

Description of Additional Supplementary Files

File Name: Supplementary Data 1

Description: Marker expression in different cardiac cell populations from control and *Isl1cre/+Rnf20fl/fl* embryos.

File Name: Supplementary Data 2

Description: DEG in single cell datasets of *Isl1cre/+Rnf20fl/fl* versus control embryos.

File Name: Supplementary Data 3

Description: Supplementary Data 3. Marker expression in different cardiac cell populations from control and *Rnf20iEC-KO* embryos.

File Name: Supplementary Data 4

Description: DEG in single cell datasets of *Rnf20iEC-KO* versus control embryos.

File Name: Supplementary Data 5

Description: DEG in RNA-seq datasets of sorted *Pecam1⁺ shRnf20* KD ECs versus control differentiated ECs.

File Name: Supplementary Data 6

Description: Genes exhibiting significant negative correlation with RNF20 levels in TOF patients, based on Spearman correlation analysis. Listed are gene names, correlation coefficients, and associated p-value

File Name: Supplementary Data 7

Description: SD1 and SD2 represent short- and long-term beating rate variability in Poincaré plots of rat cardiomyocytes co-cultured with HUVECs following silencing with different siRNAs.

File Name: Supplementary Data 8

Description: Primers used in this study. qPCR primers were designed in-house using NCBI Primer-BLAST and synthesized by Sigma-Aldrich.