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Opinion

Probiotics to Control Oral Microbiome, Resulting in Gut Microbiome

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In the worldwide, approximately 20 to 50% of populations suffer from periodontal diseases [1]. According to NHIS (2017), 7.38 million people experienced medical treatment because of periodontitis in 2009 and 14.19 million people in 2016 in South Korea, which was increased by 92.3% in only 5 years [2]. The major oral pathogenic bacteria that occur periodontitis are *Porphyromonas gingivalis, Prevotella intermedia* and *Fusobacterium nucleatum* by disruption of alveolar bone and inflammation disperse [3,4]. Periodontitis is well-known for a risk of many other diseases such as cardiovascular disease, type 2 diabetes, non-alcoholic fatty liver, and rheumatic arthritis [1,5]. It is important that a treatment of periodontitis can protect various diseases, and thus, prevention of oral pathogens is necessary.

The treatment of periodontal diseases is based on removing bacterial plaque and preventing bacterial growth, and several drugs such as ascorbic acid, antibacterials, antibiotics and etc. have been used for the treatment. However, ascorbic acid has little therapeutic effect, and antibacterials and antibiotics have a limitation for a fundamental treatment of periodontal diseases. Tetracycline and metronidazole have been primarily used for periodontal disease, but the antibiotics can occur side effects such as the emergence of stomach disorder, recolonization of the pathogens, and antibiotic-resistant [6]. Therefore, the fundamental therapy to decrease oral pathogens in oral microbiome is important. For these reasons, a new therapy using probiotics which can prevent oral pathogens should be suggested.

According to FAO-WHO (2002), probiotics are live microorganisms that are effective on health when people consume adequate volume [7]. Probiotics markets in the world will grow, and some professionals predict the value for that markets exceed 60 trillion in 2020 [8]. Probiotics regulate immunity in host [9,10], and some researchers found that the probiotics decrease the inflammatory cytokines or induces another regulatory system, and thus, symptom of disease was relieved in the mouse model [11-13]. Lactobacillus is one of the major probiotics that decreased growth of *P. gingivalis* and *P. intermedia* by 82% and 65%, respectively[14], and *Lactobacillusreuteri* can decrease bleeding and inflammation of gums [15,16]. Also, sterilized gauze inoculated with probiotics has antibacterial effects on oral pathogens such as *Bacteroides, Actinomyces, Streptococcus intermedius*, and *Candida albicans* [17]. Through some researches, probiotics that have antibacterial effects can be used for the treatment of periodontitis, and furthermore, it can be useful for improvement of oral microbiome.

Previously, probiotics are generally used to improve gut health. However, it was hypothesized that oral microbiome changed by probiotics may affect gut microbiome [18,19]. The compositions of oral microbiome between the healthy group and periodontitis patients were different. In healthy group, Neisseria *lactamica* consisted 8.8% in oral microbiome, but the periodontitis patients had 24.5%. Regarding *Streptococcus sanguinis*, causing inflammation in gum, healthy group had 2.9% composition, but the patients had 13.5% composition [20]. When *P. gingivaliswas* oral-gavaged in the mouse model, the gut microbiome composition of Firmicutes and Bacteroidetes was changed from 55.4% and 38.7% to 72.8% and 17%, respectively [21]. Oral microbiome change caused even allergy response such as atopic dermatitis because gut microbiome was influenced and immunity system was unbalanced [22,23].

In conclusion, future studies to evaluate the correlation between oral and gut microbiome, are necessary, and thus, studies to develop to control oral microbiome, resulting in improved gut microbiome need to be conducted.

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