UK-Poland Bioinspired Materials Conference

23rd-24th November 2020

Conference addressed to UK and Polish Early Career Researchers (postdocs and PhD students)

CONFERENCE PROGRAMME AND BOOK OF ABSTRACTS

ONLINE CONFERENCE VIA MICROSOFT TEAMS

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Poster 74: Cellular Studies on Stromal Cells and Piezoelectric Nanofibers Subjected to Ultrasounds Stimulations for Medical Devices

Smart piezoelectric materials are of great interest due to their unique properties. Piezoelectric materials can transform mechanical energy into electricity and vice versa. Recent years show progress in the applications of piezoelectric materials in biomedical devices due to their biocompatibility and biodegradability [1]. An example of smart materials are piezoelectric scaffolds, which can generate electrical signals in response to the applied stress [2]. The piezoelectric scaffolds can act as sensitive mechanoelectrical transduction systems. It is known that electrical charges are crucial for various activity of cells [3,4].

Polyvinylidene fluoride (PVDF, Mw = 530 000 g/mol) nanofibers were electrospun from 15% solution of dimethylformamide and acetone (DMF/Ac 4:1 weight ratio) at feed rate 0.2 mL/h (3 mm needle) and collected on drum collector (diameter 40 mm) at a distance between the needle and collector 180 mm.

Human adipose-derived stromal cells (ADSCs) were cultured in osteogenic medium on the piezoelectric PVDF scaffolds electrospun with different collector rotational speed (200, 1000 and 2000 rpm) and subjected to ultrasound stimulation (power 80 mW, frequency 1.7 MHz) for 30 minutes every 24 hours. As a control for each group, ADSCs seeded on piezoelectric PVDF scaffolds without ultrasonic stimulation were used (0 mW). In order to confirm the piezoelectric effect on ADSCs viability, PrestoBlue cell viability test was performed on day 3, 14 and 21. Results were statistically analyzed using Student's t-test. The observations of fibers and cell morphology were conducted using Scanning Electron Microscopy (SEM).

Conclusions PVDF nonwovens as piezoelectric polymer stimulated by ultrasounds is advantageous for cells' viability. The obtained preliminary results are promising from the perspective of tissue engineering applications.