Abstract

Effects of fluctuations of the female sex hormones on the periodontal tissues

and microbiota associated with threatened preterm labor.

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Abstract

Although several studies have evaluated the relationship between periodontal disease, preterm delivery, and low birth weight, the associations remain unclear. In particular, the effects of changes in female sex hormone levels during pregnancy on the periodontal tissues and microbiota at various sites have not yet been fully elucidated.

In this study, we investigated the effects of female sex hormone on the periodontal tissues and microbiota in the patients with threatened preterm labor (Study 1), human gingival epithelial cells (Study 2), and ovariectomized mice (Study 3). Furthermore, we investigated changes in the intestinal microbiota caused by systemic administration of lipopolysaccharides (LPS) from *Porphyromonas gingivalis* (Study 4).

Patients with threatened preterm labor (TPL) had moderate-to-severe gingival inflammation and greater probing depths than those without TPL. The levels of female sex hormones in the saliva were low, and salivary progesterone levels were negatively correlated with gingival inflammation in the pregnant women (Study 1). Microbiota analysis revealed no species richness or evenness in both the periodontal tissues (Study 1) or the ovariectomized mice (Study 2); however, changes in microbiota composition were observed (Studies 1 & 2). In contrast, no change in diversity of the intestinal microbiota was observed after administration of periodontal LPS (Study 4). No common bacterial pathways were detected between experiments, but common pathways were detected in each experiment (Studies 1, 3, and 4). Differential gene expression detected in Study 2 revealed pathways related to the wound-healing mechanism, signaling pathway, and cell cycle. These genes are thought to be involved in homeostasis in the gingival epithelium, and their reproducibility was confirmed not only in the human gingival epithelial cells but also in the gingival epithelium of ovariectomized mice (Study 3). Evaluation of the expression and fluctuation of inflammatory mediators in the cultured cells (Study 2) or in the mice (Studies 3 & 4) revealed no evidence of acute inflammation.

The findings in this study indicated that salivary progesterone levels were lower in TPL than in those with non-TPL and that gingival inflammation may be exacerbated in these women. In addition, fluctuations in female sex hormones during pregnancy have been suggested to affect the gingival epithelium and oral microbiota. These findings suggest that salivary progesterone levels, gingival inflammation, and changes in microbiota may influence the threatened preterm delivery.