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Organic light emitting diodes and nanoparticles for controlling the some behaviours of living organisms

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Abstract

Introduction: The chosen optical stimulation on the variety of cells and organisms is the principle goal in the new technique in neurobiology, cancer studies and other biological fields. It is so difficult to produce a suitable source that can perform these stimulations and penetrate deeply into the cells and tissues. Optical localization around the cells is also another difficult aspect of this technique. The suggested methods for the optimization of this technique are organic light emitting diodes (OLED) and nanoparticles. OLEDs have organic materials in semiconductor layer which make them flexible and compatible and cause their light to penetrate deeply. In another method, conjugated nanoparticles with specific antibodies can bind to the membrane protein and localize the heat.

Methods: Organic LED with green and blue fluorescent emission was used in this study. Their compatibility was investigated by cell culture and the cell viability was studied by nuclear staining and microscopic analysis. The movement responses of the chlamydomonas were measured in order to investigate the effectiveness of the optical stimulations of this source. Gold nanoparticles, conjugated with a neurotoxin that was bound to the Na - voltage channels, was used to localize the heat effects of the light sources.

Results and discussion: The results of cell culture show that OLEDs are compatible with the cells and their optical stimulations, change the direction and movement speed of the Chlamydomonas. Having bound to the membrane proteins, the Conjugated Gold nanoparticles absorb the green light which causes the heat to get accumulated around the cell and change the action potential of the voltage channels.

Conclusion: In general, OLEDs increase the effect of optical stimulations and are compatible with the cells. In addition, having localized the heat around the cells, the nanoparticles modify the cells and organisms' behaviours.

Keywords: OLED, optical stimulation, membrane Proteins, nanoparticles, semiconductors.

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