

Using Bioinformatics in Dentistry to identify new biomarkers

Uso de la Bioinformática en Odontología para identificar nuevos biomarcadores

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Biomarkers can be defined as measurable cellular, biochemical, and/or molecular alterations in biological matrices such as human tissues, cells, or fluids. They are biological indicators that allow the detection and monitoring of health or disease states ⁽¹⁾. Bioinformatics involves the integrated utilization of biological metadata through software programs, computational methods, data manipulation, and information analysis. Initially developed to comprehend and integrate data related to biology systems, this field has expanded to encompass various other specialties, including Dentistry.

Within Dentistry, bioinformatics has been integrated into genomics, transcriptomics, and proteomics analyses to understand the profiles of significant diseases in the oral health context. Due to the substantial volume of available data, systematized bioinformatics approaches enable a deeper understanding of the interactions between genes and proteins that correlate with oral health and other systemic conditions. This capability contributes to the identification of novel and important biomarkers that may contribute with early diagnosis, prognostic estimates, and the development of new therapeutic strategies. Specifically in Dentistry, the identification of new biomarkers may contribute to the prediction and/or early detection of important diseases, such as oral cancer and periodontal diseases.

From an academic perspective and with future prospects in mind, the use of bioinformatics approaches in dental research with the aim of identifying new biomarkers ⁽²⁾ may represent an exponential advancement in the field, as well as a benefit to society. In the context of disease, it is

essential to understand or have the possibility of a holistic approach to the individual's condition with the aim of promoting comprehensive treatment. In this scenario, the knowledge of a wide range of biomarkers, associated with specialized analysis programs, may increase the success rate of treatment.

Although bioinformatics has become established as a fundamental tool in biological areas, its use in dental research remains limited. This is because it is an area that requires interdisciplinary collaboration among professionals from different fields, such as dentistry, biology, biostatistics, and computer science ⁽³⁾. For effective work, it is necessary to invest in ensuring that all these professionals can develop their roles in collaboration, with full access to the precise resources. The objective is to achieve more rigorous methodologies that can integrate and analyze a large amount of biological information in a meaningful way, with the guarantee that the data are processed and interpreted correctly.

Despite these challenges, there is continuous development of new computational tools and an increase in the amount of available biological data, which will allow for the identification of increasingly precise biomarkers.

In summary, bioinformatics is a powerful tool for modern Dentistry, offering new perspectives that might influence diagnoses, prognoses, and treatments. Investment in the search for new biomarkers is promising, as it enables the development of databases that can be used in various areas and in various ways, with the aim of providing increase in the population's quality of life.

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