

**Figure S1. The effects of different concentrations of allantoin on mice.** (A) probability of survival. Results are presented as mean±SEM (n=10).

**Figure S2. The effects of Allantoin on the expression of inflammatory mediators and oxidative stress-related factors in MPTP-injected mice.** (A) The mRNA expression of iNOS and COX2 in the SN. (B) Catalase assay (CAT). (C) Superoxide dismutase (SOD). (D) Total antioxidant capacity assay. (E) Malondialdehyde assay (MDA). Results are presented as mean±SEM (n=3). Statistical methods used were one-way analysis of variance (ANOVA), combining multiple comparisons. \*\* $p < 0.01$  vs. NT group. # $p < 0.05$ , ## $p < 0.01$  vs. MPTP-treated group.

**Figure S3. The effects of Allantoin on BV-2 cell viability and Lipopolysaccharide (LPS)-induced inflammatory factors in BV-2 cells.** (A) Cell viability (CCK-8) analysis was used to assess the protective effect of Allantoin in LPS-induced BV-2 cells. (B-D) Levels of iNOS and COX2 were measured in LPS-induced BV-2 cells using western blot. Results are presented as mean±SEM (n=3). Statistical methods used were one-way analysis of variance (ANOVA), combining multiple comparisons.  $^{ns}p > 0.05$ , \*\* $p < 0.01$  vs. NT group. # $p < 0.05$ , ## $p < 0.01$  vs. LPS-treated group.

**Figure S4. The effects of Allantoin on indicators of oxidative stress.** (A) Total antioxidant capacity assay. (B) ROS assay. (C) Superoxide dismutase (SOD). (D) Malondialdehyde assay (MDA). (E) Catalase assay (CAT). Results are presented as mean±SEM (n=3). Statistical methods used were one-way analysis of variance (ANOVA), combining multiple comparisons.  $^{ns}p > 0.05$ , \*\* $p < 0.01$ , \* $p < 0.05$ , ## $p < 0.01$  vs. NT group. && $p < 0.01$  vs. MPP<sup>+</sup>-treated group. \$ $p < 0.05$ , \$\$ $p < 0.01$  vs. Allantoin+MPP<sup>+</sup> group.

**Figure S5. The effect of FMT on glial cell activation in the colon and SN of MPTP-injected mice.** Immunofluorescence staining was employed to assess the levels of (A) GFAP in colonic tissues, and (B) the levels of GFAP and TH in the SN region. (Scale bar=100 μm). Data are presented as mean±SEM (n=3).

