2018

Growing new dendritic spines to correct cognitive deficits of schizophrenia

BrainsCAN , Western University

Nagalingam Rajakumar
Western University

Brian Allman
Western University

Wataru Inoue
Western University, tadam@uwo.ca

Western BrainsCAN
Transforming brain research.

Project **Summary**

KNOWLEDGE MOBILIZATION & IMPACT

Growing new dendritic spines to correct cognitive deficits of schizophrenia

Background

Cognitive dysfunction is a symptom of many neurodevelopmental and acquired brain disorders - including schizophrenia, autism spectrum disorder, Parkinson's disease, Alzheimer's disease and stroke. It is also the main barrier to social well-being and long-term rehabilitation and recovery.

While there are differences in the underlying mechanisms between these various disorders, they are all fundamentally alike in that the cognitive deficit results from a loss of normal glutamatergic transmission in the brain. This process is critical for learning and memory. Glutamate is the body's most prominent neurotransmitter and the brain's main excitatory neurotransmitter, vital for sending signals between neurons, which is why the impacts are so significant when the system is disrupted.

The Problem

There have been some attempts to address the cognitive impairment in schizophrenia through pharmaceuticals, but the outcomes have been unsatisfactory and it remains an unmet need.

There is a particular structural abnormality in the brain of schizophrenia patients that is considered a hallmark of the condition - a loss of 'dendritic spines', the key to neurotransmission of glutamate between neurons. The adult brain has limited capacity to re-grow dendritic cells and if a pharmaceutical intervention does not attempt to address this, it is perhaps not surprising that the intervention is not able to address the cognitive impairment successfully.

Our long-term aim is to find a solution to address this structural abnormality that leads to dysfunctional glutamatergic neurotransmission in patients with schizophrenia, to alleviate the associated cognitive impairment.

Funding Program

BrainsCAN Accelerator Grant: Stimulus
Awarded: $79,000

Additional BrainsCAN Support

Rodent Cognition Core

Western Faculty, Group or Institution

Department of Anatomy & Cell Biology, Schulich School of Medicine & Dentistry

Keywords

Mental health, novel neuroscience/neuroimaging techniques

Related

none

Share this page

Tweet Share

The Project

In this project, we will attempt to re-grow functional dendritic spines in an animal model of schizophrenia for the first time. By re-growing dendritic spines, we intend to restore glutamatergic neurotransmission and improve cognition.

This approach is grounded in compelling evidence from multiple labs that we can facilitate formation of new dendritic spines in the prefrontal cortex by blocking a recently-discovered molecule that normally prevents dendritic spine growth in the adult brain. We hope to show that following our intervention, these newly formed dendritic spines mature and develop into functional synapses and that cognitive behaviours are improved.

Western Researchers

Nagalingam Rajakumar
Brian Allman
Wataru Inoue