

Hydrogels for Bone Tissue Engineering

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Abstract. Hydrogels are polymeric networks with three-dimensional configurations capable of imbibing large amounts of water or biological fluids. Hydrogels can be tailored by varying porosity, pore size, surface to volume ratio, compressive modulus, topography and wettability which makes them promising candidate materials for bone regeneration. Clinically bone tissue engineering has not yet been a success. For a successful outcome, four conditions need to be satisfied:

- sufficient numbers of cells with osteogenic capacity
- an appropriate scaffold to seed the cells
- factors to stimulate osteogenic differentiation in vivo
- sufficient vascular supply

The first three conditions can be fulfilled by engineering, while condition number four is dependent on patient factors, such as the size of the defect. Lack of sufficient vascular supply, resulting in immediate cell death after implantation, is generally thought to be the cause of failure of bone tissue engineering in patients.