

# Nanotechnology Developments in Restorative Dentistry, Future Perspective Dentistry

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## Perspective

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## ABOUT THE STUDY

Nanotechnology has emerged as a promising field in restorative dentistry, offering new materials and techniques to improve the longevity and aesthetics of dental restorations. Dental restorations have traditionally relied on bulk materials that lack the precision and control of nanoscale materials. However, recent advances in nanotechnology have enabled the development of nanocomposites, nanoparticles, and nanotubes that have unique properties and characteristics. One of the key advantages of nanotechnology in restorative dentistry is the ability to tailor the properties of materials at the nanoscale. Nanocomposites, for example, can be engineered to have specific mechanical, thermal, and optical properties that are superior to traditional dental materials. These materials can also be designed to mimic the natural structure and composition of teeth, leading to improved aesthetics and biocompatibility.

Another advantage of nanotechnology in restorative dentistry is the potential for improved bonding and adhesion. Nanoparticles and nanotubes can be incorporated into adhesives and cements to enhance their bonding strength and durability. These materials can also be used to create nanostructured surfaces that promote better integration with natural tooth tissue.

However, there are also challenges and limitations to the use of nanotechnology in restorative dentistry. One major concern is the potential toxicity of nanoparticles and nanotubes. While nanomaterials have shown promise in improving the properties of dental restorations, their effects on human health and the environment are still being studied. It is important for researchers and practitioners to carefully evaluate the safety and efficacy of nanomaterials before widespread clinical use. Here are some of the advanced techniques of nanotechnology in restorative dentistry:

### **Nanocomposites**

Nanocomposites are a class of materials that consist of a matrix material and nanoscale filler particles. These materials have unique mechanical, thermal and optical properties that make them ideal for dental restorations. Nanocomposites have better wear resistance, higher strength, and improved aesthetics than traditional dental composites.

### **Nanoparticles and nanotubes**

Nanoparticles and nanotubes can be incorporated into dental materials such as adhesives, cements, and composites to improve their properties. Nanoparticles improve the bonding strength and durability of dental materials, while nanotubes can be used to create nanostructured surfaces that promote better integration with natural tooth tissue.

### **Antimicrobial nanocoatings**

Antimicrobial nanocoatings are a promising technique for preventing bacterial colonization and biofilm formation on dental restorations. These coatings can be applied to the surface of dental materials to provide long-lasting protection against bacterial infections.

### **Nanoparticle-mediated drug delivery**

Nanoparticle-mediated drug delivery is a technique that involves the use of nanoparticles to deliver drugs directly to the site of a dental infection or inflammation. This technique can improve the efficacy of drug delivery, reduce side effects, and increase patient compliance.

### **Tissue engineering**

Tissue engineering is an emerging field that involves the use of nanotechnology to create biological substitutes for damaged or missing tissues. In restorative dentistry, tissue engineering can be used to create customized dental implants that mimic the natural structure and composition of teeth.

Nanotechnology has the potential to revolutionize the field of restorative dentistry by offering new materials and techniques to improve the longevity and aesthetics of dental restorations. Nanocomposites, nanoparticles, and nanotubes offer unique properties and characteristics that can be tailored to meet specific clinical needs. However, the safety and toxicity of nanomaterials must be carefully evaluated before widespread clinical use. Further research and development in this area is needed to fully realize the potential of nanotechnology in restorative dentistry.