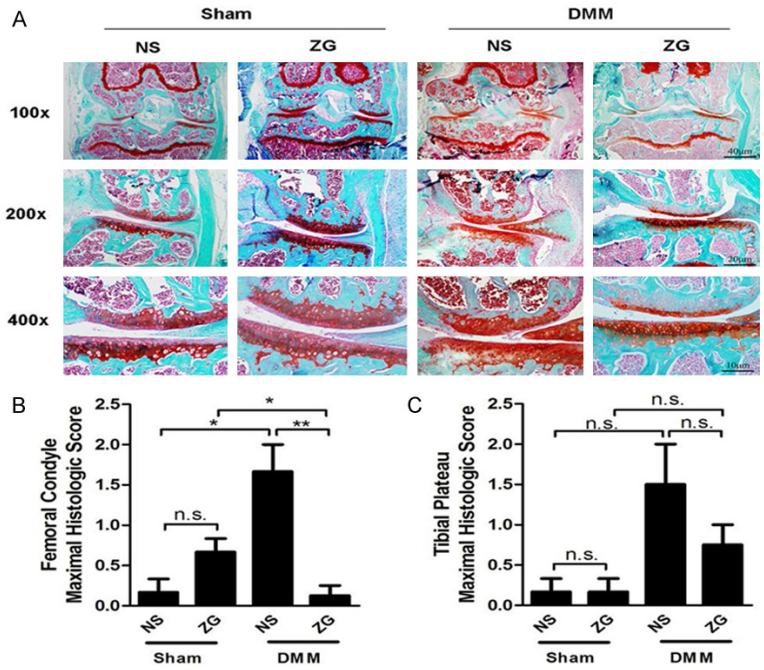
**Supplementary Table 1.** The score standards of osteoarthritic damage

| Grade | Osteoarthritic damage |
|---|---|
| 0 | Normal |
| 0.5 | Loss of Safranin-O without structural changes |
| 1 | Small fibrillations without loss of cartilage |
| 2 | Vertical clefts down to the layer immediately below the superficial layer and some loss of surface lamina |
| 3 | Verical clefts/erosion to the calcified cartilage extending to <25% of the articular surface |
| 4 | Vertical clefts/erosion to the calcified cartilage extending to 25-50% of the articular surface |
| 5 | Vertical clefts/erosion to the calcified cartilage extending to 50-75% of the articular surface |
| 6 | Vertical clefts/erosion to the calcified cartilage extending >75% of the articular surface |




**Supplementary Figure 1.** ZG slows cartilage degeneration in DMM mice at 4th week. A. Joint histology in the DMM model. Knee joint tissue sections were from DMM mice following 4 weeks of treatment (ZG) and normal saline treatment (NS). Joint sections were stained with Safranin-O/fast green. Representative images of mouse joints are shown ($n$=8 mice per time point). B. Maximal histological scores across the femoral condyle. C. Maximal histological scores across the tibial plateau. *$P$<0.05, **$P$<0.01, ***$P$<0.001, n.s, no significant.