

Biomedical Research Award

Dr. Carlos Flore-Mir, *University of Alberta*

Dr. Carlos Flores-Mir is a Professor, Graduate Orthodontic Program Director and Associate Chair, Graduate Studies at the School of Dentistry, University of Alberta. Raisa Catunda is currently an orthodontic graduate student completing a combined PhD clinical program at the University of Alberta under co-supervision of Drs. Maria Febbraio and Carlos Flores-Mir.



White spot lesions (WSLs), one of the earliest signs of enamel demineralization, are an undesired sequelae and potential adverse effect of orthodontic treatment. The prevalence rate of WSLs during orthodontics has been reported to be 30-75%, depending on the assessed parameters. The introduction of fixed appliances to the oral environment impacts the microbiome, and in some patients, a pathological shift that promotes WSLs may result. The Stephan Curve measures pH over time after a sucrose challenge, and indirectly measures aspects of oral health, including saliva flow and buffering capacity. The objective of this study is to determine if Stephan Curve kinetics can predict WSL development, and to correlate this with specific microbiome species/properties, in patients prior to placing fixed orthodontic appliances and during treatment. As the combination of these studies has not been done to date yet, assessing differences in the oral microbiome and its functions as well, the combination of these parameters may lead to stronger associations. A strength of this study is that, at baseline, all individuals should be in good oral health, with little plaque or calculus, and few risk factors for the development of disease. Thus, baseline samples, prior to fixed appliance placement, should be extremely informative. In the course of orthodontics treatment, diet and oral hygiene are important to caries development, with regard to WSL development in the context of orthodontics, even patients with good oral hygiene are at higher risk compared to those without appliances. As part of our normal clinic practice, patients are reminded to maintain good oral hygiene and hygiene is assessed in the patients at every visit. Thus, information about diet and oral hygiene can be incorporated into our data set when saliva samples are taken. An important aspect of any clinical investigation is how can the information be used to improve orthodontic education? Identification of which specific patients are of higher risk, in and of itself, however, can lead to more intensive preventive education and clinical measures that could reduce incidence. Information gained as to which bacterial species and/or their abundance in the microbiome, prior to appliance placement, are WSL pre-disposing, can lead to strategies aimed at changing the inhabitants, perhaps through diet or probiotics. More exciting however, would be the prospect of identifying specific features of the microbiome that predispose to WSL. This is important because it may be that multiple combinations of bacterial species can alter the functionality of the ecosystem to a similar end, that promotes WSL development. Thus, our study goes beyond the typical analyses and correlations. Instead of focusing on individual species inhibition (such as *Streptococcus mutans*, for example), work can be pursued in trying to block the conditions in the plaque that allow the habitation of that species or targeting an “enabler” species. Another possible outcome of our study is the identification of microbial species that form cooperative and stable associations in healthy patients and using this knowledge to develop probiotic complexes aimed at prevention.

It is our belief that this research project will improve our understanding about how to better handle and/or prevent WSLs among orthodontic patients. Given the relative high frequency of WSLs this information is of high clinical importance.

The AAOF has been paramount in my professional growth. I have been previously supported by the AAOF which has generated several publications and worldwide presentations. In this specific scenario, this funding will cover the significant costs associated with a complex microbiome analysis as proposed in this study.