

Obstacles and challenges for tissue engineering and regenerative medicine

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Tissue engineering applies the principles of biology and engineering to develop viable cell based substitutes which restore, maintain, or improve the function of human tissues. There is a renaissance of interest in tissue engineering fuelled by new biomaterials, the investment in complex three-dimensional tissue constructs, combined with the buzz of stem cells and their 'niche, plus increasing recognition of the impact of extracellular matrix modulation and biomechanical forces on post-natal cell biology. Tissue engineering research engages a multitude of creative *ex vivo* studies using tissue culture techniques to investigate factors controlling cellular responses, through to the major challenge of translating these technologies into *in vivo* therapeutic clinical applications for human benefit. Future work will focus on issues related to realistic clinical applications of tissue engineering for regenerative medicine, including the use of bioscaffolds and stem cells, and overcoming the major problem of poor survival of tissue cultured cells transplanted into the *in vivo* environment.