HISTOPARK

MRI-based in vivo histology of disease progression in early stage PD

JPND research
EU Joint Programme – Neurodegenerative Disease Research

Parkinson's disease (PD) is a slowly progressing condition that affects the brain many years before noticeable motor symptoms appear. By the time PD is diagnosed, small structures in the midbrain are irreversibly damaged, making a cure currently impossible. Therefore, early detection of PD is crucial to develop treatments that go beyond merely addressing symptoms. Current imaging methods cannot detect these early changes due to their low resolution and poor specificity.

The HISTOPARK project aims to detect the early stages of PD by combining advanced sleep diagnostics with recent developments in Magnetic Resonance Imaging (MRI) using strong magnetic fields (7 Tesla). We will focus on measuring damage to small brainstem structures that regulate sleep, which occurs very early in the disease. Our innovative MRI techniques can identify subtle changes in these tiny brain structures. By combining sleep recordings with MRI, we will enhance the diagnostic power for early PD detection and gain a better understanding of disease progression at its initial stages, paving the way for new therapeutic approaches.

Our research will extend to related disorders such as Restless Leg Syndrome, Periodic Limb Movement Syndrome, and Rapid Eye Movement Sleep Behaviour Disorder. Our goal is to understand how PD affects different brain areas and why early symptoms, such as sleep disorders, occur.

To achieve these goals, we will apply our advanced MRI methods to image the brains of a large cohort, including healthy participants, patients with sleep disorders, and individuals recently diagnosed with PD. We will utilize newly developed algorithms for image analysis and advanced statistical models to detect small changes in brain structures that regulate sleep and motion. Additionally, we will examine donated brains from deceased individuals to precisely map these small regions in the brain. By integrating techniques from anatomy, medical physics, and statistics, we aim to gain new insights into the brain processes of PD patients.

The outcomes of this project are expected to significantly enhance our understanding of the early dynamics of PD and related disorders, providing a foundation for more effective diagnostic tools and potential treatments.

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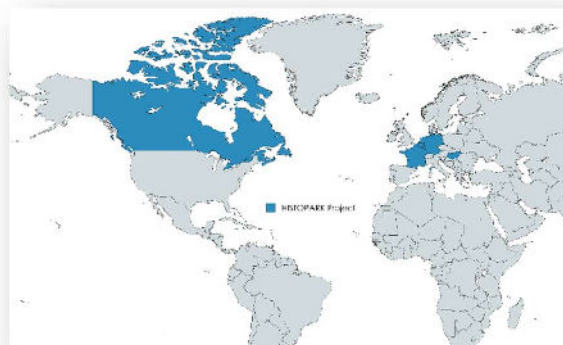
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