THE UNIVERSITY OF QUEENSLAND
AUSTRALIA
CREATE CHANGE

Unmasking the culprits to devastating neural birth defects

Exploring how the neural tube first forms in real time to understand birth defects

Some of the most common and severe birth defects, such as spina bifida, arise when the neural tube, the shared precursor to the brain and spinal cord, fails to form properly. In Australia, neural tube defects (NTDs) affect around 1 in 500 babies. Yet, the underlying causes of these NTDs are largely unknown.

To develop better diagnostic tools and treatments for NTDs, we must first understand how the neural tube forms. By revealing the dynamic interactions between cells that shape and sculpt the neural tube, we can identify new therapeutic targets and understand the origin of the most complex organ in the body: our brain.

Changing how we see neural tube defects

The Dynamics of Morphogenesis lab is working to understand how the neural tube forms in real time. By combining imaging technologies and advances in models of brain and spinal cord development, we are visualising the events that shape the neural tube as they happen.

Previous research has relied mostly on still images, which don't capture the dynamic interactions between thousands of cells as they move and change shape to form the neural tube. By studying how cells behave over time as the neural tube forms, we can identify the key processes occurring in our genome, cells and tissues. Understanding how these events are coordinated in real time will shed new light on how cells arrange themselves into the brain and spinal cord. This will also help us to identify what can go wrong during neural tube formation and how, one day, we may be able to prevent or better treat neural tube defects.

Despite their prevalence, we still don't understand what causes neural tube defects. We're building the knowledge required to understand why and how neural tube defects arise. We hope that this will eventually lead to more accurate risk assessment, better prevention, earlier and less invasive treatment options and, one day, a cure.

We aim to understand how the early brain and spinal cord form in real time.

NOT IF, *WHEN.*
THE CAMPAIGN TO CREATE CHANGE

Researcher profile

Dr Melanie White

Dr Melanie White heads the Dynamics of Morphogenesis Lab, which is focused on understanding the dynamic mechanisms controlling tissue formation and cell fate determination.

Dr White's lab is interested in how molecular events are translated into, and integrated with, cellular properties and mechanical forces to orchestrate tissue development. In particular, they focus on how these processes interact to direct the formation of the neural tube – the embryonic precursor to the brain and spinal cord.

They apply quantitative live imaging technologies to developing avian embryos and human induced pluripotent stem cell (iPSC) models to understand how the neural tube forms in real time. The knowledge Dr White's team is generating may ultimately assist in the development of methods for the prediction and treatment of some of the most common and severe birth defects.

Your opportunity to support game changing research at IMB

Together, our greatest days lie ahead.

Here are just a few ways that giving to UQ's Institute for Molecular Bioscience research can help transform how we save lives from the impact of birth defects.

$2,500	Would support an early stage scientist to gain digital engagement training to effectively showcase outcomes and research with their scientific peers globally.
$10,000	Provides the scientific consumables for a group member to perform research investigations for 12 months.
$50,000	Enables the creation of three different models to understand the effects of gene mutations from patients with neural tube defects.
$100,000	Empowers our research study with state of the art microscopy equipment to see the developing neural tube in unmitigated detail and investigate new ways to protect it.

We welcome your suggestions for other ways to support IMB's research and help accelerate the translation of discoveries into patient benefits.

"I have always been fascinated with how cells arrange themselves into all the beautiful and intricate shapes and patterns required to build an embryo. How does a small series of behaviours sum over millions of cells to form an entire tissue or organ – particularly one as complex as the brain? I am driven to understand the molecular and cellular processes that begin to form the brain and how even small variations in these can have devastating consequences for the embryo."

Dr Melanie White
Institute for Molecular Bioscience

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