Limbal stem cell deficiency (LSCD) can be caused by congenital aniridia, chemical/trauma injury, chronic severe bacterial infection, ocular cicatrical pemphigoid or significant atopic disease such as VKC (Figure 1).\(^1\)\(^-\)\(^3\)

Amniotic membrane (AM) has found resurgence as an alternative to higher risk surgical limbal tissue transplantation and provides a very good scaffold for both in vivo and ex vivo corneal limbal stem cell expansion. AM consists of the epithelium, basement membrane and stroma, with a basement membrane that closely resembles both that of the conjunctiva and cornea and therefore easily promotes epithelial cell growth.\(^4\)\(^,\)\(^9\) AM serves as a biological bandage and promotes healing in part by its modulation of inflammatory components such as interleukins, MMPs and decreased fibroblast activity.

Transplanted corneal epithelial AM sheets often eventually lose limbal stem cell progenitor characteristics when removed from their niche environment.\(^5\) The preparation method for AM limbal stem cell expansion can be can be adjusted to determine whether or not the graft's native epithelial cells and basement membrane are transferred to the recipient. This adjustment determines whether stratification and enhanced attachment or the maintenance of an active stem cell niche predominates and is an area of ongoing research.\(^6\)\(^,\)\(^9\)

There are concerns for the transmission of communicable diseases if proper donor screening is not performed or with improper storage and handling. Additionally, the widespread use of fetal bovine serum in AM limbal stem cell expansion preparations carries the additional transmission risk of animal viruses, prions and foreign proteins that can cause allergic response. Recently, a technique utilizing human serum as a single growth supplement has been utilized, which may eliminate the concerns of animal product additives.\(^7\) In a separate research line, the patient's own derived, induced and modified bone marrow mesenchymal stem cells can also be expanded on AM's for LSC replenishment.\(^2\) A further technique utilizing silk fibroin scaffolding is being perfected and demonstrates the modifiable ability to adjust the porosity characteristics to enhance niche maintenance, LSC expansion, and attachment. The silk fibroin scaffolding is hypoallergenic and can be produced in bulk.\(^5\)\(^,\)\(^8\)

References:


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