Mirror-image nucleic acids as molecular scissors in biotechnology and molecular medicine

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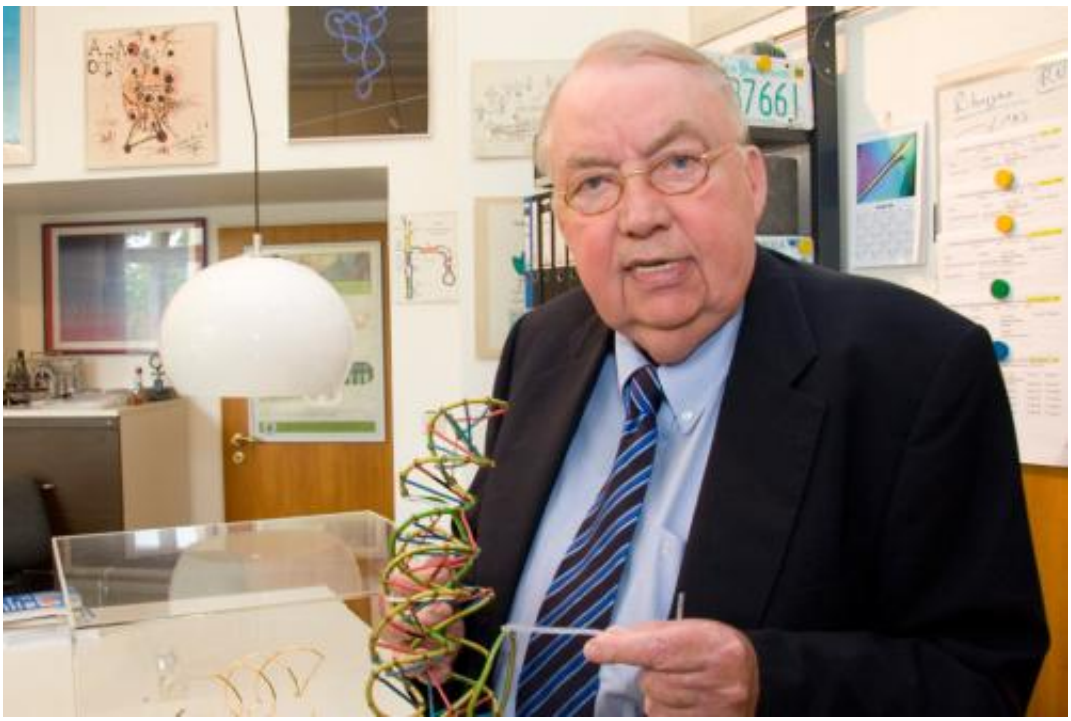

The biochemist Professor Volker A. Erdmann at Freie Universität Berlin creates mirror-image enzymes – so-called Spiegelzymes – out of nucleic acids. Credit: Stephan Töpper

The biochemist Professor Volker A. Erdmann at Freie Universität Berlin succeeded for the first time in creating mirror-image enzymes - so-called Spiegelzymes - out of nucleic acids. The Spiegelzymes can be used in

living cells for the targeted cutting of natural nucleic acids.

In an article published in *PLOS ONE*, an online journal issued by the Public Library of Science, Erdmann and his co-authors delineate how engineered Spiegelzymes have great potential for cutting up individual nucleic acids responsible for human diseases, and thus "deactivating" them. According to Erdmann Spiegelzymes, also called molecular scissors, have the advantage that they do not trigger side reactions of the immune system and they are extremely stable.

In the experiments Erdmann and his team were able to show that with specially constructed Spiegelzymes the production of a green glowing protein could be inhibited in the cells. The Spiegelzymes cut the messenger RNA, the molecule responsible for the production of the protein. Following similar procedures, it should be possible to prevent the synthesis of any one of the approximately 21,000 proteins anchored in the human genome, says Erdmann.

Volker A. Erdmann thinks it is plausible that in the future it will be possible to intervene in the processes of a cell to selectively cut RNA molecules that regulate the synthesis of proteins and other nucleic acids. Since RNA molecules are responsible for ensuring that a stem cell develops into a skin cell or muscle cell, or even a tumor cell, the targeted use of Spiegelzymes shows promise for completely new applications in basic research, biotechnology, and molecular medicine.

More information: Eliza Wyszko, Florian Müller, Marta Gabryelska, Angelika Bondzio, Mariuz Popenda, Jan Barciszewski, and Volker A. Erdmann: "Mirror-Image Hammerhead Ribozymes and Mirror-Image DNAzymes, an alternative to siRNAs and microRNAs to cleave mRNAs in vivo?" *PLOS ONE*, January 29, 2014. dx.plos.org/10.1371/journal.pone.0086673

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