

1288 ATP Bioluminescence: Quantitative Assessment of Plaque Bacteria Surrounding Orthodontic Appliances

R. SAUERWEIN, P. PELLEGRINI, T. FINLAYSON, J. KIMMELL, I. KASIMI, **D. COVELL, Jr.**, T. MAIER, and C.A. MACHIDA, Oregon Health & Science University, Portland, USA

Objectives: The objectives of this study were to determine if ATP bioluminescence could be used for the rapid assessment and quantification of plaque bacterial load on tooth surfaces surrounding orthodontic appliances.

Methods: Patients (14 individuals; ages 11-17) were bonded with orthodontic brackets and then recalled at 1 and 5 weeks post-bonding for collection of plaque surrounding the orthodontic appliances. Plaque and saliva specimens were assayed for total bacterial number, total streptococci and mutans streptococci number, and total ATP bioluminescence using a luciferin-based luminometric assay. Pearson correlations were then calculated comparing bacterial cell numbers, as a composite population of all plaque specimens, or all plaque and saliva specimens, versus ATP bioluminescence.

Results: Using the plaque specimens, we observed strong to moderate statistical correlations between total bacteria, total streptococci and mutans streptococci, versus ATP-driven bioluminescence, and calculated significant r values of 0.808, 0.674, and 0.651, respectively. High correlation coefficients were also determined when measuring ATP bioluminescence from plaque specimens using a hand-held luminometer that could be used at chair-side. When both plaque and saliva specimens were collectively analyzed, we observed strong statistical correlations between total bacteria, total streptococci and mutans streptococci, versus ATP-driven bioluminescence, with calculated r values of 0.895, 0.843, and 0.781, respectively.

Additionally, the majority of bacteria in the plaque specimens, or in the composite of plaque and saliva specimens, were streptococci; these determinations were supported with strong correlation coefficients of 0.895 and 0.940, respectively.

Conclusions: We conclude that ATP-driven bioluminescence is highly predictive of the numbers of total oral bacteria and total streptococci, and by statistical extension, is also reflective of the numbers of mutans streptococci. This study supports consideration of ATP bioluminescence as a useful tool for the rapid, chair-side quantification of bacterial load and as a general assessment indicator of oral hygiene maintained during orthodontic treatment.

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