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Investigating the effects of electrical stimulation via gold nanoparticles on *in vitro* neurite outgrowth: Perspective to nerve regeneration

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Statement of the problem: Following the injury of nervous tissue spinal cord injuries, axons do not regenerate appreciably in their native environment and current clinical approach to treating damaged nerves is inefficient; thus, medical treatment approaches are needed. Neural tissue engineering research field has been progressed by using different approaches especially for repairing of damaged neural cells. In addition, it is known that electrical stimulation can be used for neurite growth and nerve regeneration.

Methodology & theoretical orientation: In this study, conductive properties of gold nanoparticles (GNPs, 39 nm) and their contribution to the enhancement of electrical stimulation to nerve cells have been conducted. In experimental section, polyethyleneimine (PEI) polymer coated cover glasses was used to create a positively charged glass surface and adsorption of GNPs was used in conjugation with this polymer coated substrate. Subsequently, PC12 cells were cultured on the modified glass surface and pulsed electric field of 1.5 V, 20 Hz was applied as electrical stimulation for 55 min duration.

Findings: Images from FESEM showed a uniform distribution of GNPs on glasses surface. In addition, enhanced neurite outgrowth (120 µm) using electrical stimulation was determined by inverted phase contrast microscopy images.

Conclusion & significance: Finally, our study showed that pulsed current stimulation induced neurite outgrowth of PC12 cells adhered to the GNPs coated surfaces. Altogether, synergist combination of GNPs together with pulsed electrical stimulation can be used for enhanced nerve regeneration. Our future works will direct towards optimizing properties of NPs and stimulation parameters for *in vivo* nerve regeneration and do a comparative study with other nanomaterial including silk, carbon materials etc.

Speaker Biography

Moein Adel has his expertise in nerve regeneration and nanotechnology. His open and contextual evaluation model creates new combination and optimization pathways for treatment of CNS damages. He has built this model after years of experience in research, evaluation and teaching both in research and education institutions. The foundation is based on fourth generation evaluation (Guba and Lincoln, 1989) which is a methodology that utilizes the previous generations of evaluation: measurement, description and judgment. It allows for value-pluralism. This approach is responsive to all stakeholders and has a different way of focusing.

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