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The effect of pore structure of collagen scaffold on cultured human chondrocytes in cartilage tissue engineering

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Keynote Biomaterials MedAppl
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Abstract

Statement of the Problem: One of the most important problems in humans is damage to the cartilage of the Joints. Of the common case which affects most people of different ages is osteoarthritis that is due to the loss of the articular cartilage of the knee that in most cases, the subchondral bones in the cartilage subcutaneous are also damaged. These lesions are not thoroughly curable due to the limited repair power of the normal cartilage because of absence of lymph, vascular and nerve tissue. One of the newest remedies for cartilage treatment is making autologous cartilage in vitro and implanting it to the patients Joint. By using tissue engineering methods, one can design a biocompatible scaffold, using natural protein and seed it to the patient's autologous chondrocyte cells and produce living human tissue. The purpose of this study is comparison of different methods in the freeze-drying process of designing and constructing an appropriate bio-scaffold with effective porosity size and shape, so that the highest efficiency required for the implantation and proliferation in the scaffold is created. Method: During a study, identical collagen hydro gels and different scaffolds were prepared by different conditions of freeze drying. Then, the patient's cartilage was biopsied in accordance with ethical principles and chondrocyte cells were extracted and multiplied from the tissue. The cells were then placed adjacent to the scaffolds and cartilage tissues of different qualities were prepared in a month. Findings: After performing special tests related to cartilage tissue, the scaffold which had a freeze drying that reached -40 °C over a 90 minutes ambient temperature manifested the best cartilage tissue formation compared to the other groups. Conclusion: Human cells in the form of three-dimensional tissues in the scaffolds, be prepared with physical and chemical conditions in vitro and lead to fabrication of living human cartilage tissues and be used in treatment of diseases associated with cartilage damage.

Biography

Mahdi Hadi, is currently working as Biological Medicines Director at Tofagh Daru Research & Engineering Company in Tehran and is engaged in developing advanced bio-based pharmaceuticals complying with GMP requirements. He has been involved in stem cell and tissue engineering research and industrial centers of Iran for 12 years. He has worked as a Researcher at Royan Institute, Tehran. He has worked as the Project Manager of Cell Therapy Medicines Production and Tissue Engineering.

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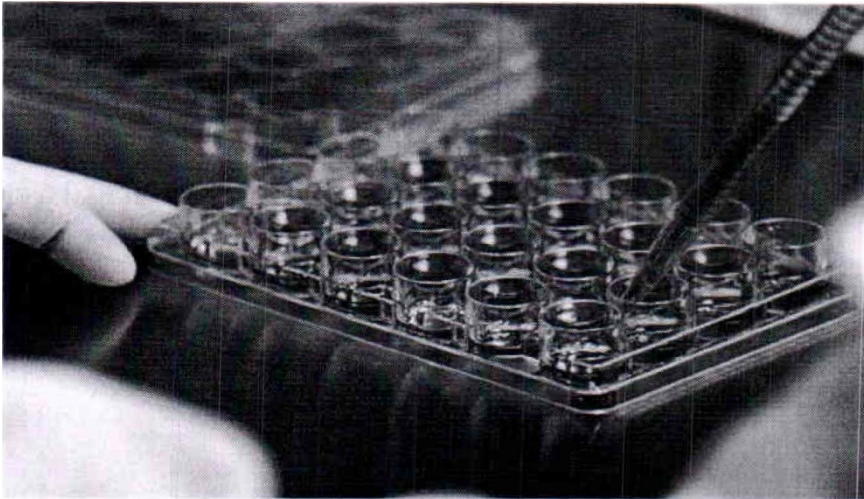
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## Iranian researcher makes human cartilage from body cells



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**Health Desk** An Iranian researcher was able to produce human cartilage by sampling, proliferating and culturing human cartilage cells on a collagen protein scaffold.

The plan's executor, Mahdi Hadi, told ISNA that the production of human cartilage is one of his research achievements, adding the initial product was manufactured in the laboratory and it can be produced industrially as a medicinal product in the near future.

Elaborating on his project, Hadi said for human cartilage production, first the patient's cartilage cells are sampled, then proliferated and cultured on a collagen protein scaffold, and finally a full human cartilage is made during 30 days.

After the cartilage tissue is formed, various quality control tests are carried out on the sample, added the researcher who has worked at Royan Institute, an Iranian clinical, research and educational institute dedicated to biomedical, translational and clinical researches, stem cell research and infertility treatment.

The tissue is valid and can be transplanted to the body if only it can pass the quality control stages and get a product identification!

Hadi, who is currently working as the biological medicines director at Totigh Daru Research and Engineering Company in Tehran, said the transplant is of the 'autologous' type, which is very important in terms of immune responses, because the patient's body does not reject it.

In 2018, a product was produced by human cartilage in the US and entered the global market. However, being manufactured for each patient separately, it is very expensive, the researcher added.

Hadi further said his MS thesis, titled 'The Effect of Pore Structure of Collagen Scaffold on Cultured Human Chondrocytes in Cartilage Tissue Engineering' paved the way for developing this research project.

The thesis was then sponsored by Tamin Pharmaceutical Investment Company of Iran's Social Security Organization and is being continued as a research project, he added.

•Recently I sent an article based on my thesis to the second World Congress on Advanced Biomaterials and Tissue Engineering, and I was invited to Rome as the keynote speaker and the chairman of the congress's Scientific Committee.

"My project attracted some reputable pharmaceutical companies participating in the congress due to implementing innovative methods in research and having a better quality compared to its US counterpart.

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