

Bone morphogenetic proteins (BMPs): how do they function and what can they offer the clinician?

- **Sykaras N.**
- **Opperman LA.**

Department of Fixed Prosthodontics, Dental School, Athens University, Athens, Greece.
nsykaras@otenet.gr

Bone Morphogenetic Proteins (BMPs) form a unique group of proteins within the Transforming Growth Factor beta (TGF-beta) superfamily of genes and have pivotal roles in the regulation of bone induction, maintenance and repair. They act through an autocrine or paracrine mechanism by binding to cell surface receptors and initiating a sequence of downstream events that have effects on various cell types. Differentiation of osteoprogenitor mesenchymal cells and up-regulation of osteoblastic features occur under the influence of cytokines and growth factors that are expressed with the direct or indirect guidance of BMPs acting at the transcriptional level or higher. The Smads family of proteins has been identified as the downstream propagator of BMP signals, whereas hedgehog genes are possible modulators of BMP expression. The inflammatory response observed during wound repair and fracture healing, results in by-products that interact with BMPs and affect their biologic potential. Additive, negative or synergistic effects are observed when homodimeric or heterodimeric forms of BMPs interact with BMP receptors. Storage within the bone matrix allows for their involvement in the modeling/remodeling process by mediating coupling of osteoblasts and osteoclasts. Micro-environmental conditions, dose, possible carrier materials and geometrical parameters of delivery matrix are critical determinants of the pharmacokinetics of BMP action and the biologic outcome during wound repair. Because of their osteogenic potential, BMPs are of tremendous interest as therapeutic agents for healing fractures of bones, preventing osteoporosis, treating periodontal defects and enhancing bone formation around alloplastic materials implanted in bone.