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'Land of the ever-young' gene reprogrammes cells

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University of Edinburgh scientists have discovered that the “ever-young” gene Nanog can cause adult cells to switch back to an embryonic state. The finding, to be published in the prestigious journal *Nature*, is the first to show that a specific gene affects the reprogramming of a mature cell type into a naïve state. The Edinburgh team believe this is a promising step towards understanding how to promote regeneration of damaged tissues and organs using a person’s own cells.

The team of scientists, lead by Professor Austin Smith at the Institute for Stem Cell Research, investigated the switching of adult cell types into embryonic stem cells after cell fusion. Fusion is the combination of two cells to form a single hybrid cell. Like nuclear transfer, the cloning process used to create Dolly the sheep, cell fusion can reprogramme the genetic information in a specialised cell to a naïve embryonic state. But this occurs very rarely. Says Professor Smith, “We set out to identify genes that could make reprogramming more efficient – our first candidate was Nanog because of its special role in formation of the early embryo and embryonic stem cells”.

The Edinburgh scientists fused mouse embryonic stem cells with brain stem cells, a type of adult stem cell. They found that the addition of Nanog resulted in a massive increase in the numbers of hybrid cells, all of which behaved like embryonic stem cells. Most importantly the hybrid cells showed the capacity to make many different cell types, such as heart and gut. “This means that the genetic programme of the brain cells has been erased and replaced by the unspecialised programme of an

early embryo cell" says Dr Jose Silva, first author of this study.

Dr Silva adds "The effect of Nanog is remarkable. All of the hybrid cells become fully converted to embryonic stem cells. If we can figure out how Nanog does this, it may become possible to switch cell types without fusion or cloning." However, the Edinburgh team must also identify at least one other key gene. "Nanog has great power" says Professor Smith, "but it does not work in isolation, only in partnership with other genes present in embryonic stem cells".

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