# Bad breath and periodontal disease: how related are they?

Rosenberg M. Bad breath and periodontal disease: how related are they?, J Clin Periodontol 2006; 33: 29-30. doi: 10.1111/j.1600-051X.2005.00874.x.

The article appearing in the current issue of the Journal of Clinical Periodontology on oral malodour in the Chinese population by Liu et al (2006) is the most recent in a series of articles on bad breath appearing in this Journal in recent years. This is a welcome sign. Bad breath is, for the most part, an oral condition. It is an awkward and embarrassing problem for millions, and can be a warning sign of medical and dental disease. Research on its diagnosis, aetiology, and treatment are of prime importance. The main purpose of this present editorial, however, is to stress that we still do not understand how periodontal health relates to the subject of bad breath.

Let me clarify my point. Periodontists with whom I have spoken often take for granted that periodontal disease is a major cause of bad breath. Indeed, on the ADA website, bad breath is cited as a warning sign of periodontal disease. This would be of a considerable help in early diagnosis of periodontal disease if only it were true.

Indeed, various papers have demonstrated significant associations between gingival index and probing depth (on the one hand), and oral malodour (as determined by odour judges and volatile sulphides); these articles were reviewed in this Journal by Morita and Wang (2001). However, several publications, notably that of Bosy et al. (1994), conducted on over 120 Canadian subjects, did not find a significant association between the two (although the level of malodour was slightly elevated in the periodontal disease group). In the years that followed, one paper from the laboratory of my esteemed colleague Walter Loesche found a significant association, the other did not. A study, which we conducted, in 1994 yielded highly significant correlations between bad breath and periodontal disease; yet in another study that we published earlier this year, no significant association between periodontal health and bad breath was apparent in a group of Israeli adults.

Perhaps this is not so surprising. If we look back to the pioneering studies of the late, great, Joseph Tonzetich and coworkers (and even farther back to the remarkable study of Grapp in the early 1930s), we see that the major source of bad breath is not the periodontium, but rather the tongue. Just by cleansing the posterior portion of the tongue dorsum, oral sulphides can be reduced by at about 70%. So at best, when we compare overall oral malodour and periodontal disease, we are looking at a fraction of the overall problem, especially in subjects with no overt periodontal complaint. Indeed, in the current journal's Liu et al. paper, tongue coating emerges as the leading variable associated with odour judge levels as well as volatile sulphides. Further, whereas the correlations between periodontal health parameters and bad breath are highly significant (given the prodigious sample size, N = 2000), the r values are low, suggesting that the state of the periodontium accounts for only a few per cent of variation in bad breath levels. This is reflected in the only slightly elevated risk in higher volatile sulphides in subjects with increased bleeding scores.

Few practicing periodontists (or general dentists, or hygienists, for that matter) would argue that periodontal pockets are putrid when probed or scaled. However, many pockets are relatively sealed, so that only a small fraction of odour escapes into the mouth air (a similar argument may be made for the foulsmelling tonsilloliths (tonsil stones) which may or may not cause bad breath, perhaps depending on the extent to which they are exposed to the air passing over the tonsillar crypts). Discussions with C.A.G. McCulloch of the University of Toronto have led us to consider the possibility that much of the odour thought to emanate from periodontal pockets actually comes from exposed inter-dental plaque. In such a scenario, subjects who have recently started to floss may have little or no odour, even though signs of periodontal disease (e.g., pocket depth) are present. Indeed, we found many years ago that flossers have significantly less mouth odour than non-flossers. This in itself can be a great motivating tool in getting patients to clean between their teeth. In going over the Bosy et al. (1994) paper (albeit, a dozen years later), we find that floss odour is significantly associated with both bad breath and periodontal health parameters, whereas bad breath and periodontal disease parameters are not associated with one another. Might we infer that poor interdental health can lead to bad breath now, and periodontal problems somewhere down the line?

If, in the future, researchers wish to continue to study the periodontal component of bad breath (and clearly, they should), then the current methods of odour judge scoring are inadequate. Currently, odour judges smell mouth air in one of several ways, e.g., (i) the odour emanating when the subject breathes out through the mouth; (ii) the odor emanating when the subject counts





# **Guest Editorial**

Focused Perspective on Liu et al., J Clin Periodontol 2006; 33:31-36

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Tel Aviv University Sackler Faculty of Medicine-Human Microbiology Tel Aviv 69978 Israel Accepted for publication 28 October 2005. aloud; (iii) the odour perceived when the mouth is open but resting; (iv) the odour collected from breath air expelled into receptacles. The large surface of the tongue dorsum, and its contribution, will tend to minimize the periodontal contribution in all these cases. In order to ascertain the periodontal component, I would suggest a different technique: subjects expel air from the mouth with the lips only slightly open and the teeth clenched. In most instances, periodontal odour is characteristic and very different from most odours that one encounters on the tongue surface.

We are left with one final intriguing factor – the relationship between tongue coating, bad breath, and periodontal health. Periodontal-associated microorganisms can be harboured on the tongue dorsum. Some studies support an association between tongue coating and periodontal health (some do not). If there is such a relationship, might it be a causative one? Deep, but gentle, tongue cleaning is recommended by researchers for alleviating bad breath. Does it impact on periodontal health as well? In closing I would like to applaud the Journal for considering manuscripts on oral malodour worthy of publication for its audience, and I expect that this trend will continue in future.

### Acknowledgement

I thank Christopher A.G. McCulloch, University of Toronto, for valuable discussions and insight.

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