Scientists find trigger to decode the genome

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Scientists from The University of Manchester have identified an important trigger that dictates how cells change their identity and gain specialised functions.

And the research, published today in *Cell Reports*, has brought them a step closer to being able to decode the genome.

The scientists have found out how embryonic stem cell fate is controlled which will lead to future research into how cells can be artificially manipulated.

Lead author Andrew Sharrocks, Professor in Molecular Biology at The University of Manchester, said: "Understanding how to manipulate cells is crucial in the field of regenerative medicine which aims to repair or replace damaged or diseased human cells or tissues to restore normal function."

During the research the team focussed on the part of the cellular genome that gives a gene its expression known as the 'enhancer'. This controls the conversion of DNA from genes into useful information that provides the building blocks that determine the structure and function of our cells.

Different enhancers are active in different cell types, allowing the production of distinct gene products and hence a range of alternative cell types. In the current study, the team have determined how these enhancers become active.

Professor Sharrocks said: "All of us develop into complex human beings containing millions of cells from a single cell created by fertilization of an egg. To transit from this single cell state, cells must divide and eventually change their identity and gain specialised functions. For example we need specific types of cells to populate our brains, and our recent work has uncovered the early steps in the creation of these types of cells.

"One of the most exciting areas of regenerative medicine is the newly acquired ability to be able to manipulate cell fate and derive new cells to replace those which might be damaged or lost, either through old age or injury. To do this, we need to use molecular techniques to manipulate stem cells which have the potential to turn into any cell in our bodies."

But one of the current drawbacks in the field of regenerative medicine is that the approaches are relatively inefficient, partly because scientists do not fully understand the basic principles which control cell fate determination.

"We believe that our research will help to make regenerative medicine more effective and reliable because we'll be able to gain control and manipulate cells – thus our understanding of the regulatory events within a cell shed light on how to decode the genome," concluded Professor Sharrocks.

Provided by University of Manchester