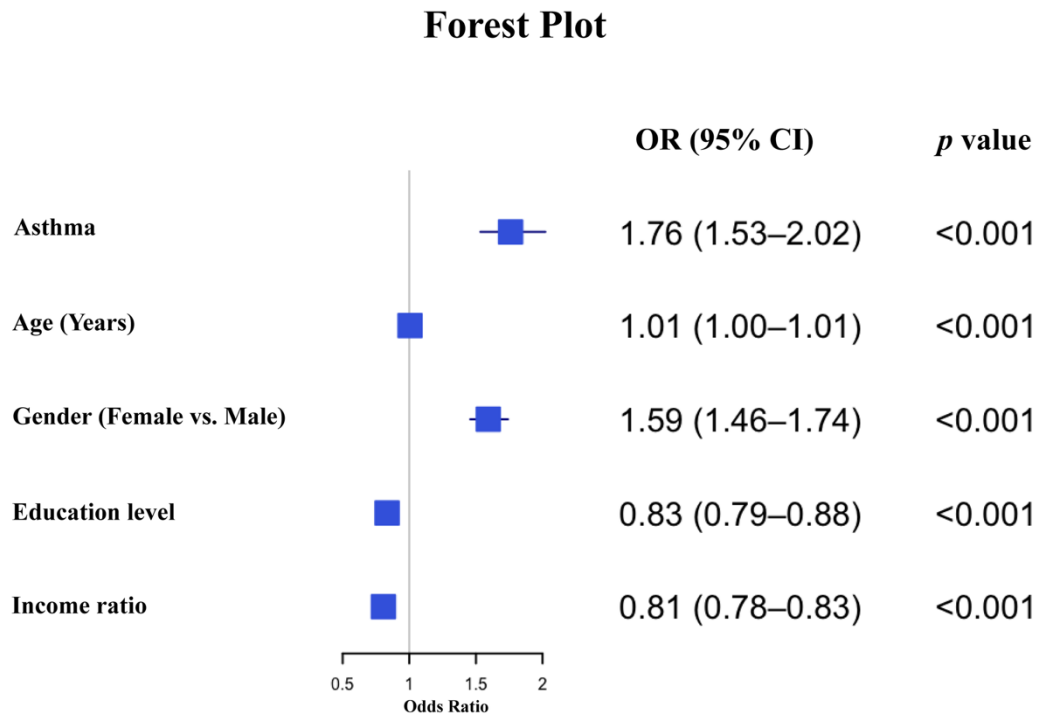
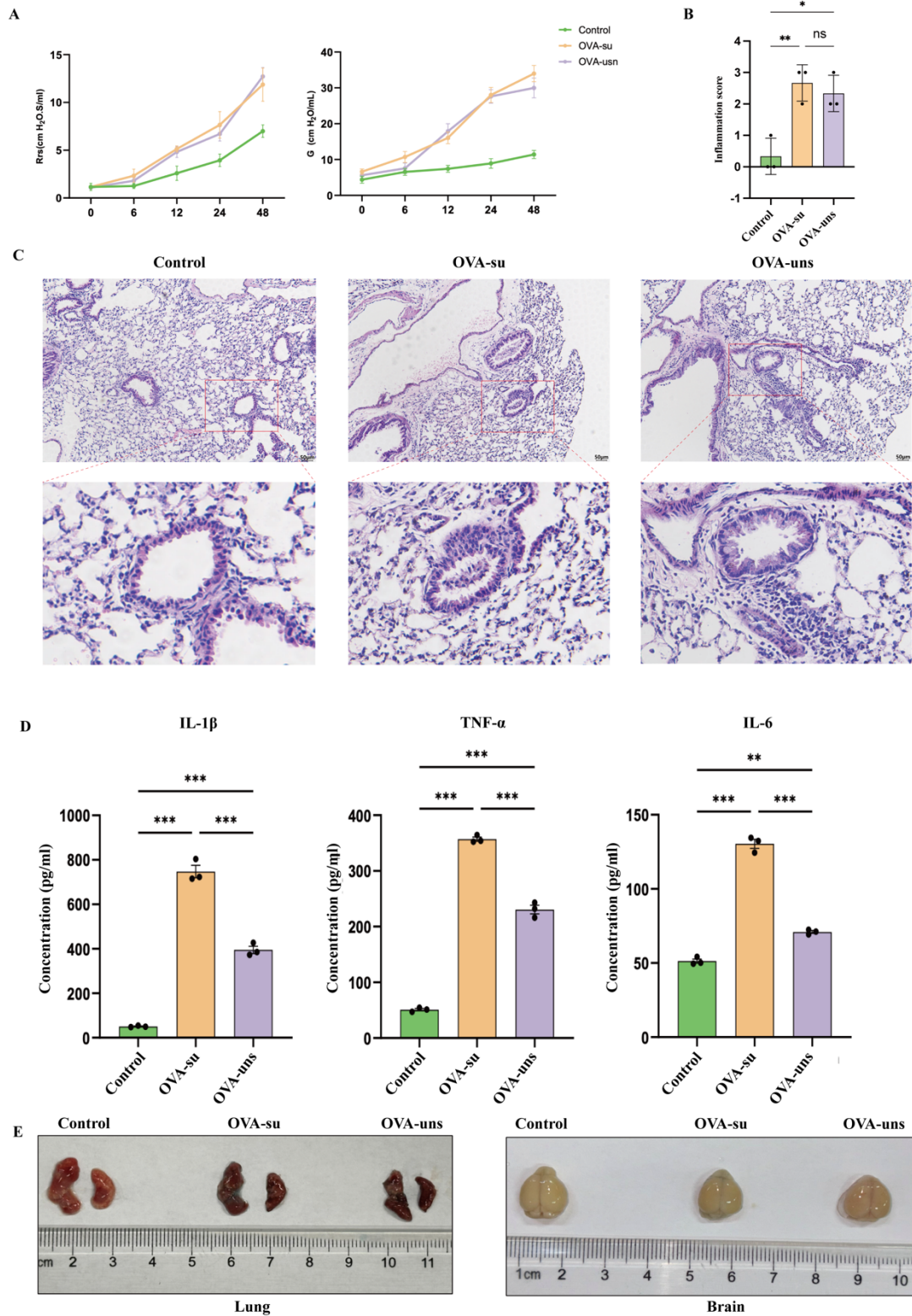


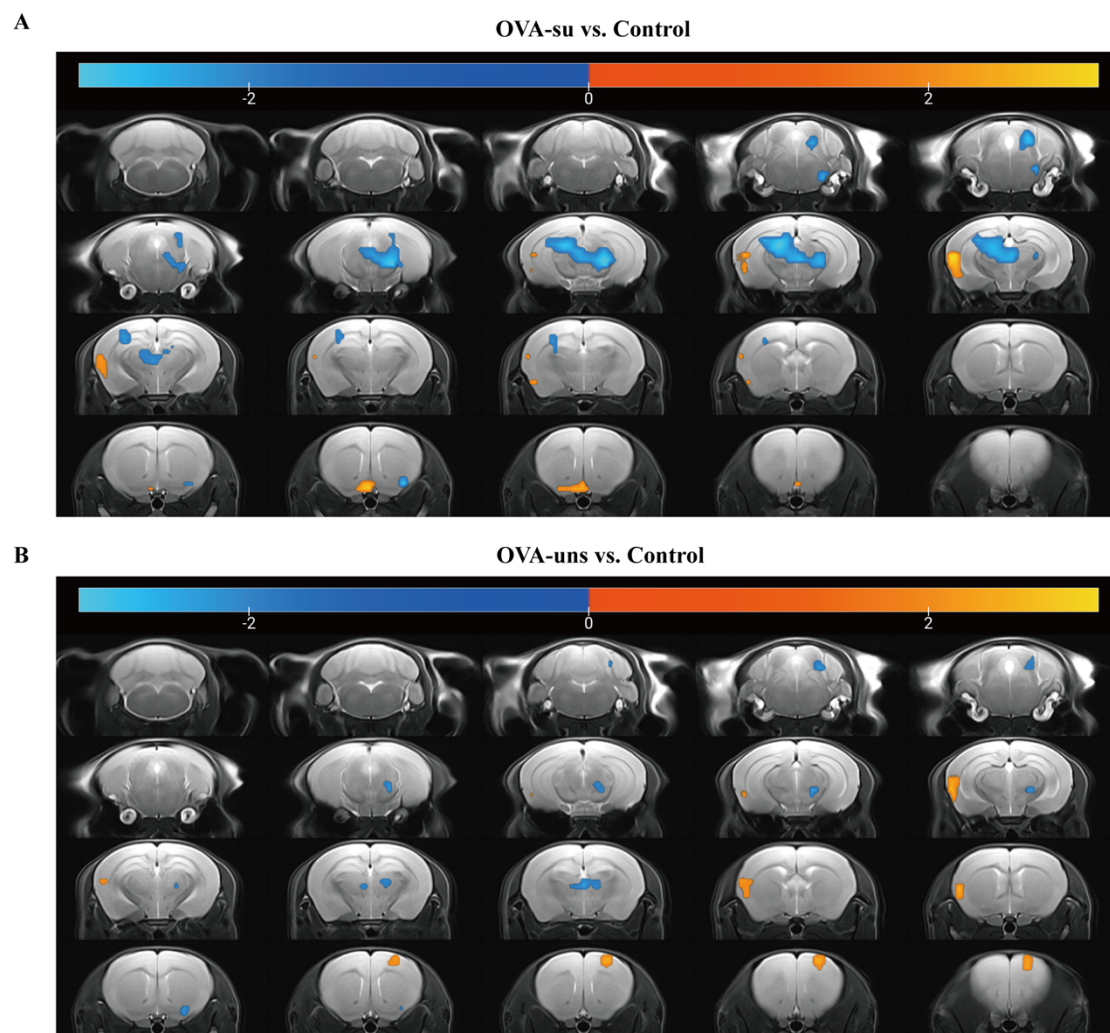


1
2 **Supplementary Figure 1. Forest plot of adjusted ORs with 95% CI for anxiety**
3 **symptoms associated with asthma and covariates (n = 35,162, NHANES). ORs**
4 **were estimated using weighted logistic regression.**
5

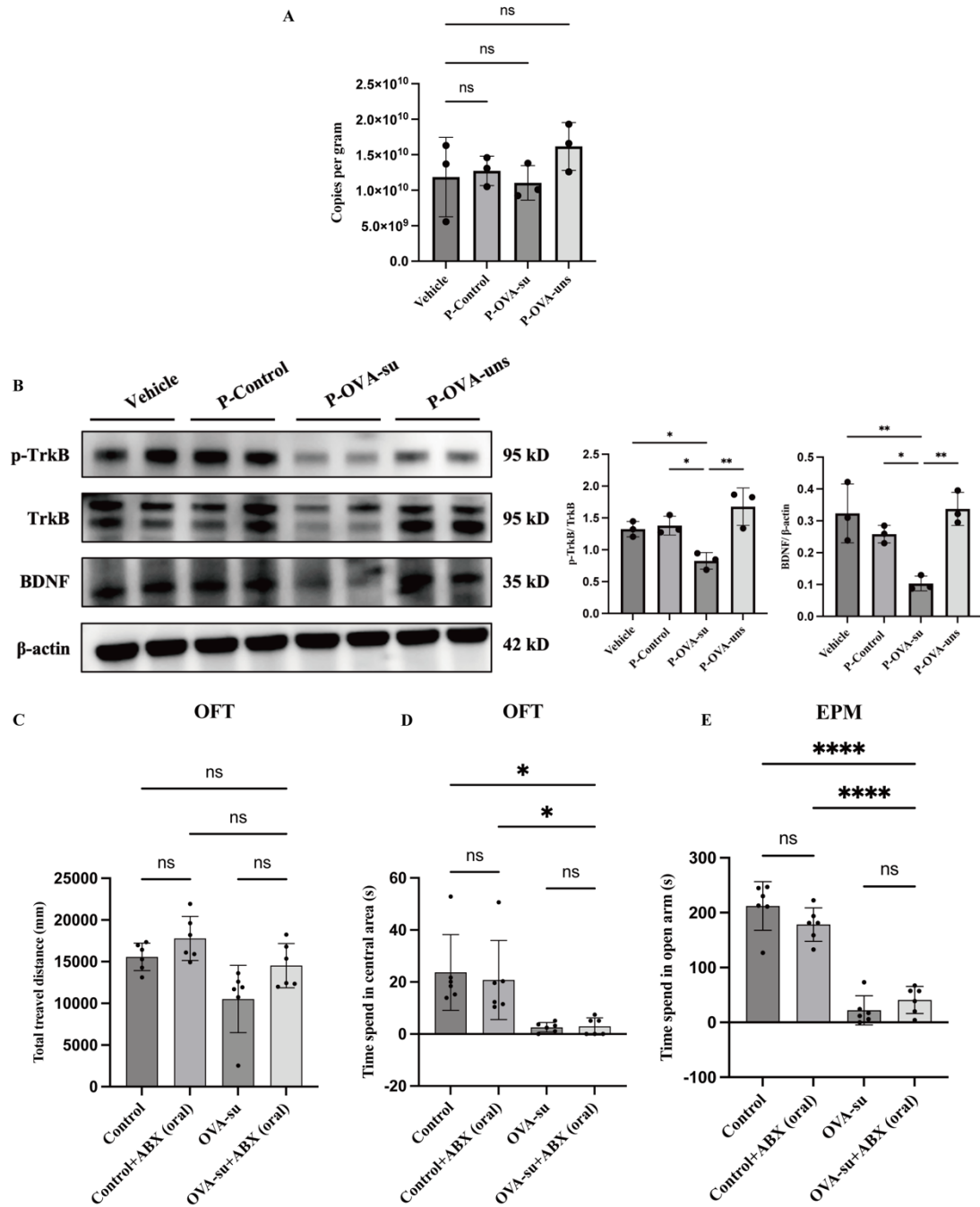


Supplementary Figure 2. OVA treatment successfully induced AHR without significant differences in the lungs between the OVA-su and OVA-uns groups. (A) Airway resistance of mice in response to nebulized methacholine at different concentrations (0, 6, 12, 24 and 48 mg/mL). **(B-C)** H&E staining and inflammation scoring confirmed that OVA treatment successfully induced pulmonary inflammation **(D)** ELISA was performed to detect the concentrations of IL-6, TNF- α and IL-1 β in the

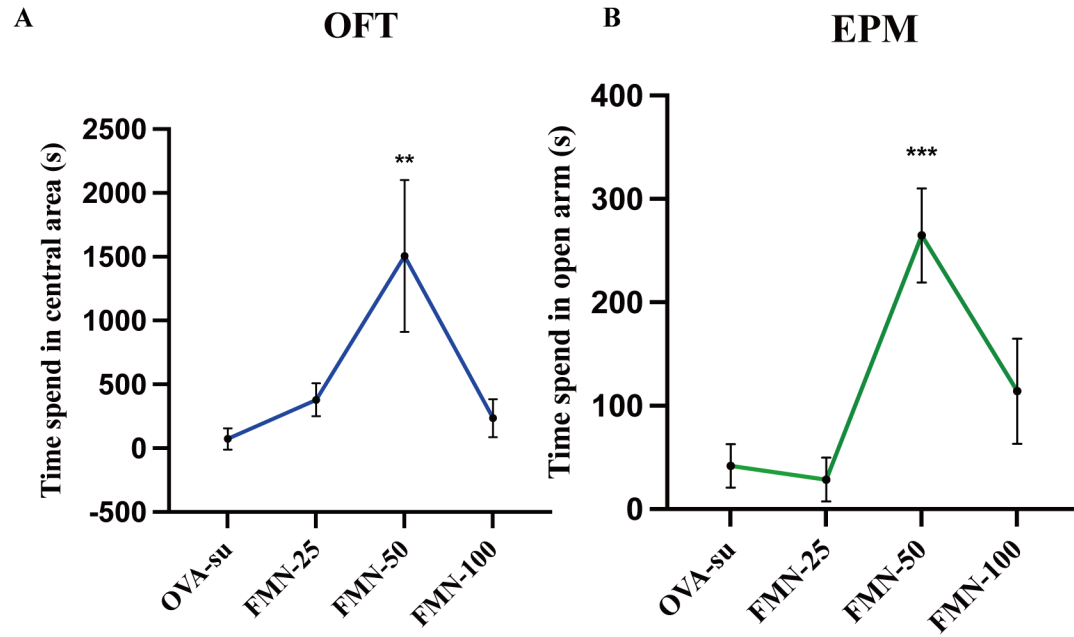
lungs. (E) Representative image of Evans Blue extravasation. Data are presented as the means $\pm$ SEMs. (n=3 per group). * $P < 0.05$, ** $P < 0.01$, and *** $P < 0.001$. One-way ANOVA.



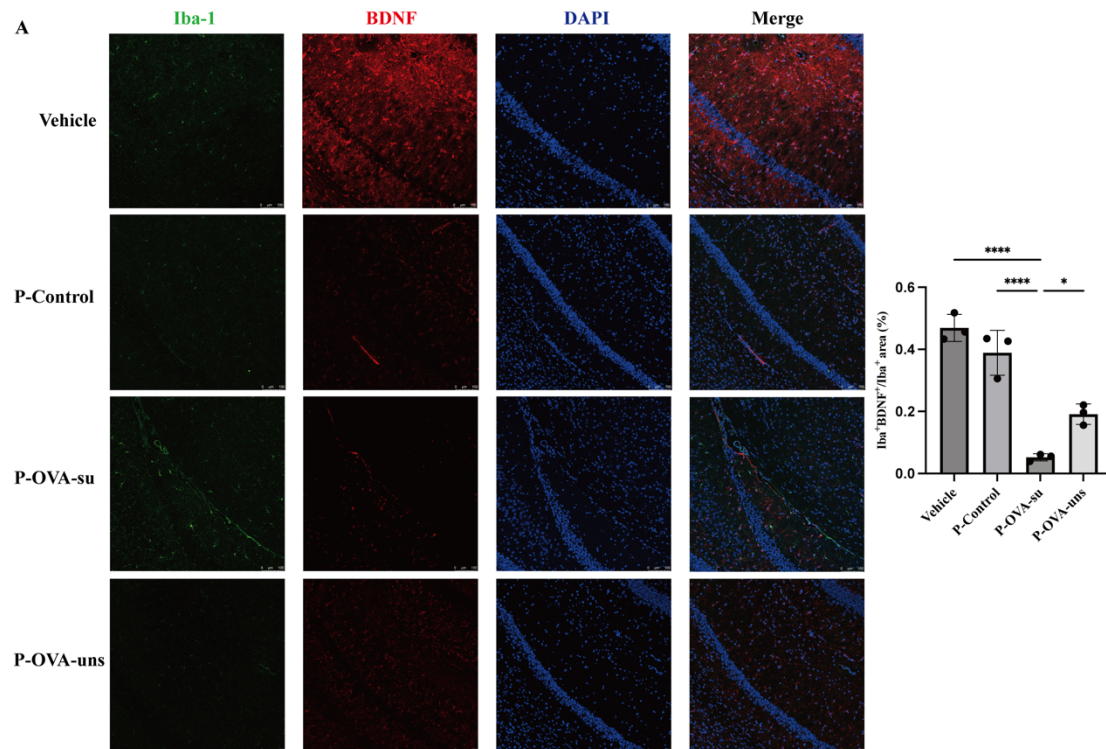
Supplementary Figure 3. (A–B) ReHo maps of the OVA-su and OVA-uns groups compared with the Control group. Significant differences in ReHo maps were identified using two-sample t-tests with GRF correction (voxel-level $P < 0.01$, cluster-level $P < 0.05$). Blue indicates regions with decreased ReHo, while red indicates regions with increased ReHo in the indicated group comparisons. (n=6 per group).



Supplementary Figure 4. Efficiency of PMT and oral antibiotic effects on anxiety-like behavior. (A) Quantitative PCR analysis of 16S rRNA gene (V3–V4 region) copy number showing successful microbial colonization following PMT. (B) Dysregulation of the BDNF/TrkB pathway in the hippocampus of P-OVA-su mice. (C–E) Behavioral assessment of OVA treated mice following oral antibiotic treatment. Data are presented as the means $\pm$ SEMs. ($n=3-6$ per group). * $P < 0.05$, ** $P < 0.01$, and *** $P < 0.001$, **** $P < 0.0001$; ns, not significant. One-way ANOVA.

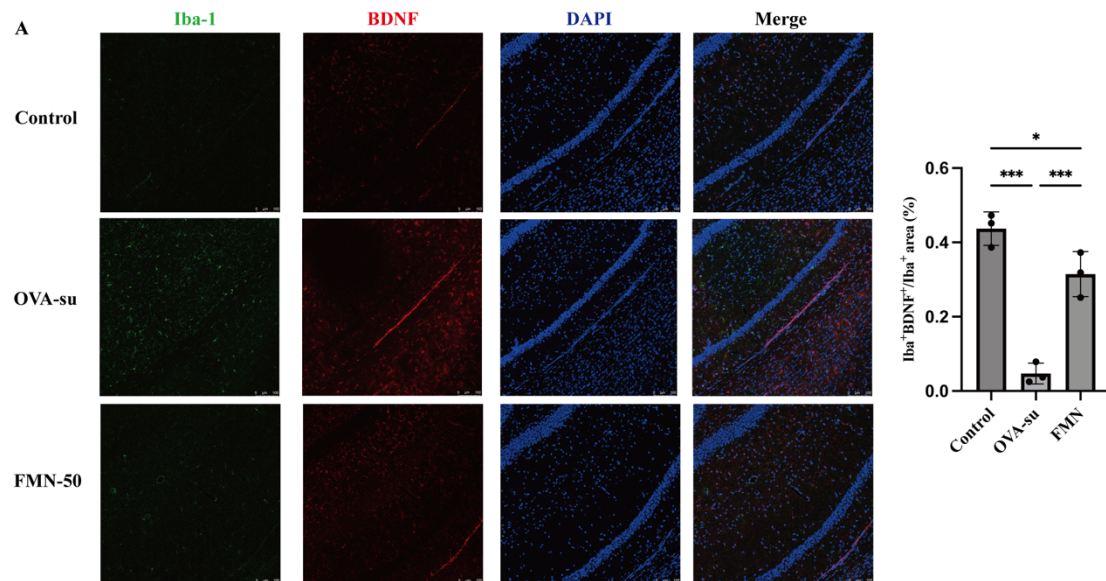


Supplementary Figure 5. The behavioral evaluation of the FMN-treated samples before the experiments. Data are presented as the means $\pm$ SEMs. (n=3 per group). ** $P < 0.01$ and *** $P < 0.001$. One-way ANOVA.

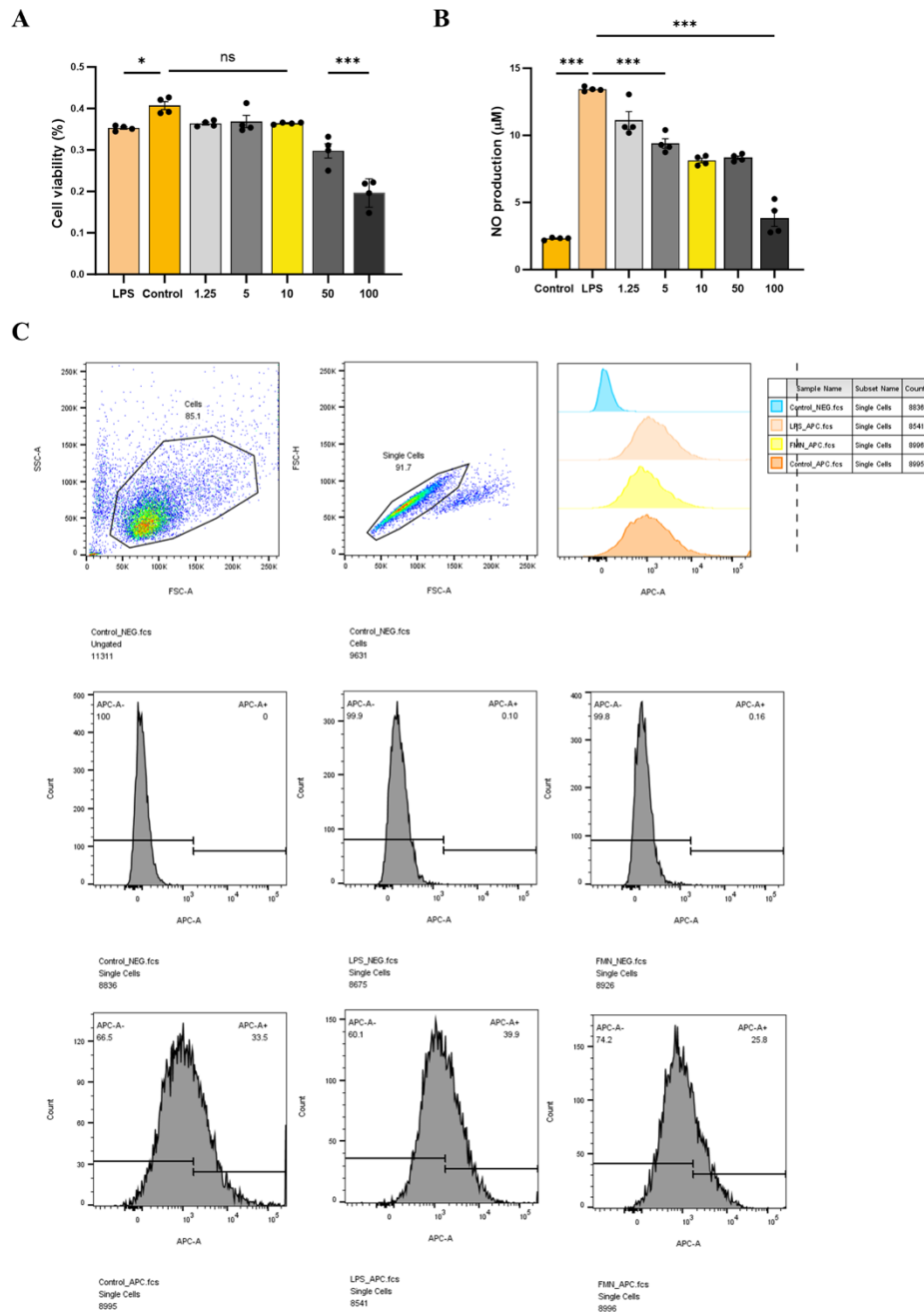


Supplementary Figure 6. Effects of PMT on microglial activation and microglia-associated BDNF in the hippocampus. (A) Representative IF images of Iba-1 (green), BDNF (red), and DAPI (blue) in the hippocampus across indicated groups. (B) Quantification of Iba1⁺BDNF⁺ cells relative to total Iba1⁺ cells. Images were obtained

from matched coronal sections at comparable levels (bregma -3.16 mm). Data are presented as mean $\pm$ SEM. ($n=3$ per group). $*P<0.05$; $****P<0.0001$. One-way ANOVA.



Supplementary Figure 7. Effects of FMN treatment on microglial activation and microglia-associated BDNF in the hippocampus. (A) Representative IF images of Iba-1 (green), BDNF (red), and DAPI (blue) in the hippocampus across indicated groups. **(B)** Quantification of Iba1⁺BDNF⁺ cells relative to total Iba1⁺ cells. Images were obtained from matched coronal sections at comparable levels (bregma -3.16 mm). Data are presented as mean $\pm$ SEM. ($n = 3$ per group). $*P < 0.05$ and $***P < 0.001$. One-way ANOVA.



Supplementary Figure 8. Preliminary experiments to determine the optimal FMN concentration and flow cytometry gating strategy. (A) Comparison of cell viability at different concentrations of FMN. **(B)** Comparison of NO concentrations at different concentrations of FMN. **(C)** Flow cytometry gating strategy. Data are presented as mean $\pm$ SEM. (n = 4 per group). * P < 0.05, *** P < 0.001, ns, not significant. One-way ANOVA.

