Locomotor disorders like bradykinesia (slowness of movement) or hesitation of gait initiation are a hallmark of Parkinson's disease (PD). In the treatment of PD, Levodopa (L-DOPA) remains the most effective drug. However, the majority of parkinsonian patients under L-DOPA therapy develops disabling motor complications like motor fluctuations, characterized by on/off phenomena, and abnormal involuntary movements, called dyskinesia.

The purpose of our study is to establish a behavioral animal model which is close to the locomotor activity performance of parkinsonian patients both during and in the absence of L-DOPA therapy.

Parkinsonian rats with 6-hydroxydopamine (6-OHDA) lesions were treated with chronic intraperitoneal injections of L-DOPA (8 mg/kg) once a day for 21 consecutive days; another group of lesioned rats received chronic injection of NaCl (vehicle) and a third group of naive animals received the standard L-DOPA chronic treatment. The motor activity of all groups was evaluated using behavioral analysis software (Ethovision) at 19th day of L-DOPA and NaCl treatment (ON period) and at 22nd day without L-DOPA and vehicle administration (OFF period), respectively.

Results: Preliminary observations about motor performance in parkinsonian rats demonstrated an higher locomotor activity, expressed as “total distance moved” and “mean velocity”, in animals during the L-DOPA ON period than during the L-DOPA OFF period. Furthermore, Levodopa-induced dyskinesia were seen only in the ON-state, similar to what is seen in parkinsonian patients under L-DOPA therapy. On the contrary, no difference in motor activity was found in the parkinsonian rats treated with NaCl during ON/OFF period and naive groups during L-DOPA ON/OFF treatment, respectively.

We conclude that our animal model's behavior is close to motor performances in human suffering from ON/OFF motor fluctuations. This experimental model is better suited for pre-clinical study in order to test the use of new pharmacological drugs, able to reduce the motor complications induced by L-DOPA treatment.