

Description of Additional Supplementary Files

File Name: Supplementary Data 1

Description: FACS sorting strategy for hematopoietic stem and progenitor cells (HSPCs) and mature cells in Fig. 1h.

File Name: Supplementary Data 2

Description: Transcriptome analysis of *Brd9*^{fl/fl} or *Mx1-Cre;Brd9*^{fl/fl} mouse BM Lin-c-Kit⁺ cells in biological triplicate.

File Name: Supplementary Data 3

Description: Gene ontology pathway of KO versus control by RNA-seq analysis.

File Name: Supplementary Data 4

Description: Transcriptional factor motif analysis of genes upregulated in MPP3, downregulated in MPP4 and MEP of KO mice by scRNA-seq analysis. P values are indicated and generated via Enricher.

File Name: Supplementary Data 5

Description: Normalized H3K27ac and ATAC signal (RPGC) at SE and TE (detected with HOMER $\text{fdr} < 0.001$) in HSPCs.

File Name: Supplementary Data 6

Description: CTCF, BRG1, and BRD4 signals in control and *Brd9* KO HSPCs.

File Name: Supplementary Data 7

Description: DEGs in *Brd9* KO HSPCs. Genes whose promoter-TSS sites locate on CTCF peaks in CTCF Up, CTCF Neutral, CTCF Down and p-values of two-sided t-test were indicated.

File Name: Supplementary Data 8

Description: GO terms enrichment of the promoter-located CTCF peaks of CTCF Up group. P values are generated via Enricher.