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Commentary

Amniotic Membranes contribution to the Success of Regenerative Medicine

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DESCRIPTION

The Amniotic Membrane (Amnio-M) is used in regenerative medicine in a variety of ways. It serves as a biocompatible natural scaffold as well as a source of a variety of stem cells and potent growth factors. Because of its excellent trapping capabilities, it can also be used as a nano-reservoir for drug administration. In the clinic, the Amnio-M has evolved from a simple sheet for topical applications for skin and corneal repair to more advanced forms, such as micronized dehydrated membrane, amniotic cytokine extract, and solubilized powder injections to regenerate muscles, cartilage, and tendons, over the last century.

The amniotic membrane is the most inner component of the placenta in direct touch with the foetus (Amnio-M). An epithelial layer facing the foetus, a basement membrane, and a stroma make up the Amnio-M. The latter is made up of three layers: A compact layer, a fibroblast layer, and a spongy outer layer. The Amniotic Epithelial Cells (AECs) and the Amniotic Mesenchymal Stromal Cells (AMSCs) make up these layers. The Amnio-M cells are important for embryo development because they produce cytokines and growth factors and contribute to the Extracellular Matrix (ECM) synthesis.

The use of the Amnio-M in medical therapy dates back to the early 1900s, when scientists advocated that it be used in skin transplantation. The dried Amnio-M was called "amnioplastin" and was used to avoid meningocerebral adhesions and posttraumatic epilepsy. The Amnio-M was later utilised as an adjuvant to autografts in chronic skin ulcers and to prepare for successive skin autograft applications in the early 1980s, resulting in successful skin healing. In 1986, the Amnio-M was introduced as a viable alternative to split skin grafts for vulvovaginoplasty vaginal reconstruction. The use of cryopreserved Amnio-M to repair ulcerated corneas in 11 patients resulted in a success rate of more than 90%.

Commercial versions of the Amnio-M in the form of suspension have lately been available to make its application easier. To avoid the intrusive method of suturing the Amnio-M graft, it was first used in the form of suspension eye drops (AMEED®) for corneal ulcer treatment in 2005. Micronized dehydrated human amnion/chorion membrane (-dHACM, EpiFix®) has also been found to be successful in treating diabetic foot ulcers, plantar fasciitis, and Osteoarthritis (OA) with low invasiveness in additional clinical trials. In an *in vivo* rabbit model, the Amnio-M was recently used as effective dermal filler for face wrinkles to restore smooth skin appearance. Its cosmetic applications, such as filling the nasolabial creases, malar fat pad, and descent of lid skin beyond the orbital rim, showed quick improvement in midface ageing correction cases. The addition of cytokines and growth factors improved the Amnio-performance M's in a variety of clinical applications in regenerative medicine, including as a Three-Dimensional (3D) scaffold for tissue creation and medication delivery.

By offering an optimum environment for cell growth, the Amnio-M applications have helped to a deeper understanding of stem cell biology. In comparison to commercially available scaffolds, our team found that Amnio-M could provide physiologically enriched, highly tailored, and topographical mechanical 3D scaffold for growing stem cells at a reasonable cost. We were also among the first to establish a continuous fluid flow to replicate extracellular fluid dynamics using a microfluidic device coated with decellularized Amnio-M. The creation of the Amnio-M organ-on-a-chip has recently given a unique platform for examining the transition and migration of AECs and AMSCs in the presence of oxidative stress during preterm birth.

CONCLUSION

Successful tissue engineering and regeneration can be achieved by integrating numerous components such as scaffolds, cells, vascularization, growth factors, and chemical and physical signals, according to the tissue engineering pyramid. Because it can offer suitable ECM, cells, and various types of growth factors, Amnio-M can cover the majority of the tissue engineering pyramid component. Researchers were inspid to construct the membrane employing new technology to modify and increase these unique and important qualities due to the large spectrum of cover available in tissue engineering.

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