A switch between life and death

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Cells in an embryo divide at an amazing rate to build a whole body, but this growth needs to be controlled. Otherwise the result may be defects in embryonic development or cancer in adults. Controlling growth requires that some cells divide while others die; their fates are determined by signals that are passed from molecule to molecule within the cell. Researchers at the European Molecular Biology Laboratory (EMBL) in Heidelberg have now discovered how one of these signaling pathways controls the life and death of cells in the fruit fly.

The breakthrough came as Barry Thompson from Stephen Cohen's group at EMBL looked at a recently discovered signaling pathway called "Hippo".

"Hippo acts as a switch between cell division and death," says Barry Thompson, "If the pathway is too active, tissues overgrow because too many cells divide and too few die. But until now, we hadn't found a connection between the signals and the cellular machinery that drives growth."

Using sophisticated genetic techniques, Thompson and Cohen established that a small molecule, a microRNA called bantam, makes this link. Without bantam, tissues grow too slowly and remain smaller than normal. The amount of bantam produced by the cell directly depends on the amount of traffic on the Hippo signaling pathway, and higher levels of bantam prompt more cell division.

"Bantam is an unusual type of RNA molecule," Thompson says.

“Normally, RNAs go on to make protein, but bantam is different. Its job is to regulate other RNAs by attaching itself to them; the result is that they block their expression into proteins. In this case, those proteins would go on to shut down cell division. With bantam around, the brake is off, and they continue to divide.”

Cohen and his lab have been studying microRNAs like bantam for some time because of their important role in the regulation of many vital processes across species. The next step will be to identify the RNAs that bantam docks onto to control. This will provide a more complete view of the Hippo pathway and may provide insights into the central role it plays in tissue growth and cancers in humans and other organisms.

The study was published in the 25 August, 2006 issue of *Cell*.

Source: European Molecular Biology Laboratory