# Studying the human brain using 3-D printing technology

March 21 2016

In a study published in *Biomaterials*, a team of researchers from Australia and the US has come up with a way of printing brain structures in 3D so they can grow nerve cells to mimic a real brain. Their work has been selected by an independent, international Advisory Board to be given the Elsevier Atlas award.

At two percent of our body weight, and made up of 100 billion nerve cells, the brain is a hugely complex organ. Scientists can study the brain using animal models, but in recent years much work has gone in to seeking alternatives, with the support of organizations like the National Centre for the Replacement, Refinement & Reduction of Animals in Research (NC3Rs).

One such alternative is creating models of brains in the lab: growing brain cells in a structural material that lets scientists observe what happens in the tissue. Until now, it has only been possible to do this in two dimensions, producing sheets of cells.

Professor Gordon Wallace and his colleagues from the University of Wollongong, Australia and the University of Texas at Dallas, US have come up with a way of creating layered 3D structures that mimic the brain more closely, using 3D printing.

"The advent of 3D printing in recent years and the ability to create structures containing materials, and even living cells, gives us that ability to start to probe some very fundamental questions," said Prof. Wallace.

"Looking at what's going on in 3D - in a similar structure to the real human brain - will give us a much better idea of the biology behind neurodegenerative diseases like Alzheimer's and Parkinson's disease, and help researchers working on ways to treat them."

The interdisciplinary team consisting of clinicians, biologists, materials scientists and chemists used gellan gum to create the new 3D structures. Gellan gum is a substance made by the bacterium Sphingomonas elodea, which is often used as a gelling agent in microbiology labs. They created a bio-ink using the gellan gum, which they combined with brain cells. The gellan gum helped the brain cells grow well and function as a network - much like in a real brain.

Prof. Kam W. Leong, Editor-in-Chief of Biomaterials, explained the significance of the research, "Inaccessibility to the human brain renders molecular studies challenging, if not impossible. A brain-like structure constructed of human cells would be invaluable for applications ranging from pathway analysis to disease modeling and drug discovery. This excellent proof-of-concept study suggests the possibility of fabricating a human brain-like structure in the future using bioprinting."

**More information:** Rodrigo Lozano et al. 3D printing of layered brain-like structures using peptide modified gellan gum substrates. *Biomaterials*, 67 (October 2015) pages 264-273; DOI: 10.1016/j.biomaterials..2015.07.022

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