



Nanotechnology: A Boon in Dentistry

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Several technological revolutions have been seen in dentistry. One concept, which has further role in bringing about paradigm shift in clinical dentistry, is nanotechnology.

Nanotechnology concept is the manipulation of matter on the molecular and atomic levels by using microscopic device entities to perform assignment. The term "Nano" is derived from the Greek word "dwarf". One nanometer is one-billionth or 10^{-9} of a meter. There are several potential applications of Nanotechnology in dentistry. Nanodentistry will possibly make the maintenance of near-perfect oral health by the use of nanomaterials, biotechnology and nanorobotics. Nanotechnology have potential to bring about significant benefits, such as improved health, better use of natural resources, and reduced environmental pollution. The evolution of nanotechnology will help dentists with more precision made materials, drugs and equipments by which both the safety and patient compliance will enhanced.

The following potential procedure are supposed to be performed better with the help of Nanotechnology:

- **Nanotechnology in Oral Medicine and Radiology procedures:** Nanodevices for the early disease identification or predisposition at cellular and molecular level and Nanomedicine to reduce toxicity and side effects of drugs
- **Nanotechnology in Oral and Maxillofacial surgery:** Advanced and controlled drug delivery system of Local anesthesia, Nanoneedles may achieve painless method of administration. A colloidal suspension containing millions of active analgesic micron-size dental robots will be instilled on the patient's gingiva. After contacting the surface of the crown or mucosa, the ambulating nanorobots would reach the pulp via the gingival sulcus, lamina propria and dentinal tubules guided by chemical gradients and temperature differentials under the control of the dentist with the help of nanocomputer, Bone replacement materials and nanomaterials for tissue engineering
- **Nanotechnology in Restorative and Endodontic:** Hypersensitivity cure, Tooth renaturalization, Dental biomimetics, Endodontic regeneration, Nanoterminators, Nanocomposites, Nano light curing glass ionomer restorative, Nano pit and fissure sealants, Nanoadhesives.
- **Nanotechnology in Prosthetics:** Nanoimpression materials, Implants coated with nanoparticles will play critical role in determining biocompatibility and bio integration and also adhesion and integration to surrounding tissues will be improved
- Nanotechnology in Oral and Maxillofacial pathology based on biosensor is useful for diagnosis of oral cancer and Oral fluid NanoSensor Test (OFNASET) for salivary gland tumours, Optical bionanosensor for apoptosis or programmed cell death. Nanoelectromechanical systems and cantilever array sensors could be the methods of the future in the detection of cancer, bacteria, fungi and viruses
- **Nanotechnology for oral cancer treatment:** Nanomaterials for Brach therapy and Photodynamic therapy for treatment of Oral Cancers
- **Nanotechnology in Periodontology and oral implantology:** Properly configured dentifrobots could identify and destroy pathogenic bacteria residing in the plaque and provide a continuous barrier to halitosis. Dental nanorobots will be very useful for dentinal hypersensitivity by occluding dentinal tubules within minutes and thus offers patients a quick and permanent cure. Triclosan-loaded nanoparticles by the process of emulsification-diffusion, obtain a novel delivery system for the treatment of periodontal disease. Tetracycline based microspheres are also being evaluated for placement in periodontal pockets.
- **Nanotechnology in Orthodontics:** Orthodontic wire with inactive fullerene-like tungsten disulfide nanoparticles will directly manipulate periodontal tissues thus allowing a rapid, painless tooth straightening, rotating, vertical repositioning within minutes to hours.

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