Chapter 7

Lithium-Containing Bioactive Glasses for Bone Regeneration

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7.1 INTRODUCTION

A growing number of studies have shown that bone tissue regeneration may be stimulated by bioactive glasses (BGs) with different chemical compositions (Gorustovich et al., 2010; Wu and Chang, 2014; Jones, 2013; Hoppe et al., 2013; Quinlan et al., 2015; Haro Durand et al., 2014; Detsch et al., 2014; Kaur et al., 2016). Experimental evidence both in vitro and in vivo has shown the angiogenic and osteogenic effects of certain ions such as Si, B, Cu, Co, and Sr released from BGs (Gorustovich et al., 2010; Wu and Chang, 2014; Jones, 2013; Hoppe et al., 2013; Quinlan et al., 2015; Haro Durand et al., 2014; Detsch et al., 2014; Kaur et al., 2016). The incorporation of other ions with proangiogenic and osteogenic potential such as lithium (Li) in BGs is therefore a useful strategy to develop novel materials for regenerative approaches for bone tissue.

Li is an alkaline metal of electronic configuration $1s^2 2s^1$, which is distributed in variable quantities in rocks, soil, and water (Mota de Freitas et al., 2016; Oruch et al., 2014). Since its outer electron detaches easily, it becomes a monovalent cation (Li^+), which is more stable and reactive, and thus is involved in different biological processes (Mota de Freitas et al., 2016; Oruch et al., 2014). Li^+ has been widely used as a drug for the prevention and treatment of neurodegenerative diseases and different psychiatric disorders such as bipolar disorder, unipolar depression, schizophrenia, and mania, because it acts on the regulation of neurotransmitters and mitochondrial function, attenuating the expression of genes associated with the signaling pathways of protein kinases A and C (PKA/PKC) in hyperexcitable neurons, favoring the stability of mood (Mota de Freitas

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