Recent Advances in Parkinson's Disease Research Regarding Gut Microbiome and Medicinal Plant

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Editorial

Parkinson's disease (PD) is the results of complex interaction between genetic, environmental and pathological factorsa that affect the general population all over the world with intense medical and financial burdens [1]. In general, this disease affects all age's population, most commonly affecting the large percentage of elderly population that include patients, caregivers, and consequently progressively increases the financial load of the country [2]. For the possible treatment of this disease, researchers have faced tremendous amount of challenge. The medication available till now for this disease have only provide the symptomatic relief to the patients and also causes severe side effects later in their life [3]. Ayurveda opens an effective way for treating these diseases and having very minimal side effects. Some medicinal plants like Mucuna pruriens (Mp), Withania somnifera, and Tinospora cordifolia found very beneficial for the treatment of neurodegenerative disease [4-8]. Nowadays researchers have focused on the causation of the PD. The gut microbiome axis has been widely utilized by the researchers to know the exact pathophysiology of the PD [9]. In addition, PI3K/Akt and quality control pathway can be utilized for the effect of gut microbiome and medicinal plant in PD treatment [10,11].

Gut Microbiome

There is a strong connection between the gut and PD as suggested by numerous researches. Gut microbiota may play an important role in the intestinal lesions. A recent study conducted by Li et al. have suggested that there is a significant difference between PD patients and healthy controls regarding gut pathology in Northeast China [12]. A range of environmental factors like physical activity, pesticides exposure, head injury, nicotine, and dietary factors directly linked with gut microbiome as it directly affected the PD onset and its progression. A study in which authors over expresses the entire human SNCA gene (SNCA-TG mice) in mouse model suggested strong evidence that enriched environment significantly changes the gut microbiome and influences the progression of PD [13]. Hertel et al., have suggested in his metabolomics study that PD-relevant host-microbial interactions in sulfur and, interlinked, bile-acid metabolism might play an effective towards the development of PD [14]. The gut microbiota is a unique type of experience-dependent ecosystem that is very dynamic and offers potential therapeutic targets which can be effectively modulated as innovative interventions for dysbiosis-related disorders like PD [15]. Recently a very important study explored the neuro protective role of Hua-Feng-Dan (HFD) in LPS plus rotenone-induced neurotoxicity and proposed that there is a significant disturbance in gut microbiota of PD rat's model. This gut dysbiosis have been correspondingly modulated in a positive way by cinnabar and realgar, both has been found as bioactive component in HFD [16]. A recent findings show that gut microbiome are very receptive and shows prominent response against α-synuclein mediated PD pathology and exerts noteworthy changes on the enteric nervous system (ENS) and. These findings clearly demonstrate the role of gut brain axis as important mediator in PD pathology [17].

Medicinal Plant and its Bioactive Component Based Therapy of PD

Medicinal plants have been utilized by Ayurvedic practitioners for the treatment of PD since last decades. The impact of medicinal plants and their global economic needs in Asian countries have been discussed by Zahra, et al. [18,19]. For example Mucuna pruriens shows Anti-Parkinsonian activity in mid-nineties by Vaidya, et al. [20]. Different parts of the plant Mp like leaf stem and seed shows potent medicinal properties. Seed extract of Mp have Anti-oxidative and Anti-inflammatory activity which was earlier explored by the researchers in toxin induced Parkinsonian mouse model [4,5,21-23]. As like Mp, Withania somnifera (Ws) exhibits Anti-oxidative and Anti-inflammatory activity

in toxin induced Parkinsonian mouse model [24,25]. Prakash, et al. [6] explored the Anti-Parkinsonian activity of Ws in Paraquat and Maneb induced PD mouse model. Similar to Mp and Ws, Tinospora cordifolia (TC) also shows Anti-Parkinsonian activity in toxin induced PD mouse model [8]. Centella asiatica (CA) is also a very important medicinal plant that is widely utilized for its Anti-Parkinsonian activity [26].

Various bioactive components have found in the above mentioned medicinal plants. In Mp, Ursolic acid is one of the bioactive components that also show Anti-Parkinsonian activity in PD mouse models [27,28]. Chlorogenic acid also found in some medicinal plants like in Ws protects the death of dopaminergic neurons in PD mouse [29]. These above mentioned medicinal plant and their bioactive components also show minimal side effects as compared to levodopa (L-Dopa) induced dyskinesia. Further study is needed to explore its Anti-Parkinsonian activity of these herbal compound and their bioactive components in PD model.

Conclusion

Gut microbiome plays a very vital role on the intimation and progression of PD. Gut dysbiosis might be targeted in an effective way to treat the PD. In addition, probiotics therapy also might be utilized as a supplement to improve the quality of patient's life. The non-motor symptoms of PD have appeared basically due to the dysbiosis in gut microbiome. This, gut brain axis can be used as a strong tool in the development of preclinical model for PD. For the diagnosis of PD, this axis also can be very helpful. Medicinal plants like Mp, Ws, TC and CA shows neuroprotective activity in different toxin induced rodent's models. This medicinal plant also might be utilized as a gut microbiome modulator and to explore it's with probiotics. Further studies will need to validate the role of gut microbiome, gut-brain axis and impact of medicinal plants in the treatment of PD.

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