

Supplementary Information

Clonotype-Resolved Single-Cell Multi-Omics Unlocks the Profile of Tumor-Infiltrating CD39⁺CD8⁺ T Cells and Enables Adoptive Cell Therapy for Solid Tumor

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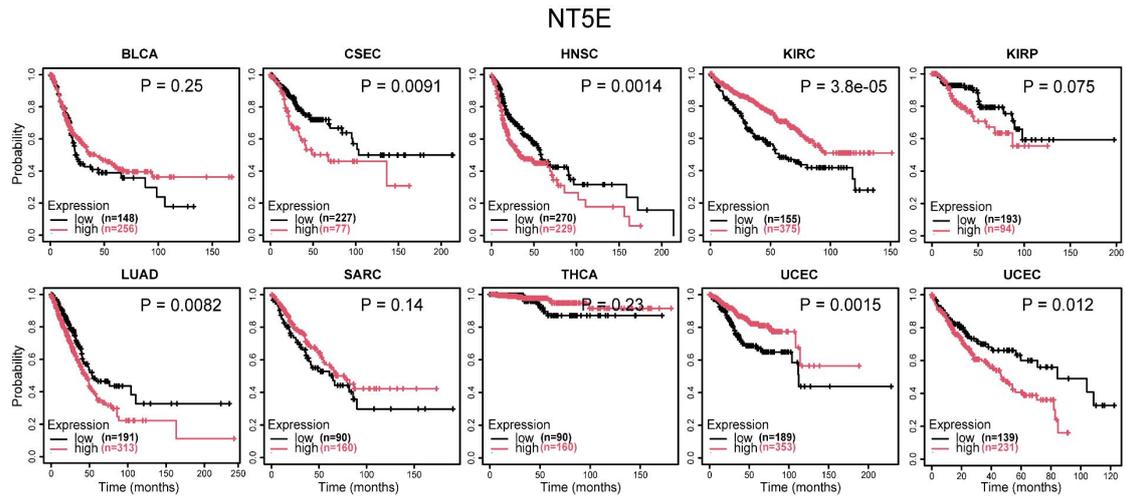


Figure S1. Kaplan-Meier curves for overall survival stratified by NT5E (CD73) expression across various solid tumors in the TCGA database.

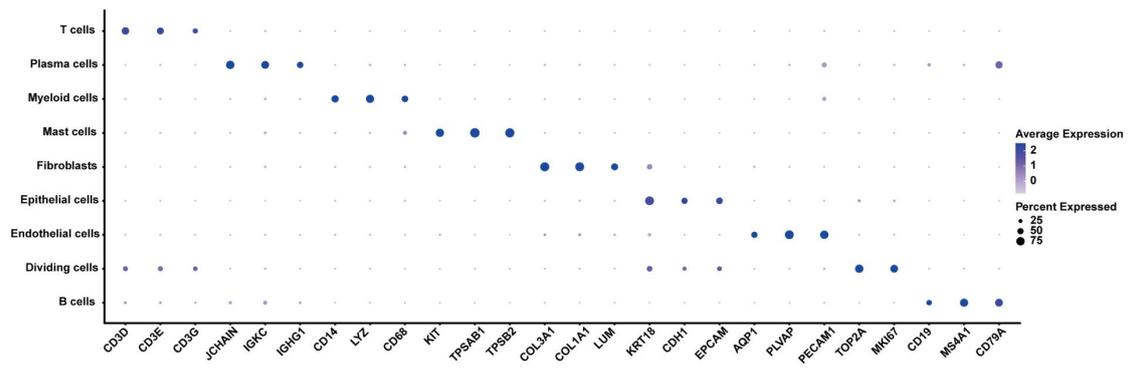


Figure S2. Top marker genes of each cell type in human bladder tissues.

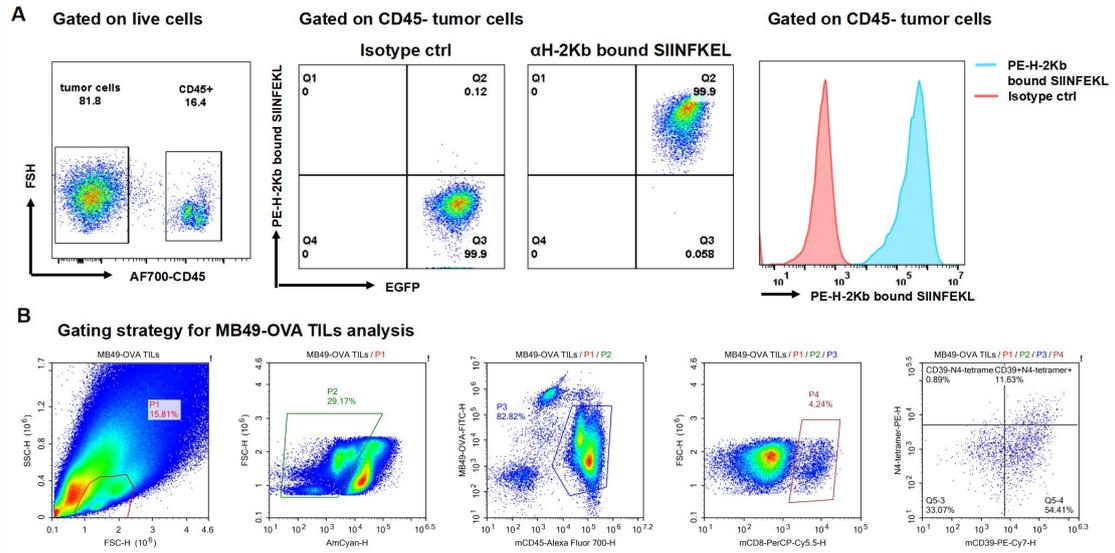


Figure S3. Establishment of MB49-OVA tumor cells and analysis of MB49-OVA TILs. (A) Expression levels of OVA in the MB49-OVA tumor cell. (B) Gating strategy for MB49-OVA CD8⁺TILs analysis.

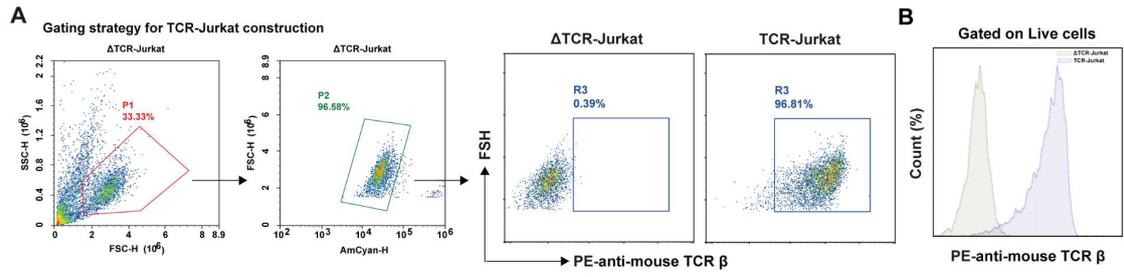


Figure S4. Construction of TCR-Jurkat cell. (A) Gating strategy for TCR-Jurkat construction. (B) Expression of mouse TCR β chain of TCR-Jurkat cell.

Gating strategy

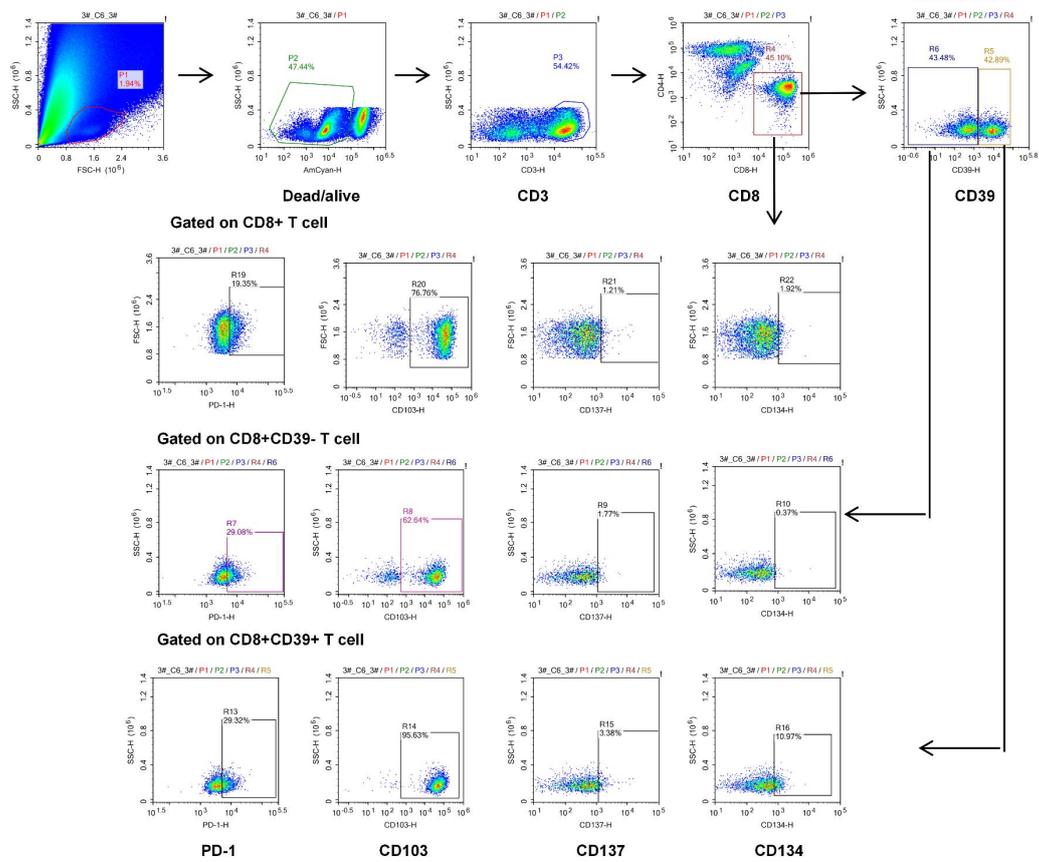


Figure S5. Representative flow cytometric gating strategy for CD39⁺CD8⁺ TILs and CD39⁻CD8⁺ TILs.

Table S1. Clinicopathologic parameters for the NJDT cohort of 82 patients with BLCA.

Parameter		Count	CD8+ TIL high	CD39⁺CD8⁺TIL high
Age	Young (< 67 years)	17 (21%)	6 (35%)	13 (76%)
	Old (≥ 67 years)	65 (79%)	33 (51%)	38 (58%)
Gender	Male	70 (85%)	34 (49%)	40 (57%)
	Female	12 (15%)	8 (67%)	11 (92%)
Grade	High	73 (89%)	39 (53%)	44 (52%)
	Low	5 (6%)	1 (20%)	5 (100%)
	Others	4 (5%)	3 (75%)	2 (50%)
pT stage	$< T2$	15 (18%)	13 (87%)	12 (80%)
	$\geq T2$	66 (81%)	36(55%)	28 (42%)
	Tx	1 (1%)	1 (100%)	1 (100%)

Table S2. Clinicopathologic parameters of 43 BLCA patients for FACS analysis.

Parameter		Count
Age	Young (< 67years)	23 (53%)
	Old (\geq 67years)	20 (47%)
Gender	Male	37 (86%)
	Female	6 (14%)
Grade	High	31 (72%)
	Low	12 (28%)
pT stage	< T2	31 (72%)
	\geq T2	12 (28%)

Table S3. Antibodies information for flow cytometry.

Antibody	Conjugate/Tag	Cat#
anti-human CD3	AF700	300324
anti-human CD4	PB	317429
anti-human CD8	PE	300908
anti-human PD-1	AF-647	329904
anti-human CD39	BV 605	328236
anti-human CD103	APC	350216
anti-human CD134 (OX40)	BV711	350030
anti-human CD137 (4-1BB)	APC/CY7	309830