

Current comprehension of liver tissue engineering

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Chronic liver disease affects people all around the world that results in liver failure and mortality. Liver transplant is considered as the definitive therapy but the liver donor availability is much less than the transplant requirement. Hence, there arose the need for novel alternative strategies. However, over the past few years, many processes have been developed for the prevention and treatment of chronic liver disease. Some of these include extracorporeal bioartificial liver devices and cell therapy. Along with time, major progress has been achieved with the development of bioengineered 3D scaffolds. The development of implantable engineered hepatic tissue could be helpful in treating liver diseases. They can overcome many challenges that are experienced with the current liver therapies, such as lack of engraftment, poor long-term cell survival, etc. Liver tissue engineering is a fast-growing field that involves in developing a three-dimensional transplantable liver tissue with cells, ECM (extracellular matrix), and signalling molecules; and the sources are human and animal primary hepatocytes, and stem cells. Implantable engineered hepatic tissues are developed by immobilising or encapsulating cells in scaffolds made of a wide range of natural or synthetic biomaterials (e.g. collagen, gelatin, PEG, etc.). Different methods are used to produce implantable hepatic tissues, such as cell encapsulation 3D printing and decellularisation or recellularisation technologies. Several technical standards have been identified and preclinical works also have been performed in recent years that show promising results. The new generation of bioreactors might advance the extracellular matrix modelling and would facilitate the progress of liver tissue engineering technologies in clinics to treat hepatic disorders.

Keywords: Liver tissue engineering, Liver disease, Liver transplantation, Implantable liver tissues, 3D scaffolds, Bioengineered scaffolds, Decellularisation, Recellularisation

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