Seema Kurup, Oral Health Dent Manag 2014, 13:2
http://dx.doi.org/10.4172/2247-2452.S1.002

OMICS Group Conferences
Accelerating Scientific Discovery

2nd International Conference and Exhibition on
Dental & Oral Health
April 21-23, 2014 Crown Plaza Dubai, UAE

From X-rays to T-rays: A new diagnostic modality on the horizon

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Untill a few hundred years ago, very little was known about the electromagnetic spectrum except for light. Then, the discovery of infra-red radiation by William Herschel in 1800 led to further discoveries of radiowaves, microwaves and ultraviolet rays. However, it specific use for humanbeings did not get recognition until the discovery of X-rays by Roentgen. This was a milestone that found purpose in a variety of uses, besides medical or dental use. The part of the electromagnetic spectrum sandwiched between the microwave and infra-red region, known as the "terra hertz gap" comprises of the terra hertz rays or T-waves or T-rays. These radiations have frequencies in the range from 0. 3THz to 10THz. The T-rays unlike X-rays is intrinsically safe, non-destructive and non-invasive and can be used as an imaging technique for characterizing molecular structures. T-rays enable three-dimensional imaging of structures and materials. Recent advances in technological development has led to further research in this part of the electromagnetic spectrum. Multiple applications ranging from investigating the molecular structure of drugs to distinguishing between different types of tissue in the body are currently in use. Terra hertz technology also helps in distinguishing between basal cell carcinoma and other forms of benign and malignant tissue growth in the skin and investigating the depth of the wounds. In the field of oral health care T-rays can be used to detect dental caries at an early stage. Conventional X-rays detect caries only when demineralization has progressed to such an extent that cavitation has occurred and restoration by cavity preparation is the only treatment modality. However, T-rays detect early decalcification of the enamel when it is possible to reverse the process by fissure sealant or fluoride application. In this review, the physics and applications of T-rays and the potential possibilities & application of these rays in human science are discussed.

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