

Frog provides insight into making specialised cells from stem cells

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The African clawed frog could help stem cell scientists in obtaining insulin-releasing cells of the pancreas from stem cells, new research published in the latest issue of the journal *Development* suggests.

Scientists at the Institute for Stem Cell Research, of the University of Edinburgh, have shown that the protein Wnt (pronounced Wint) is crucial in setting up the region of the embryo that will form the pancreas and the liver. The findings open up new avenues for modelling diseases such as diabetes, testing the effects of drugs and, ultimately, developing new transplantation therapies.

The lining of the respiratory and gastrointestinal tracts, the pancreas, the liver, the thymus and the thyroid all have their origin in a structure of the early embryo called the anterior endoderm. Josh Brickman and his team have shown that, in the African clawed frog, the anterior endoderm forms through a cascade of activities of different molecules, leading, ultimately, to the increased activity of a protein called Wnt.

They then used mouse embryonic stem cells to demonstrate that the same cascade exists in mammals and to suggest that this activity of Wnt might be exploited to contribute to current efforts to direct embryonic stem cells to become pure anterior endoderm cells. This would be the first step in obtaining, for example, liver cells and insulin-producing beta cells of the pancreas, in the laboratory.

The scientists also showed that the formation of the anterior endoderm

involves switching off a gene for another protein, called Nodal. Based on these findings, the team is already working on extending their results into embryonic stem cells. They are using the Wnt protein in mouse embryonic stem cells to try to produce a pure population of cells which lacks Nodal protein. According to Josh Brickman, “We believe that our findings in frog embryos tell us that these cells would be real anterior endoderm, which can potentially be used to make both liver and pancreas.”

Stem cell scientists are agreed that the best approach in obtaining specialised cell types from embryonic stem cells is to take into account the origin of those cells in the embryo, and the biological processes that govern their appearance. The molecular mechanisms leading to endoderm formation in mammals are not well understood and are more difficult to dissect than in frog embryos, which is, once again, proving to be a valuable ally for researchers.

Source: Institute for Stem Cell Research

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