

Media Release

“MitoCatch” delivers healthy mitochondria to diseased cells

New technology opens therapeutic opportunities for neurodegenerative diseases, optic nerve disorders, and heart failure

Basel, 15 April 2026 – Scientists led by Botond Roska at the Institute of Molecular and Clinical Ophthalmology Basel (IOB) have developed *MitoCatch*, a groundbreaking system that enables targeted delivery of healthy mitochondria to specific cell types affected by disease. This innovation is a major step toward precision mitochondrial therapy.

Mitochondrial dysfunction contributes to numerous currently untreatable conditions, including neurodegenerative disorders such as Parkinson’s and Alzheimer’s, optic nerve atrophy, and heart failure. While transplantation of healthy mitochondria has been explored as a potential therapy, conventional methods lack the specificity and efficiency needed to reach disease-affected cells.

MitoCatch overcomes these limitations by using engineered protein binders to link donor mitochondria to target cells. The system employs three complementary strategies: binders on the cell surface (*MitoCatch-C*), binders on mitochondria (*MitoCatch-M*), and bispecific binders bridging mitochondria and cell membranes (*MitoCatch-Bi*). By tuning binder affinity and multivalent interactions, researchers achieved efficient, cell type-specific mitochondrial delivery in human and mouse models across multiple cell types.

Key findings from the work of first authors Temurkhan Ayupov and Veronica Moreno-Juan and collaborators:

- *MitoCatch* directs donor mitochondria to specific cell types, including neurons, retinal, cardiac, endothelial, and immune cells.
- Binder-mediated mitochondrial delivery increases uptake compared to untargeted methods.
- Donor mitochondria internalized via *MitoCatch* become cytosol-exposed, are dynamic, and capable of fusion / fission within recipient cells.
- Protein binders can be engineered to tune delivery efficiency and specificity.
- Targeted transplantation improved survival of damaged neurons in vitro and retinal ganglion cells in vivo, and was well tolerated in animal models, with no detectable immune response.

MitoCatch enables the first efficient, targeted delivery of healthy mitochondria to the cells most affected by disease. By overcoming the long-standing challenge of cell type-specific mitochondrial transplantation, *MitoCatch* opens new avenues for research and potential therapies for multiple diseases linked to mitochondrial dysfunction. Its versatility across multiple human cell types positions it as a pioneering platform for precision mitochondrial medicine.



The full article, “*Cell type-targeted mitochondrial transplantation rescues cell degeneration*” is available in *Nature* at <https://www.nature.com/articles/s41586-026-10391-0>.

About IOB

At the Institute of Molecular and Clinical Ophthalmology Basel (IOB), basic researchers and clinicians work hand in hand to advance the understanding of vision and its diseases, and to develop new therapies for vision loss. IOB started its operations in 2018. The institute is constituted as a foundation, granting academic freedom to its scientists. Founding partners are the University Hospital Basel, the University of Basel and Novartis. The Canton of Basel-Stadt has granted the institute substantial financial support.

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