

Stem Cell and 3D Bioprinting based therapies for Blinding Eye Diseases

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Age-related macular degeneration (AMD) is the most common cause of visual impairment of the elderly in the developed countries. AMD is a multi-factorial disease that involves interaction of genetic and environmental influences. Allelic variants of genes encoding members of the alternative complement pathway including CFH, CFI and C3 strongly influence an individual's risk of developing AMD. We and others demonstrated that HTRA1 locus at chromosome 10q26 also strongly impact AMD risk (Yang et al, Science, 2006). We showed that variations in CFH, HTRA1, and C3 contribute to a majority of the genetic risk for AMD and are strongly predictive of advanced AMD and bilaterality (Chen et al, Arch Oph, 2010). Smoking is the strongest identifiable environmental factor that interacts with CFH genotypes to impact AMD risk. Epigenetics contributes to aging and age related diseases (Hannum et al, Mol Cell, 2013). Stem cell research shows great promise in modeling disease in vitro and treating blinding degenerative diseases of the eye including AMD and glaucoma (Zhu, et al, Cell Stem Cell, 2010; Li et al, PNAS, 2010; Zhang and Ding, NEJM, 2010). 3D printing of retina and cornea offer an exciting avenue of research and treatment (Ouyang, et al, Nature, 2014; Zhao et al, Nature 2015). The recent advance in genetics and stem cell therapy of eye will allow identification the high risk patients for customized intervention and treatment in the near future (Zhang, et al, Nature Review Drug Discovery, 2012).