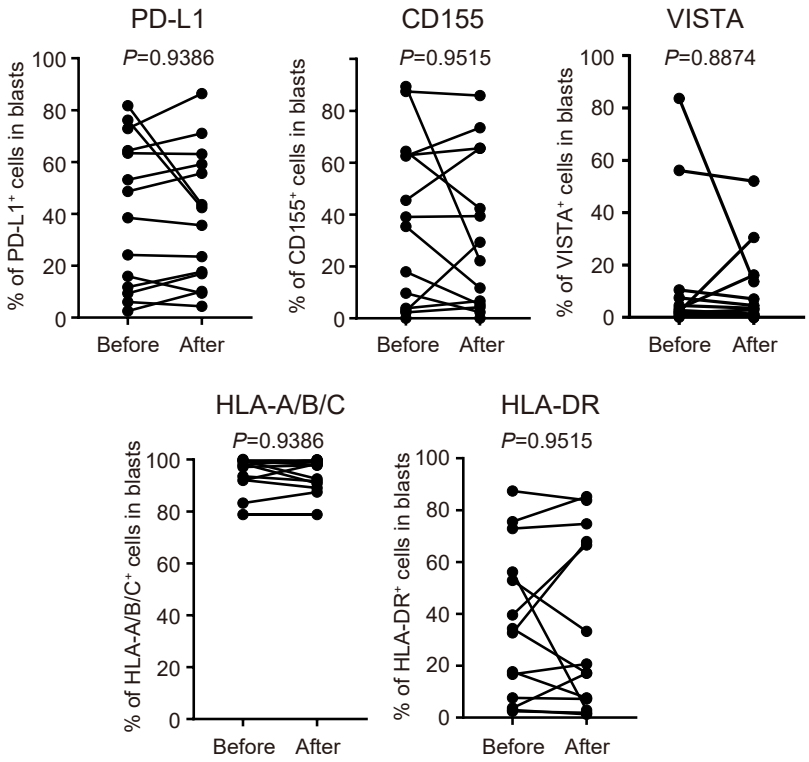

Fig S1. Expression of surface markers on circulating AML blasts before and after decitabine treatment. PBMCs from AML patients (n=14) before and after treatment were analyzed by flow cytometry. The frequencies of PD-L1, CD155, VISTA, HLA-A/B/C and HLA-DR on AML blasts are shown. All *p*-values were calculated using Wilcoxon signed-rank tests and were corrected for the multiple comparison using the Benjamini-Hochberg adjustment.

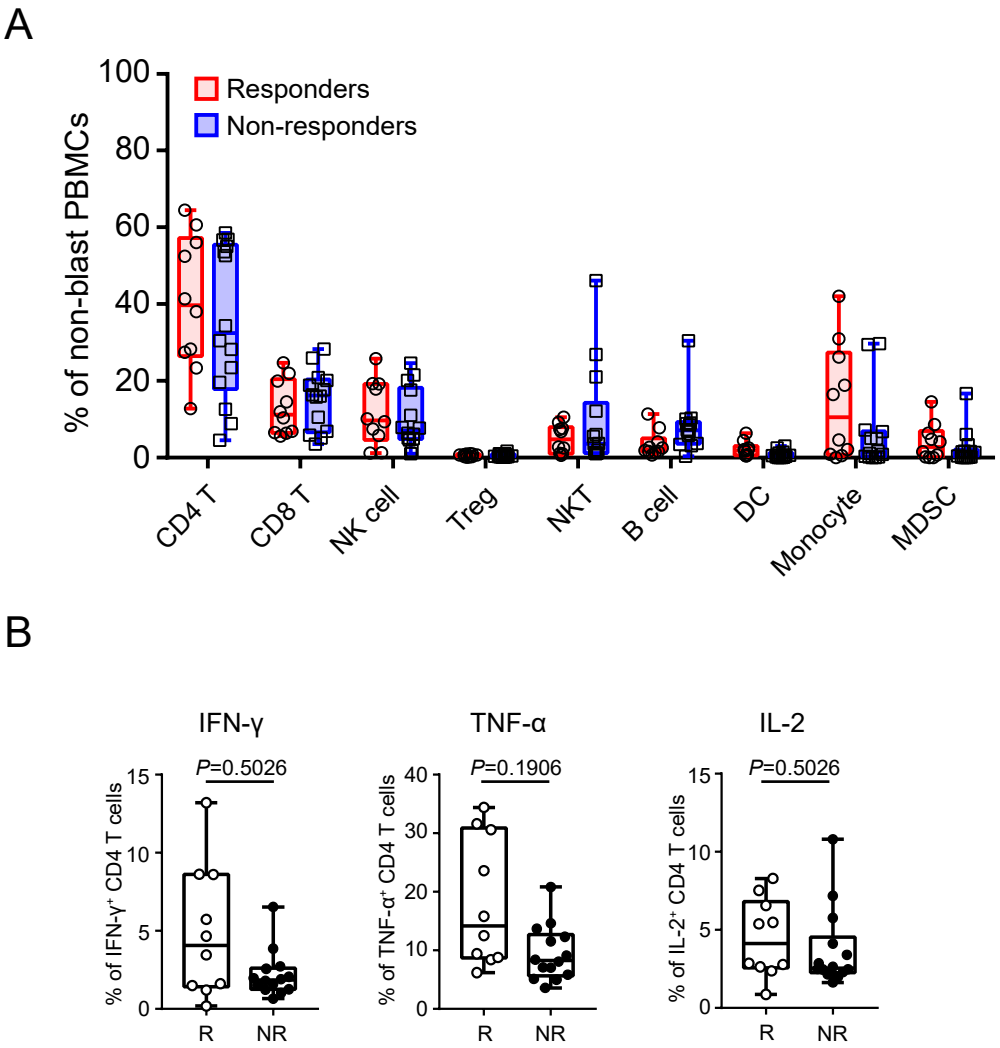

Fig S2. (A) Box-and-whisker plots show the frequency of immune cell subsets in the non-blast PBMCs between responders (circle, red, n=10) and non-responders (square, blue, n=14) of decitabine treatment each circle or square represents the data of an individual patient. (B) Cytokine production of CD4 T cells from responders (n=10) or non-responders (n=14) upon in vitro stimulation with anti-CD3 and anti-CD28 antibodies. All *p*-values were calculated using Wilcoxon-rank sum test and were corrected for the multiple comparison using the Benjamini-Hochberg adjustment. For B, total of 26 immune markers were tested on CD4 T cells and adjusted for multiple comparison. The numbers shown here indicate adjusted *p*-values.

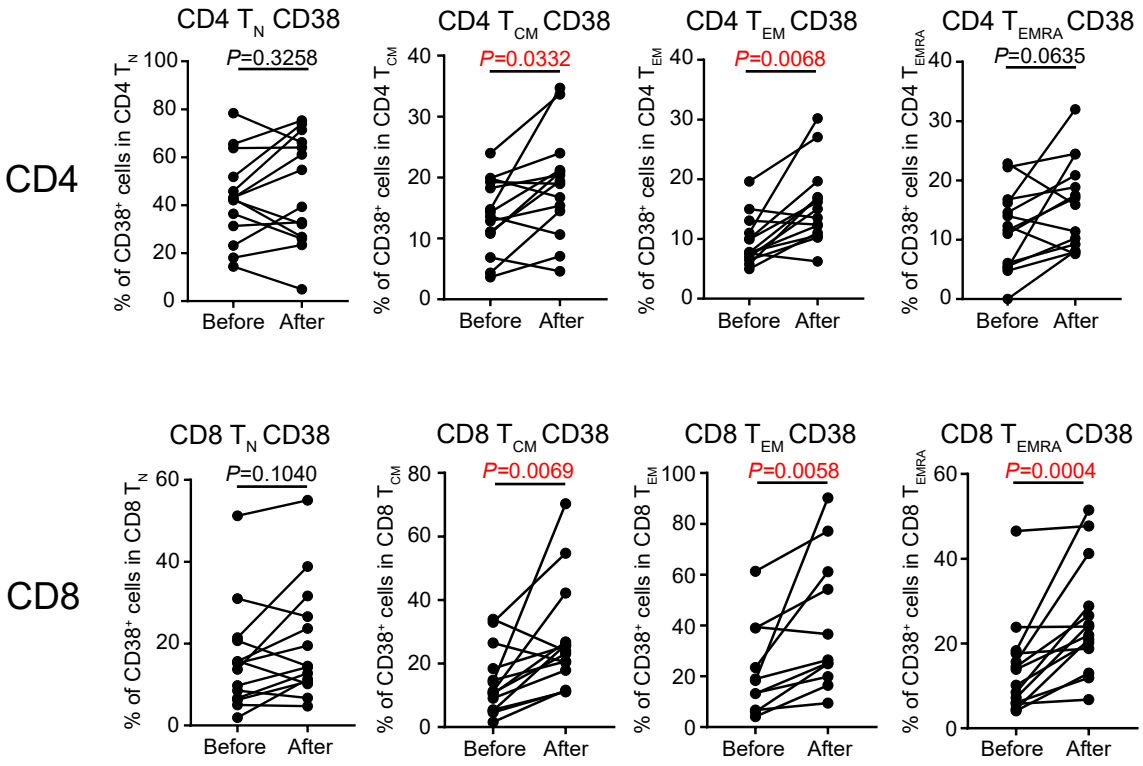

Fig S3. The expression of CD38 on each subpopulation of T cells in patients before and after decitabine treatment. PBMCs from patients (n=14) before and after treatment were analyzed by flow cytometry. The frequencies of CD38+ cells in CD4 or CD8 T cells are shown. All *p*-values were calculated using Wilcoxon signed-rank tests and were corrected for the multiple comparison using the Benjamini-Hochberg adjustment. The numbers shown here indicate adjusted *p*-values.

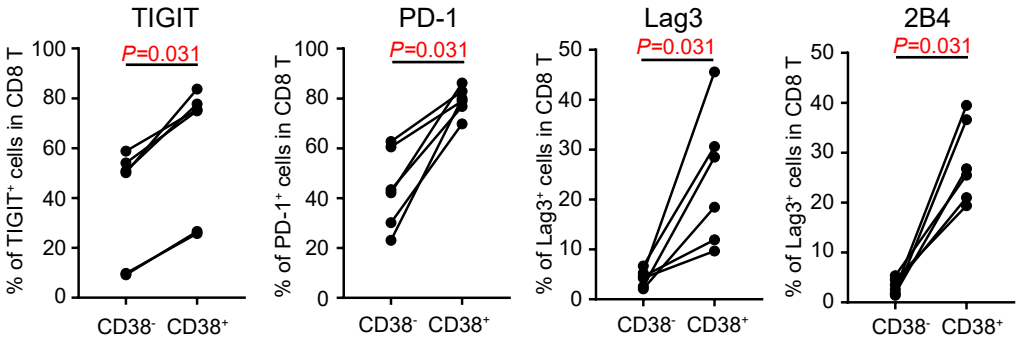

Fig S4. Expression of co-inhibitory molecules on CD38⁺ CD8 T cells. PBMCs from AML patients (n=6) at initial diagnosis were examined by flow cytometry. The frequencies of TIGIT, PD-1, Lag3 and 2B4 on $CD38^{-/+}$ CD8 T cells are shown. All *p*-values were calculated using Wilcoxon signed-rank tests and were corrected for the multiple comparison using the Benjamini-Hochberg adjustment. The numbers shown here indicate adjusted *p*-values.

Table S1. Patients' characteristics.

Patient ID	Age/Sex	Risk stratification	WBC × 10^9/L	PB Blast %	Platelet × 10^9/L	PS	Treatment regimen	Response	Time to response	Comorbidities
1	71/F	adverse	13.1	10.6	32	1	10-day	SD	N/A	Hypertension, Hypothyroid, GERD
2	71/M	adverse	1.39	0.0	57	2	5-day	SD	N/A	Diabetes, Chronic renal failure, Hypertension
3	74/M	intermediate	2.66	24.2	72	1	10-day	PR	N/A	Salivary gland tumor, TIA
4	79/M	adverse	6.04	38.7	165	3	5-day	CR	4 months	Cardiac artery disease, Chronic renal failure, Diabetes, COPD
5	71/F	adverse	5.85	19	42	1	5-day	PR	N/A	Essential thrombocythemia, Renal failure, Hypertension
6	69/F	adverse	6.3	34.1	67	2	10-day	PD	N/A	Hypertension
7	64/M	adverse	5.32	36.8	128	3	5-day	PD	N/A	Renal cell carcinoma s/p nephrectomy, Chronic renal failure
8	78/M	intermediate	12.2	0.0	44	2	5-day	CR	4 months	Coronary artery disease, Diabetes, A-Fib, Aortic stenosis
9	67/F	intermediate	14.73	74.1	31	1	5-day	CR	3 months	Neuroendocrine tumor, Ovarian cancer, Hypertension
10	52/M	adverse	8.64	5.9	10	1	5-day	CRi	4 months	HCV hepatitis, GI bleeding
11	77/F	adverse	2.57	53.8	38	1	5-day	SD	N/A	Hypertension
12	69/F	intermediate	4.36	0.0	110	1	10-day	CR	2 months	Hypertension
13	67/F	intermediate	4.1	0.0	198	1	5-day	N/A	N/A	Cardiomyopathy
14	67/F	adverse	109.96	93.5	155	2	5-day	N/A	N/A	Diastolic heart failure, Morbid obesity

*Risk stratification and response criteria is per the ELN 2017 recommendation.
**Abbreviation: PB, peripheral blood; PS, ECOG performance status; CR, complete remission; CRi, incomplete hematological recovery; PR, partial remission; SD, stable disease; PD, progressive disease; N/A, not available.

Table S2. Patients' molecular genetics.

Patient ID	Karyotype	FISH	Mutations
1	normal	negative	ASXL1, SRSF2, TET2, NRAS, CEBPA (single)
2	N/A	5q-, tri8	TP53
3	46,XY,add(20)(q11.2)[6]/46,XY[14]	negative	IDH2
4	complex	5q-, tri8	N/A
5	complex	negative	N/A
6	47,XX,del(11)(q21q23),+13[20]	negative	BCOR, RUNX1, SRSF2
7	complex	MLL-KMT2A	ASXL1, PTPN11
8	normal	negative	Flt-3 ITD, DNMT3A, NPM-1
9	46,XX,del(11)(p13),add(11)(q13)[20]	MLL-KMT2A	WT-1, CEBPA
10	normal	negative	ASXL1, RUNX1, NRAS
11	normal	negative	Flt-3 ITD, IDH1, STAG2
12	46,XX, t(3;8)(p25;23)[7]/46,XX[13].	negative	SF3B1, WT-1
13	normal	negative	DNMT3A, IDH1, Flt-3 TKD, and NPM-1
14	complex	negative	DNMT3A, RUNX1, TP53

*Abbreviation: N/A, not available.

Table S3. Staining panels for flow cytometry.

Panel 1-5 for T cells, 6-7 for NK cells, 8 for other immune cells and 9 for cell components.

Panel 1			Panel 2			Panel 3			Panel 4			Panel 5		
Antigen	**Clone**	**Company**	**Antigen**	**Clone**	**Company**	**Antigen**	**Clone**	**Company**	**Antigen**	**Clone**	**Company**	**Antigen**	**Clone**	**Company**
CD3	SK7	BD	CD3	SK7	BD	CD3	SK7	BD	CD3	SK7	BD	CD3	SK7	BD
CD4	SK3	BD	CD4	SK3	BD	CD4	SK3	BD	CD4	SK3	BD	CD4	SK3	BD
CD8	SK1	BD	CD8	SK1	BD	CD8	SK1	BD	CD8	SK1	BD	CD8	SK1	BD
CD45RA	HI100	BD	CD45RA	HI100	BD	CD45RA	HI100	BD	CD45RA	HI100	BD	CD45RA	HI100	BD
CCR7	G043H7	BioLegend	CCR7	G043H7	BioLegend	CCR7	G043H7	BioLegend	CCR7	G043H7	BioLegend	CCR7	G043H7	BioLegend
FoxP3	259D/C7	BD	CD160	BY55	BD	ICOS	ISA3	eBioscience	CD19	HIB19	BD	Ki67	B56	BD
CD226	11A8	BioLegend	2B4	C1.7	BioLegend	4-1BB	4B4-1	BD	CD20	2H7	BD	Eomes	WD1928	eBioscience
TIGIT	MBSA43	eBioscience	CTLA4	BNI3	BD	GITR	eBioAITR	eBioscience	CD38	HIT2	BD	T-bet	O4-46	BD
PD-1	EH12.2H7	BioLegend	LAG3	874501	R&D	OX40	ACT35	BD	CD69	FN50	BD	GrzmB	GB11	BD
Tim3	F382E2	BioLegend	BTLA	J168540	BD	CD28	CD28.2	BioLegend				Perforin	dG9	BioLegend

Panel 6			Panel 7		
Antigen	**Clone**	**Company**	**Antigen**	**Clone**	**Company**
CD45	HI30	BD	CD45	HI30	BD
CD3	SK7	BD	CD3	SK7	BD
CD56	NCAM16.2	BD	CD56	NCAM16.2	BD
CD16	3G8	BD	CD16	3G8	BD
KIR-NKAT2	DX27	BD	Tim3	F382E2	BioLegend
CD158	HP-MA4	BioLegend	Ki67	B56	BD
CD57	QA17A04	BioLegend	Eomes	WD1928	eBioscience
NKG2A	131411	R&D	T-bet	O4-46	BD
TIGIT	MBSA43	eBioscience	GrzmB	GB11	BD
PD-1	EH12.2H7	BioLegend	Perforin	dG9	BioLegend
CD160	BY55	BD			

Panel 8		
Antigen	**Clone**	**Company**
CD45	HI30	BD
Linage		
CD3	SK7	BD
CD19	HIB19	BD
CD20	2H7	BD
CD56	NCAM16.2	BD
CD33	P67.6	BioLegend
CD34	581	BD
CD11b	ICRF44	BD
CD14	MΦP9	BD
HLA-ABC	G46-2.6	BD
HLA-DR	G46-6	BD
Vista	730804	R&D
CD155	SKII.4	BioLegend
PD-L1	MIH1	BD

Panel 9		
Antigen	**Clone**	**Company**
CD45	HI30	BD
CD3	SK7	BD
CD4	SK3	BD
CD8	SK1	BD
CD19	HIB19	BD
CD20	2H7	BD
CD56	NCAM16.2	BD
FoxP3	259D/C7	BD
CD14	MΦP9	BD
CD11b	ICRF44	BD
HLA-DR	G46-6	BD

Table S4. Identification of immune cell populations.

Cell populations	Identifiers				
CD4 T	$CD3^+$	$CD4^+$			
CD8 T	$CD3^+$	$CD8^+$			
T_N	$CD3^+$	$CD4/8^+$	$CD45RA^+$	$CCR7^+$	
T_{CM}	$CD3^+$	$CD4/8^+$	$CD45RA^-$	$CCR7^+$	
T_{EM}	$CD3^+$	$CD4/8^+$	$CD45RA^-$	$CCR7^-$	
T_{EMRA}	$CD3^+$	$CD4/8^+$	$CD45RA^+$	$CCR7^-$	
Resting Treg	$CD3^+$	$CD4^+$	$CD45RA^+$	$FoxP3^{low}$	
Activated Treg	$CD3^+$	$CD4^+$	$CD45RA^-$	$FoxP3^{hi}$	
B cell	$CD3^-$	$CD19^+$	$CD20^+$		
NK cell	$CD3^-$	CD56+			
mature NK	$CD3^-$	$CD56^{int}$	$CD16^+$		
immature NK	$CD3^-$	$CD56^{hi}$	$CD16^{dim/-}$		
NKT cell	$CD3^+$	$CD56^+$			
Monocyte	$CD45^+$	Lin^-	$CD11b^+$	$CD14^+$	
MDSCs	$CD45^+$	Lin^-	$CD11b^+$	$CD33^+$	$HLA\text{-}DR^-$
DC	$CD45^+$	Lin^-	$CD14^-$	$HLA\text{-}DR^+$	

Lin: lineage markers CD3, CD19/20 and CD56

Table S5. T cell immune markers tested in Figure 2 and Figure 4

Immune markers
ICOS
CD28
4-1BB
OX40
GITR
CD226
CD69
CD38
TIGIT
PD-1
Tim-3
Lag-3
CTLA-4
CD160
BTLA
2B4
T-bet
Eomes
Ki67
IFN-γ
TNF-α
IL-2
IL-10
TGF-β
Granzyme B
Perforin