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MicroRNAs fight high cholesterol

For the first time, scientists are now able to examine the functions of microRNAs in adult mammals. This breakthrough has been made possible by a new method invented by Stefan Ameres of the IMBA – Institute for Molecular Biotechnology. The method is now being used to develop a treatment for high blood cholesterol.

DNA is known as the carrier of genetic information. Its genes determine which protein molecules a cell produces. But few people know that probably more than half of these protein-coding genes are controlled by tiny ribonucleic acids called microRNAs. They block the messenger RNAs that are meant to transport information from the DNA to the protein synthesis sites, and thus prevent certain proteins from being formed.

Through their influence on gene regulation, microRNAs play a significant role in the development of both various tissues and various diseases, for example metabolic disorders and cancer. Studying their functions in mammals had been difficult until now, as breeding the knock-out mouse lines required is highly complex and expensive.

New method allows efficient microRNA research

Stefan Ameres, a molecular biologist and team leader at IMBA, worked with colleagues from China and the USA to develop a new method that allows efficient and systematic research into the workings of microRNAs. It also allows the functions of microRNAs to be studied in adult mammals. Knock-out mice no longer need to be bred, and scientists arrive at relevant results more quickly.

In this new method, tiny nucleotide snippets are channeled into the body via the bloodstream. Acting as decoys, they intercept microRNAs and stop them from blocking the RNA, thus allowing it to fulfill its purpose unhindered. To carry the decoy to the right place in the body, the researchers use modified adeno viruses, similar to cold viruses, as transporters – also a first. Attached to these viruses, the microRNAs penetrate the cell via the bloodstream and the cell wall.

Developing a treatment for hypercholesterolemia

A fascinating follow-on project is now the development of a treatment for hypercholesterolemia: high blood cholesterol. For that, a molecule that specifically blocks the microRNA responsible for regulating the cholesterol level is channeled into the liver. Such a microRNA blocker is already being used in clinical tests, but patients must inject it every two to three weeks. „In our studies, my colleagues and I have observed that this method keeps the blood cholesterol levels stable for several months in mice,“ said Ameres, commenting on the first successful results.

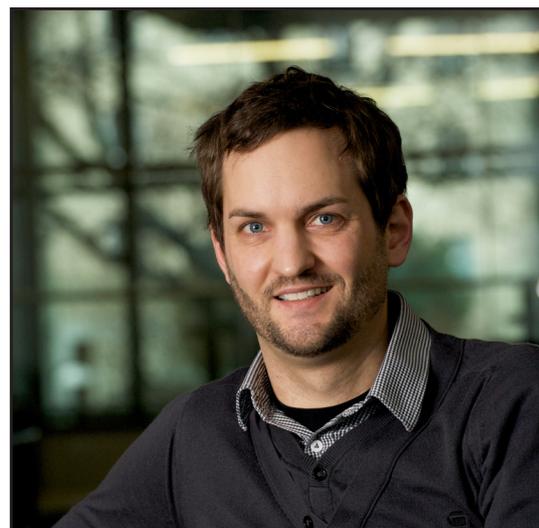


Photo Stefan Ameres (©IMBA): <http://de.imba.oeaw.ac.at/presse-foto>

IMBA Press Release

Library of microRNA functions for systematic research

The scientists aim to exhaust every possibility this new method offers. „There are 267 microRNAs that are identical in humans and mice. We are building up an „anti-microRNA library“, a collection of microRNA counterparts that allow each one of these microRNAs to be singled out and blocked,“ said Ameres about the next steps planned. If a scientist wants to study the function of a specific microRNA, that will be possible simply by channeling the respective counterpart into the body via the transporter virus.

Stefan Ameres:

Stefan Ameres, a molecular biologist, has been a team leader at the IMBA since January 2012. Along with his team, he conducts research into small RNAs. After finishing his studies at the University of Erlangen in Germany, he did his PhD in the laboratory of Renée Schroeder at the MFPL in Vienna. He went on to work as a researcher in the USA at the University of Massachusetts Medical School in Worcester, which conducts seminal research into microRNAs.

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