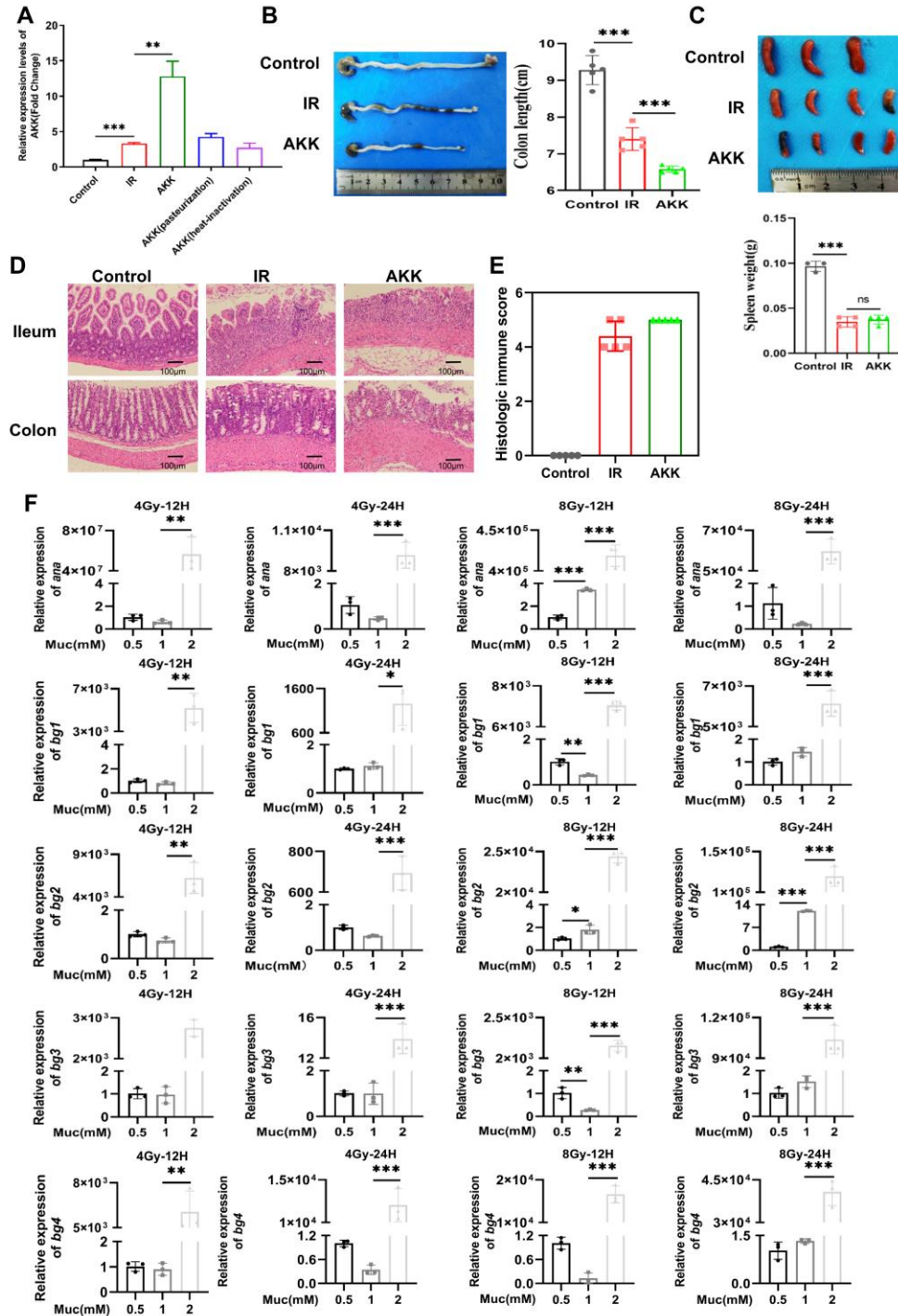
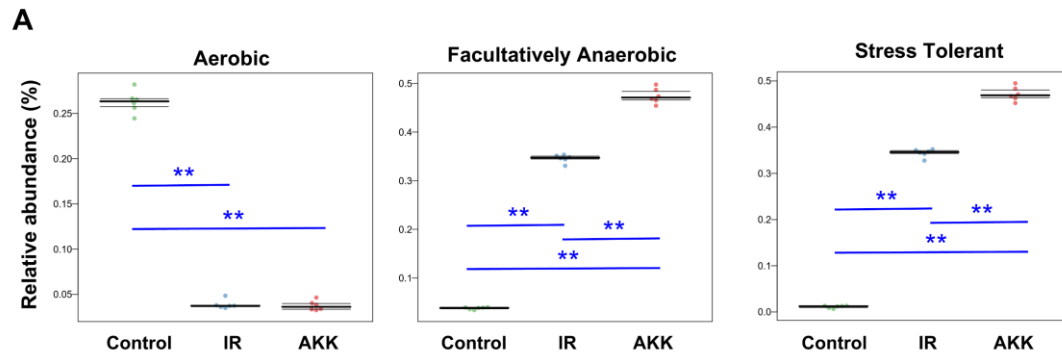




Supplementary Figure 1. Characterization of *A. muciniphila* effects on the gastrointestinal tract following radiation exposure.(A) The relative abundance of *A. muciniphila* in the feces was detected by qRT-PCR. (B) Representative photographs of the colons and statistical results of colon length of mice from the control, IR, and AKK groups. (C) Representative images of the spleens and weight across different groups. (D) Histological analysis of ileum and colon sections stained with H&E. (E)

Quantitative histologic immune scores of different groups. (F) The relative mRNA expression levels of mucin-utilizing genes (*ana*, Beta-galactosidase) were examined in *A. muciniphila* post-irradiation. There are four homologous genes of Beta-galactosidase (*bgl-bg4*) in *A. muciniphila*. *P<0.05, **P<0.01, ***P<0.001.



Supplementary Figure 2. Phenotypic profiling of gut microbiota in Control, IR, and AKK groups.(A) Relative abundance of aerobic, facultatively anaerobic, and stress-tolerant bacterial populations across different groups. *Significance levels: ** $P < 0.01$.