

Nanodentistry - What can We Expect From the Future?

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It seems that every time I write an article on innovations such as artificial intelligence, nanotechnology and robotics, I'm instantly reminded that these fields are developing at an alarming rate. So much research is being dedicated to all of these areas, but if there's one that I think we should all be keeping an eye on, it's nanodentistry.

What is nanodentistry?

Nanotechnology is, effectively, quite a broad term that relates to technology that deals with dimensions and tolerances of less than 100 nanometres. In this way, it usually involves the manipulation of matter on a molecular or atomic level. You've probably heard of nanobots – these are typically particles such as atoms or molecules that have been specifically engineered to act in a certain way, rather than small robotic devices.

So, when nanotechnology is used in dental applications, this is called nanodentistry. As you can imagine, when we take the opportunity to look at things on a nano-level, this opens the doors to a huge number of innovations and solutions that were previously unthinkable. In this article I want to take a closer look at some of the potential nanodentistry breakthroughs on the horizon, and what these could mean for us, and our patients, in the (hopefully near) future.

Next-level anaesthetic

Local anaesthesia is an essential part of providing a pain-free, comfortable experience for patients. However, there are complications associated with modern day anaesthetics, and depending on the drug being used, we still see complications – some of which are potentially quite dangerous. For instance, side effects can include headache, nausea and vomiting, pain at the injection site and even complications such as trismus.

In nanodentistry, local anaesthetic could be achieved by injecting a fluid containing millions of nanobots into the patient's gingiva. Once in situ, these particles could be manipulated by the dentist to shut down any sensitivity in the treatment area, effectively blocking the body's pain receptors so that no pain is experienced during the procedure. As an added bonus, this method of delivery could instantly restore sensation to the area through further manipulation – avoiding any of the short-term complications of traditional anaesthesia.

Cleaning on a nano level

Another huge advantage that nanodentistry could enable is allowing patients and professionals to better manage the oral microbiome. As you're aware, as much as someone brushes, flosses and uses mouthwash, it's inevitable that some small percentage of bacteria will remain.

If nanodentistry were to become mainstream, there is every potential for nanorobots to be programmed to clean the dentition, gingiva and subgingival pockets at an atomic level. This would mean that activated particles would remove all the pathogens from these areas, and could be programmed to do so in both a morning and evening time period so that optimum hygiene could be achieved.

What's particularly intriguing about this is how it would revolutionise dental care for everyone. People would no longer struggle with reaching tricky-to-reach places in their mouths. This would make a huge difference to people with limited dexterity as well as those who struggle with traditional tooth cleaning methods. Plus, the long-term effects of such a fantastic cleaning option would also inevitably mean less periodontitis and other issues – massively improving the oral health of the nation and overcoming a number of the common challenges we clinicians face on a daily basis.

This same concept and delivery method could even be applied for general maintenance beyond cleaning – e.g enamel repair. One study I found suggested that this method could even be used to enhance the natural strength of the dentition by replacing the top layer of enamel with hard substances such as diamond – an interesting prospect that could see

nanotechnology enhance our natural features for the better.

Speedy orthodontics

Another hugely interesting area where nanodentistry would really excel is using nanorobotics in orthodontic applications. While current appliance systems are very effective, one significant drawback is the time they take to achieve a result. Nanorobots would facilitate the manipulation of soft tissues and allow dentists to reposition teeth in real time. Imagine – this could mean that a full orthodontic case is completed in minutes or hours – completely changing the face of orthodontics forever and providing patients with a swift, pain-free way to achieve a straighter smile.

Mouth cancer diagnosis and treatment

As you're probably already aware, mouth cancer rates are currently at an all-time high. Indeed, deaths resulting from mouth cancer have risen by 20% over the last 5 years, suggesting that the disease is fast becoming a pressing concern.

Nanodentistry could easily be harnessed to improve diagnosis and facilitate effective treatment in this area. From a diagnostic point of view, particles could be manipulated to detect cancerous cells as well as other oral pathologies and instantly report back to the dentist, eliminating the need for lab testing.

Treatment-wise, again nanorobots would be revolutionary – whether that's using them to deliver cancer-battling drugs more effectively or to even destroy any cancerous cells themselves.

Dentistry will enter a new era

At the end of the day, with so much potential surrounding nanodentistry it's likely that should it become an established, accessible option, dentistry would never be the same again. There are very few limits faced by innovation at this level, and while we are, regrettably, not there

yet, I think the future is closer than we think.

Read the [original article](#) on The Probe.