Stem cell derived retinal pigment epithelial cells have similar water transport properties as retinal cells in a human body

In the back of the eye the pigment epithelial (RPE) cells have an important role in maintaining ionic imbalance between the photoreceptor cells and blood flow. In normal conditions, this ionic gradient leads to passive fluid absorption by RPE cells, likely through water channel, called aquaporins. Aquaporin gene expression or protein dysfunction is affected in several common retinal diseases such as in diabetic retinopathy, retinal ischemia and autoimmune uveitis.

BioMediTech researchers investigated whether both embryonic stem cell and induced pluripotent stem cell derived RPE cells have the same gene expression profile and functional characteristics as native RPE cells. The stem cell derived RPE cells expressed all other aquaporins except aquaporin 2, which is in line with the results from the RPE cells from the human body. Furthermore the expression of aquaporin1 and aquaporin11 genes increased during the maturation and whilst cells matured, the localization of aquaporin1 concentrated at the apical plasma membrane of polarized cobblestone RPE cells. Lastly, aquaporin inhibitors significantly reduced aquaporin functionality in hESC-RPE cells.

“Our study shows that the human embryonic stem cell and human induced pluripotent stem cell - derived retinal pigment epithelial cells, grown and differentiated under serum-free conditions resemble their native counterpart in the human eye. Therefore these cells could also be used for in transplantation therapies and vitro drug testing”, says Kati Juuti-Uusitalo, a senior researcher of the Ophthalmology group

More information: