

Differentiation of human embryonic stem cells into limbal stem cells promotes corneal regeneration in limbal stem cell deficiency

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Human embryonic stem cells (hESCs) are an ideal seed cell sources for tissue regeneration. It is known that the culture microenvironment is vital for the differentiation fate and the stemness preservation of hESCs. Our research establishes a feasible and efficient strategy for inducing hESCs into limbal stem cells (LSCs)-like cells by using the conditioned media harvested from human LSCs and the specific extracellular matrix to replicate the limbal microenvironment in vitro. These hESCs derived LSCs-like cells (hESCs-LSCs) could highly express specific markers of LSCs and show low expression level of specific markers of terminally differentiated corneal epithelial cells. hESCs-LSCs have strongly clonogenic and proliferative capacity and are able to differentiate into corneal epitheloid cells in subsequential culture in vitro. These differentiated cells also display an adorable biocompatibility with human amniotic membrane (HAM) and acellular porcine corneal matrix (APCM) in vitro. hESCs-LSCs give rise to stratified epithelial cell sheets on HAM and APCM and the basal cells still keep the LSCs characteristics. And in rabbit limbal stem cell deficiency (LSCD) models, hESCs-LSCs could functionally reconstruct the damage ocular surface, satisfactorily inhibit the invasion of corneal neovascularization, reduce inflammation reaction and partially alleviate the scar formation in anterior corneal stroma. These findings indicate that hESCs are capable of differentiating into LSCs in vitro and the differentiated cells may be a potential choice for ocular surface regeneration in LSCD patients.

Biography

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