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Dental Biomaterials Research Trends and Future Directions

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Dental resin-based composites (resin composites), dentin adhesives, and attempts at dental silver amalgam replacements have all evolved in response to the increased need and demand for cosmetic restorations. Many people believe in the benefits of conserving natural and undamaged tooth tissues as much as possible, which has moved the paradigm of modern dentistry toward minimally invasive (conservative) and adhesive dentistry. Growing interest in implant dentistry has shifted the focus of research to ceramic implant materials, their design, and surface treatment, primarily by adding inorganic or organic phases to increase Osseo integration. The exploitation of the micro biome is another example. Because bacteria affect most, if not all, complex ecological systems, exploitation of biological know–how is projected to open up new markets and business models in a wide range of biotechnology disciplines. Medicine, health care, food systems, industrial and home processes and materials, resource recycling, and energy capture are some of the possibilities. To make this a reality, wide basic biotechnology discovery research on micro biomes must reach a tipping point, allowing for R&I for smaller and larger possibilities across industries [1-2].

Combe conducted a study to determine the number of research abstracts published and patents issued in the field of dental materials. Between 1907 until 1972, he concentrated on ceramic, metallic, and polymeric materials. Combe observed that research into gypsum products, ceramics, dental cements, and investment materials reduced throughout this time period, but stayed consistent for metallic materials, maybe surprisingly. Nonetheless, there was a rising interest in polymeric materials research at the time. However, since the year 2000, there has been a paradigm change in biomaterials research, including dental materials. Functional materials are needed when the balance of biomedical research shifts toward regenerative biomaterials (resorbable) or bioinert materials (biostable) with particular needs, new implant fabrication procedures, and the use of laser in restorative dentistry. Materials having specific physical, mechanical, chemical, and biological properties might be used to improve adhesion, healing, and tissue regeneration. Materials with a higher surface-to-volume ratio are explicitly credited with these tailored qualities [3].

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Before any biomaterial can be judged safe and appropriate for clinical use, it must meet a variety of regulations and standards established by organisations such as the International Organization for Standardization, the American Dental Association, and the US Food and Drug Administration. This is why each new experimental dental biomaterial is subjected to a thorough evaluation and inspection during which its qualities are evaluated against those requirements. However, these rules are constantly amended and updated in light of new findings, and experimental items are subjected to rigorous testing in accordance with industry norms and laws.

In addition, the Academy of Dental Materials published recommendations to assist researchers in selecting appropriate test procedures. Emerging developments in dental materials research are aimed at creating new materials or customising the features of current materials to achieve and improve desired qualities. The authors agree that quantifying shifting trends in dental biomaterials research is necessary in order to assess the direction in which research is heading. It's worth noting that doing a bibliographic study of scientific research in dental biomaterials is a difficult task, and no one technique has been devised to meet all of the researchers' needs.

When considering the mechanical, biological, and, in particular, thermal demands of materials to be utilised in the oral and maxillofacial area, aesthetics, in combination with third-generation biomaterials, should be prioritised. With the biomimetic approach, which can safely link materials with human tissues, the paradigm has shifted from inert materials to functionally active materials. Furthermore, for both preventative and therapeutic reasons, targeted drug-releasing materials and/or the addition of antibacterial agents will be critical. Nonetheless, stem cell research in connection to dental material science might be the way of the future, leading to regenerative medicine. Ionic substitution can improve the biological and mechanical characteristics of bioceramics. The structure of the crystal lattice is altered as a result of ion substitution, which has an impact on the solubility of these materials. Surface modification of fillers and reinforcing agents can also improve the characteristics of dental resin composites. Incorporating ceramics such as alumina, zirconia, and other ceramics as reinforcement to boost fracture toughness is predicted to improve the mechanical and physical characteristics of dental resin composites [4,5].

Conflict of Interest

Authors declare no conflict of interest.

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