Antimicrobial chitosan-nanocomposites for biomedical applications: efficiency and safety

Summary

The PhD project aims to create and analyse novel chitosan-Ag (or CuO) nanocomposites (CS-NCs) for biomedical applications, such as wound-dressings and implants, and identify the CS-NCs physicochemical properties yielding the highest antimicrobial and immune-modulating efficiency with no adverse side effects to humans.

Research field:	Chemistry and biotechnology
Supervisors:	Mariliis Sihtmäe Dr. Kaja Kasemets
Availability:	This position is available.
Offered by:	National Institute Of Chemical Physics And Biophysics
Application deadline:	Applications are accepted between May 03, 2021 00:00 and May 31, 2021 23:59 (Europe/Zurich)

Description

This PhD project aims to create and analyze chitosan-Ag (and/or CuO) nanocomposites (CS-NCs) with synergistic properties of antimicrobial and immune-stimulating action. Thus, the main objective of the project is to synthesize CS-NCs and identify their physicochemical properties yielding the highest antimicrobial and immune-modulating efficiency with no adverse side effects to humans.

Main tasks within the PhD project:

- Synthesis of the library of CS-NCs (with different sizes and charges) using different chitosan formulations
- Physicochemical characterization of CS-NCs by UV-Vis, XRD, EDX, SEM, TEM, DLS, FTIR, NMR, and the solubility by the AAS
- Evaluation of CS-NCs antimicrobial potency and mode of action to the clinically relevant bacterial and fungal strains (including antibiotic-resistant ones)
- Evaluation of CS-NCs cytotoxicity in vitro using cell cultures
- Evaluation of the CS-NCs bio-interactions with the microbial and mammalian cells in vitro by the laser scanning confocal microscopy, and scanning and transmission microscopy
- Conducting data analysis
- Manuscript writing

Applicants should fulfill the following requirements:

- Master's degree in biology, chemistry, pharmacology, or a related discipline
- Experience in nanoparticle synthesis and characterization (e.g. UV-Vis, XRD, EDX, SEM, DLS, and FTIR), microbiology, and in vitro cell culture methods are a bonus
- Strong team-working skills, capable of independent work and taking initiative
- Good command of English (verbal and written)
- Data analysis/statistics skills
- The applicant should submit a letter of motivation in English (one A4 page) and be prepared for a Skype interview

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Co-supervisor: Dr. Mariliis Sihtmäe (mariliis.sihtmae@kbfi.ee), National Institute of Chemical Physics and Biophysics

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