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3D Brain Models to Reveal the Effects of Curcumin on Parkinson's Disease

Abstract:

Parkinson's disease (PD) is the second most prevalent neurodegenerative disease; more than 1% of the population over the age of 65 suffers from this disease, and this number is predicted to double by 2030. Drug screening platforms that mimic the metabolism of Parkinson's are desperately required to unravel the characteristics and drug response of this disease. 3D in vitro neurodegenerative disease models have been presented as an effective approach that overcomes the drawbacks of 2D and animal models. Curcumin has a significant role in PD due to its anti-inflammatory and antiapoptotic antioxidant traits. In this work, neuroblastoma SH-SY5Y cells are differentiated into neuron-like cells employing retinoic acid and BDNF. Then, 3D brain models are developed utilizing a 3D bioprinter and hydrogel composed of gelatin and alginate with differentiated neuroblastoma SH-SY5Y cells. To induce PD-related features, rotenone is applied to both the 3D bioprinted brain models and the models exposed to curcumin treatment. The same procedure is also applied to 2D cell cultures. The metabolic activities of cells in 2D cultures and in the scaffolds are determined using staining techniques under a fluorescent microscope. This study aims to reveal whether curcumin has any neuroprotective effect on PD. The viability of cells and the 3D scaffold integrity were maintained successfully over 20 days. Curcumin at high concentrations showed a toxic effect; however, further inquiries are needed to conclude.

Biography

Ilkay Irem Ozbek completed her MSc at Bogaziçi University and continues her doctorate at the same institution. She worked on developing a genome-scale model of medulloblastoma, pharmacokinetic modeling, 3D in vitro cancer models, and neurogenerative diseases.