**Primary Cilia in the Ventromedial Hypothalamus Regulate Energy and Bone Homeostasis through Sympathetic Nervous System**

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Dysfunction of primary cilia is related to homeostatic disruption leading to a wide range of disorders. The ventromedial hypothalamus (VMH) has been known to regulate several body homeostasis. However, specific homeostasis modulated by VMH primary cilia is not known. In this study, we identify that VMH primary cilia as an important organelle maintaining energy and skeletal homeostasis by controlling autonomic nervous system. Specifically, we deleted primary cilia specifically in the VMH either by targeting IFT88 (IFT88 KOSF1) using SF1-cre (Steroidogenic factor 1-cre) or by injecting AAV-cre virus directly into the VMH. Functional impairments of VMH primary cilia are linked to decreased sympathetic tone and central leptin resistance, which leads to marked obesity and high bone density. Obesity was associated with hyperphagia, insulin and leptin resistance, decreased energy expenditure (EE), and blunted brown fat function. In addition, we found that increased osteoblastic and decreased osteoclastic activities exhibiting increased bone density in the KO femur. Therefore, this study reveals the role of VMH primary cilia as a central hub for energy and skeletal homeostasis.