

# Oral flora imbalance in Parkinson's disease

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## Introduction

Parkinson's Disease, PD, is regarded as a serious neurodegenerative disorder caused by degeneration of dopamine neurons [1], affecting many regions of the nervous system [2]. It affects 0.3% of the world's general population and the incidence rate is about 1% in people over 60 years of age and 4-5% in the population aged between 85 years or older [3]. This disease causes motor dysfunction, cognitive, autonomic and mental dysfunction [4]. It is obviously that life quality is seriously decreased [3]. Bradykinesia, rigidity and tremor are dominant three main signs in PD [5]. These manifestations were associated with drooling, dysphagia, xerostomia and periodontal disease [6].

## Oral symptoms in PD

The dominant manifestations of oral symptom in PD presents salivary excretion, swallowing difficulties, dry mouth, tongue diseases [7], periodontitis and tooth decay [8].

Firstly, the drooling is an universal phenomenon of excessive accumulation and overflow of saliva inside the oral cavity [9] in PD patients, which affects their diet, speech and social interaction with others [10]. The prevalence of drooling in PD is 10%~81% [11]. Furthermore, there is a positive correlation between increasing drooling and accelerating dysphagia [12,13].

Secondly, the PD patients are reporting stiffness in oropharyngeal muscles [14], which may lead to dysphagia. Accompanied with decreased swallowing, their oropharyngeal secretions are accumulating. This is the key factor causing the infection of oral secretions and increasing the possibility of risk of developing aspiration pneumonia [12,13].

Thirdly, periodontitis has been often a symptom by PD patients [15]. The decreased amount of saliva flow in PD patients may be leading to a weak oral cleaning ability [16]. Moreover, the deficit of motor and cognitive control, their oral health hygiene level is extremely low [17]. Interestingly, Chen CK, *et al.* reported that the patients with periodontitis have a higher risk of developing a PD [18]. Periodontal disease can be a leading factor to increase systemic inflammatory mediators [17], which then destructs the blood-brain barrier [18]. Consequently, lipopolysaccharide (LPS) produced from periodontal microbes may be a dominant factor in the development and progression of PD [6]. Therefore, it is of great significance to strengthen the education on good oral hygiene habits to prevent Parkinson's disease by reducing inflammation [18].

Fourthly, salivary secretion has been decreased in PD patients. Consequently, this reduces the ability of oral hygiene and bacteriostasis.

The weak oral clearance and poor periodontal health may be more progressive in the later stage [19].

## Relationship between oral flora and symptoms

Both, Gram-positive and negative bacteria are increased in the oral cavity of PD patients [20]. Pereira, *et al.* in 2017 reports that there was a difference in beta diversity and abundance of individual bacterial groups between the PD patients and control group [21]. Interestingly, the number of Porphyromonas gingivalis and mutant cocci have increased. Furthermore, opportunistic oral pathogens including Veillonella, Prevotella, Prevotellaceae, Corobacter, Lactobacillaceae, and Iaceae in PD were increased, however, the kingella, caphocytophaga, Rothia, Leptotrichiaceae and Actinomyces decreased respectively [22].

The presence of gram-negative bacteria in PD patients was identified which is the dominant factor for periodontal disease [23]. Due to dystonia in PD patients, the accumulation of oral saliva was increased [24]. As a result of aggravating saliva flow instability, saliva inhibition activity disappeared; the microbial community was transferred to Gram-negative bacteria accordingly [25]. Furthermore, Michelle A, *et al.* reported that there were more Streptococcus mutant in the oral cavity of patients with PD [26]. These bacteria were dominant leading to the decayed tooth [27,28].

## Prospective

Long time neuroinflammation process may accelerate the progress of central nervous disease. Therefore, it is important to keep oral clean.

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