



ALBERT-LUDWIGS-  
UNIVERSITÄT FREIBURG



## [eng] Micro RNAs make Genes shut up

**German Researchers have discovered a Novel Mechanism for Gene Regulation -  
Publication in CELL**

**Freiburg, 08.01.2010**



Cutting-edge Science as Art: Micro RNAs silence DNA

RNA molecules are the mobile messengers of genes. They carry information on the production of proteins from the DNA to the ribosomes. In addition to these messenger RNAs all living beings have micro RNAs that can hinder the messenger RNAs and thus the production of proteins. Biologists at the University of Freiburg, Germany, around Lecturer Dr. **Wolfgang Frank** und Professor Dr. **Ralf Reski** from the Chair Plant Biotechnology have discovered that such micro RNAs also come into direct contact with genes, effectively turning off the genes in the process. Their findings have now been published in the current issue of the leading scientific journal CELL.

With the exception of some viruses all living beings store their hereditary information, the sum of all their genes, as DNA. Active genes are transcribed into messenger RNAs (mRNAs) that function as blueprints for the production of proteins on ribosomes. Inactive genes are not transcribed into mRNAs. The fine balance between switched-on and switched-off genes differs between organs and changes during development and under varying environmental conditions. When this balance is disturbed disfiguration and illnesses such as cancer occur. In 2006 the American biologists Mello & Fire were awarded the Nobel Prize for their discovery that minute RNA molecules in the worm *C. elegans* can attach themselves to mRNAs und thus hinder their translation into proteins.

The biologists in Freiburg together with researchers from the Max-Planck-Institute for Developmental Biology in Tuebingen have now, in the current issue of CELL, described how microRNAs not only indirectly turn off genes by obstructing mRNAs, but can also turn off genes directly. In the process the

genes are silenced chemically by adding methyl groups. In the world of Biology such changes are termed as Epigenetics.

The researchers at the Freiburg Chair Plant Biotechnology have found this novel mechanism for gene regulation in their favoured object of research, the moss *Physcomitrella patens*. The title of the publication is "Transcriptional control of gene expression by microRNAs" (CELL 140, January 8<sup>th</sup>, 2010). The Editors at CELL have emphasised the importance of this discovery by choosing a cover picture (see attached) that illustrates the central findings of this work.

Besides Dr. Frank and Prof. Reski, Dr. **Basel Khraiwesh**, **M. Asif Arif**, Dr. **Gotelinde I. Seumel** from Freiburg, and **Stephan Ossowski** and Prof. **Detlef Weigel** from the MPI Tuebingen were involved in this study. The idea for the cover picture came from **Christoph Baechtle** and Dr. **Ralf Kindervater** from BioPro Baden-Wuerttemberg, the artwork was carried out by **Hannes Rall** and **Michael Meier**.

When the biologists in Freiburg created so called knockout-mosses, they were surprised by the effect because it contradicted all existing expectations. Now they suspect that their newly discovered mechanism for gene regulation occurs not only in moss, but also in many other life forms, including us humans.

The work in Freiburg was supported by the Landesstiftung Baden-Wuerttemberg, the German Federal Ministry of Education and Research (BMBF) via the Freiburg Initiative for Systems Biology (FRISYS) as well the German Federal and State Excellence Initiative via the Centre for Biological Signalling Studies (bioss). One of the first authors of the publication, M. Asif Arif, was a scholarship holder from the German Academic Exchange Service (DAAD). The cover picture for the scientific study was supported by BioPro Baden-Wuerttemberg GmbH.

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