Oxygen key to 'cut and paste' of genes

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Oxygen is an essential source of energy, which is why jet pilots and climbers need their own oxgen supply, but it also influences how our genes are expressed.

(PhysOrg.com) -- An oxygen-sensitive enzyme has been found to play a key role in how genes create the many different proteins that make up our bodies.

The finding shows that the enzyme, termed Jmjd6, directly intervenes in the process in which the DNA of our genes is 'cut and pasted' into instructions for the creation of specific proteins.

The discovery, reported in this week's *Science* by a team led by scientists from Oxford University and Ludwig-Maximilians-University, Munich, opens up a new area of molecular research into conditions such as heart disease and cancer.

'Previous work from Oxford has shown that some of these enzymes,

called oxygenases, affect which genes are expressed in response to low levels of oxygen. What we have now found is that they also regulate the specific form this expression takes - to give the different proteins that make up everything from heart cells to tumours,' said Professor Chris Schofield of Oxford University's Department of Chemistry, one of the authors of the paper.

Genes, stored in the form of DNA, are converted into proteins by a 'middleman molecule' called Messenger Ribonucleic Acid - or 'mRNA'.

Individual genes can often give rise to many different proteins because of a process known as mRNA splicing which enables the cutting and pasting of the mRNA that is produced from DNA. The proteins that the new oxygenase, termed Jmjd6, acts on are involved in regulating the 'cutting and pasting' process.

Angelika Böttger, who led the Munich group, said: 'The discovery of a role for an oxygenase in mRNA splicing reveals that it is very likely that oxygen levels are involved in regulating almost all steps in the process of gene expression. The challenge now is to determine how the pattern of genes changes in different environments when oxygen is in short supply, enabling us to tackle important questions such as "why do tumour cells respond differently to low oxygen levels than normal cells?"'

A report of the research, entitled 'Jmjd6 catalyses lysl-hydroxylation of U2AF65, a protein associated with RNA splicing,' is published in this week's *Science*.

Provided by Oxford University (news : web)

https://phys.org/news/2009-07-oxygen-key-genes.html