

# The need to consider oral hygiene in preventing the onset of oral bacteria-related systemic diseases: Commentary

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A relationship between oral bacteria and systemic diseases,<sup>1</sup> such as Alzheimer's disease (AzD), type 2 diabetes mellitus, rheumatoid arthritis, and cardiovascular diseases, has been suggested. These systemic diseases pose major public health challenges in most countries. Thus, the importance of oral bacteria has been even gaining more attention in regard to the interrelationships with these systemic diseases. However, hundreds of species of bacteria live in the oral cavity, making it difficult to identify and eradicate the causative bacteria. So far, preventive measures should be required to treat these systemic diseases. We discuss oral hygiene approaches to prevent the onset of these systemic diseases caused by oral bacteria, as an unavoidable immediate issue.

## *Alzheimer's disease*

AzD<sup>2</sup> is the most common form of dementia, a general term for the loss of memory and other intellectual abilities that is serious enough to interfere with daily life, affecting most people aged 65 years and older.<sup>1</sup> The number of AzD patients is said to be on the rise.<sup>3</sup> AzD is associated with many aetiologies and pathophysiological processes, such as amyloid beta (A $\beta$ ) plaques and neurofibrillary tangles in the brain.<sup>2</sup> Recently, it has been confirmed that AzD is caused by *Porphyromonas gingivalis* (*P. gingivalis*),<sup>1</sup> probably via the accumulation of immune complexes with the fimbriate oral bacterium *P. gingivalis* and its immune reactor in the brain.<sup>1</sup> It has been pointed out that components of *P. gingivalis* can cross the blood brain barrier and may accelerate AzD-specific neuropathology by increasing neuroinflammation,<sup>1</sup> due to plaque/tangle formation and dysregulation of iron homeostasis.<sup>4</sup>

## *Type 2 diabetes mellitus*

Type 2 diabetes mellitus<sup>5</sup> also known as adult-onset diabetes, is characterised by high blood sugar, insulin resistance, due to insufficient insulin production in the beta cells. Obesity is common, and serious systemic complications associated with the setting of insulin resistance are concerned.<sup>6</sup> Considering the number of patients with type 2 diabetes worldwide,<sup>7</sup> the bacterial aetiology hypothesis,<sup>1</sup> that oral bacteria may also be a cause, is supported.

## *Systemic diseases and ozonated water*

The author has recently reported that leukocyte-mediated inflammatory skin disease, palmoplantar pustulosis (PPP),<sup>8</sup> a peculiar skin disease that forms pustules on the palms and soles, was cured by oral rinsing with ozonated water, indicating a novel oral bacteria-related disease.<sup>8</sup> This new sterilising agent has shown mechanical antibacterial effects, which disrupts the bacterial cell wall through its strong

oxidation power. However, it is also necessary to consider the existence of bacteria that are resistant to oxidation.<sup>9</sup> The Alzheimer's causative agent *P. gingivalis* is also oxidation-resistant,<sup>9</sup> due to extracytoplasmic components that protect the cell from oxidative stress and antioxidant enzymes that neutralise these oxidants. Antibacterial agents alone cannot deal with them, although the strength against ozone oxidation, mechanical and not chemical, of this bacterial wall structure in the anti-oxidant mechanism has not been sufficiently investigated. So far, periodontal care, including plaque removal from the periodontal pockets, may be necessary to manage these systemic diseases. This is especially important for patients with a family history of the disease.<sup>2</sup>

However, from the onset mechanism of these systemic diseases, we have pointed out that even if the cause is oral bacteria, there is a large difference in the symptom improvement of the disease, when using ozone water.<sup>10</sup> PPP, an inflammatory disease mediated by neutrophils,<sup>8</sup> can be cured by rinsing the mouth with ozone water,<sup>8</sup> but not AzD,<sup>10</sup> which may be caused by the accumulation of causative substances in the brain, and type 2 diabetes, which should also be considered to be a dysfunction of the pancreatic islet cells.<sup>5</sup> In recent clinical studies, it has become clear that oral care for AzD patients has been debated,<sup>11</sup> with it being said that only a certain degree of effectiveness can be expected in early-stage cases. The same could be said about type 2 diabetes. In a study examining the effect of periodontal treatment on HbA1c, blood glycaemic control in diabetic patients was not improved.<sup>12</sup> In the case of rheumatoid arthritis,<sup>1</sup> even if the cause is oral bacteria, arthritis accompanied by joint deformation cannot be expected to improve even if the causative bacteria are removed. While the susceptibility to UV (ultraviolet) rays of these oral bacteria is currently being investigated,<sup>13</sup> it is necessary to further consider the effects of UV rays to be utilised.

## *Bacterial transmission*

Moreover, it has been shown previously that bacteria that cause tooth decay is often passed from mother to child,<sup>14</sup> because baby food may be tasted or pre-chewed by the mother. It is not difficult to imagine thus the mother's oral flora is passed on to the child. In support of this, both AzD<sup>2</sup> and type 2 diabetes<sup>15</sup> have been reported to occur in families, and familial AzD has been pointed out to be conspicuous in young-onset cases.<sup>2</sup> The way in which the oral flora is inherited from mother to child, and the onset of the disease, along with the genetic predisposition, may be inherited within the family similar to a hereditary disease.

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**CONCLUSION**

As previously shown, a cure, let alone improvement, in a patient with AzD and a patient with type 2 diabetes, cannot be expected, even if the bacteria is eradicated.<sup>10</sup> Based on these evidences, in cases where the familial onset of these systemic diseases is expected, it is important to take appropriate measure, such as periodontal cleaning, before the onset of symptoms, because the disease can be prevented. While the development of new drugs is being actively carried out, it is also important to prevent the onset of systemic diseases caused by these oral bacteria, and shouldn't the WHO also be working on this issue?

**REFERENCES**

1. Peng X, Cheng L, You Y, Tang C, Ren B, Li Y, et al. Oral microbiota in human systematic diseases. *Int J Oral Sci* 2022; 14(1): 14.
2. Wolfe MS. In search of pathogenic amyloid beta-peptide in familial Alzheimer's disease. *Prog Mol Biol Transl Sci* 2019; 168: 71-8.
3. No authors listed. 2024 Alzheimer's disease facts and figures. *Alzheimers Dement* 2024; 20(5): 3708-821.
4. Liu S, Butler CA, Ayton S, Reynolds EC, Dashper SG. Porphyromonas gingivalis and the pathogenesis of Alzheimer's disease. *Crit Rev Microbiol* 2024; 50(2): 127-37.
5. Taylor RT. Type 2 diabetes: etiology and reversibility. *Diabetes Care* 2013; 36(4): 1047-55.
6. Rodríguez-Poncelas A, Mundet-Tudurí X, Miravet-Jiménez S, Casellas A, Barrot-De la Puente JF, Franch-Nadal J, et al. Chronic kidney disease and diabetic retinopathy in patients with type 2 diabetes. *PLoS One* 2016; 11(2): e0149448.
7. Khan MAB, Hashim MJ, King JK, Govender RD, Mustafa H, Al Kaabi J. Epidemiology of type 2 diabetes – Global burden of disease and forecasted trends. *J Epidemiol Glob Health* 2020; 10(1): 107-11.
8. Horiuchi Y. Palmoplantar pustulosis treated with oral rinse using ozone nanobubble water: A case series. *Dermatol Ther* 2020; 33(6): e13924.
9. Henry LG, McKenzie RME, Robles A, Fletcher HM. Oxidative stress resistance in Porphyromonas gingivalis. *Future Microbiol* 2012; 7(4): 497-512.
10. Horiuchi Y. Consideration of ineffectiveness of oral care in Alzheimer's disease and type 2 diabetes. *Act Med Eur* 2024; 6(3): 77-8.
11. Marchini L, Ettinger R, Caprio T, Jucan A. Oral health care for patients with Alzheimer's disease: An update. *Spec Care Dentist* 2019; 39(3): 262-73.
12. Engebretson SP, Hyman LG, Michalowicz BS, Schoenfeld ER, Gelato MC, Hou W, et al. The effect of nonsurgical periodontal therapy on hemoglobin A1c levels in persons with type 2 diabetes and chronic periodontitis: a randomized clinical trial. *JAMA* 2013; 310(23): 2523-32.
13. Aung N, Aoki A, Takeuchi Y, Hiratsuka K, Katagiri S, Kong S, et al. The effects of ultraviolet light-emitting diodes with different wavelengths on periodontopathic bacteria in vitro. *Photobiomodul Photomed Laser Surg* 2019; 37(5): 288-9.
14. Virtanen JI, Vehkalahti KI, Vehkalahti MM. Oral health behaviors and bacterial transmission from mother to child: an explorative study. *BMC Oral Health* 2015; 15: 75.
15. Daak-Hirsh S, Schumacher AC, Shah L, Campo S. Type 2 diabetes familial risk personalization process profiles: Implications for patient-provider communication. *Res Nurs Health* 2019; 42(5): 369-81.