

Neuroscientists isolate gene essential to early brain development

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University of Queensland neuroscientists have discovered the crucial role a specific gene plays in forming the neural tube, the earliest identifiable structure in the developing brain and an essential precursor to the entire central nervous system.

While investigating neural tube closure in the clawed toad (*Xenopus laevis*) and in zebrafish, Associate Professor Helen Cooper at the Queensland Brain Institute (QBI) has, for the first time, described one of the processes that drive this crucial stage of brain development, which is common to all vertebrates.

“Globally, neural tube closure defects occur in about one-in-a-thousand human pregnancies, resulting in malformations of the central nervous system and conditions such as spina bifida or anencephaly,” Dr Cooper said.

In spina bifida, for example, incomplete closure of the embryonic neural tube leads to incorrect development of the spinal cord, often resulting in significant disability.

“Although it has been known for some time that regular intake of folic acid before conception greatly reduces the incidence of neural tube abnormalities, scientists are still trying to understand the complex interplay of genes during this crucial early stage of brain development.”

“Our laboratory has now established that a copy of one particular gene (Neogenin) is essential for proper formation of neural folds, the first stages in the development of neural tubes.

“If the neural folds do not develop then the neural tube cannot close, resulting in neural tube defects,” Dr Cooper said.

“And just as importantly, our lab has also discovered that Neogenin is vital for differentiation of neural stem cells throughout the development

of the early central nervous system.”

Neuroscientists studying early brain development often investigate zebrafish because these small freshwater animals produce several hundred embryos, which develop rapidly and are almost totally transparent from fertilisation to hatching (about 48 hours), allowing scientists to view brain development as it happens.

Dr Cooper's research: “Neogenin and RGMA control neural tube closure and neuroepithelial morphology by regulating cell polarity” is published in this week's edition of the *Journal of Neuroscience*.

Provided by University of Queensland

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