production of three dimensional whole organ scaffolds to assembly of engineered complete organs. This study decellularized porcine livers to generate liver constructs as a scale that can be clinically relevant. Adult ischemic porcine livers were successfully decellularized using a custom perfusion protocol, the decellularization process preserved the ultrastructural ECM components, functional characteristics of the native microvascular and bile drainage network of the liver, and growth factors necessary or angiogenesis and liver regeneration. Furthermore, isolated hepatocytes are engrafted and reorganised in the porcine decellularized liver using a human sized organ culture system. These results provide proof of principle for the generation of a human sized, three dimensional organ scaffold as a potential structure for human liver graft reconstruction for transplantation to treat liver disease.

Ophthalmic biomaterials

The eye

The eye is the primary sense organ providing visual information about the surrounding environment. Light is focused via the cornea and lens onto the retina in amounts controlled by constriction of the pupil. Photochemical receptors convert photonic stimuli into neural impulses. The visual cortex then converts complex signals into images.

Globally the number of people of all ages visually imparied is estimated to be 285 million, of whom 39 million are blind. People 50 years and older are 82% of all blnid (WHO statistics 2010). Cataracts are the primary cause of blindness, cataracts are surgically treatable, however, in developing countries such surgical skills aren't available. Other causes of blindness include; glaucoma, age related macular degeneration (AMD) which is untreatable, diabteic retinopathy and corneal opacity.



The outermost coat of the eyeball, the fibrous layer, is composed of dense avascular connective tissue, it consists of the sclera and the cornea. The sclera is white and forms the posterior portion of the fibrous layer. The sclera protects and shapes the eyeball and provides an anchoring site for the extrinsic eye muscles. The transparent cornea forms the anterior portion of the fibrous layer. The cornea allows light to enter the eye and is responsible for light refraction. Epithelial sheets cover both faces of the cornea. The external sheet, a stratified squamous epithelium protects the cornea from abrasion. The corneal endothelium, composed of simple squamous epithelium, lines the inner face of the cornea; its cells have sodium pumps that maintain the clarity of the cornea by keeping its water content low. The vascular layer forms the middle coat of the eyeball and consists of the choroid, ciliary body and the iris. The choroid is a highly vascularised dark brown membrane, its blood vessels nourish the eyeball. Its dark brown pigment, produced by melanocytes, absorbs light, preventing it from scattering and refracting within the eye. The ciliary body consists of ciliary muscles which control lens shape. The round central opening of the iris, the pupil, allows light to enter the eye. The iris is made up of smooth muscle layers with bunches of elastic fibres which allow the iris to vary pupil size. The innermost layer of the eyeball is the retina. The retina contains; numerous photoreceptors that transduce light energy, other neurons involved in processing responses to light, and glia. The posterior

were carried out to monitor the effects of multifunctional coatings in cellular adhesion, proliferation and migration. And the intraocular implantations was performed on rabbits to evaluate the in vivo PCO inhibitory effect of sync surface functionalized IOLs. the positively charged CT DNP were successfully prepared by ionic gelation. The QCM-D results indicated the successful preparation of the HEP-CTDNP multilayer film. Drug release profiles showed that surface-functionalized IOL had drug sustained release properties .in vitro cell culture results showed significant inhibition of adhesion, proliferation and migration of LECs after surface modification. The in vivo results showed that the IOLs with multifunctional surface can effectively reduce the posterior hyperplasia and soemmering's ring formation. These results suggest that such multi functionalized drug-eluting IOLs can improve patient vision recovery and maintenance.

Retinal implants

Disease such as age related macular degeneration and retinitis pigmentosa, result in the gradual and permanent destruction of retinal cells. Such cases can be treated by retinal implants.

Alsaeedi., et al., 2020

Stem cell based therapy in photorece[tpr and retinal pigment epithelium transplantation is well received, however, the drawbacks of retinal transplantation is the limited clinical protocols development, insufficient number of transplanted cells for recovery, the selection of potential stem cell sources that can be differentiated into the target cells. And the ability of cells to migrate to the host tissue. Dental pulp stem cells (DPSCs) belong to a subset of mesenchymal stem cells, and are recently being studied due to its high capability of differentiating into cells of the neuronal lineage. Thus there is a potential use of DPSCs in treating retinal degeneration.