



Crosstalk between Vitamin D and Melatonin and its importance in Dental health.

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OPINION:

Vitamin D is a vital and essential biomolecule required for overall growth and development of every human being. Recently, vitamin D has become the most important and master regulator of dental health and plays a prominent role in calcium absorption for mineralisation and it also increases the revitalization and regenerative ability of dental pulp cells and tissue *in vivo*^[1]. It also protects different types of dental cells from harmful chemicals and pathogenic bacteria. Vitamin D can be synthesised by just exposing body to natural sun as well as through nutritious healthy diet.

In cellular and molecular level active vitamin D enters the cytoplasm and acts as a ligand for its receptor called vitamin D receptor (VDR). This ligand and receptor complex then enter the nucleus and forms a complex with RXR, a receptor for 9-cis retinoic acid which is a metabolite of vitamin A that mediates all the cellular and molecular functions of vitamin A. Finally, this vitamin D receptor and RXR along with vitamin D binds to the promoter regions of various genes. This vitamin D responsive promoter region is called vitamin D response elements (VDRE). There are many genes which have VDRE on their promoter region. Through this VDRE region along with VDR-RXR complex vitamin D transactivates various genes and plays pivotal role in molecular, cellular and tissue function, calcium absorption, bone and teeth growth and finally controls overall metabolism of the human body^[2].

On the other hand, melatonin, a natural circadian hormone secreted by the pineal gland in the human brain and plays a major role in sleep wake cycle. It is secreted in high amount during night-time and seized during day time. Sun light plays major role in preventing the expression and secretion of melatonin hormone. This melatonin also controls human biochemical metabolism in

many ways. It protects the cells from the harmful effect of oxidative stress and inflammation. Recently, many experimental evidences support the beneficial effect of melatonin on dental health similar to vitamin D^[3,4].

Functions of Melatonin and its biochemical role in dental health resembles the function of vitamin D, on many cells. Recently, a very important and an elegant study pointed out and elucidated that the Melatonin activates VDR and induces the expression of Runx2-related transcription factor 2 (Runx2) gene^[5]. This Runx2 gene has major role in tooth development and it is a target gene of vitamin D and VDR^[6]. Vitamin D regulates Runx2 gene both positively and negatively and it depends on cell type in specific manner^[7]. The molecular mechanism and the action of melatonin via VDR has established a strong connection between vitamin D and melatonin hormone (**Figure 1**). The possible action of melatonin via VDR and Runx2 in dental cells and tissues still needs to be evaluated and elucidated with fine experiments. Experimental evidence will help in understanding the synergistic role of melatonin and vitamin D and dental health as well as overall health. This possible cross talk between melatonin and vitamin D may aid in clinical research and therapeutics as well as in lifestyle based dental pharmacology.

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Figure Legend

Figure 1: Possible crosstalk between Vitamin D and Melatonin via VDR in Dental cells.

