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Oral Pathogens affect Gut Inflammation and Systemic Diseases

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Abstract

Over the past decade, research has mounted linking oral pathogens with several systemic diseases. The migration of such pathogens from the mouth to other parts of the body follows different mechanisms and routes. For example, a recent study reviewed here demonstrates that even a single oral dose of *Porphyromonas gingivalis* can penetrate the gut barrier, change the gut microbiota, and affect the influx of gut microbiota into the liver.

Keywords: Oral microbiome; Oral pathogens; Gut microbiome; Gut inflammation; Systemic diseases; Disbiosys; *Porphyromonas gingivalis*

Opinion

Gut microbiota is a focus for both those concerned with maintaining good health and those investigating its link with systemic diseases. With the establishment of the human oral microbiome database in 2010, it has been discovered that the mouth is home to the second most diverse microbial community in the human body harboring over 700 species of bacteria [1]. Importantly, oral microbiota bear "Dual Citizenship" and migrate to other organs [2]. Research has shown that migrating oral microbiota are associated with systemic diseases, including cardiovascular diseases, rheumatoid arthritis, adverse pregnancy outcomes, stroke, perio arthritis, gestational diabetes, stroke, respiratory tract infection, meningitis or brain diseases, lung, liver or spleen abscesses, appendicitis etc. [1-3]. Nitrate reductase – expressing bacteria that convert dietary nitrate to nitrite – serve as an example of the link between oral bacteria and systemic disease. Salivary nitrite after swallowing gets converted to nitric oxide, a potent vasodilator with antimicrobial activity which plays a critical role in sustaining cardiovascular health [4].

The overgrowth of oral pathogens which leads to periodontitis also creates a dysbiosis (microbial imbalance) of oral microbiota, which is further implicated as a risk factor for various systemic diseases. However, the mechanism(s) by which periodontitis induces systemic diseases is an active area of research. Arimatsu et al. [5] demonstrated that repeated oral doses containing pathogenic bacteria, *Porphyromonas gingivalis*, induces endotoxemia through changes in gut microbiota in the ileum, bringing forth systemic inflammation and resistance to insulin. Further, in this study, alteration of gut bacterial composition coincided with inflammatory changes in the adipose tissue and liver. Qin et al. [6] reported that major changes in the gut microbiota are attributed to massive invasion of the gut by oral bacterial species in patients with liver cirrhosis. These are but two examples of how the overgrowth of oral pathogens leads not only to oral disease by dysbiosis of the oral microbiota.

A study by Nakajima et al.[7] takes this concept to next level demonstrating that even a single oral dose of *P. gingivalis* can penetrate the gut barrier, change the gut microbiota, and affect the influx of gut microbiota into the liver. *P. gingivalis* significantly altered gut microbiota, increasing phylum *Bacteroidetes*, a decreasing phylum *Firmicutes*, and increasing serum endotoxin levels. Alteration of the gut microbiota composition commenced within 24 hrs of the dosage and changes in gene expression were evident 48 hrs after *P. gingivalis* was administered. Most significantly, these changes preceded systemic inflammatory response; dysbiosis and changes in gene expression precede the response of the host. In dysbiosis, bacteria belonging to the order *Clostridiales* were reduced, and such reduction and ensuing imbalance, Nakajima and associates speculate, may be responsible for the proinflammatory nature of the intestine following the administration of *P. gingivalis* [5,7]. Altered gut microbiota also may be influxed in the liver due to an impaired gut barrier function. Such impairment is indicated by the reduced mRNA expression of tight junction proteins in the small intestine. Finally, *P. gingivalis* administration induced an increased mRNA expression of proinflammatory cytokines in the intestine. The investigators further propose that similar mechanism seen in periodontal tissue destruction by *P. gingivalis* may also occur in the gut.

Conclusion

The Nakajima et al. [7] study further affirms that the mouth is a significant pathway to systemic health. More largely, this study is also evidence that a new era of investigations in the oral microbiome engaged by the advancements in genomics research. Reports demonstrating the link of oral pathogens to several diversified diseases are on the increase in the literature. The take-away is that maintaining balanced healthy oral microflora is equally (or even more) important than maintenance of intestinal microflora. Armed with such knowledge, professional and home oral care practices are going to change significantly in coming years. Also, medical professionals concerned with systemic conditions will increasingly look to the mouth and oral health as a pathway to systemic health. In conclusion, these recent developments bridge the fields of dentistry and medicine that were separated for past many decades and puts oral health on forefront for controlling systemic diseases.

References

1. Kilian M, Chapple ILC, Hannig M, Marsh PD, Meuric V, et al. (2016) The oral microbiome- an update for oral healthcare professionals. Br Dent J 221(10): 657-666.
2. Simpson KT, Thomas JG (2016) Oral microbiome: contribution to local and systemic infection. Current Oral Health Reports 3(1): 45-55.
3. Sampaio M, Caldas B, Pereira IM, Perez M, Araujo R, et al. (2016) , The oral microbiome in health and its implication in oral and systemic health. Advances in Applied Microbiology. 97: 171-210.
4. Kapil V, Webb AJ, Ahluwalia A (2010) Inorganic nitrate and the cardiovascular system. Heart 96(21): 1703-1709.
5. Arimatsu K, Yamada H, Miyazawa H, Minagaw, T, Nakajima M, et al. (2014) Oral pathobiont induces systemic inflammation and metabolic changes associated with alteration of gut microbiota. Sci Rep 6:4:4828.
6. Qin N, Yang F, Li A, Prifti E, Chen Y, et al. (2014) Alterations of the human gut microbiome in liver cirrhosis. Nature 513(7516): 59-64.
7. Nakajima M, Arimatsu K, Kato T, Matsuda Y, Minagawa T (2015) Oral administration of *P. gingivalis* induces dysbiosis of gut microbiota and impaired barrier function leading to dissemination of Enterobacteria to the liver. PLoS ONE 10(7): e0134234.

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