Article: Rogue weeds defy rules of genetics

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Rogue weeds defy rules of genetics
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Andy Coghlan

Mendelian inheritance, the central tenet of genetics, is under attack from a few scrawny weeds that have not read the textbooks. The weeds are somehow inheriting DNA sequences from their grandparents that neither of their parents possessed − which is supposed to be impossible.

The orthodox view is that genes are passed down in the form of DNA, and all organisms have to make do with this parental DNA inheritance, mutations and all. Chemical or structural modifications to DNA can switch off genes, and these changes can pass from generation to generation, a phenomenon called epigenesis. But epigenetic changes do not alter the actual sequence of DNA.

Yet that is what seems to occur in the weedy cress Arabidopsis thaliana, the workhorse of plant biologists. Cress with two mutant copies of one gene seem to be able to correct the DNA they pass on, ensuring that at least a few of their offspring revert to normal. Robert Pruitt, whose team at Purdue University in West Lafayette, Indiana, US, made this extraordinary discovery, thinks that the mutant genes are being repaired using RNA templates inherited from earlier generations.

Other biologists are astonished by the findings. "It's amazing," says David Baulcombe, an expert on plant RNA at the John Innes Centre in Norwich, UK. "The notion that RNA carries the information almost seems like the only way it could happen."

RNA back−ups
It is possible that the phenomenon is limited to this one plant. But in Nature (vol 434, p 505), Pruitt's team speculates that it might be a more widespread mechanism that allows plants to "experiment" with new mutations while keeping RNA spares as a back−up.

If the mutations prove harmful, some plants in the next generation revert to their grandparents' DNA sequence with the help of the RNA. "It does make sense," Pruitt says.

Such a mechanism would be especially useful to plants that self−pollinate and so are not as genetically variable as other plants. But it might happen in all plants and even animals.

Pruitt's team made the discovery after finding that some Arabidopsis refused to "breed true". To Pruitt's irritation as many as 1 in 10 of the offspring grew normally despite their parents having a mutation in both copies of the hothead gene, which causes petals and leaves to stick to one another. He assumed that normal seeds or pollen were contaminating his trials.

But a series of experiments ruled out contamination. They also ruled out other possibilities, including the gene spontaneously mutating back to the normal form, the existence of more than two copies of the hothead gene, or closely related DNA sequences providing a template for repairs.

Eventually, Pruitt was left with one, unbelievable explanation: the normal offspring were somehow acquiring genetic information from ancestors other than their parents.

Full Text at NewScientist
http://www.newscientist.com/article.ns?id=dn7185

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