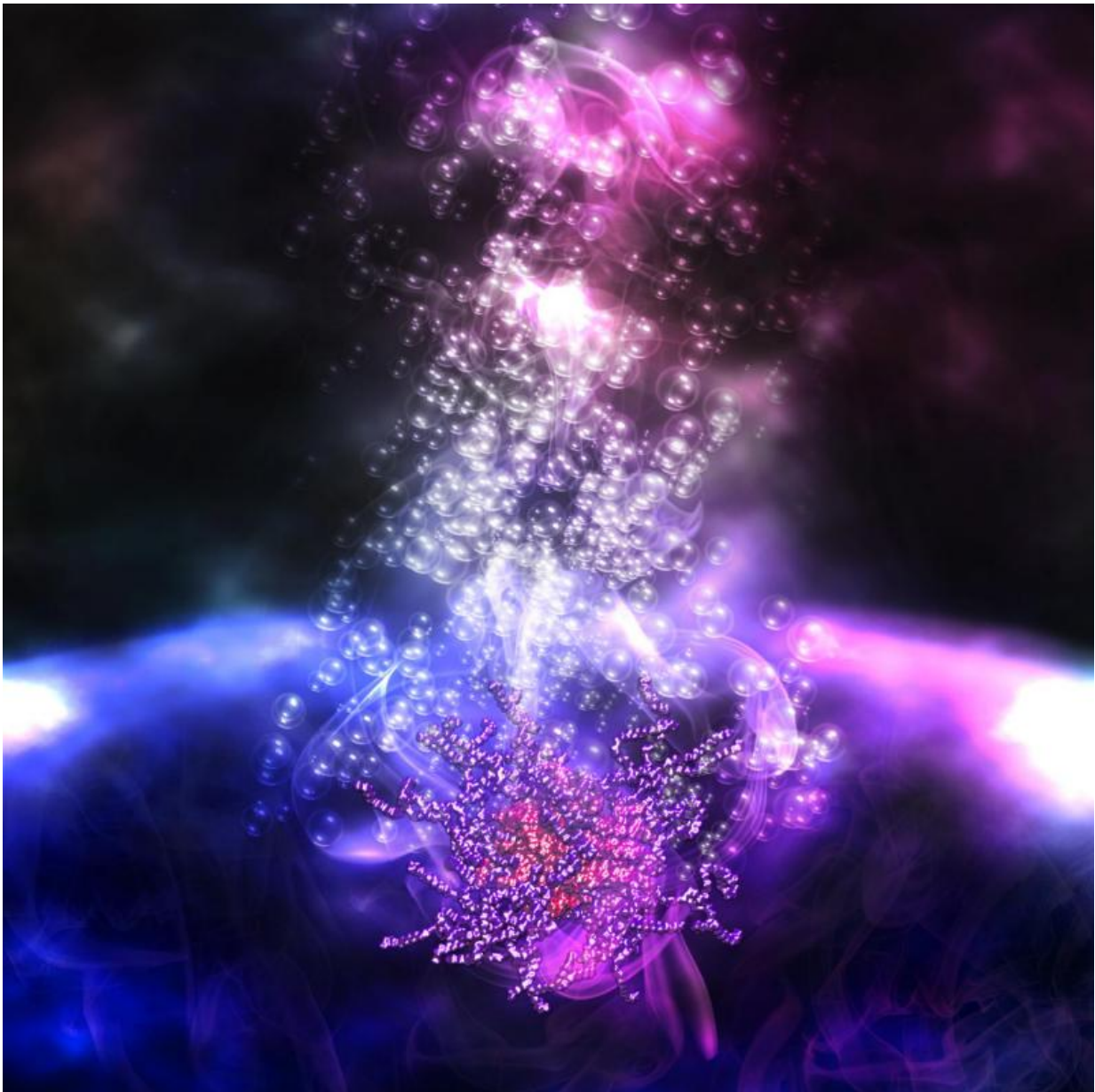


Tissue 'scaffold' technology could help rebuild large organs

June 17 2015



Artist's impression of myoglobin-based artificial membrane binding proteins supplying oxygen to the stem cells during tissue engineering. Credit: Warwick Bromley

Scientists have developed a new tissue 'scaffold' technology that could one day enable the engineering of large organs.

Research led by the Universities of Bristol and Liverpool has shown that it is possible to combine cells with a special scaffold to produce living tissue in the laboratory. It is hoped this can then be implanted into patients as a way of replacing diseased parts of the body.

Until now, the approach has generally been limited to growing small pieces of tissue, as larger dimensions reduce the [oxygen](#) supply to the cells in the centre.

A team of researchers, led by Dr Adam Perriman from the University of Bristol and Professor Anthony Hollander from the University of Liverpool, used [cartilage tissue](#) engineering as a model system for testing a new method of overcoming the oxygen limitation problem.

They synthesised a new class of [artificial membrane](#) binding proteins that can be attached to stem cells. By attaching an oxygen-carrying protein, myoglobin, to the stem cells before they are used to engineer cartilage, they ensure that each cell has its own oxygen reservoir that it can access when the oxygen in the scaffold drops to dangerously low levels.

Dr Perriman from Bristol's School of Cellular and Molecular Medicine said: "From our preliminary experiments, we found that we could produce these artificial membrane binding proteins and paint the cells

without affecting their biological function.

"However, we were surprised and delighted to discover that we could deliver the necessary quantity to the cells to supplement their oxygen requirements. It's like supplying each cell with its own scuba tank, which it can use to breathe from when there is not enough oxygen in the local environment."

The team's findings, published today in *Nature Communications*, could really expand the possibilities in [tissue engineering](#), not only in cartilage, but also for other tissue such as cardiac muscle or bone.

Professor Hollander said: "We have already shown that stem cells can help create parts of the body that can be successfully transplanted into patients, but we have now found a way of making their success even better.

"Growing large organs remains a huge challenge but with this technology we have overcome one of the major hurdles.

"Creating larger pieces of cartilage gives us a possible way of repairing some of the worst damage to human joint tissue, such as the debilitating changes seen in hip or knee osteoarthritis or the severe injuries caused by major trauma, for example in road traffic accidents or war injuries."

Their new methodology, describing the conversion of a normal protein into a membrane binding protein, is likely to pave the way for the development of a wide range of new biotechnologies.

Professor Hollander's pioneering work includes the development of a method of creating [cartilage cells](#) from stem cells, which helped to make possible the first successful transplant of a [tissue](#)-engineered trachea, utilising the patient's own [stem cells](#).

More information: Artificial membrane-binding proteins stimulate oxygenation of stem cells during engineering of large cartilage tissue, J.P.K. Armstrong et al. *Nature Communications*, [DOI: 10.1038/ncomms8405](https://doi.org/10.1038/ncomms8405)

Provided by University of Bristol

Citation: Tissue 'scaffold' technology could help rebuild large organs (2015, June 17) retrieved 26 June 2024 from <https://medicalxpress.com/news/2015-06-tissue-scaffold-technology-rebuild-large.html>

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