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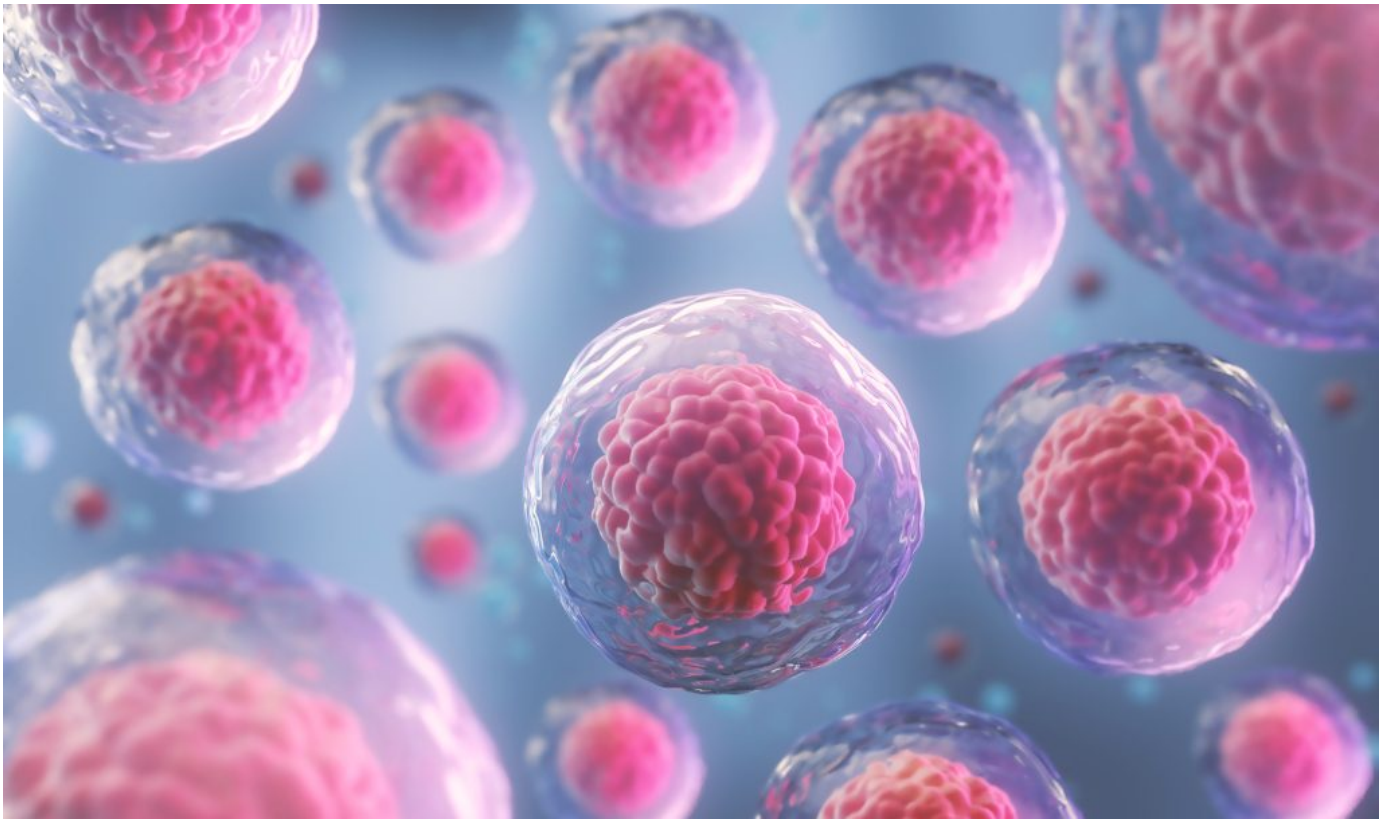
Harvesting Healing Factors From Stem Cells

Using a soft hydrogel, scientists in Singapore have found a way to induce stem cells to secrete large amounts of healing factors.



AsianScientist (Feb. 10, 2020) – Scientists at Nanyang Technological University, Singapore, have found an easier way to harvest healing factors from adult stem cells. They published their findings in in the journal *Advanced Healthcare Materials*.

Adult stem cells known as mesenchymal stem cells (MSCs) are present in many tissues of the body. When MSCs detect tissue damage, they produce healing factors to speed up repairs. Currently, scientists 'pre-condition' MSCs to secrete healing factors by placing them in a low-oxygen chamber or by using biochemicals or genetic engineering.

In the present study, researchers led by Assistant Professor Dalton Tay at NTU devised a different approach to get MSCs to produce healing factors—they mimicked the native environment of MSCs using a soft hydrogel, a three-dimensional network of polymers with high water content.

Tay's team found that MSCs grown on hydrogel secreted more healing factors as compared to MSCs grown on hard surfaces. They showed that the softness of the hydrogel triggered the activation of a signaling protein called hypoxia-inducible factor 1-alpha (HIF 1-α) in MSCs, causing the cells to increase their secretion of healing factors under normal oxygen conditions.

Because blood vessel formation is an important part of wound healing, the researchers next used a chicken egg membrane model to test whether the factors released by MSCs grown on hydrogel promoted vascularization. Chicken egg membranes treated with the secretome of MSCs grown on hydrogel exhibited improved blood vessel formation by up to 60 percent over three days compared to non-treated controls.

The researchers believe that their approach to stimulating healing factor secretion in MSCs would be advantageous to biopharmaceutical companies that are exploring the development of new MSCs-based cell-free therapies.

> "Our goal is to make MSCs produce the same healing factors in the lab as they do in the body during tissue repair, and that these might then be made into serums or incorporated into tissue patches that when applied to injuries, would increase the speed of healing," said Tay.

The article can be found at: Yang et al. (2019) Materials Stiffness-Dependent Redox Metabolic Reprogramming of Mesenchymal Stem Cells for Secretome-Based Therapeutic Angiogenesis.

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Source: Nanyang Technological University; Photo: Shutterstock.