Making heads and tails of embryo development

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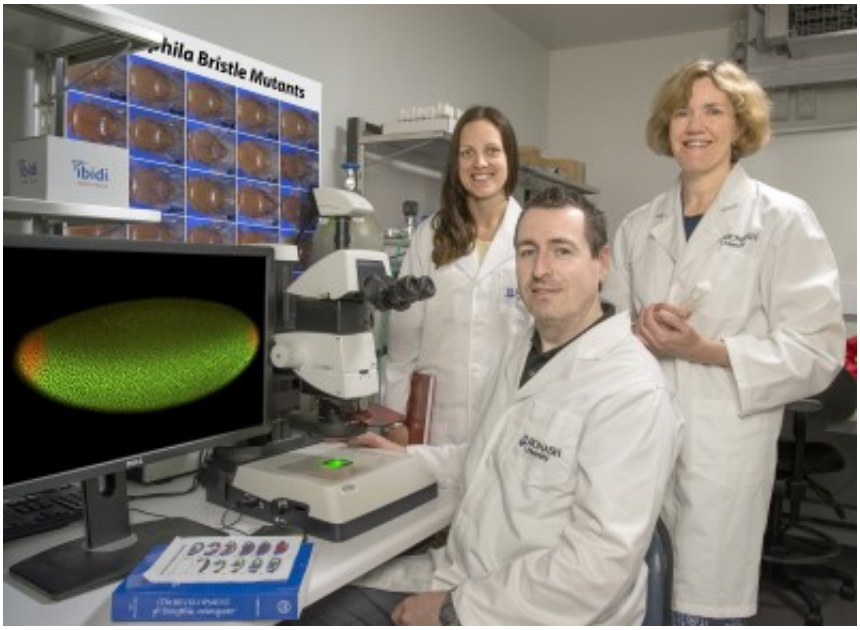

(L-R) Dr Michelle Henstridge, Dr Travis Johnson & Associate Professor Coral Warr

Proteins usually responsible for the destruction of virally infected or cancerous cells in our immune system have been found to control the release from cells of a critical growth factor governing head and tail development in fruit flies (*Drosophila melanogaster*). This may help explain how these perforin-like proteins function in human brain development and neurodevelopmental disorders such as Autism Spectrum Disorder.

The research published today in *Nature Communications* was carried out at Monash University by postdoctoral researcher Dr Michelle Henstridge, Australian Research Council DECRA Fellow Dr Travis Johnson, and co-led by Associate Professor Coral Warr in the School of Biological Sciences and Professor James Whisstock in the Department of Biochemistry and Molecular Biology. Their research solves a long-standing question in developmental biology: how a growth factor in the fly embryo is controlled to determine where the head and tail form.

"These findings are significant and exciting as they suggest a completely new mechanism for how growth factor activity can be controlled," Dr Johnson said.

Dr Henstridge added, "Understanding how growth factor activity is controlled is vital because loss of control of growth factors underlies many of the major diseases that afflict society, such as cancer and obesity."

The perforin-like protein in the fruit fly is called 'Torso-like' because female flies lacking this protein produce embryos lacking heads and tails. Associate Professor Warr explained why the fruit fly is a perfect model for investigating the role perforin-like proteins play in development.

"The fruit fly Drosophila is a fantastic organism for investigating the question of how these perforin-like proteins act in embryo development; most of our knowledge of how human development and growth is regulated started with studies in the fruit fly. This is because most human genes controlling development and growth act in the same way in fruit flies," Associate Professor Warr said.

Professor James Whisstock, who is also the Director of the Australian Research Council Centre of Excellence in Advanced Molecular Imaging,

went on to explain the significance of discovering that a protein related to the human immunity protein perforin, which punches holes in and kills foreign pathogen cells, is used to release a growth factor only at each end of the fly embryo.

"What's exciting about our research is the discovery that a protein related to perforin—which usually functions to kill cells—is actually helping cells develop and differentiate in fly embryos. This is important because a group of perforin-like proteins found in the human brain have, in previous research, been shown to be associated with proper brain development," Professor Whisstock said.

Associate Professor Warr added, "While we don't yet know how these proteins work, we suspect they may also be involved in controlling growth factor release from cells."

The team believe their findings may provide new opportunities for the generation of novel therapeutics, for example to treat brain developmental disorders and conditions such as Autism Spectrum Disorder.

With support from a Monash University grant, they plan to continue to study fruit flies to explore the functions of important mammalian proteins on a much larger scale.

Methods

The research was carried out using innovative microscopy and imaging techniques to observe how biological systems function at the molecular level. On this occasion the Olympus CV1000 laser scanning confocal microscope was used.

Provided by Monash University