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FOREWORD

The fourth edition of *Principles of Tissue Engineering* examines a variety of important areas. In the introductory section, an important overview on the history and challenges of tissue engineering as well as a chapter on stem cells and the movement of engineered tissues into the clinic is examined. This is followed by an analysis of important areas in cell growth and differentiation including aspects of molecular biology, extracellular matrix interactions, cell morphology, and gene expression and differentiation. Next, *in vitro* and *in vivo* control of tissue and organ development is analyzed. The involvement of biomaterials in tissue engineering is also addressed. Important aspects of polymers, extracellular matrix, materials processing, novel polymers such as biodegradable polymers as well as micro and nano fabricated scaffolds and three-dimensional scaffolds are discussed. Tissue and cell transplantation including methods of immunosuppression, immunomodulation, and even transplantation in the future are analyzed.

As mentioned earlier, stem cells have become an important part of tissue engineering. As such, important coverage of embryonic stem cells, adult stem cells, and postnatal stem cells are examined. Gene therapy is another important area and both general aspects of gene therapy as well as intracellular delivery of genes and drugs to cells and tissues are discussed. Various important engineering tissues including bone tissue engineering, tissues of cardiovascular systems such as myocardium, blood vessels and heart valves, endocrine organs such as the pancreas and the thyroid are discussed. The tissues of the gastrointestinal system, such as liver and the urinary tract, important aspects of the hematopoietic system are analyzed as is the engineering of the kidney and genitourinary system.

Much attention is devoted to the musculoskeletal system including bone and cartilage regeneration, tendon and ligament replacement. The nervous system is also discussed, including brain implants, and the spinal cord. This is followed by a discussion of the eye where clinical replacement and vision enhancement systems are examined. Oral and dental applications are also discussed as are the respiratory system and skin. The concluding sections of the book cover clinical experience in such areas as cartilage, bone, skin and cardiovascular systems as well as the bladder. Even tissue engineered food is evaluated. Finally, regulatory and ethical considerations are examined.

In sum, the 30 chapters in this third edition of *Principles of Tissue Engineering* examine the important advances in this burgeoning field of tissue engineering. This text will be very useful for scientists, engineers, and clinicians engaging in this important new area of science and medicine.