanced scientific results for the encapsulation, targeting and controlled intracellular release of the cytostatic agent (TRL3). All these components were proved to be valuable for the drug delivery systems, but all of them were never assembled in a single advanced delivery system with expected synergistic effect, and this is the step forward in our research and the novelty of this proposal for a laboratory demonstration. Based on our knowledge, it is for the first time that Irinotecan-loaded MSN is combined with fucoidan for a synergistic anticancer effect. Another novel aspect of this proposal consists in identification of membrane/intracellular localization of nanoplatform used for cytostatic agent delivery by using hyperspectral microscopy. Modulation of Irinotecan-nanoplatform cytotoxic activity will highlights the main endocytotic mechanisms involved in nanoplatforms uptake.

Estimated results

- 2 papers in ISI journals
- at least 4 contributions at international conferences
- a nanoplatform with synergistic cytostatic effect containing irinotecan and sulphated polysaccharide with specifications validated at laboratory scale.