

Table S1. Candidate 5hmC marker genes associated with cell-of-origin and clinical factors.

Cell-of-origin	Stage	LDH	IPI
FCGR3B	COX6A2	CCDC85B	GPR33
FOXD4L5	SAAL1	CLUAP1	RP11-201K10.3
TMEM189-UBE2V1	PNPLA5	GPR33	XRCC6BP1
KLB	WDR53	HIRIP3	HLA-DMA
FAM27E2	KCNK16	LIMK2	OR2AG2
CDKN1C	KRTAP5-1	PPAN-P2RY11	FAAP24
PPP1R15B	STX3	SF3B3	OR2M7
HNF1B	VARS2	TIMM10	KRTAP5-6
RP11-2C24.9	ZNF780A	TSRM	PATL2
PIIB	GMPPA	HBZ	TMEM98
SIM1	CLCNKA	EBPL	C7orf34
ZNF714		MLX	TRAF5
		OR10AD1	WDR53
		ACADVL	ZNF586
		CDV3	PGLYRP1
		CLTB	CLEC11A
		COMMD7	EXTL1
		MSX1	OR14A2
		DEFB128	SLIRP
		OR51E2	SPINK14
		KCNK15	SUPT4H1
		ZNF347	TMEM229B
		GOLGA6D	TMEM110-MUSTN1
		SIRT7	TRIM64
		IFI35	HINT1
		OR10J5	PRPSAP1
		OR51E1	ZNF165
		AC002451.1	CLUAP1
		AC005549.3	RPL3
		TGIF1	TESK1
			IFI27L1
			PCDHA1
			RGP1
			RGPD2

Table S2. Candidate 5hmC marker genes associated with clinical events.

Gene	coef	se	p.value	Final.panel	Weight
GBA2	16.58101577	4.835368979	0.000605562		
DEFB114	5.462832815	1.761051981	0.001921997		
OR5B17	7.498281506	2.435316773	0.002077135	Yes	-616.8557376
OR4F5	6.295426926	2.121317699	0.003000405	Yes	-204.1811451
SLC2A4	-8.259417645	2.855225423	0.003819003	Yes	215.9992279
PSMC1	-13.56757098	4.749550968	0.00428204	Yes	166.0655279
FOXN4	-5.729336881	2.017540266	0.004514701		
ADAR	9.639517649	3.434831136	0.005009812		
GOLGA6B	-5.801113462	2.077849505	0.005240224		
PCBD1	8.014550252	2.88084969	0.005402351		
NOTCH2NL	11.02107381	3.986823472	0.005703201	Yes	486.568811
CSHL1	-11.7350525	4.30159151	0.006370565		
NDUFA2	9.033843164	3.34711914	0.006955014		
KPRP	6.838495606	2.576313819	0.007945615		
NKX6-2	-5.190085771	1.969885275	0.008420802		
TMEM14B	22.4446283	8.551836408	0.008676635	Yes	-700.0771409
OR5AS1	9.37019893	3.571072024	0.00869248	Yes	-155.7998525
GEMIN5	-9.972182361	3.801073206	0.008702696		
CCDC96	7.596740391	2.903739815	0.008891659	Yes	1270.523469
GSTK1	8.587706075	3.314476414	0.009570608		
SENP3-EIF4A1	5.746628801	2.222270744	0.009711764		
RRM2	9.970614358	3.885637467	0.010287359	Yes	312.983027
RRAGA	7.889135434	3.08276099	0.010493946		
IRF2BP2	6.558942595	2.566243702	0.010592775		
SYCE3	-11.80253794	4.630112722	0.010800684		
MT1HL1	6.69623398	2.633642177	0.011003884	Yes	147.683733
HIRIP3	9.551635144	3.780603195	0.011521049		
AL133318.1	6.440140517	2.560815103	0.011907319		
EBF4	-5.548953873	2.236712868	0.013106873		
STK19	-6.187960276	2.497349255	0.013219103		
KLK9	7.445469689	3.021542907	0.01373469		
LDLRAD1	-6.168198325	2.507907132	0.013913058		
RP11-286N22.8	-12.40226723	5.071199628	0.014460016		
TMEM98	-5.575459537	2.313044558	0.015933209		
BCL2L2-PABPN1	-9.081941629	3.775641011	0.0161546		
FAM161A	-5.736601756	2.387883485	0.016288811		
PRG2	7.635331191	3.184684908	0.016506686	Yes	746.7807167
CLRN2	-3.692613355	1.55098501	0.017274234		
FAM209A	7.979877674	3.356107405	0.017420133	Yes	-253.5093072
FAM73A	-5.826168895	2.450703892	0.017437765		
C2orf78	-3.343866593	1.408522957	0.017595431		

DCDC2	-3.597962309	1.520894596	0.017996597		
CYP11A1	-7.592120663	3.209937866	0.018020706		
RPS23	-4.882922709	2.065339628	0.018067951	Yes	-515.7754902
FRAT1	11.39986187	4.831335104	0.018296246		
KRTAP20-3	8.248579786	3.495835997	0.018297398		
IFI16	3.924722434	1.667297238	0.018575466		
RNF212B	-5.300117901	2.258034264	0.018913752		
ZNF582	-7.724914315	3.297193392	0.019135756	Yes	-171.4423481
RP11-108K14.8	-5.714041472	2.441037142	0.019241169		
NHP2	8.092304175	3.467946419	0.019624168	Yes	214.8224221
TP53BP1	-6.878408778	2.947884956	0.01963047		
MMP24-AS1	-6.991244131	3.004319316	0.019961845		
TMEM86B	-5.749422031	2.471494856	0.020002907		
SOWAHB	-5.077960111	2.187843374	0.020287445		
VIM	4.986385904	2.150812633	0.020429059		
ANGEL1	-7.137009699	3.08353227	0.020637215	Yes	329.5263597
ZNF846	-6.123376591	2.65497209	0.021089365		
OR51L1	8.626081854	3.753011862	0.021536619	Yes	-39.15858667
RHNO1	17.08123695	7.437352965	0.0216369		
HIST1H4G	8.728164954	3.815977647	0.022180164		
OR2T1	9.027968445	3.949014739	0.022246545		
FBXO5	4.063570193	1.790551527	0.023240872		
C7orf33	-4.337689304	1.911492951	0.023252049		
PIWIL3	-7.833525494	3.455903629	0.02340805		
AHSP	8.716414934	3.848258825	0.023510946		
GOLGA6D	-3.25782412	1.439741359	0.02364899		
OR2T34	5.877303555	2.598139412	0.02368998		
TCTN2	-4.017409456	1.776674269	0.023747098		
GALNTL5	-4.948853779	2.190992007	0.023900344		
OR9G4	6.833080301	3.027423543	0.024004249		
E2F4	5.191736365	2.300315072	0.024010105		
ID1	7.682406422	3.406413161	0.024115926		
RNF181	9.026433453	4.008343077	0.024327872		
NT5C3B	-7.070293009	3.14328071	0.024491156		
DEFB113	6.773911272	3.016379855	0.024722656		
RP11-1021N1.1	-4.878079977	2.177856767	0.025100439		
MRPL24	9.947360295	4.453150364	0.025497521		
RP3-382I10.7	-5.120883909	2.297616212	0.025828464		
C5orf15	-5.016999932	2.25148596	0.025860109		
MRPL16	5.704324879	2.566338986	0.026232796		
HOXD13	-4.864623929	2.190702215	0.026379595		
CCS	-5.683630334	2.560671121	0.026446869		
AC003002.4	-6.931693918	3.124795095	0.026535236		

ENPP4	3.705800491	1.671098894	0.026583278		
MLH1	-6.964633994	3.14505504	0.026796378		
ADAL	-5.040519586	2.278857253	0.026976146		
RP11-407N17.3	-5.117422287	2.315557713	0.027103971		
ATP6V0A4	-4.601497603	2.086938136	0.027460853		
DUSP23	8.575932492	3.889503987	0.027461741		
RNASE3	6.342764518	2.879141522	0.027594363		
SDCCAG3	4.312711592	1.958043407	0.027625649		
LILRA2	7.364967501	3.359746449	0.028370841		
PMCH	7.338028015	3.350164242	0.028498955		
TSPAN17	4.32262521	1.974742641	0.028600021		
RAP2B	7.782300897	3.565895413	0.029078148		
CTD-2132N18.3	-4.042682496	1.85245708	0.029084795		
VPS16	-6.478808263	2.970292525	0.029168472		
C6orf229	7.301851427	3.349951661	0.029280553		
SMYD5	-6.8995006	3.170510924	0.029544205		
CLLU1OS	6.98510722	3.212760174	0.029691893		
LMO2	3.205931138	1.475053779	0.029747714		
HIST1H2AE	5.265865352	2.42362466	0.029801162	Yes	198.4275331
DGAT1	3.168147226	1.458302095	0.029818697		
SOAT2	-5.872928538	2.707855743	0.030094197		
HIST2H2AA4.dup	18.99809798	8.79691233	0.030801129		
HIST1H2BC	18.99809798	8.79691233	0.030801129		
UBE2W	18.99809798	8.79691233	0.030801129		
TMEM141	18.99809798	8.79691233	0.030801129		
KLK8	18.99809798	8.79691233	0.030801129		
PCDH20	10.97794005	5.083244453	0.030801129		
SPATA2	5.830523931	2.699915689	0.03080979	Yes	711.8483084
MRPS10	-7.186576969	3.340287364	0.031437967		
ITPRIP	3.494109877	1.624794273	0.031516182		
HIST1H2AG	6.368184423	2.963073794	0.031619987	Yes	107.0218765
SVOPL	-4.167494946	1.947242794	0.032338362		
AC131935.1	5.462485115	2.558608255	0.032765592		
RP11-96O20.4	-9.418288786	4.415497968	0.032924139		
TNIP1	3.498734471	1.640366801	0.032933124		
TSRM	-13.17695507	6.182182258	0.03305285	Yes	-257.8392518
KRT31	-6.758491223	3.172072079	0.033120174	Yes	-513.7996564
NSA2	-5.707081585	2.680526729	0.033246848		
THY1	6.885836926	3.237635989	0.033435865		
FHDC1	5.705777999	2.687298285	0.033733783		
GPX3	6.03244691	2.841231714	0.033738755		
RP11-2C24.9	6.91336959	3.257602879	0.033818763		
SLC25A17	-6.070489439	2.864971494	0.03410183		

TPRG1L	-7.118936651	3.361318863	0.034183552		
CFAP73	-7.40265952	3.498218038	0.034334351		
TRIM62	-7.147930696	3.379396511	0.034417161		
C3orf80	5.494697	2.600580632	0.034611626		
C20orf24	9.152927543	4.336891065	0.034816919		
RDH5	20.8231222	9.8912624	0.03527358	Yes	-718.6279484
HSPB1	-4.199344932	1.996321769	0.035418495		
C1QTNF9	6.713871608	3.19344966	0.035519264		
IFI44L	2.611329875	1.242320677	0.035555263		
PHGR1	-2.98926211	1.425656031	0.036014604		
TTC28	-3.63683131	1.737138268	0.036297751		
PDSS1	6.874196659	3.287403078	0.036521607	Yes	-509.9673467
HOXD3	3.559036067	1.703866696	0.036725767		
TAGLN	5.65437756	2.709660427	0.03691095		
TCEA3	-8.115325213	3.899285811	0.037412516		
GOLGA6A	-3.511825306	1.688253205	0.037511483		
FCGR3B	4.533271374	2.182195942	0.037765606		
BIRC5	6.468206209	3.113755616	0.03777383		
TCL1B	-3.79691472	1.827859342	0.037778799		
ZNF556	-3.188589424	1.537925261	0.038143826		
GTSF1L	4.945994144	2.386247743	0.038199488		
AC107021.1	5.741689392	2.771108301	0.038267023		
JPH4	-5.329150354	2.576461628	0.03860253	Yes	-342.3813776
RP11-287D1.3	-4.463845431	2.158346768	0.038623283		
DFNB59	-6.170737867	2.987371726	0.038865542		
RPL8	7.582317912	3.670894216	0.038873504		
FRG2B	-4.719065341	2.286500741	0.039029005		
PCCB	-7.802133838	3.790757765	0.039571035		
TCFL5	5.530354058	2.693977564	0.040086328		
KRT32	-5.674849176	2.764724839	0.040112266		
DNAJC5G	-3.835899718	1.870910141	0.04033659		
SPRYD3	5.635290164	2.752614917	0.04063357		
PFKFB2	6.015589711	2.938463706	0.04063956		
ANO1	-3.777514539	1.84656759	0.040786364		
ERVK3-1	9.062182686	4.43083139	0.040829666		
RP11-176H8.1	-5.179558964	2.534753326	0.04101114		
DLX6	4.860951193	2.378942346	0.041020325		
SPINT1	5.722803079	2.800746928	0.041021447		
TBP	-5.224978144	2.560094877	0.041257641		
SHANK2	-2.36091255	1.157335142	0.041354727		
WNT6	-5.072419941	2.489866179	0.041627407		
IGSF22	-6.559079674	3.219978313	0.041650545		
STARD4	2.837537981	1.397101343	0.042253168		

AOC2	4.641765938	2.286189072	0.042320888		
E2F1	6.256979537	3.085482545	0.042572788		
SFT2D1	6.26376576	3.090853685	0.042708579		
HIST3H2A	6.654784158	3.287265374	0.042927631		
TPST1	-6.632791876	3.282967497	0.043345565		
AL353791.1	4.664164513	2.313965226	0.04383566		
RPF2	-6.22296974	3.088982081	0.043949754		
ABCF2	6.046506926	3.002150175	0.044003362		
ZNF69	-5.044073003	2.505244732	0.044072009		
GBP1	3.72523028	1.852148502	0.044293551		
ARHGDIB	3.302932416	1.643219372	0.044427229		
CBLN3	6.799699846	3.384517705	0.044530749		
C9orf47	5.796800238	2.888772092	0.044785257		
AGO1	-6.337642761	3.17516892	0.045933731		
KRT33A	-5.451571821	2.73472144	0.046210539		
RPL13	7.159104567	3.591570137	0.046227759		
LRRFIP1	5.813960244	2.91716558	0.046259599		
GCSAM	7.273102441	3.65029215	0.046319368		
GATA3	4.842872979	2.432086804	0.046454307		
SERPINC1	-5.802420247	2.914416929	0.046487823		
CYB5A	5.26809177	2.646291765	0.046508942		
GART	-4.160966973	2.093683972	0.046879175		
NF2	-3.833477508	1.929574154	0.046956081		
OR5M3	6.843010025	3.445247218	0.047009188		
PKP2	-3.580007054	1.802637737	0.047035264		
HMGA1	4.547621018	2.290311864	0.047078835		
TAF11	5.077868331	2.559634996	0.047275333		
MICALCL	-5.79083747	2.921720692	0.047479736		
PRB4	-3.933557599	1.984792745	0.047496252	Yes	-336.1885262
GLYATL2	-4.101482369	2.072663458	0.047833316		
AC025263.3	8.483661235	4.287566756	0.047853658		
POPDC2	4.996858319	2.526879556	0.047987196		
IAH1	8.62647414	4.362902739	0.048015328		
CYB5R1	5.843898418	2.957764744	0.04817947		
H2AFY2	-6.092149456	3.087372491	0.048467393		
RP11-507M3.1	-4.099629306	2.081310131	0.048868755		
C4B	-2.836499517	1.44015551	0.048886683		
RP3-468K18.7	6.044039705	3.069957212	0.048979507		
WFDC3	-3.710726706	1.886516656	0.049186361		
FAM43B	5.394724832	2.744002909	0.049297974		
CD1D	5.892911955	3.000279782	0.049516083		
MAFB	5.261265962	2.680874033	0.049702102		
PRMT9	4.839474062	2.46714551	0.049812783		

SETD6

5.128301331 2.614499147 0.049822452 Yes

821.6842827

Table S3. Enriched KEGG pathways in the candidate genes associated with clinical events.

Term	Count	%	PValue	Genes	Fold Enrichment	FDR
hsa05322:Systemic lupus erythematosus	8	0.036140224	7.61E-04	HIST1H2BC, HIST1H2AG, C4B, HIST1H2AE, H2AFY2, HIST3H2A, FCGR3B, HIST1H4G	5.198564141	0.869603473
hsa03010:Ribosome	6	0.027105168	0.018724151	MRPL24, RPL13, MRPL16, RPL8, MRPS10, RPS23	3.841586001	19.50525891
hsa05034:Alcoholism	6	0.027105168	0.049907099	HIST1H2BC, HIST1H2AG, HIST1H2AE, H2AFY2, HIST3H2A, HIST1H4G	2.951727097	44.43906013