

TABLE 6.2 Gene Regulation for Different Cell Types to 45S5 Bioglass (Jell and Stevens, 2006)

	Genes	Expression and Cell Type
Bone	Bone sialoprotein Osteopontin Osteocalcin Osteonectin Bone morphogenetic protein (BMP-2) Alkaline Phosphatase	Expressed (HOB, rat OB) Expressed (FOB, rat OB) Expressed (FOB, rat OB), upregulated (HOB) Expressed (FOB, rat OB) Upregulated (HOB) Expressed (FOB, HOB, Rat OB)
Cartilage	Collagen II Collagen X 50×9 Cbfa2/Runx1	Expressed (FC) Expressed (FC) Expressed (FC) Expressed (FC)

both the glasses have capability for stimulating osteoblast differentiation and activity. Osteogenesis can be linked to the gene expression by both 45S5 and Bios-2P.

6.8 BIOACTIVE GLASS IN OSTEOBLAST PROLIFERATION

Xynos et al. (2001) conducted the microarray analysis of osteoblast gene expression and found that the ionic products of bioactive glass directly influence gene behavior of human osteoblasts. The genes were induced with the process relevant to bone homeostasis and osteoblast metabolism. The human osteoblasts were treated with the bioactive glass dissolution products. The genes included the one, which promoted cell matrix attachment (integrin β_1), participated in the modeling of ECM remodeling (metalloproteinases), induced osteoblast proliferation (RCL) and perform differentiated functions (CD44). c-myc was induced together with its transcription factor PuF and the effector gene, RCL.

Hattar et al. (2005) studied the effect of bioactive glasses and osteoproducer materials on the proliferation and differentiation of the mouse preosteoblastic cell line, MC3T3-E1. Cells were cultured for up to 28 days in media with three types of granules, that is, 45S5 Bioglass granules (BG), 45S5 granules coated with enamel matrix proteins (Emdogain) (BG/EMD), and a control glass, 60S. Differentiation zones could be observed during earlier stages in the cultures of BG and BG/EMD, indicating that all the substrates supported osteoblastic cell growth. Ultrastructural features similar to intramembranous ossification with direct bone opposition could be seen in the phase contrast microscopy. Transcription factor Runx2/Cbfa1 was stimulated on the 13th day of culture of BG as compared to the other two cultures. Osteocalcin and bone sialoprotein (BSP) expression was increased in BG/EMD and BG cultures as compared to 60S (Fig. 6.10).