Dundee researchers make gene breakthrough

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Researchers at the University of Dundee have made a significant breakthrough in understanding how human cells decode genes important for cell growth and multiplication.

Dr Joost Zomerdijk and colleagues in the Wellcome Trust Centre for Gene Regulation and Expression in the College of Life Sciences at Dundee study the process of transcription, in which cells copy the DNA of genes into RNA, ultimately leading to the manufacture of proteins.

Transcription must be tightly controlled because otherwise the cells can die or they can grow and multiply without restraint, as seen in certain human diseases including cancer.

Dr Zomerdijk and his team have discovered a previously hidden link within the components of the transcription machinery, the details of which are published in a research paper in the journal *Science*.

'Three separate transcription machineries exist in human cells. Each is important for transcription of a subset of genes within the cells and each is made up of one specific RNA polymerase enzyme and several other groups of proteins that direct and control transcription activity.' said Dr Zomerdijk.

'The transcription machineries of RNA polymerases II and III contain TFIIB or TFIIB-like proteins, which are essential for transcription of their particular subsets of genes. It was surprising that a similar protein had not been identified as a component of the RNA polymerase I

transcription machinery, which produces the millions of copies of ribosomal RNAs needed to sustain normal cell growth and multiplication.

'Now, we have discovered that the protein TAF1B, one of a group of proteins that directs the RNA polymerase I enzyme to the ribosomal RNA genes, is similar to TFIIB and Brf1 in structure and function.

'This discovery indicates that the three transcription machineries of human cells, which are likely to have evolved from a common ancestor, are even more similar than previously realised.

'My lab and I are extremely excited to have discovered this important missing link. Furthermore, this research, funded primarily by the Wellcome Trust, advances our understanding of how normal transcription is maintained and controlled in human cells, which will help us to work out how transcription becomes deregulated in certain diseased cells and, potentially, how we can reverse such deregulation.'

Provided by University of Dundee