New pathways discovered to prevent blindness

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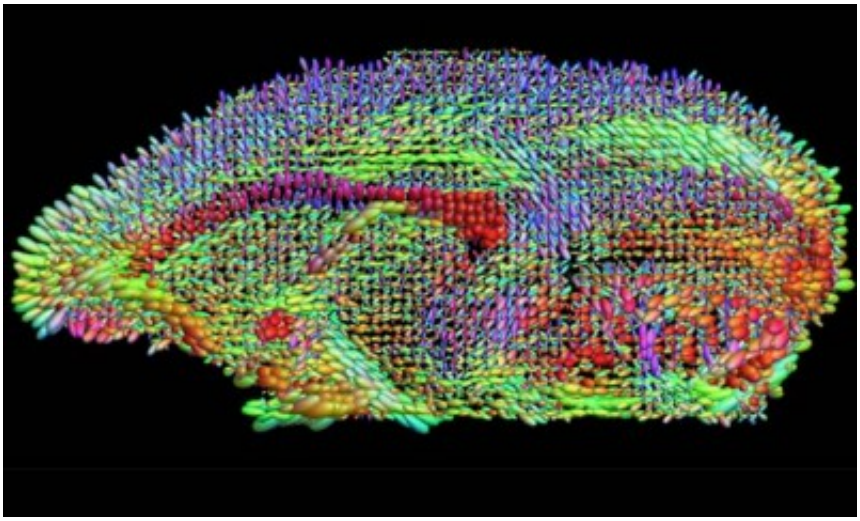

Visualisation of the complex wiring of the brain and the associated networks by MRI

Scientists have made a major new discovery detailing how areas of the brain responsible for vision could potentially adapt to injury or trauma and ultimately prevent blindness.

The Monash University led study, published today in *Current Biology*, sheds new light on the relationship between vision loss and brain plasticity - the extraordinary ability of the brain to modify its own structure and function as a result of change or damage.

Focusing on the visual system, the study details how visual information can be rerouted in the brain to bypass damaged areas.

Vision is the most complex sense, with over 50 per cent of the large outer layer of the brain, known as the cortex, devoted to it. It was thought that one specific pathway from the eye to the brain was responsible for conscious vision, and in the absence of this pathway an individual was rendered blind. However, the research led by Associate Professor James Bourne from the Australian Regenerative Medicine Institute (ARMI) at Monash University, reveals the importance of a second pathway, through an area of the brain called the pulvinar.

Researchers discovered the pulvinar plays not only an important role in brain development but also following an injury to the primary pathway, especially in the first year of life.

Previous studies demonstrated that children who receive an injury to the primary pathway often retain normal visual capacity, whereas an adult with an identical lesion is left blind. Researchers say developing a greater understanding of the mechanisms for rerouting visual information and the potential of brain plasticity provides great possibilities for regenerative medicine, especially brain injuries caused by stroke and trauma.

Associate Professor Bourne said the study provides vital new information on how the visual system is wired together in the brain following an injury.

"Decades of research have focused on one pathway in the brain thought to be responsible for conscious vision. We knew the brain has the capacity to re-wire itself following injury or trauma but the idea that there is a second pathway providing visual information to the brain is a relatively new phenomenon," Associate Professor Bourne said.

"Our research proves a second pathway exists but significantly it also shows the brain is much more plastic than originally believed."

The research team established novel techniques that haven't been used in combination before, to profile the specific changes over a period of time. This included novel MRI techniques, which made it possible to map connections and see how they shrunk or grew after an injury. This also allowed the research team to zoom in to the cellular level and identify special characteristics of these cells including how it is possible for them to be able to transmit visual information.

Monash PhD student, Ms Claire Warner, who also took part in the study, said identifying the existence of this second pathway was the foundation for future research in this field.

"The next step is to undertake more work to better understand the complex circuitry of the visual brain and how pathways are established in early life and removed at a later stage," Ms Warner said.

"We're a long way off but this opens up a whole new line of inquiry to see if we can develop regenerative techniques to restore vision loss."

Provided by Monash University