Parkinson’s disease (PD) is a neurodegenerative disorder affecting around 10 million people worldwide. PD is characterised by the degeneration of dopaminergic neurons in the substantia nigra of the brain. PD is a multifactorial disease where genetic and environmental factors contribute to disease aetiology in a so-called “multiple hit hypothesis” model. Many studies have demonstrated an interplay between the brain and the gut in PD and highlighted the role played by the gut microbiota in this process (Westfall et al., 2017). Moreover, analysis of mucosal and faecal samples have highlighted dysbiosis in PD compared to healthy donors (Minato et al., 2017). Identification of bacterial strains that can potentially ameliorate the neuroinflammation and/or the neurodegenerative processes associated with PD, may lead in the near future to the development of new therapeutic approaches for the clinical management of the disease.

As a microbiome company with a proprietary culture collection consisting of over 6,500 commensal bacterial isolates from healthy donors, we have developed the multi-disciplinary MicroRx functional screening platform enabling us to target specific biological functions. A panel of 69 bacterial strains from our culture collection was screened during our PD Discovery Campaign on different in vitro neuro-immune cell models. We have identified two bacterial strains, Parabacteroides distasonis MRx0005 and Megasphaera massiliensis MRx0029, with different and complementary cell responses to the stimuli used to mimic in vitro the different features of PD pathology, namely neurodegeneration and neuroinflammation induced by both environmental and familiar triggers, neurodifferentiation and effects on the gut barrier function.

Key Findings

We have identified two gut-derived bacteria that can modulate the gut:brain axis. The two strains have complementary characteristics:

- *P. distasonis* MRx0005 has a predominantly anti-inflammatory signature;
- *M. massiliensis* MRx0029 is potentially able to promote neurodifferentiation, protects neurons from cytotoxicity induced by both environmental and familiar PD triggers and reduces colon permeability.

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