**SUPPLEMENTARY DATA**

**Phenotyping of *Macrod2* knock-out mice**

*Macrod2* knock-out mice of the different genotypes were born at the expected Mendelian frequencies (*p*=1). *Macrod2* homozygous, heterozygous and matched wild-type littermates (2 male and 2 female animals per group) were evaluated for developmental and histological abnormalities at 5 months of age by the Australian Phenomics Network (APN) Histopathology and Organ Pathology Service, The University of Melbourne. Comprehensive organ-wide pathology review detected no aberrations in the intestine or other organs (including blood counts). Tissues assessed included: Adrenal glands, bladder, blood counts, bone marrow, brain, cecum, cervix, clitoral gland, colon, duodenum, epididymis, eyes, gall bladder, Harderian glands, head, heart, hind leg (long bone), bone marrow, synovial joint, skeletal muscle, ileum, jejunum, kidney, liver, lungs, mammary tissue, mesenteric lymph node, ovaries, oviducts, pancreas, penis, preputial gland, prostate glands, salivary glands and regional lymph nodes, seminal vesicles, skin, spinal cord, spleen, stomach, tail, testes, thymus, thyroids, trachea and uterus.