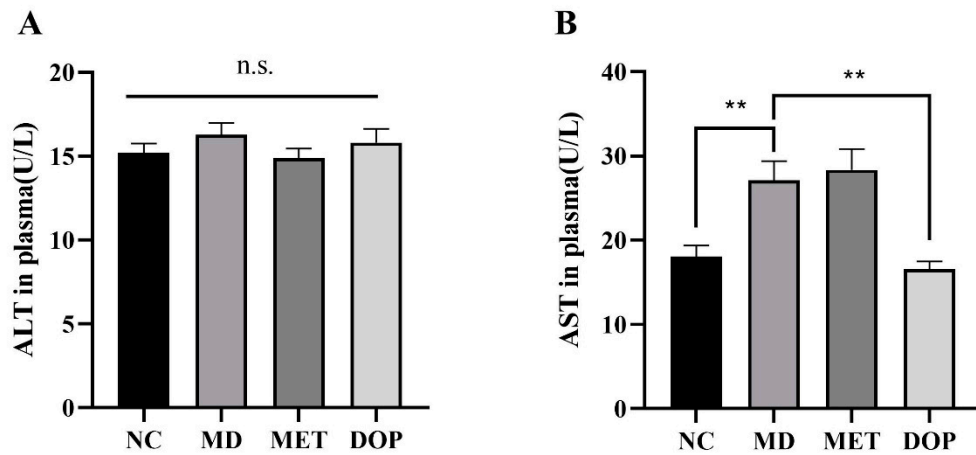


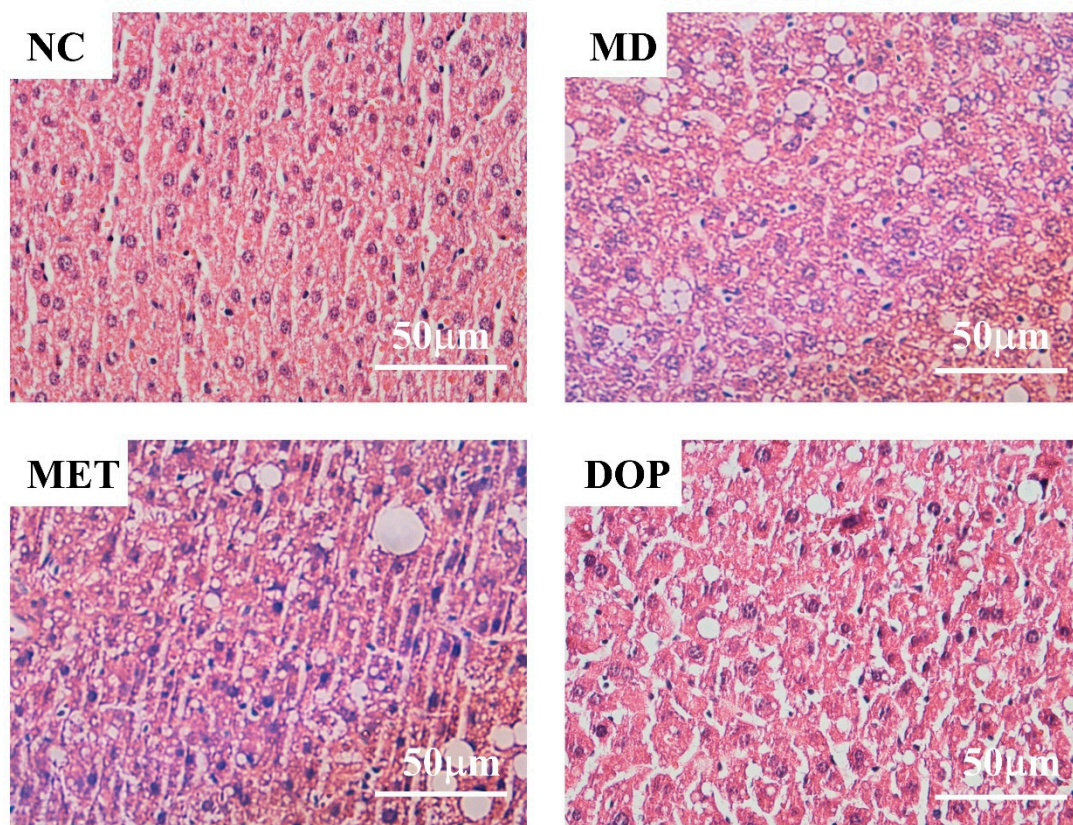
## Supplmention

**Table S1 Monosaccharide standard curve of PMP-HPLC**

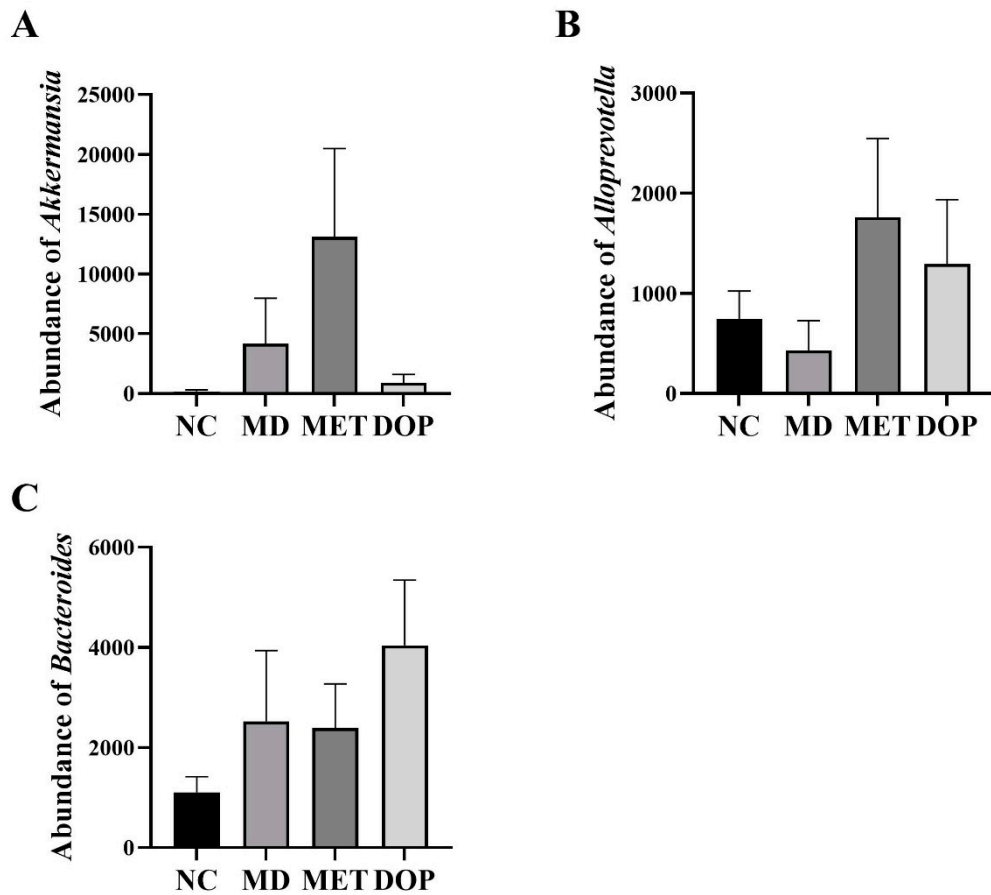
Type of monosaccharide	standard curve	R <sup>2</sup>
Man	$y = 13420894.70 x - 111874.07$	0.9999
Glc	$y = 8403312.60 x + 349394.33$	0.9986



**Figure S1. (A,B) Effect of DOP or metformin on the level of ALT and AST.** Values are shown as the mean  $\pm$  SEM. Comparisons between groups were analyzed using one-way ANOVA followed by Tukey's post-hoc test. A value of  $P < 0.05$  was considered statistically significant, and  $**p < 0.01$  vs. mice in the MD group.



**Figure S2. H&E staining for the evaluation of histological changes in mice liver.** Tissue sections were observed and photographed at 200× using a light microscope.



**Figure S3. (A,B,C) Relative abundance of *Akkermansia*, *Alloprevotella*, and *Bacteroides* in vivo.** Values are shown as the mean  $\pm$  SEM. Comparisons between groups were analyzed using one-way ANOVA followed by Tukey's post-hoc test. A value of  $P < 0.05$  was considered statistically significant.