Gene transfer optimization

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Controlled gene transfer into different target cells by means of specific surface markers is significantly more efficient than gene transfer without this assistance. Gene therapies using lentiviral transfer of genetic information can thus be optimized. These findings were reported by scientists of Helmholtz Zentrum München in the *Biomaterials* journal.

Lentiviruses, which belong to the family of retroviruses, are used as vectors to exchange genetic material in cells and can be used to replace a defective gene as defined by gene therapy. Increasing the efficiency of such a treatment poses a major medical challenge: the virus should specifically track the target cells, but the number of virus used should be as low as possible.

A research team led by Dr. Ines Höfig and Dr. Natasa Anastasov from the Institute of Radiation Biology (ISB) at Helmholtz Zentrum München in cooperation with Sirion Biotech GmbH in Munich and the Fraunhofer Institute in Aachen has now developed an adjuvant which enhances the effect of the virus transduction. Thus the transfer into the target cells is optimized without additional toxicity.

The scientists equipped the viruses with additional surface molecules that facilitate the attachment of the viruses to their target cells. The surface molecules consist of a glycoprotein which is fused to an antibody fragment. This antibody fragment detects the surface receptors of specific target cells, such as EGFR+ or CD30+, and binds to these.

"Through this specific binding to the target cell we can enhance three

fold the transduction rate (transfer of the viruses into the target cells)," said research group leader Anastasov. "Thus, the transduction efficiency is improved, and at the same time fewer transfer viruses are needed."

In further studies, analog to the established system, suitable antibody fragments shall be evaluated for specific surface markers of various target cells, e.g. for bone marrow stem cells and immune cells. Gene therapy can thus be used as a treatment for specific genetic disorders (e.g. metachromatic leukodystrophy, Wiskott-Aldrich syndrome).

More information: Höfig, I. et al. (2014), "Systematic improvement of lentivirus transduction protocols by antibody fragments fused to VSV-G as envelope glycoprotein." *Biomaterials*, doi: 10.1016/j.biomaterials.2014.01.051

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