Tissue Engineering

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***Abstract*— This growing field combines aspects of biology, engineering, and medicine. It has allowed people to create models of different tissues of the body to study how viruses and diseases affect it. With the research in this field, we are moving towards finding cures for even the most complex of diseases.**

I. Introduction

TISSUE Engineering is an ever evolving field of engineering the combines aspects of biology, engineering, and medicine together to address the world's need in healthcare. Tissue Engineers study the growth of connective tissues or organs and utilize the research to produce artificial tissues from different cells of the body. There are several new advances in the field and professors at universities around the United States continue to perfect concepts that they already have. Stem cells are a large part of Tissue Engineering. Though they are highly controversial, the study of stem cells allows doctors to develop new therapies to treat even the harshest of illness, diseases and cancers.

II. Methods

There are three different areas of research within Tissue Engineering. These areas are mimicking, regeneration, and replacement. The focuses of this research cover many different topics in biochemistry, biomedical engineering, and biology. Some of these include biological packaging, differentiation of cells, and stem cells. Biological packaging of cells is the creation of new cells and tissues to ship new tissues. This is most commonly used for delivering new tissue or cells to a part of the body. The differentiation of cells is a key part the process of forming functional tissues. The differentiation of a cell gives the identity to newly created tissue. Lastly, Stem cells are used to form new cell and tissue therapies.

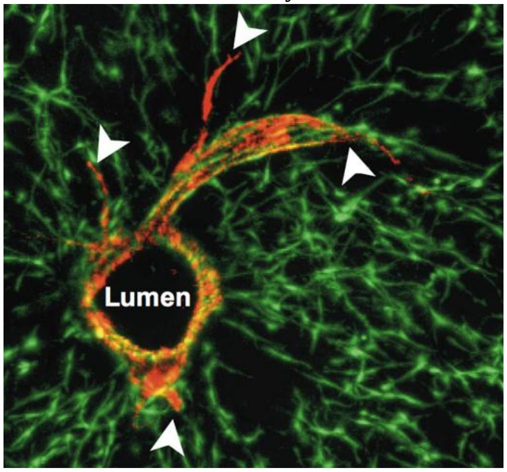
A basic case of Tissue Engineering uses a building material to create the tissue which essentially becomes the scaffolding. The starting material can be some type of extracellular matrix or biodegradable polymer. Then the scaffolding is seeded with live cells and they are provided with the correct physiological environment. From here, the scaffolding is implanted into the specimen. After the scaffolding dissolves, the new tissue attaches itself to the blood vessels and blends with its surroundings.

Professor Bhatia of MIT along with Christopher Chen of the University of Pennsylvania recently developed the first stem-cell-derived 3-D liver tissue model that includes their own network of blood vessels.

III. Results

Often A patient's immune system may reject the stem cells from donated embryos. Although using adult stem cells or IPSCs could solve this problem, since the cells were taken from the patient, those cells are less flexible and harder to manipulate than embryonic cells. In addition IPSCs are too new for transplants to be successful.

The study of stem cells has driven a wedge into the decision either to continue or to terminate research in the field. The research of stem cells, though highly beneficial, sacrifices embryos for the study. Some view this as inhumane and others believe that the research is necessary.



IV. Discussion

Though there has been much advancement in the field of Tissue Engineering, there are some obstacles that they still need to overcome before their research can be practiced. In many cases the patient's immune system rejects the stem cells from a donated embryo. However with discovery of induced-pluripotent stem cells (IPSCs) engineers are able to create stem cells from a person's existing skin cells. Although the body does not reject these, adult cells or IPSCs are harder to manipulate and they are too new for transplantations to work. In spite of the challenges Tissue Engineers face, the future of this field is very promising and will forever change the way we look at medicine.

References

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