Re-creating the basal ganglia circuitry in a dish: Towards a model for developing therapies for Parkinson’s

https://neurodegenerationresearch.eu/survey/re-creating-the-basal-ganglia-circuitry-in-a-dish-towards-a-model-for-developing-therapies-for-parkinsons/

Principal Investigators

Dr Rosemary Fricker

Institution

Keele University

Contact information of lead PI
Country

United Kingdom

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Re-creating the basal ganglia circuitry in a dish: Towards a model for developing therapies for Parkinson's

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Parkinson's UK

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2

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Research Abstract

There is a lack of in vitro models of neurodegeneration in Parkinson’s that allow for functional measurement of the neuronal circuitry involved, and easy, reliable manipulation, to give accurate read-outs for screening new therapies. This innovative project aims to construct a replica of the basal ganglia circuitry affected in Parkinson’s by culturing specific neuronal subtypes within a Bio-MEMS microfluidic device. We will construct a device with separate

chambers for four classes of neurons: midbrain dopamine neurons, striatal neurons, pallidal neurons and cortical neurons; each generated from dissected embryonic CNS tissue. The chamber containing striatal neurons will be connected to all other chambers using graduated microchannels, to allow unidirectional axonal afferents to grow in from the cortical and midbrain neurons, and for efferent projections from the striatal neurons to grow out into the chamber containing pallidal neurons. Thus we will create and interconnect the key nuclei of the basal ganglia.We aim to assess the function of this neuronal circuit by measuring neuronal function at the population level, using aluminium microelectrodes embedded within the base of the Bio-MEMS device. We will compare electrical activity with calcium imaging to assess neuronal responses within the circuit, to optimise accuracy/reliability of our system and to assess changes in neuronal activity with pharmacological stimulation/blockade. Establishing this novel in vitro model aims to lay the foundations to investigate neurodegeneration, to develop a more sustainable model using stem cell-derived neurons, and to become a high-throughput screening tool for emerging therapies.

Further information available at:

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Investments < €500k

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