Project no. 74 PCCDI/2018, acronym TehnoBioMed: *„Emerging molecular technologies based on micro and nano-structured systems with biomedical applications”*
code PN-III-P1-1.2-PCCDI-2017-0010, time interval January 2020 - December 2020

Stage 3 Summary

Stage 3 of the project 74 PCCDI/2018 (acronym TehnoBioMed), web page: http://www.itim-cj.ro/PNCDI/tehnobiomed/ had unfolded in 5 constituent projects, comprising a total number of 18 activities. Hereby we briefly present the principal results obtained for each of the constituent project:

Project component 1

- A versatile and biocompatible plasmonic nanoplatform was developed. The platform was functionalized with antimicrobial peptides and exhibited a highly efficient antimicrobial activity and biofilm formation inhibition activity. The antimicrobial activity was tested on Gram-negative and Gram-positive bacteria and showed a nearly 100% microbial inhibition activity in case of plancton bacteria.
- A new SERS-based method for in situ rapid detection of *Staphylococcus aureus* and *Enterococcus faecalis* in various aquatic sources was developed.

Project component 2

- The interaction mechanisms between dendrimers (conjugated or not with biologically active molecules) and biomimetic lipidic systems were investigated using fluorescence microscopy.
- The activity of biologically active molecules confined inside dendrimers was tested on target cells (bacteria, fungi, tumoral cells).
- A series of conjugated dendrimers with antimicrobial peptides and/or Colistin were selected, and their effect on Gram-negative bacteria resistant to Colistin and on fungi was studied.

Project component 3

- A series of numerical algorithms able to improve the quality of OCT images were generated and successfully applied on raw OCT images.
- A new software application for the automatization and synchronization of the numeric data registration based on a XY controlled movement of the samples holder was developed.
- The plasmonic coupling phenomenon was visualized by applying the developed numerical algorithms used for OCT data processing and correction.

Project component 4

- A new immunochemical procedure for the nano-immuno-adsorbent based antibody characterization was developed.
- A series of physical parameters of the nano-immuno-adsorbent based antibody were assessed: the affinity constant, the Gibbs energy, the rate for the immune reaction between the nano-immuno-adsorbent (Ab) and the pesticide (with or without enzyme marker), the dissociation rate for the immune reaction between the nano-immuno-adsorbent (Ab) and the pesticide (with or without enzyme marker), the surface density of the antibodies anti-pesticide coupled with nanoparticles.

Project component 5

- Photosensitive materials based on phycobiliproteins and semi-conductive nanoparticles were synthesized.
- A highly efficient plasmonic substrate was synthesized and subsequently functionalized with phycobiliproteins in order to assesed the corresponding fluorescence emission.
- The experimental parameters involved in the photosensitive materials synthesizing protocol were optimized.

Director Proiect Complex,

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