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Invited Review Paper
Osteobiology

Biological and biophysical principles in extracorporeal bone tissue engineering: Part I

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Abstract

Advances in the field of **bone tissue engineering** have encouraged physicians to introduce these techniques into clinical practice. Bone tissue engineering is the construction, repair or replacement of damaged or missing bone in humans or animals. Engineering of bone can take place within the animal body or extracorporeal in a bioreactor for later grafting into the body. Appropriate cell types and non-living substrata are minimal requirements for an extracorporeal tissue engineering approach. This review discusses the biological and biophysical background of *in vitro* bone tissue engineering. Biochemical and biophysical stimuli of cell growth and differentiation are regarded as potent tools to improve **bone formation** *in vitro*. The paper focuses on basic principles in extracorporeal engineering of bone-like tissues, intended to be implanted in animal experiments and clinical studies. Particular attention is given in this part to the contributions of cell and material science to the development of bone-like tissues. Several approaches are at the level of clinical applicability and it can be expected that widespread use of engineered bone constructs will change the surgeon's work in the near future.

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Keywords

bone tissue engineering; osteoblasts; cell stimulation

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