

Chapter 6

Bioactive Glasses in Gene Regulation and Proliferation

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6.1 INTRODUCTION

45S5 Bioglass has stimulated osteogenesis via osteogenic differentiation and proliferation of human osteoblasts (Xynos et al., 2000, 2001). The bioactive glasses have regulated the gene expression in hard and soft tissues. 45S5 Bioglass has obtained FDA approval for the endosseous ridge maintenance implants and middle ear prosthesis (Jell and Stevens, 2006; Livingston et al., 2002; Hamadouche et al., 2001; Fujishiro et al., 1997). For the regeneration process, it is mandatory that the body's own repair process must be activated. Therefore, the proliferation and differentiation of stem cells/progenitor cells present in tissues must be controlled. Extensive research has been conducted on the effect of bioactive glass on the proliferation and differentiation mechanism, but the molecular mechanisms mediating these vital processes are yet to be understood completely (Kaur et al., 2014a, 2016a; Kaur, 2017a; Garg et al., 2016). Tissue engineering aims at the development of structures capable of mimicking the cellular behavior within the in vivo environment. Bioactive glasses depict characteristic properties like cell adhesion, extracellular matrix (ECM) production, cytoskeletal organization, migration, proliferation, and cell degeneration (Garg et al., 2016; Rahaman et al., 2011; Baino et al., 2016a; Hench, 2006; Kaur et al., 2017). These specific cell activities make bioactive glasses bioinert, bioactive, biocompatible, and/or biotolerant. Basically, bioactive glasses exhibit vital roles in influencing cellular behavior due to the production of ECM via surface topography, surface chemistry, and ionic dissolution products (Kaur et al., 2012, 2014b, 2016b, 2017; Hench and Wilson, 1993; Baino et al., 2016b;