Genes in the sex cells of plants are marked to switch on or off before fertilisation

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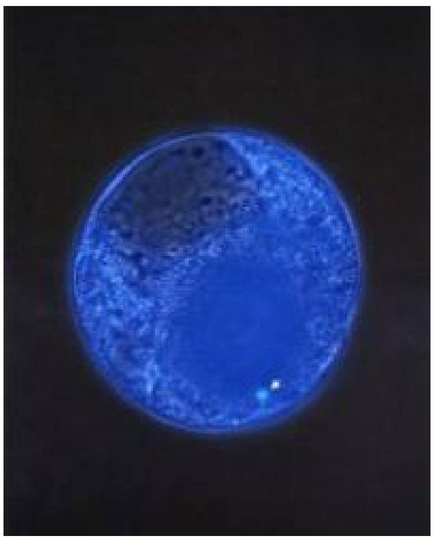

Birth of the maize grain with the entry of the male sex cell into the female sex cell.

Plant genes share the same mechanism found in mammals in the way they are marked or 'imprinted' to switch on or off depending on their sex, just before fertilisation. Oxford scientists have now shown that differences in the expression states of parental gene copies are not due to actual changes in the genetic code, but to chemical changes in the DNA by a naturally occurring process known as 'methylation'.

Oxford University's Department of Plant Sciences collaborated with scientists from a university in Germany and a biotech company in France

(Biogemma) on the study, to be published in Nature Genetics in August.

Researchers investigated the way plant genes are marked, so that only the maternal copies are switched on while the paternal copies are switched off after fertilisation. They analysed two maize ‘imprinted’ genes in the products of fertilisation – the seed embryo and its accompanying placenta-like structure, the endosperm. They found that the parental copies of these genes that were switched on were not methylated, while those copies that were switched off were methylated.

In mammals, the healthy development of the offspring relies on the unique contribution of maternal and paternal chromosomes. Through their research, the Oxford scientists have discovered that plants too have adopted the same mechanism to mark out certain genes to be expressed solely from the maternal chromosomes. The next stage is for the research team to find the mechanism responsible for this action of gene imprinting.

Dr José Gutiérrez-Marcos, a Senior Research Fellow in Plant Sciences, said: ‘It is remarkable that such divergent organisms have evolved a highly-complex placental structure which controls growth and development of the embryo, not least the fact that they share similar genetic mechanisms to imprint key genes in these placental tissues – a striking example of convergent evolution.’

Professor Hugh Dickinson, from the Department of Plant Sciences who led the BBSRC funded project, said ‘This finding is important because it provides an insight into the very delicate molecular interactions which take place between male and female chromosomes during fertilisation – and which ultimately determine the size and content of the cereal grain – the staple food of the world’s population.’

‘Epigenetic asymmetry of imprinted genes in plant gametes’ by José

Gutiérrez-Marcos et al. was published online in *Nature Genetics* and will appear in the printed version in August.

Source: University of Oxford