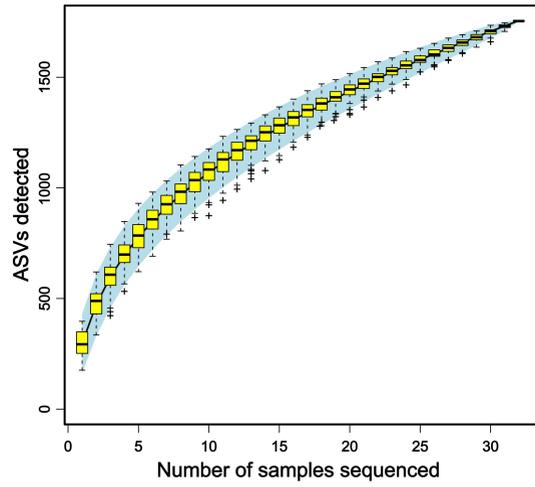
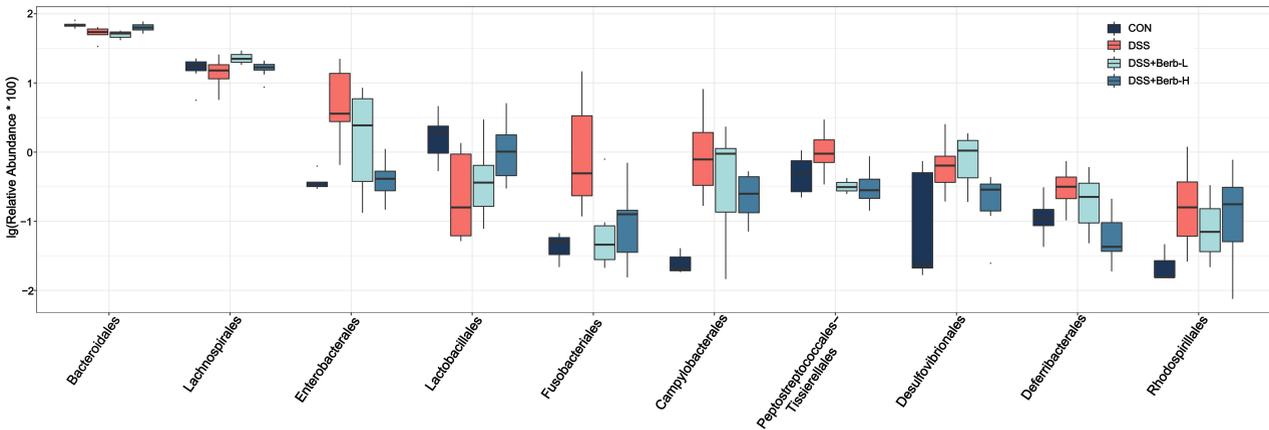


Supplementary Figure S1

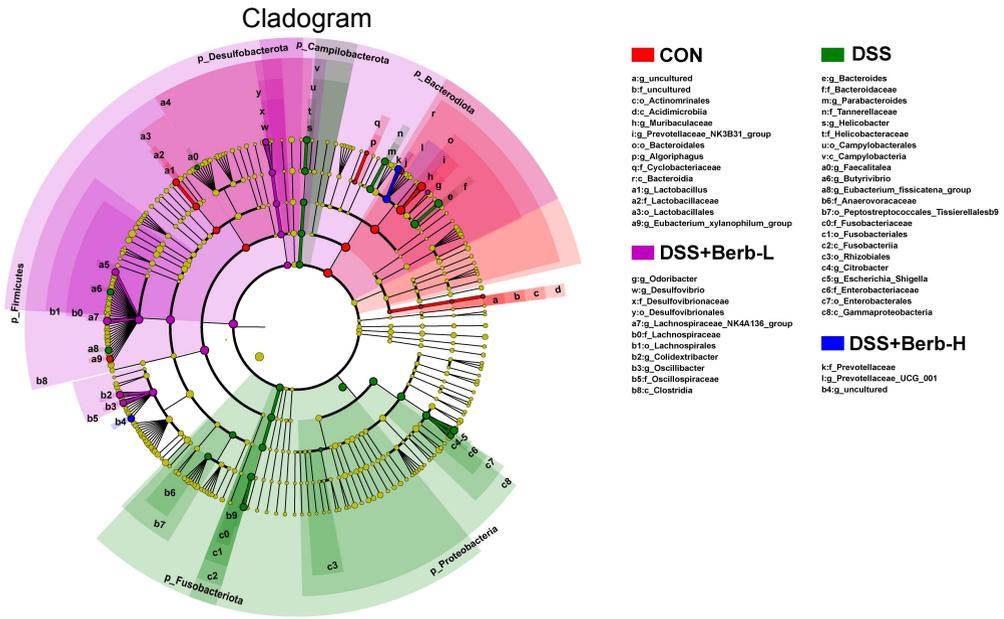
A



B



C



MATERIALS AND METHODS

Euthanasia procedure

At the conclusion of the experiment, euthanasia was performed using cervical dislocation. The procedure followed is outlined as follows: Personnel involved in the procedure had undergone specific training and practical assessments. Sterile gloves were worn to prevent cross-contamination, and a non-slip operating table was prepared, along with a sealed bag for animal carcasses and a stethoscope. During the procedure, the left thumb and index finger gently but firmly pressed on both sides of the mouse's head, while the palm of the hand was placed against the mouse's back to maintain alignment of the head and body. The right thumb and index finger grasped the base of the tail, and a quick, forceful pull was made along the mouse's body axis, away from the body. Simultaneously, the left hand maintained the head's position, and the neck was dislocated by the opposite force, which was accompanied by a slight "crack" sound, indicating successful separation of the spinal cord from the brain. The entire procedure was completed within 1–2 seconds, with no repeated actions to avoid causing unnecessary pain to the animal. Death was confirmed using three criteria: 1) Observation of the chest for 30 seconds to confirm the absence of respiratory movement (no breathing); 2) Pinching the mouse's hindfoot with sterile forceps to ensure no withdrawal reflex (loss of pain response); 3) Using a stethoscope to listen to the heart area on the left side of the chest for 1 minute, confirming no heartbeat. If any of these criteria were not met, immediate termination was performed using sterilized scissors to decapitate the animal, ensuring complete death. After confirming death, the mouse was cleaned with 75% ethanol, placed in a sealed bag, and transferred to a dedicated -20 ° C freezer for temporary storage. Subsequent disposal followed the protocols of the Ningbo University Laboratory Animal Center for humane treatment.

Supplementary Table 1 Disease activity index (DAI) scoring system.

Score	Percentage of body weight loss	Stool consistency	Body posture
0	Stable weight or weight gain	Normal and well formed	Smooth fur and no hunchback
1	5–10%	Very soft and formed	Mildly ruffled fur and hunchback
2	10–15%	Loose stools	Moderately ruffled fur and hunchback
3	>15%	Bloody stools	Severely ruffled fur and heavy hunchback

Supplementary Table 2 Histological scoring system.

Score	Inflammatory cell infiltration	Damage to intestinal architecture
0	Presence of occasional inflammatory cells in the lamina propria	No mucosal damage
1	Increased numbers of inflammatory cells in the lamina propria	Focal erosions
2	Inflammatory cells extending into the mucosa and submucosa	Slight crypt loss and focal ulcerations
3	Inflammatory cells extending into the mucosa and submucosa, sometimes accompanied by transmural infiltration	Extended ulcerations and moderate crypt loss
4	Severe transmural extension of the infiltrate	Extensive crypt loss, mucosal damage, and extension into deeper structures of the bowel wall