# Bioreactors for Bone Tissue Engineering: A perspective in Modulation of Mechano-sensitivity in Bone

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May 6, 2022

## Abstract

There have been significant developments in the area of bone tissue engineering since its advent in terms of biomaterials as well as techniques of scaffold fabrication. Despite all these developments, the translation of research to clinical applications is very limited. The most challenging obstacle in the road of translation of engineered tissue construct into clinical applications is the manufacturing of the designed substitutes in a scalable manner. This bottleneck could be overcome by using bioreactors for the manufacture of tissue constructs. In this review, a current scenario of bone defects and cause of translational gap between laboratory research and clinical use has been briefly discussed. Furthermore, various types of bioreactors being used in the area of bone tissue regeneration in recent studies have been highlighted along with their advantages and limitations. After literature survey, we found that bioreactors should have the following attribute: (i) A dynamic combined bioreactor providing more than one physico-mechanical cues; (ii) Support the growth of multiple tissue engineered constructs simultaneously along with homogeneous distribution of cells throughout the scaffolds; (iii) Versatile to support different types of scaffolds and cell types to produce a patient/defect specific tissue construct as well as to fulfill the adequate supply demand for clinical applications; (iv) Automated with easy to operate protocols for minimal manual handling; (v) Effectively handled and reproducible; and (vi) Commercialization aspects, quality control and safely requirements. Furthermore, computational approaches could be combined with bone tissue engineering experiments using bioreactors to simulate and optimize the cellular growth in bone tissue constructs.

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