Gum disease genes identified

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Researchers at Columbia University College of Dental Medicine (CDM) Columbia University Medical Center (CUMC) have identified 41 master regulator genes that may cause gum disease, also known as periodontal disease. The study was the first of its kind to employ genome-wide reverse engineering to identify the gene pathways that contribute to periodontitis.

Identification of the genes represents a vital step toward developing compounds that can be used in targeted, individualized treatment of severe periodontitis, before loss of teeth and supportive bone occurs.

Findings of the study were published recently in the *Journal of Dental Research*.

In gene expression studies, investigators find those genes that are most commonly expressed in either healthy or diseased tissue. But such studies cannot identify a causal link between these genes and the disease, and often miss genes that affect a larger number of genetic pathways, which may have a large impact on the disease process.

In this study, a team led by Panos N. Papapanou, DDS, PhD, professor and chair of oral, diagnostic and rehabilitation sciences at the College of Dental Medicine at CUMC, "reverse-engineered" the gene expression data to build a map of the genetic interactions that lead to periodontitis and identify individual genes that appear to have the most influence on the disease. "Our approach narrows down the list of potentially interesting regulatory genes involved in periodontitis," says Dr.

Papapanou. "This allows us to focus on the handful of genes that represent the most important players in the process rather than the whole transcriptome."

To identify the genes, Dr. Papapanou partnered with CUMC investigators in Systems Biology who had previously developed algorithms to identify regulatory genes that fuel cancer growth. The researchers examined RNA from healthy and diseased gum tissues of 120 patients with periodontitis.. They applied one algorithm to study the interactions among the genes and used another algorithm to identify genes that disrupt healthy tissue and drive the disease process.

Many of the genes identified by Dr. Papapanou and his team are implicated in immune and inflammatory pathways, confirming laboratory and clinical observations of the development of periodontal disease.

Identification of the master regulator genes will allow investigators to test compounds that interrupt their action, creating treatments that stop periodontal disease at its source. "Now it's important to do the downstream work of validating these master regulators in the lab before we can test these genes in experimental models," says Dr. Papapanou.

The paper is titled, "Identification of Master Regulator Genes in Human Periodontitis."

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