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A New Trend in Dental Materials Is Bioactivity

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Abstract: An area of particular focus is the quickly developing field of bioactivity since it is a fascinating and interesting subject in the world of dentistry. Bioactive restorative materials continue to exhibit intriguing promise and provide substantial advantages to the patient and dentist. When subjected to an inorganic phosphate solution, such promising materials can develop an apatite-like surface layer along the materials' tissues' interface. Their use in dentistry includes repairing bone abnormalities, maintaining long-lasting dental bonded restorations, and remineralizing hard tissues. This article explains the idea, advancements, and evaluation of bioactivity and highlights the potential benefits of bioactive materials that have not yet been fully explored.

Keywords: Bioactivity; dental materials; remineralization.

The bioactivity is currently the topic of conversation in all areas of dentistry, but particularly in the field of dental biomaterials. It is emphasised as an important area of research for the development of new restorative materials.

What is bioactivity?

Bioactivity, in general, refers to any substances that affect, provoke, or interact with live tissues or cells, such as promoting the synthesis of hydroxyapatite[1].

The phrase "bioactive materials" was initially used by Larry Hench in 1969 to describe a new substance for bone restoration that could develop a link with bodily tissues. Hench created a wholly artificial substance known as bioglass, mostly made of calcium silicophosphate glass that the body does not reject and chemically binds to bone[2]. The original definition of bioactivity was restricted to a biomaterial that causes a certain biological reaction at the material–tissue interface and causes a link to form between them. The idea of bioactive materials has significantly evolved since then[3].

A substance becomes bioactive when it can trigger both an intracellular and extracellular reaction at its interface[4]. Dental materials that are bioactive are not regarded as novel. The initial trend in bioactivity is the adhesion of dental materials to tooth structure by an apatite-like substance with the help of fluoride-releasing materials or, more recently, by action of calcium phosphate-releasing materials. As a result, materials with varying degrees of bioactivity have been widely employed for a long time. These materials are primarily used to restore, rebuild, and regenerate dental injuries. For instance, because of their potential to remineralize tooth structure and their constant dynamic release of fluoride, which delays the development of secondary caries around restorations, glass ionomers have been referred to as bioactive materials.

The long-used calcium hydroxide can also be broken down into calcium and hydroxyl ions, which sets off a chain of events that promotes the formation of reparative dentin and tooth remineralization[6]. Glass ionomer and calcium hydroxide are among the earliest recognised bioactive dental materials as a result of these actions. When exposed to an inorganic phosphate solution, bioactive dental materials can be characterised as those that create a layer of an apatite-like substance at the tissue material interface[7].

Mechanisms of bioactivity:

A bioactive restorative substance exhibits at least one of the behaviours listed below[8]–[10].

1. Renewal of the hard tissues' mineral content through the release of fluoride or other minerals.
2. After being submerged in a liquid that resembles the typical physiological fluids, apatite-like development is observed along the material-tissue contact.
3. Tissue regeneration and repair by supporting the body's natural healing process.

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