**SUBJECT: BARRIER MEMBRANES WITH PROLONGED DRUG RELEASE FOR DENTAL APPLICATION**

The proposed research aims to develop **electrospun barrier membranes** using three-component nonwovens **with prolonged drug release for dental application**. Membranes made of fibres will be developed and optimized from two perspectives. The first major one is the optimization of morphology to establish the required pore size for barrier function, preventing soft tissue cell migration into bone defect sites. The second one is related to the optimization of drug release in terms of controlled and prolonged release. Considering the aim and main perspectives of the project, triaxial electrospinning will be used as a method of core-shell type fiber production. Electrospun membranes will be prepared from biocompatible materials, including synthetic and natural polymers. The molecular mass and ratio of the components will be differentiated to analyze their impact on the structure, mechanical properties, biodegradation rate, and biocompatibility of the developed membrane.

**SUPERVISOR:** Prof. Pawel Sajkiewicz, IPPT PAN (SPPiB), tel.no.: +48 22 826 12 81 ext. 400, room: 337, e-mail: psajk@ippt.pan.pl
**Co-supervisor:** Dr. Dorota Kolbuk-Konieczny, , IPPT PAN (SPPiB), tel.no.: (+48) 22 826 12 81 ext. 425, room: 338, e-mail: dkolbuk@ippt.pan.pl

**DESCRIPTION:** Periodontal diseases are the most common health problems and during the chronic diseases, periodontal bacteria can enter the circulation from the infected tissue and cause serious systemic infections such as cardiovascular disease, diabetes.[1,2] Classical treatments cause tissue reparation rather than tissue regeneration due to the competition between different periodontal tissues i.e., alveolar bone, periodontal ligament, and the difference in the rate of migration, and proliferation of periodontal cells.[3-5] To overcome these, the Guided Bone Regeneration (GBR) and Guided Tissue Regeneration (GTR) are developed allowing sufficient bone and periodontal regeneration by using a dedicated **barrier membrane (BM)** between epithelial tissue and bone. BMs are used to prevent soft tissue ingrowth by blocking faster-growing epithelial cell migration into the periodontal defect site.[6,7] BMs should have some key qualifications: biocompatibility, sufficient mechanical properties, convenient degradation rate, and being cell occlusive.[1,8] Considering the application, incorporation of antimicrobial agents into the fibers is a highly interesting research topic due to bacterial infection being the most challenging factor causing the failure of GBR/GTR.[8] In this research, triaxial electrospinning, an innovative method, will be used to **manufacture the BMs**. In this method, there is a core polymer and there are two polymers as sheath layers (intermediate and shell) surrounding the core. **It is challenging to determine the manufacturing parameters of the membranes and confirm required properties.** According to literature the main challenges beyond the selection of process parameters are sustained and controlled drug release, poor solubility of drugs, problems with loading multiple drugs, insufficient mechanical properties, and biodegradation, not adequate biocompatibility.[9,10] Nagiah et al., (2020) have reported interesting results for dual drug delivery applications using triaxial electrospun fibrous matrices.[11] In this study, they used a material system containing synthetic biodegradable polymers for core and sheath, and a natural polymer for the intermediate layer. They used two different dyes modelling drugs to observe the drug release. As a result, they have achieved a relatively long release time, nearly 21 days. Additionally, they claim that the mechanical properties of the developed triaxial electrospun fibers are promising for regenerative medicine applications. To the best of our knowledge, **no report has yet been presented in the literature on a triaxial nanofiber membrane developed for dental application**. The ambition will be to complete the project with the results, allowing us to broaden knowledge in manufacturing membranes for BMs and add an original contribution to the literature. Our results will provide crucial elements for the further steps before the final clinical evaluation of a new, effective drug-loaded membrane for dental applications.

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**Sahranur TABAKOGLU-TIB PAN**

**IPPT PAN-SPPiB; room:335 ext:337 e-mail: stabakog@ippt.pan.pl**