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New findings offer hope in treating cancer by gene switch control

DICK AHLSTROM,
Science Editor

A RESEARCH project led by an Irish scientist has revealed possible ways to switch genes on and off. The finding could point to new methods to turn off cancer genes permanently and to develop other medical treatments.

The work in the European Molecular Biology Laboratory in Heidelberg in Germany and in the University of Rennes in France was overseen by Prof Frank Gannon. Prof Gannon is now the director general of the research funding body, Science Foundation Ireland.

The discoveries by the two research teams are published this morning in the prestigious journal, *Nature*. They deliver surprise findings about the biological processes that turn genes on and off. "It is unexpected," Prof Gannon said. "What you have is a core paradigm shift in how nature is working."

The process of turning genes on and off is an essential element of life. Each of our cells has a full copy of our genetic blueprint, DNA, but only a tiny portion of the total DNA is allowed to become active in any given cell, he said.

Control over the expression of DNA, whether a gene is turned on or turned off, is related to a chemical process called methylation. It can switch DNA on or off without changing any of the genetic code.

Prof Gannon said: "The view of the world and every text book says if you methylate something it stays methylated, it is an indelible mark." Yet he and his collaborators, including Dr George Reid in Heidelberg and Dr Raphael Metivier in Rennes, found that this is not the case. The methylation is established and then reversed, established and reversed again.

The discovery offers new ways to intervene in medical conditions where a disease is caused by how genes are turned on or off.

Prof Gannon said that in 70 per cent of colon cancer cases, the tumour suppressor gene p53 has been switched off by methylation.

Now it may become possible to intervene and permanently set the gene switch. "Because we have been able to show it is cycling and changing very suddenly, you have an opportunity to use a drug to affect it," Prof Gannon said.

The research also provided new information about how access to the DNA for methylation is controlled by proteins called histones.