Abstract: Parkinson's disease (PD) is characterized by progressive degeneration of dopaminergic neurons. Thus the development of therapeutic neuroprotection and neurorescue strategies to mitigate disease progression is important. In this study we evaluated the neuroprotective and neurorescue effects of erythropoietin Fc fusion protein (EPO-Fc) and carbamylated erythropoietin Fc fusion protein (CEPO-Fc) in a rat model of PD. Behavioral evaluations consisted of rota-rod, cylinder and amphetamine-induced rotation tests. Tyrosine hydroxylase (TH) staining was performed as immunohistochemical investigations. In the neuroprotection experiment, CEPO-Fc group demonstrated significant improvement in the amphetamine-induced rotation test throughout the 4 week follow-up period. Additionally, more TH positive neurons were recognized in the substantia nigra pars compacta (SNc) in CEPO-Fc group than in PBS and EPO-Fc groups. In the neurorescue experiment, rats receiving CEPO-Fc showed significantly better behavioral scores than those receiving PBS. TH staining of the striatum also showed that CEPO-Fc group had significantly better preservation of TH positive fibers compared to PBS and EPO-Fc groups. Importantly there were no increases in hematocrit or hemoglobin levels in CEPO-Fc group both in the neuroprotection and neurorescue experiments. Consequently, CEPO-Fc demonstrated neuroprotection and neurorescue benefits in a rat model of PD.