

Biomaterials for Endothelial Cell Stabilization During Cornea Transplants

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The eyes are one of the most important organs in the human body that allows us to tangibly interact with the world around us. However, it is not uncommon for them to become damaged through trauma, infection, inflammation, or scarring. This can lead to vision problems and difficulty seeing. Patients with these issues may be candidates for corneal transplants. A cornea transplant is surgical procedure to replace a damaged cornea with one from a recently deceased donor. These procedures are performed by ophthalmologists and require great skill due to the delicacy of the eye.

Typically, the most important part to transplant is the layer of endothelial cells on the back side of the eye. Normally, in order to do this, part of the stroma layer is taken out of the donor eye as well to be able stabilize the endothelial cell layer and give the ophthalmologist something sturdier to handle during surgery, as opposed to a single layer of cells. However, inserting a new stroma lay sometimes leads to clouding in vision and difficulties healing. This can cause vision problems for the patient as the healing process continues.

The purpose of this project is to design and implement a polymeric base layer that would be able to hold the endothelial cells during the transplant so as to not disrupt the patient's stroma, allow for flexible movement and ease of maneuvering during the transplant, and degrade after a week in the eye. This material would provide a sturdy base layer for the endothelial cells to allow for the ophthalmologist to put the cells in the correct spot. This means the stroma layer would not have to be affected during the procedure and eliminate complications. The material would then degrade in the eye for the period of a week to provide stability for the cells as they attach to the eye and heal. The design and development of this polymer is essential to reducing risk in corneal transplants and will provide ophthalmologists with more ease and control during transplants.