

SUPPLEMENTAL INFORMATION

SINGLE-CELL MULTIOMICS OF HUMAN FETAL HEMATOPOIESIS DEFINES A DEVELOPMENTAL SPECIFIC POPULATION AND A FETAL SIGNATURE

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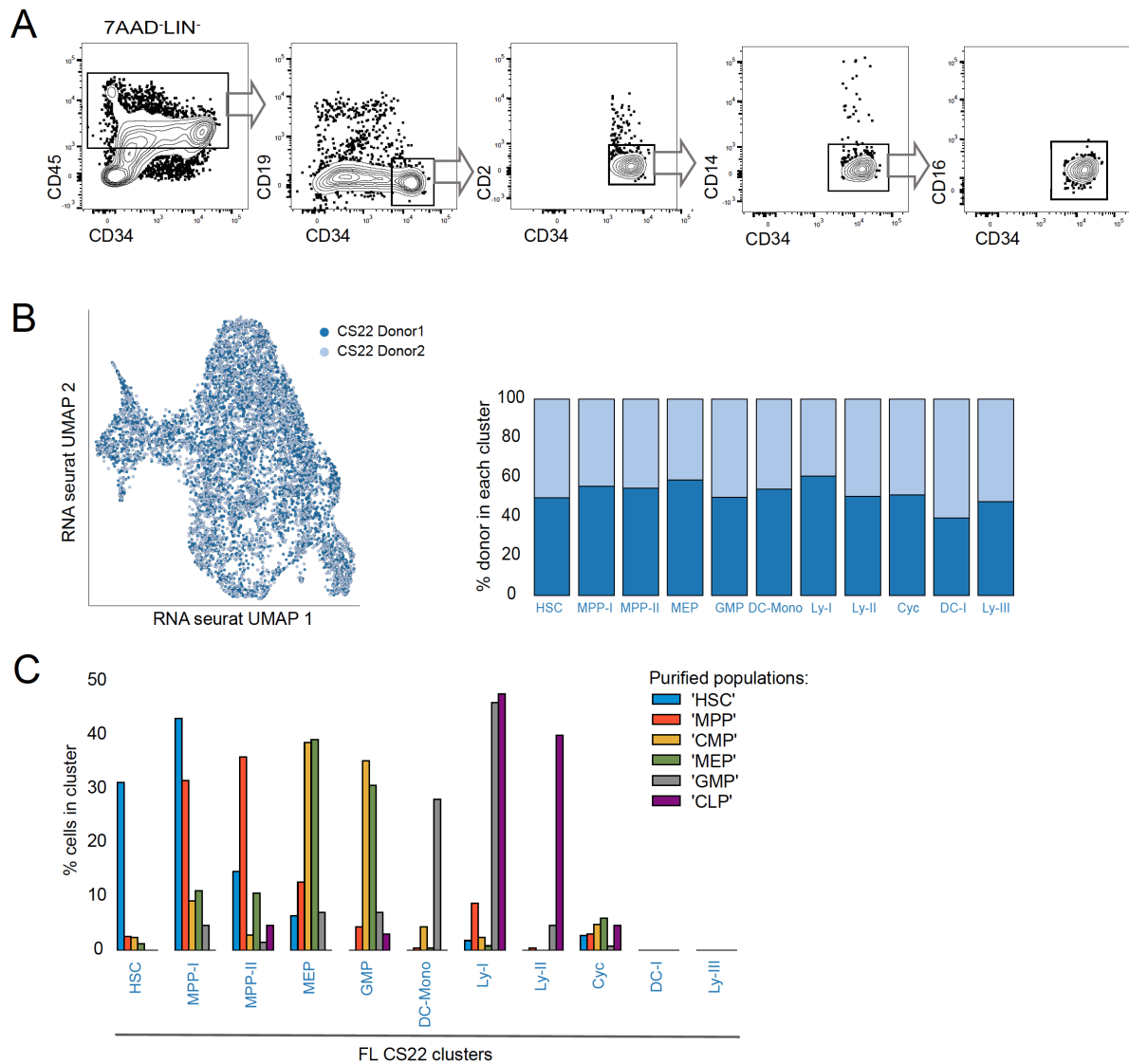
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Supplemental information contains:

- Supplemental Figures 1–6
- Supplemental Tables 1–5

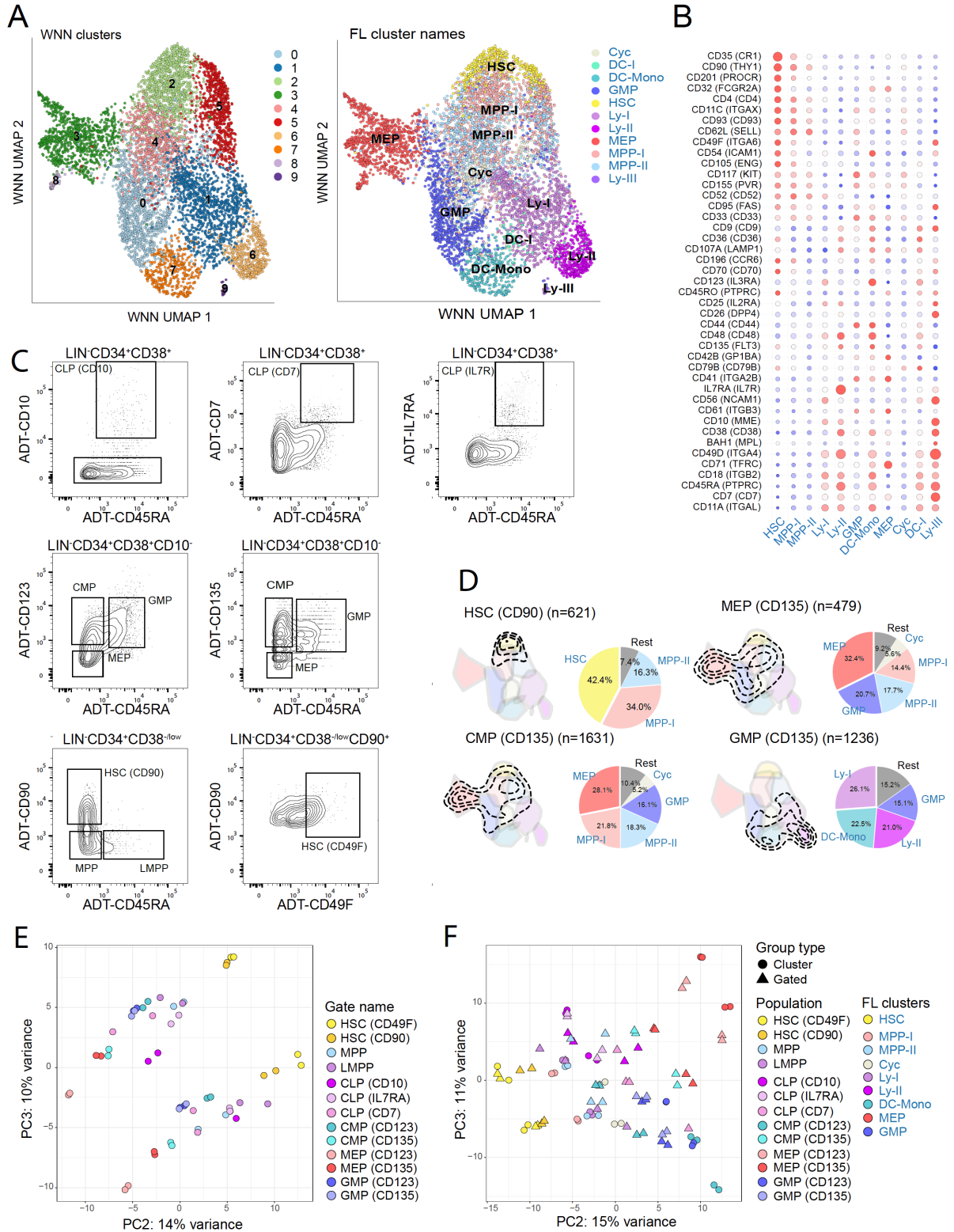
SUPPLEMENTAL FIGURES



Supplemental Figure 1

Individual donor contribution and verification of cluster identities

(A) Sorting strategy of CS22 LIN⁻CD45⁺CD34⁺ FL cells. Viable cells (7-AAD⁻) were selected based on size (scatter) and gated negative for mature lineage markers (CD3, CD235a). Further gating is indicated in the figure. (B) UMAP of LIN⁻CD45⁺CD34⁺ FL cells at CS22, as per donor (*left*) and bar plot of donor contribution per cluster (percent; *right*). (C) Immunophenotypic defined HSPCs from *Ranzoni et al* [12] were projected on the CS22 UMAP in *Figure 1B*. Distribution per cluster of each population is shown. In total 87-97% of the cells from the different populations mapped.

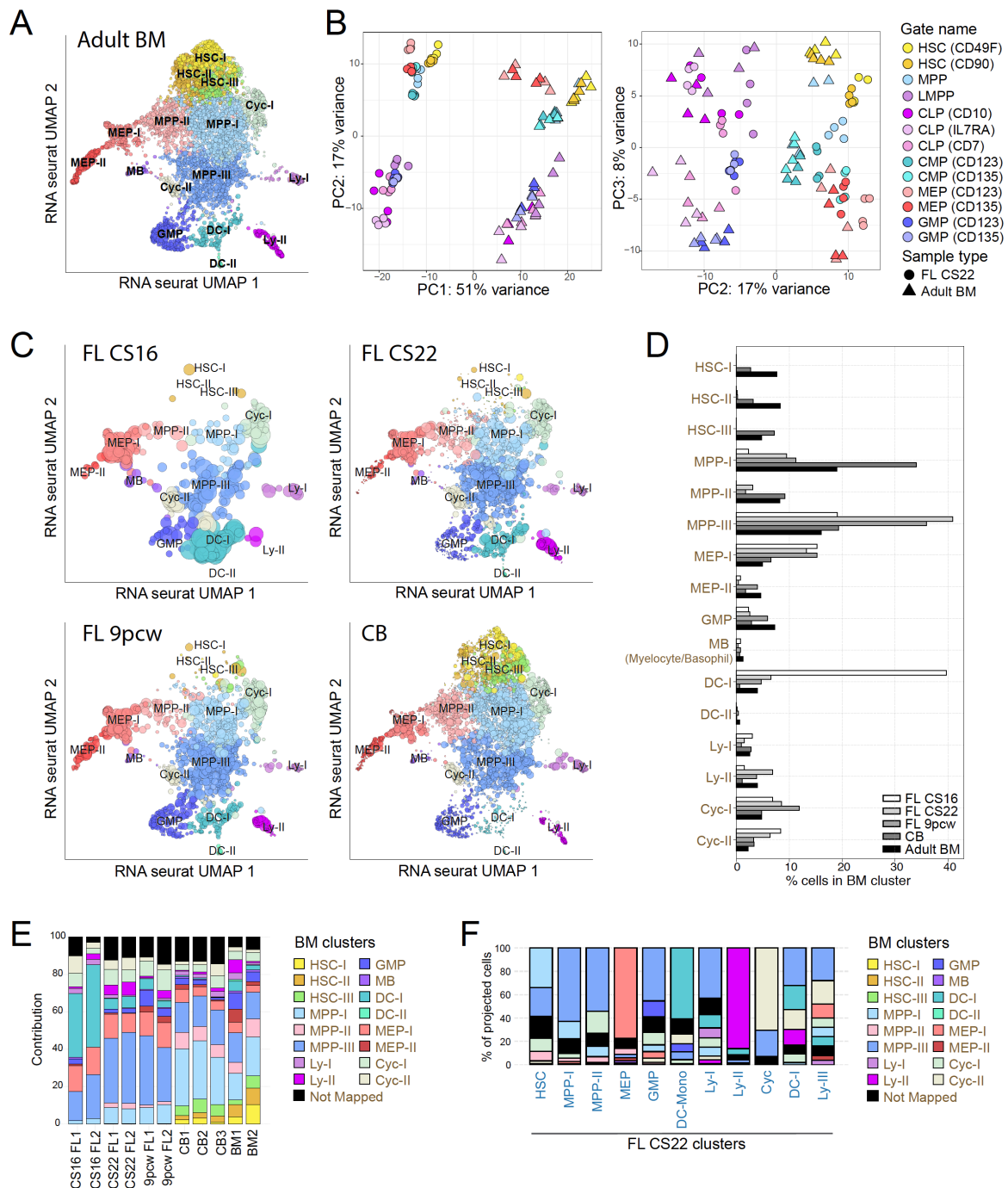


Supplemental Figure 2

Integration of ADTs and transcriptome data and immunophenotypic gating strategy

(A) The ADTs and the transcriptome data were integrated using WNN. UMAPs showing WNN clusters (*left*) and the FL clusters defined in *Figure 1B* (*right*). (B) Bead plot of z-scored ADT

expression values per cluster, where size of the circle represents fraction of cells with expression and the color correlates with expression level. (C) Gating of conventional immunophenotypic populations using ADT signals (cells were sorted LIN⁻CD45⁺CD34⁺ as shown in *Supplemental Figure 1A*). Top row CLP gating, middle row myeloid progenitors (CMP, GMP, MEP) and bottom row primitive populations (HSC, MPP, LMPP). (D) Transcriptional cell states captured for each immunophenotypic gated population are shown within the contours on the FL CS22 UMAP. Pie charts show percentage of the different molecular clusters (as per *Figure 1B*) within each immunophenotypic gated progenitor. (E) PC2 vs PC3 of pseudo-bulked ADT gated cell populations using top 500 variably expressed genes (2 replicates/donor). (F) Combined PCA of pseudo-bulked ADT gated cell populations and clusters (defined in *Figure 1B*), top 500 variably expressed genes. PC2 vs PC3 is shown. (For immunophenotypic definition of populations see *Materials and Methods*.)

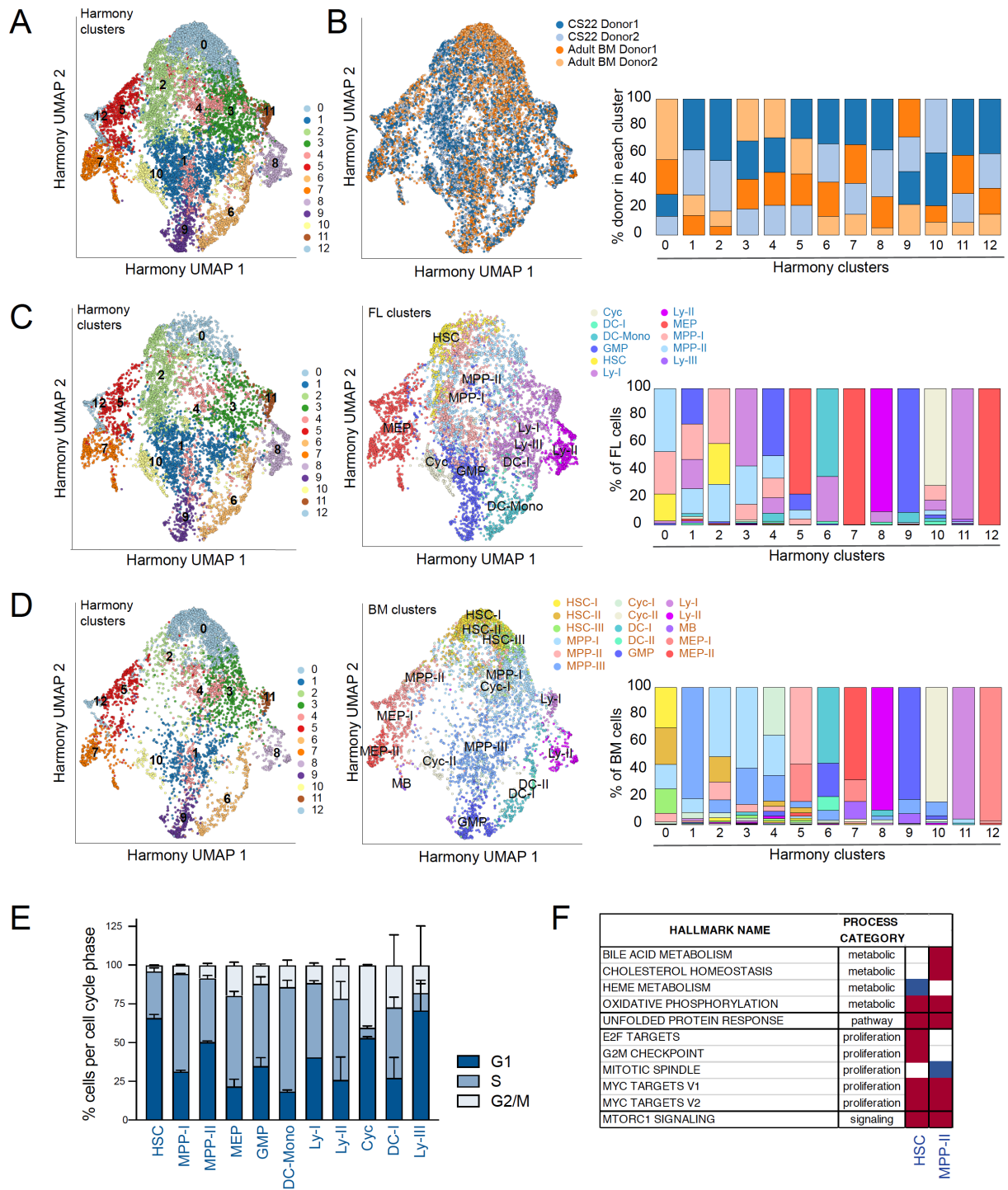


Supplemental Figure 3

Projection of primitive FL and CB cells on adult BM reference

(A) UMAP of LIN^+CD34^+ adult BM cells with cluster annotations from [19]. (B) PCA of pseudo-bulked immunophenotypic populations from FL CS22 and adult BM using 500 top variably expressed genes. PC1 vs PC2 (*left*) and PC2 vs PC3 (*right*). (C) Projection of FL CS16, FL CS22, FL 9 pcw and CB on the adult BM UMAP. Size of dots represents mapping-score

and color of dots represents BM clusters. (D) Quantification of projected cells (*Supplemental Figure 3C*) in all mapped developmental stages. (E) Contribution (percent) of individual donors to the mapping in *Supplemental Figure 3C-D*. (F) Classification of FL CS22 derived clusters (x-axis) on adult BM.

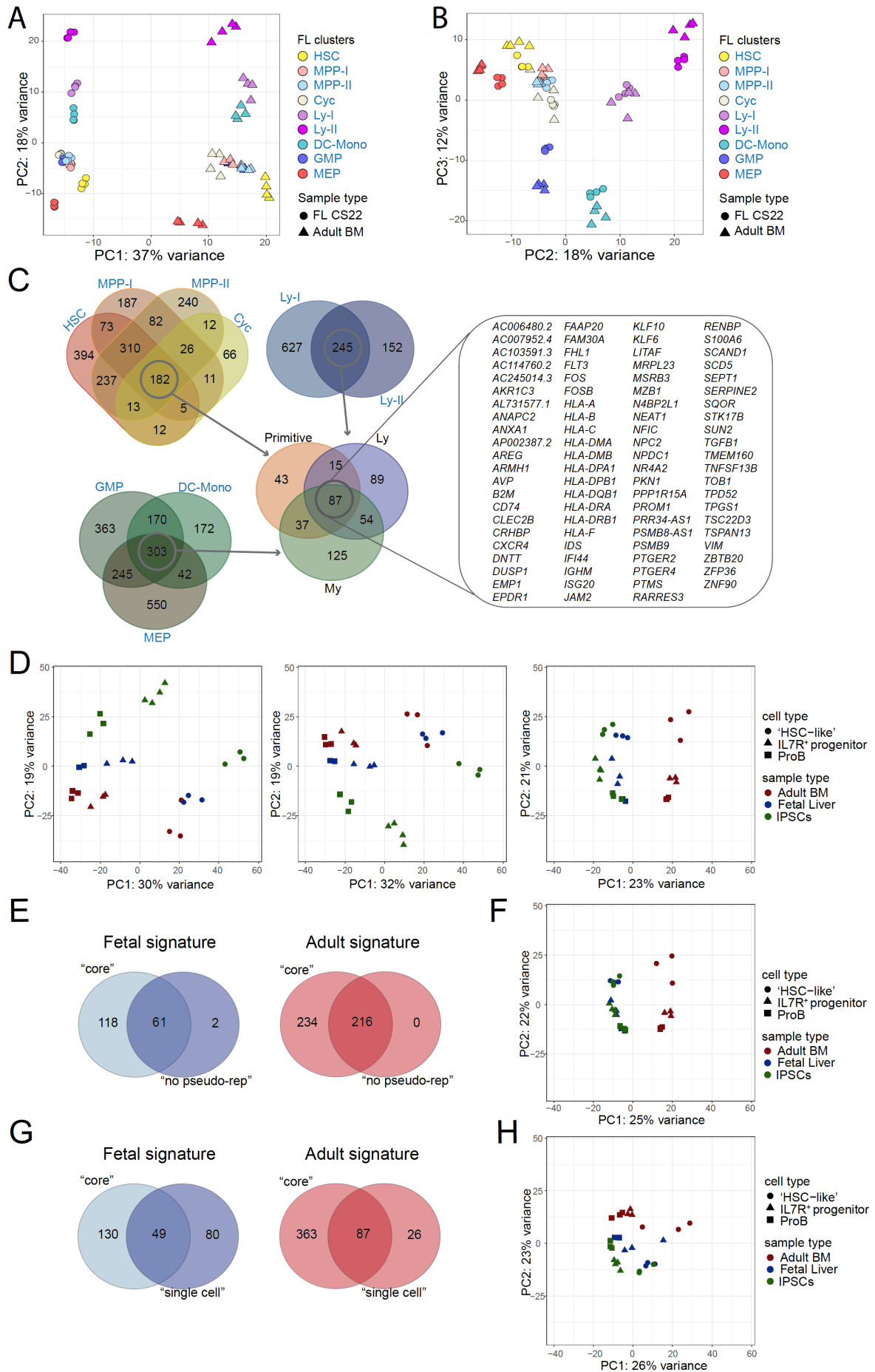


Supplemental Figure 4

Integration of FL CS22 and adult BM transcriptome data

(A) UMAP of cellular states after integration of FL CS22 and adult BM using Harmony. (B) Harmony UMAP of individual donors (*left*) and contribution of individual donors per cluster (percent, *right*). (C) Harmony UMAP displaying only the CS22 FL cells with Harmony clusters

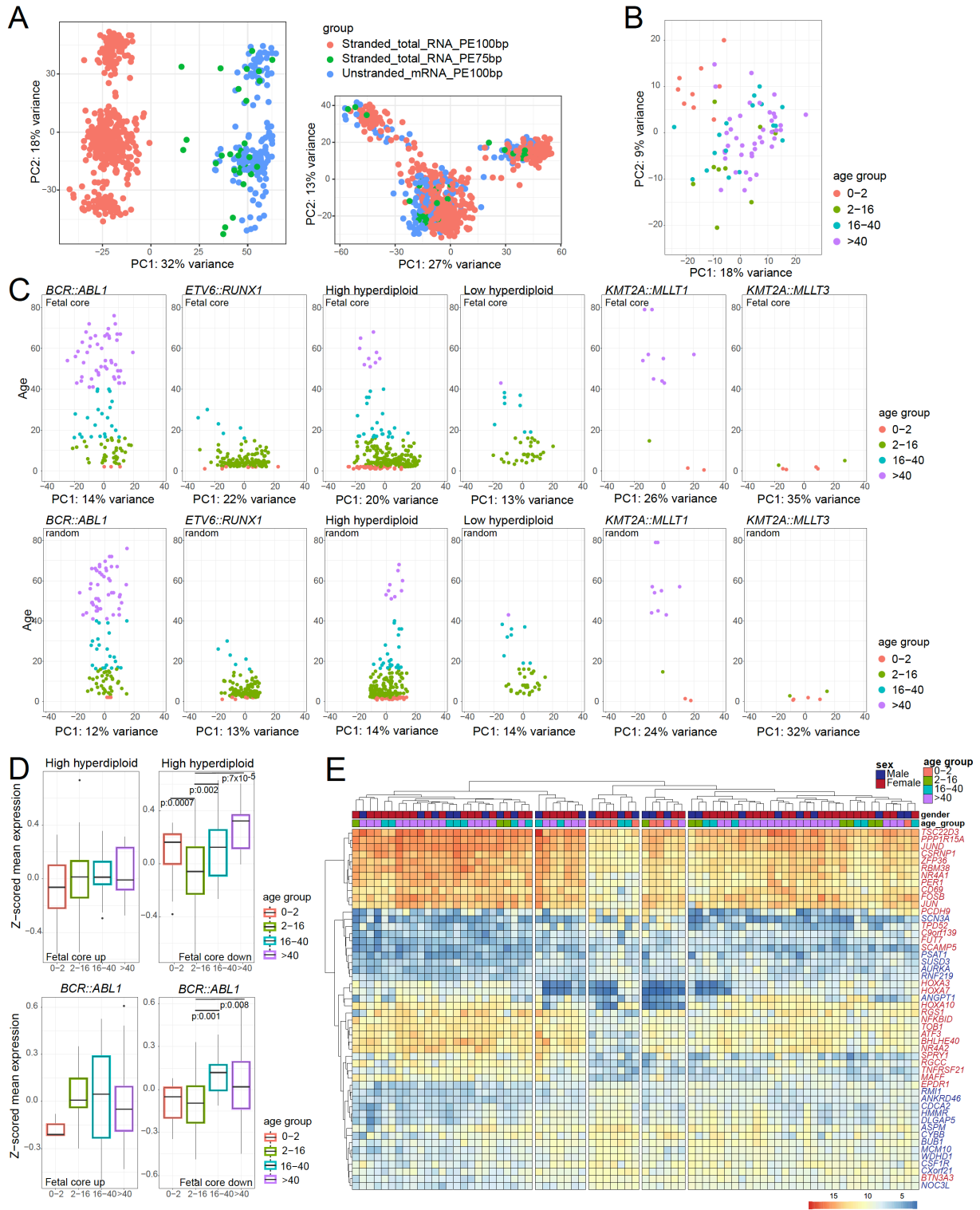
(left) and FL clusters as per *Figure 1B (mid)*. Bar plot (*right*) shows distribution of FL clusters per Harmony cluster. (D) Harmony UMAP displaying only the adult BM cells with Harmony clusters (*left*) and BM clusters as per *Supplemental Figure 3A (mid)*. Bar plot (*right*) shows distribution of BM clusters per Harmony cluster. (E) Predicted cell cycle phase for each FL CS22 cluster. (F) GSEA of pseudo-bulked clusters comparing MPP-I to HSC and MPP-II respectively. Color code according to NES (Normalized Enrichment Score) value; red; upregulated and blue; downregulated in MPP-I. Selected gene sets with FDR q-value of <0.05 are shown.



Supplemental Figure 5

Differential gene expression analysis comparing CS22 FL and adult BM counterparts

(A-B) PCA of pseudo-bulked clusters from FL CS22 and adult BM counterparts using 500 top variably expressed genes. Colors represent clusters and shapes represents sample type (*circle*: FL CS22 and *triangle*: adult BM). (A) PC1 vs PC2; (B) PC2 vs PC3. (C) Venn diagrams of downregulated genes in FL CS22 compared to adult BM counterparts defined by \log_2 fold change < -1 and adj. P value < 0.05 . (D) Validation of the *fetal core signature* using data set [15]. *Left*: PCA of 500 top variably expressed genes; *mid*: as left but eliminating *fetal core signature* genes; *right*: PCA of *fetal core signature* genes. (E) Venn diagrams showing overlap between *fetal core signature* and DEGs detected without pseudo-replicates. (F) PCA of gene set generated without pseudo-replicates using data set [15]. (G) Venn diagrams showing overlap between *fetal core signature* and DEGs detected using a single cell method (\log_2 fold change $< |0.5|$). (H) PCA of gene set generated with single cell method using data set [15].



Supplemental Figure 6

Fetal core signature in B-ALL patient samples

(A) PCA of B-ALL samples [18] before batch correction (*left*) and after batch correction (*right*), of top 500 variably expressed genes. Color coded according to sequencing type. (B) PC1 vs PC2 of *KMT2A::AFF1* (*MLL::AF4*) B-ALL using the *fetal core signature*. Age group color

code is shown to the right. (C) PCA of individual leukemia sub-types using the *fetal core signature* (*top*) and representative PCA plot using random genes (*bottom*). PC1 vs age. (D) Box plots showing z-scored mean expression of the *fetal core signature* per age group. Up and down regulated gene sets are shown separately. High hyperdiploid (*top*), *BCR::ABL1* (*bottom*), adj. P values <0.05 indicated in the figure. The boxes include first to third quartile and the line indicates the median. (E) Heatmap of the genes marking the top 25 highest and 25 lowest values of PC1 in *KMT2A::AFF1* B-ALL. Samples were hierarchically clustered based on their gene expression. Top rows describe sex and age, and gene names are shown to the right (*blue label: fetal signature; red label: adult signature*).

Supplemental Table 1: Samples included in the study.

Sample	Sex	# Sorted cells	# Cells pre-filtering	# Cells used in analysis
FL CS16 Donor1	Female	906	210	109
FL CS16 Donor2	Male	244	63	34
FL CS22 Donor1	Female	10 000	4536	3692
FL CS22 Donor2	Male	10 000	3797	3040
FL 9pcw Donor1	Male	2 213	458	297
FL 9pcw Donor2	Male	4 946	1057	842

Supplemental Table 2: CITE-seq antibodies used.

Reactivity	Surface marker	Product	Clone	Isotype	Cat number	Lot	Company
Anti human	CD38	Totalseq-A0059	HIT2	mIgG1 k	94672	B254149	Biolegend
Anti human	CD90	Totalseq-A0060	5E10	mIgG1 k	94673	B254151	Biolegend
Anti human	CD117 (cKIT)	Totalseq-A0061	104D2	mIgG1 k	94674	B254153	Biolegend
Anti human	CD10	Totalseq-A0062	HI10a	mIgG1 k	94675	B254154	Biolegend
Anti human	CD45RA	Totalseq-A0063	HI100	mIgG2b k	94676	B254155	Biolegend
Anti human	CD123	Totalseq-A0064	6H6	mIgG1 k	94677	B254157	Biolegend
Anti human	CD127 (IL7RA)	Totalseq-A0065	A019D5	mIgG1 k	94678	B254159	Biolegend
Anti human	CD7	Totalseq-A0066	CD7-6B7	mIgG2a k	94679	B254161	Biolegend
Anti human	CD71	Totalseq-A0067	CY1G4	mIgG2a k	94680	B254162	Biolegend
Anti human	CD105	Totalseq-A0068	43A3	mIgG1 k	94681	B254163	Biolegend
Anti human	CD201 (EPCR)	Totalseq-A0069	RCR-401	mIgG1 k	94682	B254164	Biolegend
Anti human	CD49f	Totalseq-A0070	GoH3	rIgG2a k	94683	B254165	Biolegend
Anti human	BAH1 (cMLP)	Totalseq-A0071	BAH1	mIgG1 k	94684	B254166	Biolegend
Anti human	CD18	Totalseq-A0385	TSI/18	mIgG1 k	302121	B270525	Biolegend
Anti human	CD25	Totalseq-A0085	BC96	mIgG1 k	302643	B271394	Biolegend
Anti human	CD196	Totalseq-A0143	Go34E3	mIgG2b k	353437	B270546	Biolegend
Anti human	CD62L	Totalseq-A0147	DREG-56	mIgG1 k	304847	B272608	Biolegend
Anti human	CD4	Totalseq-A0072	RPA-T4	mIgG1 k	300563	B268766	Biolegend
Anti human	CD26	Totalseq-A0396	BA5b	mIgG2a k	302720	B261042	Biolegend
Anti human	CD32	Totalseq-A0142	FUN-2	mIgG2b k	303223	B263613	Biolegend
Anti human	CD42b	Totalseq-A0216	HIP1	mIgG1 k	303937	B271616	Biolegend
Anti human	CD45RO	Totalseq-A0087	UCHL1	mIgG1 k	304255	B269954	Biolegend
Anti human	CD9	Totalseq-A0579	H19a	mIgG1 k	312119	B271599	Biolegend
Anti human	Integrin B7	Totalseq-A0214	FIB504	rIgG2a k	321227	B269330	Biolegend
Anti human	CD93	Totalseq-A0446	VIMD2	mIgG1 k	336121	B270926	Biolegend
Anti human	CD61	Totalseq-A0372	VI-PL2	mIgG1 k	336423	B271605	Biolegend
Anti human	CD95	Totalseq-A0156	DX2	mIgG1 k	305649	B269386	Biolegend
Anti human	CD135	Totalseq-A0351	BV10A4H2	mIgG1 k	313317	B272437	Biolegend
Anti human	CD11c	Totalseq-A0053	S-HCL-3	mIgG2b k	371519	B270802	Biolegend
Anti human	CD52	Totalseq-A0033	HI186	mIgG2b k	316017	B260031	Biolegend

Anti human	CD36	Totalseq-A0407	5-271	mIgG2a k	96419	B267789	Biolegend
Anti human	CD41	Totalseq-A0353	HIP8	mIgG1 k	303737	B271597	Biolegend
Anti human	CD48	Totalseq-A0029	BJ40	mIgG1 k	336709	B260028	Biolegend
Anti human	CD107A	Totalseq-A0155	H4A3	mIgG1 k	328647	B273007	Biolegend
Anti human	CD35	Totalseq-A0167	E11	mIgG1 k	333407	B269337	Biolegend
Anti human	CD155	Totalseq-A0023	SKIL4	mIgG1 k	337623	B269344	Biolegend
Anti human	CD79b	Totalseq-A0187	CB3-1	mIgG1 k	341415	B270535	Biolegend
Anti human	CD33	Totalseq-A0052	P97.6	mIgG1 k	366629	B259970	Biolegend
Anti human	CD56	Totalseq-A0084	QA17A16	mIgG1 k	392421	B273249	Biolegend
Anti human	CD44	Totalseq-A0125	BJ18	mIgG1 k	338825	B270931	Biolegend
Anti human	CD11a	Totalseq-A0185	TS2/4	mIgG1 k	350615	B260299	Biolegend
Anti human	CD54	Totalseq-A0217	HA58	mIgG1 k	353123	B269343	Biolegend
Anti human	CD70	Totalseq-A0027	113-16	mIgG1 k	355117	B263558	Biolegend
Anti human	Hashtag 4	Totalseq-A0254	LNH-94/2M2	mIgG1 k	394607	B264726	Biolegend
Anti human	Hashtag 5	Totalseq-A0255	LNH-94/2M2	mIgG1 k	394609	B264725	Biolegend
Anti human	Hashtag 6	Totalseq-A0256	LNH-94/2M2	mIgG1 k	394611	B264724	Biolegend
Anti human	Hashtag 7	Totalseq-A0257	LNH-94/2M2	mIgG1 k	394613	B264723	Biolegend
Anti human	Hashtag 8	Totalseq-A0258	LNH-94/2M2	mIgG1 k	394615	B264722	Biolegend

Supplemental Table 3: Contribution of individual donors (percent) to the gated populations (related to Figure 2C and Supplemental Figure 2D).

Gated populations	CS22	
	FL1	FL2
HSC ^{CD49F}	17	83
HSC ^{CD90}	44	56
MPP	40	60
LMPP	45	55
CMP ^{CD123}	60	40
CMP ^{CD135}	60	40
GMP ^{CD123}	54	46
GMP ^{CD135}	53	47
MEP ^{CD123}	60	40
MEP ^{CD135}	61	39
CLP ^{CD10}	80	20
CLP ^{CD7}	65	35
CLP ^{IL7R}	55	45

Supplemental Table 4: Fetal core signature upregulated genes (Fetal signature) (related to Figure 4D).

Fetal signature					
Primitive clusters	Ly clusters		My clusters		All clusters
<i>ANGPT1</i>	<i>AASDHPPT</i>	<i>KLHL9</i>	<i>ALKBH1</i>	<i>IGF2BP3</i>	<i>ANGPT1</i>
<i>ARID3A</i>	<i>ACY3</i>	<i>KNOP1</i>	<i>ANGPT1</i>	<i>IGFBP2</i>	<i>CD7</i>
<i>BAMBI</i>	<i>ADGRG5</i>	<i>KNSTRN</i>	<i>ANKRD46</i>	<i>IL6ST</i>	<i>CHD7</i>
<i>CALCRL</i>	<i>AL590226.1</i>	<i>KPNA2</i>	<i>ARID3B</i>	<i>IPCEF1</i>	<i>CRNDE</i>
<i>CCT8</i>	<i>ANGPT1</i>	<i>LCK</i>	<i>ASPM</i>	<i>ITGA4</i>	<i>CTHRC1</i>
<i>CD200</i>	<i>ANKRD46</i>	<i>LIN28B</i>	<i>AURKA</i>	<i>KIF15</i>	<i>DLK1</i>
<i>CD7</i>	<i>ARID3A</i>	<i>LTB</i>	<i>BACH1</i>	<i>KIF2C</i>	<i>FBLN1</i>
<i>CHD7</i>	<i>ASPM</i>	<i>MAD2L1BP</i>	<i>BAMBI</i>	<i>KNL1</i>	<i>HSPA1A</i>
<i>CLCN3</i>	<i>BACH1</i>	<i>MARCKS</i>	<i>BLM</i>	<i>KPNA2</i>	<i>HSPA1B</i>
<i>CRNDE</i>	<i>BET1</i>	<i>MARCKSL1</i>	<i>BUB1</i>	<i>LAMC1</i>	<i>HSPA6</i>
<i>CSF1R</i>	<i>BRCA2</i>	<i>MED21</i>	<i>BUB1B</i>	<i>LDAH</i>	<i>IGF2BP1</i>
<i>CTHRC1</i>	<i>CD164</i>	<i>MOB4</i>	<i>CA8</i>	<i>LEF1</i>	<i>IGF2BP3</i>
<i>DLK1</i>	<i>CD244</i>	<i>MS4A1</i>	<i>CACNA2D3</i>	<i>LIN28B</i>	<i>ITGA4</i>
<i>FAM43A</i>	<i>CD3D</i>	<i>MT2A</i>	<i>CD200</i>	<i>LTB</i>	<i>LIN28B</i>
<i>FBLN1</i>	<i>CD7</i>	<i>MTERF3</i>	<i>CD300C</i>	<i>MAPK6</i>	<i>TPM2</i>
<i>GNG11</i>	<i>CDK1</i>	<i>MYC</i>	<i>CD7</i>	<i>MARCKS</i>	
<i>GOLM1</i>	<i>CHD7</i>	<i>N4BP2</i>	<i>CDCA2</i>	<i>MCM10</i>	
<i>GSTM3</i>	<i>COMMD10</i>	<i>NOC3L</i>	<i>CDCA8</i>	<i>MDK</i>	
<i>GSTM5</i>	<i>CRNDE</i>	<i>NUP37</i>	<i>CDK1</i>	<i>MEG3</i>	
<i>HMGA2</i>	<i>CTHRC1</i>	<i>PDE3B</i>	<i>CHD7</i>	<i>MIR99AHG</i>	
<i>HSPA1A</i>	<i>CXORF21</i>	<i>PPP1R14A</i>	<i>CHORDC1</i>	<i>NCAPG</i>	
<i>HSPA1B</i>	<i>CYBB</i>	<i>PRKDC</i>	<i>CIP2A</i>	<i>PPAT</i>	
<i>HSPA6</i>	<i>DICER1</i>	<i>PSMB5</i>	<i>CRNDE</i>	<i>PPIL4</i>	
<i>IGF2BP1</i>	<i>DLGAP5</i>	<i>RBM7</i>	<i>CTHRC1</i>	<i>PRKCA</i>	
<i>IGF2BP3</i>	<i>DLK1</i>	<i>RIF1</i>	<i>DHRS9</i>	<i>PRSS21</i>	
<i>IGFBP2</i>	<i>DNMT3B</i>	<i>RIOK2</i>	<i>DIAPH3</i>	<i>PSAT1</i>	
<i>ITGA4</i>	<i>EIF5A</i>	<i>RM11</i>	<i>DICER1</i>	<i>PUDP</i>	
<i>KDM5B</i>	<i>FAM110A</i>	<i>RNF146</i>	<i>DLAT</i>	<i>PWWP2A</i>	
<i>LIN28B</i>	<i>FBLN1</i>	<i>RNF219</i>	<i>DLK1</i>	<i>QPRT</i>	
<i>MARCKSL1</i>	<i>FBXO5</i>	<i>RRAS2</i>	<i>DNAJB1</i>	<i>RAB7B</i>	
<i>MYCN</i>	<i>FKBP4</i>	<i>RSRC2</i>	<i>DNMT3B</i>	<i>RDX</i>	
<i>NEK6</i>	<i>FSCN1</i>	<i>SAMSN1</i>	<i>DSCC1</i>	<i>RNF146</i>	
<i>NRIP1</i>	<i>GMNN</i>	<i>SCN3A</i>	<i>DTL</i>	<i>RNF219</i>	
<i>RGS10</i>	<i>GPR174</i>	<i>SLC39A10</i>	<i>FBLN1</i>	<i>RRM2</i>	
<i>SUPT16H</i>	<i>HACD3</i>	<i>SMARCAD1</i>	<i>FBLN2</i>	<i>SMARCA1</i>	
<i>SUSD3</i>	<i>HEMGN</i>	<i>SS18</i>	<i>FBXO17</i>	<i>SMARCAD1</i>	

<i>TPM2</i>	<i>HIST1H1D</i>	<i>ST18</i>	<i>FBXO5</i>	<i>STIP1</i>	
<i>TRH</i>	<i>HMGA1</i>	<i>SUPT16H</i>	<i>GNG11</i>	<i>SUSD3</i>	
	<i>HMMR</i>	<i>TAF2</i>	<i>GNPDA1</i>	<i>TPM2</i>	
	<i>HSPA1A</i>	<i>TESC</i>	<i>GOLM1</i>	<i>TRH</i>	
	<i>HSPA1B</i>	<i>TPM2</i>	<i>GSTM3</i>	<i>TRIP13</i>	
	<i>HSPA6</i>	<i>TPM4</i>	<i>HACD3</i>	<i>ZBTB16</i>	
	<i>HSPB1</i>	<i>TRMT11</i>	<i>HEATR1</i>	<i>ZGRF1</i>	
	<i>HSPD1</i>	<i>WDHD1</i>	<i>HIST1H1A</i>		
	<i>HSPE1</i>	<i>WDR43</i>	<i>HIST1H1B</i>		
	<i>HSPH1</i>	<i>ZC3H8</i>	<i>HIST1H1D</i>		
	<i>IFI16</i>	<i>ZNF217</i>	<i>HIST1H2BH</i>		
	<i>IGF2BP1</i>	<i>ZNF644</i>	<i>HMGA1</i>		
	<i>IGF2BP2</i>		<i>HMGA2</i>		
	<i>IGF2BP3</i>		<i>HPGDS</i>		
	<i>IPO7</i>		<i>HSPA1A</i>		
	<i>ITGA4</i>		<i>HSPA1B</i>		
	<i>ITM2A</i>		<i>HSPA6</i>		
	<i>KCNQ1OT1</i>		<i>HSPH1</i>		
	<i>KDM5B</i>		<i>IGF2BP1</i>		

Supplemental Table 5: Fetal core signature downregulated genes (Adult signature)(related to Supplemental Figure 5C).

Adult signature							
Primitive clusters		Ly clusters		My clusters			All clusters
<i>ABCA2</i>	<i>PCDH9</i>	<i>ABHD15</i>	<i>KLF10</i>	<i>A1BG</i>	<i>GBP1</i>	<i>RUNX2</i>	<i>AC006480.2</i>
<i>AC002454.1</i>	<i>PKN1</i>	<i>ABTB1</i>	<i>KLF13</i>	<i>A1BG-AS1</i>	<i>GBP2</i>	<i>SI00A10</i>	<i>AC007952.4</i>
<i>AC004130.1</i>	<i>PPP1R15A</i>	<i>AC004687.1</i>	<i>KLF4</i>	<i>AC004069.1</i>	<i>GLI4</i>	<i>SI00A6</i>	<i>AC103591.3</i>
<i>AC006480.2</i>	<i>PRKG2</i>	<i>AC006480.2</i>	<i>KLF6</i>	<i>AC004540.2</i>	<i>GOLGA8B</i>	<i>SARM1</i>	<i>AC114760.2</i>
<i>AC007952.4</i>	<i>PRNP</i>	<i>AC007952.4</i>	<i>KLF7</i>	<i>AC004687.1</i>	<i>GSAP</i>	<i>SCAND1</i>	<i>AC245014.3</i>
<i>AC020916.1</i>	<i>PROM1</i>	<i>AC008429.1</i>	<i>L3MBTL4</i>	<i>AC004865.2</i>	<i>HAGHL</i>	<i>SCD5</i>	<i>AKR1C3</i>
<i>AC026369.3</i>	<i>PRR34-AS1</i>	<i>AC016866.1</i>	<i>LINC00226</i>	<i>AC006480.2</i>	<i>HDAC5</i>	<i>SEPT1</i>	<i>AL731577.1</i>
<i>AC103591.3</i>	<i>PSMB8-AS1</i>	<i>AC087239.1</i>	<i>LINC00623</i>	<i>AC007325.4</i>	<i>HLA-A</i>	<i>SERPINB9</i>	<i>ANAPC2</i>
<i>AC114760.2</i>	<i>PSMB9</i>	<i>AC103591.3</i>	<i>LINC01089</i>	<i>AC007952.4</i>	<i>HLA-B</i>	<i>SERPINE2</i>	<i>ANXA1</i>
<i>AC245014.3</i>	<i>PTGER2</i>	<i>AC114760.2</i>	<i>LITAF</i>	<i>AC020916.1</i>	<i>HLA-C</i>	<i>SH3D21</i>	<i>AP002387.2</i>
<i>AKR1C3</i>	<i>PTGER4</i>	<i>AC245014.3</i>	<i>LPXN</i>	<i>AC044849.1</i>	<i>HLA-DMA</i>	<i>SH3PXD2A</i>	<i>AREG</i>
<i>AL136454.1</i>	<i>PTMS</i>	<i>ACSL1</i>	<i>LRRC26</i>	<i>AC092069.1</i>	<i>HLA-DMB</i>	<i>SLFN11</i>	<i>ARMH1</i>
<i>AL731577.1</i>	<i>RARRES3</i>	<i>ACSM3</i>	<i>LRRK1</i>	<i>AC103591.3</i>	<i>HLA-DPA1</i>	<i>SMIM3</i>	<i>AVP</i>
<i>ANAPC2</i>	<i>RENBP</i>	<i>ACTN1</i>	<i>MAN1A1</i>	<i>AC114760.2</i>	<i>HLA-DPB1</i>	<i>SMIM6</i>	<i>B2M</i>
<i>ANKRD28</i>	<i>RIPOR2</i>	<i>AHNAK</i>	<i>MAP2K2</i>	<i>AC133919.1</i>	<i>HLA-DQB1</i>	<i>SMKR1</i>	<i>CD74</i>
<i>ANXA1</i>	<i>RNF24</i>	<i>AJ009632.2</i>	<i>MAP7</i>	<i>AC245014.3</i>	<i>HLA-DRA</i>	<i>SOCS3</i>	<i>CLEC2B</i>
<i>AP002387.2</i>	<i>SI00A11</i>	<i>AKR1C3</i>	<i>MCUB</i>	<i>AC245297.3</i>	<i>HLA-DRB1</i>	<i>SPATC1L</i>	<i>CRHBP</i>
<i>AREG</i>	<i>SI00A6</i>	<i>AL355075.4</i>	<i>MFSD6</i>	<i>ACTL10</i>	<i>HLA-F</i>	<i>SPRY1</i>	<i>CXCR4</i>
<i>ARMH1</i>	<i>SCAMP5</i>	<i>AL592183.1</i>	<i>MIB2</i>	<i>ACTN1</i>	<i>HOTAIRM1</i>	<i>SQOR</i>	<i>DNTT</i>
<i>ATF3</i>	<i>SCAND1</i>	<i>AL731577.1</i>	<i>MILR1</i>	<i>ADARB1</i>	<i>HOXA10</i>	<i>SRGN</i>	<i>DUSP1</i>
<i>ATP1B1</i>	<i>SCD5</i>	<i>ALDH1A1</i>	<i>MME</i>	<i>ADGRG6</i>	<i>HOXA3</i>	<i>SRSF5</i>	<i>EMP1</i>
<i>ATP2B1-AS1</i>	<i>SCN9A</i>	<i>ANAPC2</i>	<i>MRPL23</i>	<i>AHNAK</i>	<i>HOXA7</i>	<i>STAT4</i>	<i>EPDR1</i>
<i>AVP</i>	<i>SDK2</i>	<i>ANXA1</i>	<i>MSRB3</i>	<i>AIG1</i>	<i>HSBP1L1</i>	<i>STK17B</i>	<i>FAAP20</i>
<i>B2M</i>	<i>SEPT1</i>	<i>ANXA2</i>	<i>MT-ND3</i>	<i>AKR1C3</i>	<i>IDS</i>	<i>SUN2</i>	<i>FAM30A</i>
<i>BTG2</i>	<i>SERPINE2</i>	<i>AP001453.2</i>	<i>MXD4</i>	<i>AL121944.1</i>	<i>IFI27L2</i>	<i>SYNE3</i>	<i>FHL1</i>
<i>C16ORF54</i>	<i>SLC39A3</i>	<i>AP002387.2</i>	<i>MYLK</i>	<i>AL136454.1</i>	<i>IFI44</i>	<i>TAP1</i>	<i>FLT3</i>
<i>C1ORF21</i>	<i>SLC40A1</i>	<i>AREG</i>	<i>MZB1</i>	<i>AL355075.4</i>	<i>IGHM</i>	<i>TCF7</i>	<i>FOS</i>
<i>C22ORF34</i>	<i>SMIM6</i>	<i>ARHGAP45</i>	<i>N4BP2L1</i>	<i>AL731577.1</i>	<i>IGSF10</i>	<i>TGFB1</i>	<i>FOSB</i>
<i>C3ORF80</i>	<i>SOCS2</i>	<i>ARL4C</i>	<i>NBEAL1</i>	<i>ALDH1A1</i>	<i>IL17RC</i>	<i>TMEM102</i>	<i>HLA-A</i>
<i>C9ORF139</i>	<i>SOCS3</i>	<i>ARMH1</i>	<i>NEAT1</i>	<i>ALDH2</i>	<i>IL18</i>	<i>TMEM107</i>	<i>HLA-B</i>
<i>CARD16</i>	<i>SOD2 1</i>	<i>ASB13</i>	<i>NEGR1</i>	<i>ANAPC2</i>	<i>ISG20</i>	<i>TMEM14A</i>	<i>HLA-C</i>
<i>CAT</i>	<i>SPARC</i>	<i>ATP10D</i>	<i>NFIC</i>	<i>ANKH</i>	<i>JAKMIP2</i>	<i>TMEM160</i>	<i>HLA-DMA</i>
<i>CAVIN1</i>	<i>SPNS3</i>	<i>ATP6V0E2</i>	<i>NFKBID</i>	<i>ANKRD28</i>	<i>JAM2</i>	<i>TNFRSF14</i>	<i>HLA-DMB</i>
<i>CBX6</i>	<i>SPPL2B</i>	<i>AVP</i>	<i>NPC2</i>	<i>ANXA1</i>	<i>JUND</i>	<i>TNFSF13B</i>	<i>HLA-DPA1</i>
<i>CD69</i>	<i>SQOR</i>	<i>B2M</i>	<i>NPDC1</i>	<i>ANXA2</i>	<i>KLF10</i>	<i>TNNT3</i>	<i>HLA-DPB1</i>
<i>CD74</i>	<i>STK17B</i>	<i>BAD</i>	<i>NR1H2</i>	<i>ANXA2R</i>	<i>KLF13</i>	<i>TOB1</i>	<i>HLA-DQB1</i>

CD9	SUN2	BLNK	NR4A2	AP002387.2	KLF2	TPD52	HLA-DRA
CDCP1	TGFB1	BLVRA	OPTN	AP002748.3	KLF4	TPGS1	HLA-DRB1
CEBPA	TMEM160	BSPRY	PARP10	AREG	KLF6	TRADD	HLA-F
CLEC2B	TMEM246	BST1	PBXIP1	ARL4A	KLF9	TRBC2	IDS
CLEC9A	TNFAIP3	BTG2	PDE4B	ARMH1	KRT18	TRIM47	IFI44
CLIC2	TNFRSF14	C16ORF86	PHACTR1	ASB13	L3MBTL4	TSC22D3	IGHM
CRHBP	TNFSF13B	C1ORF162	PKN1	ATL1	LGALS3BP	TSPAN13	ISG20
CTSW	TOB1	C1QTNF4	PLK2	ATP10D	LHFPL6	TSTD1	JAM2
CXCR4	TPD52	CAPN2	PNRC1	ATP2B1-AS1	LINC00623	TTC32	KLF10
DNTT	TPGS1	CAST	PPP1R14B	AVP	LINC01637	VAMP2	KLF6
DUSP1	TRBC2	CAVIN2	PPP1R15A	AZU1	LINC02256	VIM	LITAF
EMP1	TSC22D3	CBR3	PRKCH	B2M	LINC02573	WAC-AS1	MRPL23
EMP3	TSPAN13	CCND3	PROM1	BCAS4	LITAF	WDR49	MSRB3
EPDR1	TSPO	CCZ1B	PRR34-AS1	BEX5	LRCH4	Z93241.1	MZB1
EREG	TSTD1	CD69	PSMB8-AS1	BHLHE40	LRRC26	ZBTB20	N4BP2L1
FAAP20	TUBA1A	CD74	PSMB9	BLVRA	LRRK1	ZC3HAV1	NEAT1
FAM30A	VIM	CD9	PTGER2	BSPRY	LTBP3	ZDHHC2	NFIC
FCER1A	YBX3	CDKN2D	PTGER4	BST2	LTC4S	ZFP36	NPC2
FHL1	ZBTB20	CIITA	PTMS	BTN3A3	MAFF	ZNF385C	NPDC1
FLT3	ZBTB7A	CLEC2B	RABL6	C16ORF45	MAP3K8	ZNF395	NR4A2
FOS	ZDHHC2	CLIP4	RARRES3	C16ORF54	MAP7	ZNF90	PKN1
FOSB	ZFP36	CLN8	RBM38	C1ORF21	MARCH9		PPP1R15A
FUT7	ZNF90	COBL	REL	C1QTNF4	MCL1		PROM1
GUCY1B1		CPT1A	RENBP	C21ORF2	MCUB		PRR34-AS1
HLA-A		CRHBP	REPIN1	C22ORF34	MED17		PSMB8-AS1
HLA-B		CRTAP	RETREG1	C3ORF80	MESP1		PSMB9
HLA-C		CSRNP1	RETREG2	C9ORF139	METTL7A		PTGER2
HLA-DMA		CXCR4	RGS1	C9ORF43	MFSD6		PTGER4
HLA-DMB		DACH1	RGS2	CARMIL2	MGLL		PTMS
HLA-DPA1		DDIT4	RHPN1	CAST	MIF		RARRES3
HLA-DPB1		DNTT	RIPOR1	CAT	MLXIP		RENBP
HLA-DQA1		DUOX1	RNF43	CAVIN1	MRPL23		S100A6
HLA-DQB1		DUSP1	RUBCN	CBR1	MSRB3		SCAND1
HLA-DRA		EAF2	RUBCNL	CBR3	MT-ND1		SCD5
HLA-DRB1		EIF4E3	RUNX2	CCDC57	MT-ND3		SEPT1
HLA-F		EMP1	S100A10	CCL28	MT1F		SERPINE2
ID2		ENTPD6	S100A11	CD151	MTURN		SQOR
IDS		EPDR1	S100A6	CD300LF	MVP		STK17B
IER2		FAAP20	SCAND1	CD38	MYCT1		SUN2
IFI27L2		FAM215B	SCD5	CD59	MYO1G		TGFB1
IFI44		FAM30A	SCHIP1	CD74	MZB1		TMEM160
IFI6		FBXW5	SDK2	CDCP1	N4BP2L1		TNFSF13B

<i>IGFBP7</i>		<i>FCMR</i>	<i>SEPT1</i>	<i>CDK14</i>	<i>NAALADL1</i>		<i>TOB1</i>
<i>IGHM</i>		<i>FHL1</i>	<i>SERPINB9</i>	<i>CDKN2C</i>	<i>NBEAL1</i>		<i>TPD52</i>
<i>IL18</i>		<i>FKBP5</i>	<i>SERPINE2</i>	<i>CHST2</i>	<i>NDRG1</i>		<i>TPGS1</i>
<i>IMPA2</i>		<i>FLOT1</i>	<i>SMIM3</i>	<i>CIITA</i>	<i>NEAT1</i>		<i>TSC22D3</i>
<i>IRF2BP2</i>		<i>FLT3</i>	<i>SOD2 1</i>	<i>CITED4</i>	<i>NECTIN1</i>		<i>TSPAN13</i>
<i>ISG20</i>		<i>FOS</i>	<i>SPARC</i>	<i>CLEC12A</i>	<i>NFIA</i>		<i>VIM</i>
<i>JAM2</i>		<i>FOSB</i>	<i>SPATC1L</i>	<i>CLEC2B</i>	<i>NFIC</i>		<i>ZBTB20</i>
<i>JUN</i>		<i>GBP1</i>	<i>SPINK2</i>	<i>CLGN</i>	<i>NFKBIZ</i>		<i>ZFP36</i>
<i>JUNB</i>		<i>GBP2</i>	<i>SPRY1</i>	<i>CLIC2</i>	<i>NPC2</i>		<i>ZNF90</i>
<i>KCNAB2</i>		<i>GSAP</i>	<i>SQOR</i>	<i>CLIP4</i>	<i>NPDC1</i>		
<i>KLF10</i>		<i>H1FX</i>	<i>SRSF5</i>	<i>COG3</i>	<i>NPW</i>		
<i>KLF6</i>		<i>HAGHL</i>	<i>SRSF6</i>	<i>CPT1A</i>	<i>NR4A1</i>		
<i>LAT2</i>		<i>HHIP-AS1</i>	<i>STK17B</i>	<i>CRHBP</i>	<i>NR4A2</i>		
<i>LINC01122</i>		<i>HLA-A</i>	<i>SUN2</i>	<i>CRYL1</i>	<i>NUCB2</i>		
<i>LINC01637</i>		<i>HLA-B</i>	<i>TAP1</i>	<i>CST7</i>	<i>OSBPL10</i>		
<i>LITAF</i>		<i>HLA-C</i>	<i>TESPA1</i>	<i>CTSF</i>	<i>OSM</i>		
<i>LKAAEAR1</i>		<i>HLA-DMA</i>	<i>TGFB1</i>	<i>CTSW</i>	<i>P4HTM</i>		
<i>LRCH4</i>		<i>HLA-DMB</i>	<i>THEMIS2</i>	<i>CXCR4</i>	<i>PARD6A</i>		
<i>MAP3K8</i>		<i>HLA-DOA</i>	<i>TIGD3</i>	<i>CYTH1</i>	<i>PARP10</i>		
<i>MAP4K1</i>		<i>HLA-DPA1</i>	<i>TMEM107</i>	<i>DACH1</i>	<i>PER1</i>		
<i>MCL1</i>		<i>HLA-DPB1</i>	<i>TMEM160</i>	<i>DDO</i>	<i>PHKG1</i>		
<i>MESP1</i>		<i>HLA-DQA1</i>	<i>TMEM220</i>	<i>DGCR6</i>	<i>PIEZO1</i>		
<i>MGLL</i>		<i>HLA-DQB1</i>	<i>TNFRSF21</i>	<i>DNAJC4</i>	<i>PKN1</i>		
<i>MIF</i>		<i>HLA-DRA</i>	<i>TNFSF13B</i>	<i>DNTT</i>	<i>PLXND1</i>		
<i>MRPL23</i>		<i>HLA-DRB1</i>	<i>TNK2</i>	<i>DUSP1</i>	<i>PODXL2</i>		
<i>MSRB3</i>		<i>HLA-E</i>	<i>TOB1</i>	<i>EDARADD</i>	<i>PPP1R15A</i>		
<i>MT-ND2</i>		<i>HLA-F</i>	<i>TP53I13</i>	<i>EIF4E3</i>	<i>PROM1</i>		
<i>MX1</i>		<i>HOXA10</i>	<i>TPD52</i>	<i>ELANE</i>	<i>PRR34-AS1</i>		
<i>MYO5C</i>		<i>HPCAL1</i>	<i>TPGS1</i>	<i>EMP1</i>	<i>PRR7</i>		
<i>MZB1</i>		<i>ID2</i>	<i>TRIM8</i>	<i>EPDR1</i>	<i>PRRG4</i>		
<i>N4BP2L1</i>		<i>IDS</i>	<i>TSC22D3</i>	<i>EREG</i>	<i>PSMB8</i>		
<i>NAALADL1</i>		<i>IER2</i>	<i>TSPAN13</i>	<i>FAAH</i>	<i>PSMB8-AS1</i>		
<i>NEAT1</i>		<i>IFI44</i>	<i>TTC32</i>	<i>FAAP20</i>	<i>PSMB9</i>		
<i>NEGR1</i>		<i>IFI44L</i>	<i>TTPAL</i>	<i>FAM117A</i>	<i>PTGER2</i>		
<i>NFIA</i>		<i>IGHD</i>	<i>UBE2J1</i>	<i>FAM30A</i>	<i>PTGER4</i>		
<i>NFIC</i>		<i>IGHM</i>	<i>UBR5-AS1</i>	<i>FBXW5</i>	<i>PTMS</i>		
<i>NFKBIZ</i>		<i>IL17RC</i>	<i>UCP2</i>	<i>FCER1A</i>	<i>PYROXD2</i>		
<i>NPC2</i>		<i>IMPA2</i>	<i>VAMP2</i>	<i>FHL1</i>	<i>RAB40B</i>		
<i>NPDC1</i>		<i>ISG20</i>	<i>VIM</i>	<i>FKBP5</i>	<i>RARRES3</i>		
<i>NPW</i>		<i>ITM2C</i>	<i>WAC-AS1</i>	<i>FLNA</i>	<i>RENBP</i>		
<i>NR1H2</i>		<i>JAKMIP2</i>	<i>YPEL3</i>	<i>FLT3</i>	<i>RGCC</i>		
<i>NR4A2</i>		<i>JAM2</i>	<i>ZBTB20</i>	<i>FOS</i>	<i>RGS1</i>		

<i>NT5M</i>		<i>JUN</i>	<i>ZFP36</i>	<i>FOSB</i>	<i>RHPN1</i>		
<i>OSM</i>		<i>JUNB</i>	<i>ZNF90</i>	<i>FRY</i>	<i>RNASE2</i>		
<i>PARD6A</i>		<i>JUND</i>		<i>GAS6-AS1</i>	<i>RNF130</i>		