Saliva-Based Cytokine Score to Predict the Severity of Clinical Periodontal Inflammation

Unmet Need

Convenient, simple, and accurate methods to measure the severity of clinical periodontal inflammation.

Technology

The Kamer Lab at NYU College of Dentistry has developed weighted and unweighted indexes that correlate cytokine levels in a subject's saliva with Periodontal Inflamed Surface Area (PISA), a continuous measure of clinical periodontal inflammation and periodontal disease severity. These composite indexes measure 6 cytokines: IL-10 and IL-13, in addition to the well-known pro-inflammatory cytokines IL-1β, IL-6, IL-8 and TNF-α. In a 67 person pilot study with individuals with a range of clinical periodontal inflammation, as described in Tang et al PLoS ONE 2023, the researchers found (using regression analysis) moderately strong correlations between these indexes and PISA, as demonstrated by R2 values of 0.37 ($p<0.001$) and 0.29 ($p=0.001$). Therefore, if confirmed, salivary cytokine levels could serve as surrogate markers for periodontal inflammation and remove the need for inconvenient, costly, and tedious oral examinations for periodontal disease. Additionally, periodontal inflammation is a function of subgingival bacteria and host response; therefore, such indexes have the potential to serve as markers for future periodontal disease progression.

Background

Periodontal disease is a chronic inflammatory condition present in approximately 50% of U.S. adults and results from the interaction between subgingival dysbiotic bacteria and the host immune response leading to local inflammation mediated by pro-inflammatory cytokines. Current methods to measure PISA involve time-consuming, inconvenient, and uncomfortable procedures such as bleeding on probing (BOP) and pocket depth measurements. Thus, innovative new methods to measure PISA that are non-invasive, simple, and accurate are an urgent and unmet need.

Applications

- Monitoring of patient's response to periodontal disease treatments (e.g., deep cleaning or antibiotics) in individuals with mild-to-moderate periodontitis
- Potential diagnostic tool to predict periodontal disease progression and detect periodontitis in healthy individuals
- Potential diagnostic tool to indicate systemic inflammation associated with other diseases (e.g., CVD, kidney disease, and Alzheimer's)

Category

Life Sciences/Diagnostics
Life Sciences/Dental
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Advantages

- **Non-invasive, quick, and easy:** Only whole saliva is required for the cytokine level measurement
- **Convenient measurement:** The saliva sample could be drawn at the patient's home or at a collection facility; no need to see a dentist or go to a dental office
- **Improved patient experience**: Time-consuming and uncomfortable procedures such as BOP or pocket depth measurements are avoided.
- **Permits routine monitoring of disease status during treatment:** Procedure's convenience allows for frequent saliva sampling and cytokine level measurements
- **Indicator of other diseases:** High cytokines levels are linked to cardiovascular disease (CVD), kidney disease, diabetes, Alzheimer disease, and rheumatoid arthritis

Intellectual Property

U.S. provisional patent application filed covering the design of the cytokine indexes and their method of use

References

1. Vera Tang , Bubak Hamidi , Malvin N. Janal , Cheryl A. Barber , Benjamin Godder , Leena Palomo , Angela R. Kamer , https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0280333