

The general goal of this project is to obtain a composite biomaterial with broad regenerative potential for bone and periodontal tissues. The active agents of the composite will be polyphenols of plant origin with antimicrobial and anti-inflammatory properties and bioactive glass with bone-forming properties. The project aims to: obtain a biocompatible matrix releasing long-lasting antibacterial and anti-inflammatory polyphenol; develop a composite based on the above-mentioned matrix containing bone-forming bioactive glass; optimize the matrix and the composite in terms of their multi-functional biological properties and obtain a composite with defined biological activities *in vitro*; preliminarily verify the clinical applicability of the composite in a pilot study on a group of canine patients of a selected veterinary clinic diagnosed with periodontitis. The composite material will be based on a chitosan/collagen (CTS/Coll) polymer matrix cross-linked with tannic acid (TA) or similar polyphenols (e.g. such as ferulic- or gallic acid) and simultaneously enriched with unmodified, or zinc or strontium modified, bioactive sol-gel glass (SBG) from the CaO/SiO<sub>2</sub>-(P<sub>2</sub>O<sub>5</sub>) system. A consortium team consisting of Dr. hab. Anna M. Osyczka, Prof. of Jagiellonian University in Krakow (Project Leader), Dr. hab. Katarzyna Cholewa-Kowalska, Prof. of AGH University of Science and Technology in Krakow, and Dr. Beata Kaczmarek-Szczepańska of Nicolaus Copernicus University in Torun will be responsible for developing, characterizing and verifying the biological activity of the designed composite. Based on the previous scientific experience of the project Authors and the preliminary results of the current project, the developed composite is expected to exhibit antimicrobial, immunomodulatory and osteoinductive properties. The project addresses the demand of veterinary clinics for formulations to help treat periodontitis in pets, but also includes extensive basic biological research on human bone marrow cells and cells of the periodontal ligament, with a view to potential future use of the developed composite in humans. The project is guided by the global "One Health" mission, which takes an integrated, unifying approach to balance and optimize human and pet health. This approach assumes that human health is closely linked to domestic animals well-being and our shared environment. Therefore, we expect that improving the quality of life of pets (i.e. dogs with advanced periodontitis) will also improve the quality of life of their owners. Due to the project's time constraints and study design, a relatively small group of dogs diagnosed with advanced periodontitis from a selected veterinary clinic will be enrolled in the project's crowning pilot study. However, if this study is successful compared to the current standard treatment, the results of the pilot study will form the basis for a larger clinical trials to develop products for the treatment of periodontitis in pets.