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Host immune response linked to the high risk of periodontal disease in diabetics

Eastman Department of Dentistry researchers discover that dysfunctional leukocytes may explain why there is a higher risk for severe periodontitis in diabetic patients

The May issue of the prestigious high-impact journal *Diabetes* includes a research study on periodontal disease submitted by a group of dental and medical researchers D. A. Mahamed *et al*., led by Dr. Andy Teng, an Associate Professor at Eastman Department of Dentistry (EDD) and several of his graduate students from the University of Rochester/Eastman Dental Center. Involved in the study was Dr. Bhagirath Singh, director of the Infection and Immunity Institute, Canadian Institutes of Health Research/the University of Western Ontario, and Dr. Josef M. Penninger, director of IMBA, of the Institute of Molecular Biotechnology of Austria.

Periodontal disease results from interactions between a biofilm below the gum line and the host immune/inflammatory response. It is a prime cause of the global epidemic of tooth loss in adults. The American Academy of Periodontology reports that severe periodontitis is the 6th most common complication in diabetic patients. In particular, among the millions of type-1 diabetics in North America, many suffer from advanced periodontal infection

where extraction of the infected teeth is often the only treatment. The rate of those who suffer from periodontal disease is as high as 40%.

The researchers found that certain leukocytes provide the molecular basis of the advanced periodontal breakdown associated with type-1 diabetes. In contrast to the classical complications associated with diabetic hyperglycemia, Teng's research study shows that the autoimmune environment and $CD4^{+}$T-cells display an unusual hyperactive response when mounting an anti-bacterial immunity to oral microbial assaults in the experimental diabetic NOD mice, which is similar to human type 1 diabetes.

These findings will lead to a new understanding of the potential causes of the high rates of microbial infections in diabetics and future treatments for both periodontal/dental care and medical risk factor management. This study clearly describes the impact of the autoimmunity environment to anaerobic infection in an experimental periodontitis model of type-1 diabetes. Moreover, these cells may open a new door for the therapeutic potential of treating periodontal disease in high-risk diabetic patients.

Dr. Teng began this project in 2001 while he was at the University of Western Ontario. It was funded by the National Institutes of Health/National Institute of Dentofacial Cranial Research (NIH/NIDCR). Teng's research team recently completed the project at the new Laboratory of Molecular Microbial Immunity located at Eastman Dental Center of EDD, University of Rochester.

"Research is playing an important role in Dentistry's future as we continually strive to find novel preventive and treatment options in the oral health

field," said Dr. Cyril Meyerowitz, director of Eastman Dental Center and professor and chair of the EDD.

Regarding the publication in *Diabetes*, Teng said, "There is emerging evidence that T-cells can regulate or control the bone remodeling processes including the ones involved in the inflammatory bone disorders such as human periodontitis."

Dr. Jack G. Caton, professor and chair of EDD's Division of Periodontology and past president of the American Academy of Periodontology said, "The findings linking periodontal disease and diabetes is another example of how dentistry and medicine are working together to promote wellness in our community. We have also found that patients who have severe periodontitis may demonstrate increased risk for developing coronary heart diseases, bacterial pneumonia, and pre-term low birth-weight babies. More research is absolutely needed to understand these disease links and develop new and innovative treatments so the public's oral and general health can be further improved and protected in the future."

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Diabetes is the official publication of the American Association of Diabetes Educators (AADE). It publishes papers on various aspects of both patient and professional education and serves as a reference for the science and art of diabetes management.

Background information:

http://www.urmc.rochester.edu/dentistry/

http://www.aadenet.org/AboutAADE/index.html

Diabetes:

D.A. Mahamed, A. Marleau, M. Alnaeeli, B. Singh, X. Zhang, J.M. Penninger, and Y.-T.A. Teng G(-) Anaerobes-Reactive CD4+ T-Cells Trigger RANKL-Mediated Enhanced Alveolar Bone Loss in Diabetic NOD Mice