3D-Printed Scaffold Device for Cell Transplantation

**Background:**
Hundreds of millions of people across the world live with diabetes mellitus and are dependent on insulin supplementation. This is often provided in the form of injections which require constant blood glucose monitoring, and imprecisions in monitoring often complicates treatment. Use of transplanted insulin-producing $\beta$ cells has been explored as a treatment option, however current clinical work in this area is based on cell infusion. These transplants also require donors and are only suitable for a small fraction of patients. Additionally, alternative approaches to cell replacement therapy involve cellular encapsulation, which puts cells in a hypoxic environment and greatly hinders survival and function.

**Technology Description:**
Transplanted insulin-producing $\beta$ cells is currently an area of interest for diabetes cell replacement therapy. By using 3D printing, this technology enables the transplantation of differentiated human pluripotent stem cells into *in vivo* systems. Printed with polylactic acid, the device secures cells with fibrin gel making it both biocompatible and macroporous. This allows for the necessary large number of cells needed to treat diabetes and is also retrievable for replacement purposes, as well as safety monitoring. This technology offers a novel way to treat diabetes and an exciting platform to further develop cell replacement therapy.

**Advantages:**
- Low-cost 3D printed device
- Macroporous device allows for quick glucose sensing and promotes $\beta$ cell survival
- Device maintains structural integrity while implanted and is retrievable for safety purposes
- Novel platform for cell replacement therapy development

**Patent/Patent Application:** Patent Pending (Application 62/410,760)

**Related Publication:** Economic 3D-Printing Approach for Transplantation of Stem Cell-Derived B cells. *Biofabrication*. 2016. PMID 27906687

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**Application Space**
3D printing, regenerative medicine, cell transplantation, diabetes