Advance of research in musculoskeletal regeneration

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Tissue regeneration is the progression of renewal, regeneration and growth. Tissue engineering of musculoskeletal tissues, particularly bone, cartilage and tendon, has been the topic of substantial research over the past two decades. Recently, tissue engineering strategies have included gene therapy and stem cells. Gene transfer has been suggested to improve repair and regeneration of tissue at sites of injury. This process enables local, sustained and potentially regulated expression of therapeutic gene products including morphogens, growth factors and anti-inflammatory agents.

Stem cells have been introduced into the field of tissue engineering due to their high proliferative, synthetic, and immunomodulatory activities as well as their potential to differentiate to the target cell types and undergo genetic modification. Stem cell-based therapeutic approaches offer great potential to promote tendon repair and regeneration.

Stimulating bone regeneration particularly in osteoporotic bone has been a challenge. Tissue engineering of bone regeneration has focused on bone graft substitute materials and developments of biodegradable scaffolds. A promising strategy of engineering functional bone seems to be using combinations of stem cells, scaffolds and bioactive factors.

Despite technological advances have improved orthopaedic implants and surgical techniques for bone reconstruction, the improvements in surgical techniques to reconstruct bone have been limited by the paucity of autologous materials available and donor site morbidity. Recent advances in the development of substitute materials have provided attractive alternatives to autograft and allograft grafting materials for restoring the form and function of injured bone.

This Danish–USA joint workshop presents the state of the art knowledge in this field of musculoskeletal regeneration covering various aspects from bench to bedside. Specifically the following topics will be discussed: gene therapy to bone healing; stem cells to tendon repair; stimulating bone regeneration in osteoporotic bone; and clinical experiences of bone stimulation in orthopaedic surgery and traumatology.

Speakers

Speaker 1: Expedited gene therapy approaches to bone healing
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Speaker 2: Advances in stem cell-based therapeutic approaches to tendon repair and regeneration
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Speaker 3: Stimulating bone regeneration in osteoporotic bone
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Speaker 4: Clinical experiences of bone stimulation in orthopaedic surgery and traumatology
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