Scientists progress in successful tissue engineering

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Tissue engineering is a relatively new field of basic and clinical science that is concerned, in part, with creating tissues that can augment or replace injured, defective, or diseased body parts.

The approach to fabricating the tissues involves adding specific cell types to grow on a polymer scaffold having the shape of the tissue to be restored. The scaffold gradually disappears, while the cells continue developing in the scaffold shape. With the use of non-human animal cells, there has been considerable recent progress made in the engineering of skin, bladder, cartilage, and several other tissues.

Today, during the 85th General Session of the International Association for Dental Research, scientists are reporting on experiments applying human cells from cartilage (chondrocytes) on a scaffold. If the chondrocytes could be successfully grown in this manner, they were also interested in determining whether their development could be enhanced by a protein (osteogenic protein-1) that was known to increase production by chondrocytes of a major cartilage extracellular matrix component, proteoglycan. This study had not been undertaken previously.

Experiments were conducted as follows: Normal ankle cartilage was obtained from a deceased adult through the Gift of Hope Organ & Tissue Donor Network in Elmhurst, IL. The chondrocytes from the cartilage were isolated and purified by standard laboratory procedures. They were then applied to small polymer (polyglycolic acid) scaffolds

that were disc-shaped.

Three such constructs were created for comparison of possible cell growth and proteoglycan production. The first consisted of a scaffold treated with cells only, the second a scaffold with cells to which osteogenic protein-1 (from Stryker Biotech, Hopkinton, MA) was added drop-wise, and the third a scaffold incorporating timed-release capsules of osteogenic protein-1 together with cells.

The constructs were maintained for 4 weeks and then analyzed for the presence of chondrocytes and production of proteoglycan. Results showed successful tissue engineering of the chondrocytes on scaffolds and enhancement of proteoglycan production with osteogenic protein-1 delivered to the cells by either droplet addition or timed release.

The studies established that human chondrocytes are able to develop cartilage by the tissue-engineering methods used, and promise further advances toward therapeutic tissue engineering by laboratory means.

Source: International & American Association for Dental Research