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Rebuilding the brain after stroke

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Enhancing the brain's inherent ability to rebuild itself after a stroke with molecular components of stem cells holds enormous promise for treating the leading cause of long-term disability in adults.

Michael Chopp, Ph.D., Scientific Director of the Henry Ford Neuroscience Institute, will present this approach to treating neurological diseases Thursday, Feb. 13, at the American Heart Association's International Stroke Conference in San Diego.

Although most stroke victims recover some ability to voluntarily use their hands and other body parts, half are left with weakness on one side of their body, and a substantial number are permanently disabled.

No treatment currently exists for improving or restoring this lost motor function in stroke patients, mainly because of mysteries about how the brain and nerves repair themselves.

But Dr. Chopp and other Henry Ford scientists may have solved some of these mysteries through experiments at the molecular level identifying and testing components of stem cells.

"Even in older people, the central nervous system is highly plastic, meaning it has a unique ability to change and rebuild itself," Dr. Chopp explains. "We have demonstrated that this plasticity can be stimulated to promote neurological recovery after a stroke."

One such therapy involves proteins that shape the developing brain,

specifically a type that releases tissue plasminogen activator, or tPA, which causes axons and dendrites – the brain's neural cables and communications network – to rewire.

"We have shown that administering tPA in a nasal spray promotes this rewiring and significantly enhances neurological recovery," Dr. Chopp says.

Dr. Chopp will also speak at the AHA conference about other microscopic material in stem cells called exosomes that offer a "robust" treatment for stroke's crippling effects.

These blister-like microscopic "bubbles" were once were thought to carry and get rid of "old" proteins that were no longer needed by the body. However, exosomes were recently found to provide an essential form of "communication" between brain cells using "packages" sent out by stem cells with vital directions for gene regulation.

This is done through microRNA, master molecular switches that alter brain cells and promote recovery from trauma.

Dr. Chopp and his team have shown and confirmed that stem cell therapy works by firing off these "information bullets."

But they have also shown that neurological diseases can be treated with exosomes alone, separate from stem cells.

"This approach may be a revolutionary way to successfully treat stroke and many other diseases," Dr. Chopp says.

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