William Hancock et al., J Glycomics Lipidomics 2016, 6:3 (Suppl)
http://dx.doi.org/10.4172/2153-0637.C1.005

Impact of calcium-independent phospholipase A_2 beta ($iPLA_2\beta$) on differentiation and activity of calvarial bone-derived osteoblasts

William Hancock, Amjad Javed and **Sasanka Ramanadham**
University of Alabama at Birmingham, USA

Bone modeling is modulated by lipid signals, especially arachidonic acid and its metabolites. These lipid signals can be generated by phospholipases A_2 which hydrolyze the sn-2 fatty acid substituent from membrane phospholipids; cellular AA is esterified in this position within membrane glycerophospholipids. Knockout mice lacking the group VIA calcium-independent phospholipases A_2 beta ($iPLA_2\beta$) exhibited an enhanced, age-related decline in cortical bone size, trabecular bone volume and bone mineralizing surfaces. They also revealed a dramatic decrease in mineral apposition rate by 6-months of age and accelerated age-related lipid droplet accumulation in their bone marrow. Current studies demonstrated that osteoblasts from calvaria of $iPLA_2\beta$-knockout mice express lower levels of Runx2, bone morphogenetic protein 2 and alkaline phosphatase mRNA, relative to WT osteoblasts. These findings correlate with decreased osteoblastogenesis and osteoblast activity, as reflected by reduced mineralization determined by Alizarin red staining and quantification. This reduction can be rescued by the treatment of osteoblasts with arachidonic acid and prostaglandin E2, a cyclooxygenase-catalyzed metabolite of arachidonic acid, which was hydrolyzed through activation of $iPLA_2\beta$. Prostaglandin E2 was known to increase osteoblast replication and differentiation. Our studies indicated that induction of differentiation factors and bone mineralization occur, in part, by activation of $iPLA_2\beta$ and subsequent generation of $iPLA_2\beta$-derived lipid signals. These findings indicated a prominent role for $iPLA_2\beta$ in determining mesenchymal stem cell fate, bone maintenance and bone remodeling.

Biography

William Hancock has completed his PhD from the University of Alabama at Birmingham School of Medicine in the Department of Cell, Developmental, and Integrative Biology. Utilizing an undergraduate background in Physics, he is pursuing a wider understanding of the impact of potent lipid derived signals in the control of transcriptional events related to Physiology and Pathophysiology.

bill@uab.edu

Notes: