

## Study shows nearly 1/3 of human genome is involved in gingivitis

December 7 2009

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Gingivitis, which may affect more than one-half of the U.S. adult population, is a condition commonly attributed to lapses in simple oral hygiene habits. However, a new study shows that development and reversal of gingivitis at the molecular level is apparently much more complicated than its causes might indicate.

Research conducted jointly by the University of North Carolina at Chapel Hill and Procter & Gamble Oral Care has found that more than 9,000 genes - nearly 30 percent of the genes found in the human body - are expressed differently during the onset and healing process associated with gingivitis. Biological pathways associated with activation of the immune system were found to be the major pathways being activated and critical to controlling the body's reaction to plaque build-up on the teeth. Additionally, other [gene expression](#) pathways activated during plaque overgrowth include those involved in wound healing, neural processes and skin turnover.

Results of the study are published today in the December 2009 edition of the *Journal of Periodontology*. This study is the first to successfully identify gene expression and biological pathways involved with the onset and healing process of gingivitis.

Gingivitis is characterized by gums that are red, swollen and tender and that bleed easily during brushing and flossing. If untreated, gingivitis can lead to periodontal disease, which has been studied extensively for its possible relation to heart disease, diabetes and pre-term birth.

Researchers said that understanding how gingivitis develops and resolves on a molecular level can possibly provide critical insights into gum disease prevention, as well as new treatments.

"The study's findings demonstrate that clinical symptoms of gingivitis reflect complicated changes in cellular and molecular processes within the body," said Steven Offenbacher, D.D.S., Ph.D., the study's lead author and director of the UNC School of Dentistry-based Center for Oral and Systemic Diseases. "Understanding the thousands of individual genes and multiple systems involved in gingivitis will help explain exactly what is occurring in a person's body at the onset of the disease and how it relates to their overall health."

The build-up of plaque formed during the onset of gingivitis represents the overgrowth of bacteria as a biofilm on the teeth above and below the gum line. Biofilms can form in other parts of the body and are known to be involved with health conditions, such as urinary tract infections, ear infections and chronic sinusitis. Researchers believe learning about how the body interacts with bacteria overgrowth during gingivitis could provide insight into a variety of bio-film-associated diseases.

"Data generated by the study will be crucial in developing new approaches to treating gingivitis," said Leslie Winston, D.D.S., Ph.D., co-author of the study and Director of Professional and Scientific Relations at P&G Oral Care (makers of Crest and Oral-B). "We plan to conduct additional research to identify biomarkers of gum disease in at risk individuals and hope that this will lead to new and more advanced treatment options and preventative measures."

## **About the Study**

The objective of this study was to understand gingivitis on a molecular level by identifying changes in gene expression taking place in the mouth

during gingivitis onset and the healing process. Fourteen healthy individuals with mild gingivitis participated in the study. After baseline tooth cleanings, gingivitis was induced in each study participant, followed by the participants adhering to an [oral hygiene](#) regimen of twice-daily brushing and regular flossing. Gum tissue was collected at baseline, four weeks after the induction of gingivitis and one week after resuming the oral hygiene regimen of brushing and flossing.

Gene expression data was analyzed using gene chip technology that enabled the investigators to detect changes in the expression of more than 30,000 genes. By applying advanced genomics bioinformatics tools, the investigators were able to identify the biological pathways and gene expression patterns associated with gingivitis.

As part of the study findings, researchers identified several biological pathways triggered by the onset and healing of gingivitis, including those associated with immune response, energy metabolism, neural processes, vasculature, chemotaxis, wound healing and steroid metabolism.

Source: Spectrum

Citation: Study shows nearly 1/3 of human genome is involved in gingivitis (2009, December 7) retrieved 25 April 2024 from <https://medicalxpress.com/news/2009-12-human-genome-involved-gingivitis.html>

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