EMD seemed to enhance the cellular differentiation. The EMD effect is dependent on many factors like culture conditions, dose/time of administration, stage of differentiation, and cell type (Schwartz et al., 2000). BG/EMD revealed higher protein production than BG on day 20.

Bosetti and Cannas (2005) investigated the ability of three bioactive glasses [45S5 Bioglass, 58S, and 77S] to induce cell mineralization and osteogenic differentiation. The cells cultured in contact with 45S5 Bioglass yielded the most mineralized tissue, almost the same as cells treated with dexamethasone (Dex) (used as positive control). Cells in contact with 58S resulted in the same level of mineralized tissues as that in negative control cultures. In contrast to this, 77S produced higher mineralized tissues than the negative control culture and cells on 58S. Calorimetric calcium analysis confirmed highest calcium accumulation for the osteoblasts cultured in contact with 45S5 Bioglass. The lowest Ca accumulation could be seen in cells in contact with 58S, as compared to the control untreated cells. 45S5 Bioglass and 77S stimulated the bone marrow cells to differentiate the osteoblast like cells along with mineralized tissue formation. In addition to this, 77S treated cells inhibited the multinucleated TRAP-Positive cells (Osteoclast like cells) as compared to the control untreated cells and 58S/45S5 Bioglass treated cells.

The gene expression of human osteoblasts in response to different biomaterials like 45S5 Bioglass, pure titanium (cpTi), stainless steel (316L), HAp, and polymethylmethacrylate (PMMA) has been studied using the cDNA microarray technique (Bombonato-Prado et al., 2009). Stainless steel and cpTi are considered to be bioinert. Both of these metals exhibited different behavior regarding the upregulation and downregulation of the genes. Stainless steel revealed the highest proliferation rates for the culture of human bone tissue from femur or femoral head followed by cpTi and the titanium alloy (Schmidt et al., 2001). In the presence of titanium, the ossification genes expressed less than the other genes as downregulation of OSTF1, BGLAP, CDH11, and ALPL could be seen. Stainless steel promoted CRTAC1 (cartilage acidic protein) upregulation, whereas cpTi led to enhanced ALP activity. Cells cultured in the presence of HAp yielded upregulation of genes linked with the skeletal development and ossification, that is, MSX2 (Msh homeobox homolog 2), COL1A2, and BMPR2 (BMP receptor, type II) and (ALP, bone/kidney/liver). 45S5 Bioglass® cultured cells exhibited upregulation of SMURF1 (SMAD specific E3 ubiquitin protein ligase 1), COL1A2 (collagen-I), and EXTI (exotoses multiple 1) genes. 58S bioactive glass ionic dissolution products yielded proliferation of osteoblast cells and upregulation of IGF-I, MAPK3/ERK1, and gpl 30 genes (Christodoulou et al., 2006; Bielby et al., 2004). 13-93 (vivoxid) glass particles were implanted in the rat-tibia to investigate the gene expression in the defect area (Välimäki et al., 2005). The defects filled with glass revealed high mRNA expression for the bone resorption and bone formation genes.

Valerio et al. (2004) investigated the morphology changes, proliferation, metabolic activity, and cellular viability of rat primary culture osteoblasts in