

Doctoral School of Information and Biomedical Technologies
Polish Academy of Sciences
(TIB PAN)

Subject: Piezoelectric biodegradable scaffolds for chronic wound healing (detailed title will be clarified as a result of the PhD student-supervisor interaction)

Discipline: biomedical engineering

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Description: The research will be focused on developing innovative dressing for chronic wound healing based on piezoelectric biodegradable electrospun polymers. Traditional wound dressing act as a temporary barrier for homeostasis and infection prevention purposes. In some pathological states like diabetes, infections, or in general aging, one of the most serious complications is related to the lack of proper angiogenesis, leading to so called chronic wounds. Our research will use tissue engineering methods for effective stimulation of angiogenesis as well as limitation of inflammation. We plan to investigate electrospun biodegradable piezoelectric nanofibers from the group of aliphatic polyesters. This material is intended for electric charge formation using external ultrasound source. Although in the case of piezoelectric materials there is relatively few data indicating that they are effective for angiogenesis, it is highly evidenced their beneficial activity for the improvement of cell proliferation/migration toward the wound edge. Additionally, the literature data indicate clearly that electric charges induced in piezoelectric materials are important for prevention of bacterial infections. The most commonly investigated piezoelectric polymer, used alone or as a matrix filled with some additives, both piezoelectric like BaTiO₃ or non-piezoelectric, like nano hydroxyapatite, is polyvinylidene fluoride (PVDF). However, the PVDF nanofibers are very hydrophobic and not degradable, thus exhibiting a low absorbability of exudates and insufficient adhesion/retention of cells/moisture which are important for wound healing.

References:

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