

Parkinson's and the microbiome

Recent research has confirmed distinct differences in the microbiota of those with Parkinson's and that the composition of the microbiota is related to motor symptoms. Prevotellaceae in feces of PD patients was reduced by 77.6%, and Enterobacteriaceae was positively associated with the severity of postural instability and gait difficulty. Indeed it is now widely considered that microbiota interact with the autonomic and central nervous system hence the term 'gut-brain barrier' [1]

The link between a pathological balance of microbes in the gut with inflammatory chronic conditions has now become evident. Both animal and human studies are discovering the link between lifestyle factors such as diet and exercise reducing the risk of these disease states, partly by their effect on altering the microbiome composition [2]. For example high fat diets also representative of the 'Western diet' have been shown to alter the gut microbiota compositions, with a decrease in Bacteroidetes and an increase in Firmicutes which in turn leads to an increase in inflammatory and chronic conditions [3]

The microbiome is involved in the highly bidirectional communication between the brain and the gut is markedly influenced by the microbiome through integrated immunological, neuroendocrine and neurological processes. Gut dysbiosis and bacterial overgrowth in the intestinal tract, in combination with higher intestinal barrier permeability, may result in systemic inflammation and resulting in alpha-synuclein pathology and possibly the initiation of Parkinson's. The gastrointestinal symptoms and altered microbe composition are now also thought to possibly cause the onset of Parkinson's [4]

Medications commonly used in Parkinson's patients including catechol-O-methyltransferase-inhibitors, anticholinergics, and possibly carbidopa/levodopa seem to have distinct effects on the gut microbiome composition. Hill-Burns et al [5] found significantly altered abundance of Bifidobacteriaceae, Christensenellaceae, [Tissierellaceae], Lachnospiraceae, Lactobacillaceae, Pasteurellaceae and Verrucomicrobiaceae families in people with Parkinson's. Importantly, the changes in composition influenced numerous pathways including metabolism of plant-derived compounds and xenobiotics degradation.

Premotor symptoms experienced in Parkinson's such as constipation, hyposmia, sleep disorders, and depression occur years before a diagnosis and are thought to now stem from the gut microbiota changes. It is thought that the vagal nerve which stems from the gut to the

brain may be the link between pathological microbiome species and the initiation of neurological diseases [6].

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4. Caputi, V. and M.C. Giron, *Microbiome-Gut-Brain Axis and Toll-Like Receptors in Parkinson's Disease*. *Int J Mol Sci*, 2018. **19**(6).
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