

Preface

Bone healing is the process whereby deficiencies and discontinuities in bone tissue are repaired by a regeneration process that rescues the biomechanical properties of the skeleton. Inevitably, this process involves an ultimate net gain in the amount of mineralized matrix at the affected sites. This gain may progress slowly, as in the case of the positive shift of bone remodeling balance induced in the osteoporotic skeleton by bone anabolic agents, or, as an outburst of bone formation and remodeling characteristic of the bone tissue reaction to traumatic insults. The importance of bone healing to medicine and biomedical research is illustrated by the number of publications on the different aspects of the subject, which exceeded 2,000 in 2011 alone.

Either form of bone healing is affected by a multitude of genetic, environmental, mechanical, cellular, and endocrine variables which eventually lead to changes in gene expression that enhance the guided action of osteoblasts (and chondroblasts) to lay down bone that restores, or even improves, the skeletal load bearing capacity and body motion. Needless to say, osteoclasts are also involved in shaping the healed tissue. Recent breakthroughs in understanding the regulatory aspects of bone formation and resorption, at the basic, translational, and clinical arenas, offer new modalities to induce, enhance, and guide repair processes in bone for the benefit of millions of patients with conditions such as osteoporosis, nonunion fractures, critical size defects, orthodontic tooth movement, periodontal bone loss, intraosseous implants, and deformed bones.

An immense number of approaches to treating these conditions are currently under basic, preclinical, and clinical investigations. They range from the development of sophisticated biomaterials for implant surgery, identification of neurotransmitters active in bone and other molecular drug targets, new drugs engineered by cutting edge pharmacological and molecular approaches, and advanced methods for tissue engineering and gene and cell therapies.

Because of the multidisciplinary nature of these efforts, this book addresses the modern aspects of bone healing, with a special attempt to enhance the convergence of the different experimental and clinical approaches designed for the study and treatment of bone healing in its diverse forms and under varying conditions. The information and ideas provided should have value not only for the experimental skeletal biologist and clinician treating bone conditions but also for a general interpretation of healing and regenerative processes in mammals.

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Principles of Bone Regeneration

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2012, XII, 156 p., Hardcover

ISBN: 978-1-4614-2058-3