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The effectof Low-Intensity Pulsed Ultrasoundand Pulsed Electromagnetic Field on human Schwann and neural cells

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Damage to the peripheral nerves is considered on of the main factors leading to the development of Diabetic Foot Syndrome (DFS). Therefore, the crucial aspect is to prevent deterioration of human neural cells. It has already been observed that Low-Intensity Pulsed Ultrasound (LIPUS) and Pulsed Electromagnetic Field (PEMF) enhances peripheral nerve regeneration, but this aspect requires further examination. The aim of this research is to determine the effect of LIPUS and PEMF on human primary Schwann cells and neuronal cells.

In our study, Schwann cells were seeded into 12-well plates (6.5 thousand per well), then the cell culture was subjected to for 9 days to specific LIPUS field frequencies (20kHz or 40kHz) and/or PEMF (4,

15, 50,100, 1000 Hz) 40 cycles/40s. The Comet Test Assay was used to analyze DNA damage and repair.

The obtained results showed that Schwann cells as well as neuronal cells in the LIPUS field and PEMF at specific frequencies show altered expression of genes involved in growth and regeneration processes peripheral nerves and genes responsible for pro-inflammatory processes. Schwann cells and neuronal cells after 9 days of exposure to both fields showed a reduction in expression at all tested frequencies genes involved in pro-inflammatory processes IL-1, IL-6, TNF-α and the increase in IL-10. At the same time, the same cells express genes involved in the processes growth and regeneration of peripheral nerves, i.e. BDNF, NGF and TGF-β, increased significantly. In Schwann cells after exposure to both fields a significant increase in the expression of the CRYAB gene was observed. A similar effect was observed in the case of the Ki67 gene. In Schwann cells after exposure to both fields, an increase in Ki67 expression was observed level of 850%, while in neuronal cells, the expression increased by approximately 450%.

Biography

Robert Gajewski has been working in pedology sector since 1996. his main area of interest is the prevention of various foot deformations in the course of diseases (RA and diabetes, primarily) but also orthopedic support for the feet as a result of various diseases. The main area of expertise covers prevention of the Diabetic Foot Syndrome. in this matter, he acquired knowledge about the impact of diabetes on the development of foot ailments and deformations. in addition to conducting research on people with diabetes, he uses the acquired knowledge in practice by designing and making individual footwear and insoles for people with diabetes.

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