A new generation of scaffolds based on curdlan and whey protein isolate obtained by electrospinning for the treatment of cartilage, bone, and osteochondral defects

The joint diseases, osteoarthritis (OA), osteoporosis (OP), spinal disorders, and severe trauma are considered as most frequently occurring musculoskeletal conditions affecting millions of people globally. In 2019, an estimated 528 million people worldwide suffered from OA, which constitutes an increase of 113% since 1990. On the other hand, bone associated diseases constitute half of chronic diseases in people over 50 years old, and 9 millions osteoporotic fractures occur worldwide each year. Besides this, an increase in the incidence of fractures due to accidents make that bone is considered as the second most commonly transplanted tissue all over world. Due to limitations of autografts (grafts derived from the same patient) or alternative allografts (grafts derived from a deceased patient) and lack of "ideal" scaffolds, there is a need to develop new, improved cartilage, bone, and osteochondral biomaterials.

Thus, the aim of this project is to develop electrospun fibrous scaffolds based on both curdlan and whey protein isolate (WPI), which will possess new composition and structure similar to mammalian extracellular matrix (ECM), controlled biodegradability, mechanical stability, and will promote cellular response as well as tissue regeneration. Therefore, these biomaterials will be subjected to evaluation of their structural, physicochemical, and mechanical properties. Moreover, a number of biological experiments will be performed (*in vitro*, *ex ovo*, *ex vivo*, and *in vivo*). Such comprehensive approach will allow to determine the biosafety and the biomedical potential of newly designed scaffolds.

To sum up, this project will provide answer about the significance of electrospun scaffolds based both on curdlan and WPI in the context of the treatment of cartilage, bone, and osteochondral defects. Potentially, newly designed biomaterials will be able to be used as an alternative to autografts and allografts. They will also be able to be modified by drugs in the future.