

A drugstore within: Mesenchymal stem cells protect and heal

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A stem cell that can morph into a number of different tissues is proving a natural protector, healer and antibiotic maker, researchers at Case Western Reserve University and their peers have found.

Mesenchymal stem [cells](#) reaped from bone marrow had been hailed as the key to growing new organs to replace those damaged or destroyed by violence or disease, but have failed to live up to the billing.

Instead, scientists who'd been trying to manipulate the cells to build replacement parts have been finding the cells are innately potent antidotes to a growing list of maladies.

The findings are summarized in the July 8 issue of *Cell Stem Cell*.

The cell, referred to as an MSC, "is a drugstore that functions at the local site of injury to provide all the medicine that site requires for its successful [regeneration](#)," said Arnold Caplan, professor of biology at Case Western Reserve, and lead author of the paper.

Here's how:

MSCs sit on every blood vessel in the body. When a blood vessel is injured or enflamed, the cells detach and jump into action.

"From the front end, the cell puts up a curtain of molecules which stop an overaggressive [immune system](#) from sending in cells to survey the

damage – which, if successful, would mount an autoimmune response," he said. "The back face of the MSC secretes [molecules](#) that set up a regenerative microenvironment so that the damaged tissue can repair itself and not make scar tissue."

Researchers around the world have been using the cells in a broad range of preclinical animal models of disease and injury and in clinical trials during the last decade.

By injecting MSCs into damaged tissue or infusing them into the blood stream, the therapy appears to have muted damage or cured such diverse conditions and disorders as acute heart attack, stroke, kidney failure, tendonitis, juvenile diabetes, radiation syndrome, arthritis, amyotrophic lateral syndrome, burns, wounds and more.

The researchers have found that MSCs from one human do not cause an immune response in another, nor in animals injected with human MSCs.

Most of the research has been done using cells culled from [bone marrow](#), but results using cells extracted from fat, placenta, umbilical cord and muscle have shown similar but not identical potential.

Which source of cell is the best for each disease or injury requires further investigation.

Recent work, led by the University of San Francisco scientists, shows the cell's arsenal is even greater. They found the cells produce a protein that kills bacteria including *E. coli* and *Staphylococcus aureus*, and enhance clearance of the microbes from the body.

Because MSCs are showing themselves capable of far more than a foundation for tissue engineering, Caplan suggests the acronym should now stand for medicinal signaling cells.

Provided by Case Western Reserve University

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