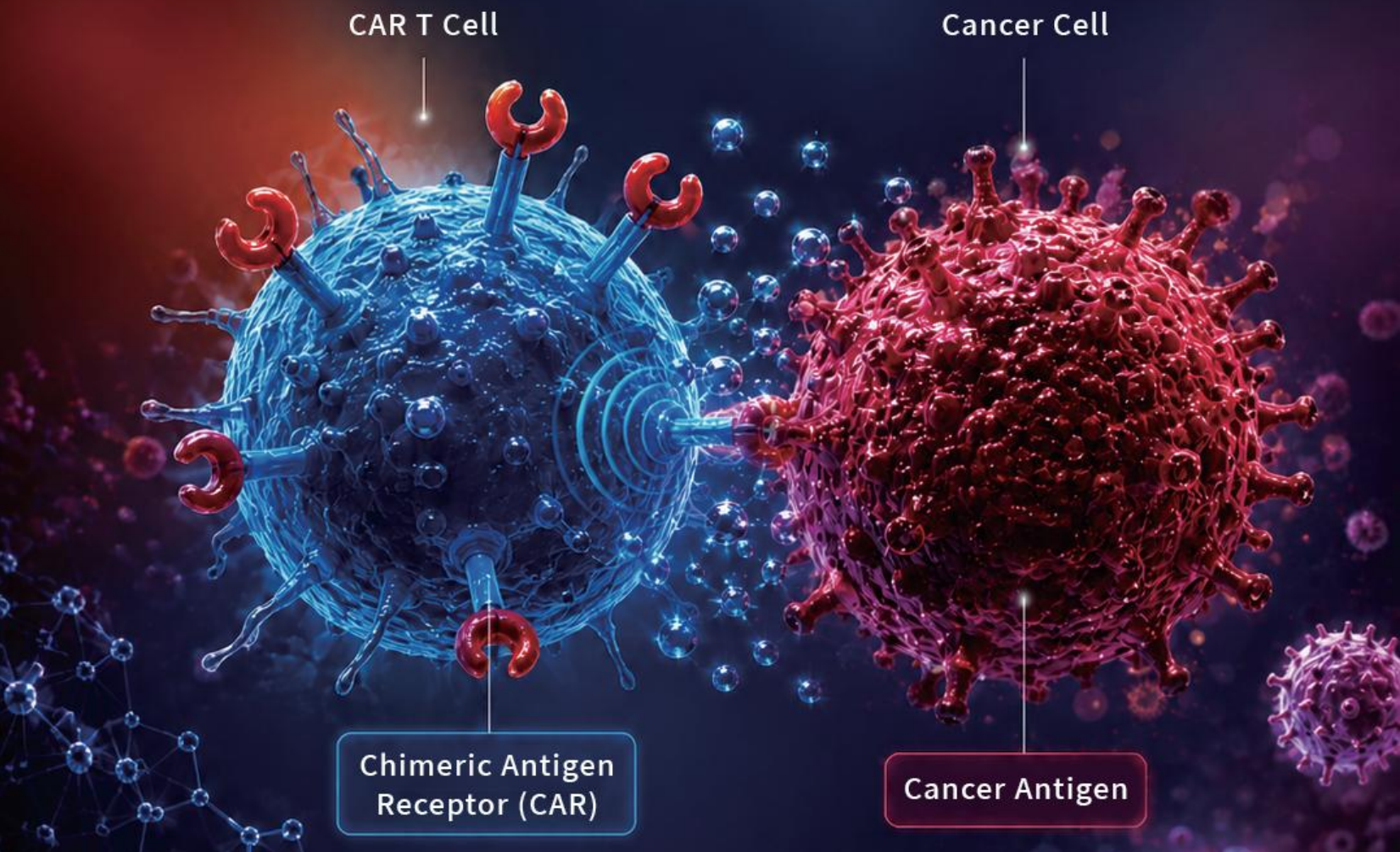
BIOZOL

Elabscience®

Immune Fate with CAR-T Cell Therapy into Programmable Immunity



Elabscience Bionovation Inc.

Elabscience®

Who We Are

Advancing cellular insights through integrated research technologies, Elabscience Bionovation Inc. orchestrates an ecosystem of cell culture technologies, cellular analytics, and functional profiling platforms that accelerate discovery across life science research and biopharmaceutical development. Since 2011, the company has engineered a robust portfolio of research tools enabling precise investigation of cellular mechanisms, biological pathways, and therapeutic paradigm shifts.

Elabscience® stands at the forefront of biotechnology innovation, expertly combining independent design, R&D, manufacturing, and sales to deliver premier reagents and services for cell detection research. Our diverse product portfolio includes advanced solutions for detecting membrane and intracellular proteins (Flow cytometry antibodies), secreted proteins (ELISA kits), cell glycolipid metabolic intermediates and inorganic salts (Metabolism Assays), and comprehensive assessments of cellular function and health (Cell Apoptosis Assay, Cell cycle Assay, Cell Proliferation /Cytotoxicity/Viability).

Validated through ISO 9001, ISO 13485, NMPA, and EU CE certifications, Elabscience technologies extend across 150+ countries and regions, catalyzing cell therapy innovation, biopharmaceutical discovery, next-generation biomedical breakthroughs and the future of human health sciences.

130,000 ft²+
Office space

160,000 ft²+
Lab space

Class 10,000
GMP Clean Workshop

Regulatory & Manufacturing Excellence

Built upon extensive regulatory expertise and development capabilities, Elabscience holds 400+ domestic registrations and production approvals, alongside 110+ CE certifications. With established strengths in quality systems, medical device registration, R&D, and manufacturing infrastructure, Elabscience delivers integrated CDMO capabilities for life science and biomedical innovation.









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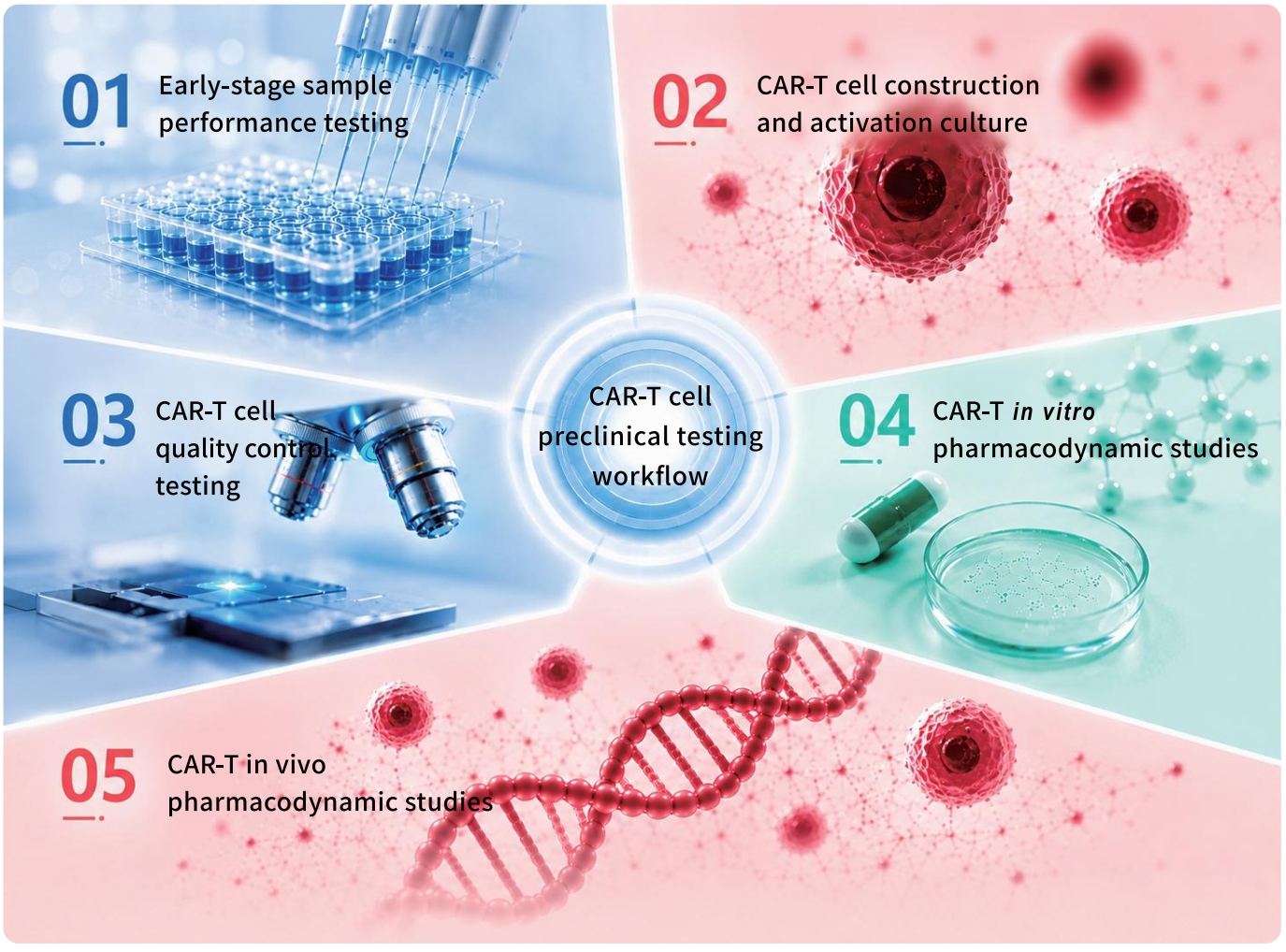
CAR-T Turning T Cells into Tumor Hunters

CAR-T (Chimeric Antigen Receptor T cell) therapy represents a breakthrough in adoptive cellular immunotherapy, in which T cells are endowed with synthetic antigen-recognition capability that enables precise targeting of malignant cells. By integrating tumor-specific recognition with intrinsic T-cell activation signaling, CAR-T cells are capable of selectively identifying and responding to cancer-associated antigens on the surface of tumor cells.

Upon antigen engagement, CAR-T cells initiate potent cytotoxic responses, including the release of Perforin and Granzyme B to eliminate target cells directly. Beyond immediate cytolysis, they orchestrate a broader immune cascade through cytokine secretion, recruiting and activating endogenous immune populations to amplify anti-tumor efficacy. Importantly, a proportion of CAR-T cells persist as memory-like populations, supporting long-term immune surveillance and sustained tumor control.

Clinically, CAR-T therapies have delivered transformative outcomes in hematological malignancies and continue to advance as a promising strategy for solid tumor intervention. Elabscience® provides comprehensive, workflow-integrated solutions supporting CAR-T research from foundational exploration through preclinical development.

End-to-end workflow for CAR-T basic research and preclinical development



Early-Stage Sample Performance Testing

In early-stage CAR-T research, cell collection represents the initial step of the manufacturing workflow. Both basic and preclinical studies may utilize peripheral blood from healthy donors, patient-derived blood samples, organoid-like systems, or animal-derived materials for proof-of-concept validation. To enhance manufacturing success rates and ensure robust process control, donor samples should be systematically evaluated across three key dimensions: donor health status, clinical indication-related information, and physiological changes in blood parameters during collection.

Early-stage sample immunophenotyping analysis

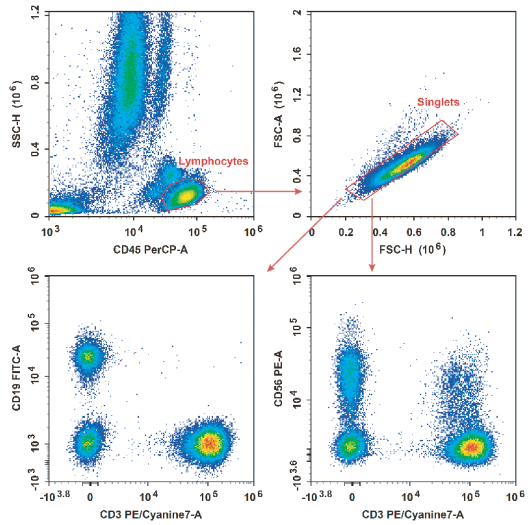


Figure 1. Immunophenotyping analysis of TBNK cell subsets in human peripheral blood. TBNK cell populations in human peripheral blood samples were analyzed using the Anti-Human CD19-FITC/CD56-PE/CD3-PE/Cyanine7/CD45-PerCP Cocktail (E-AB-FC0011).

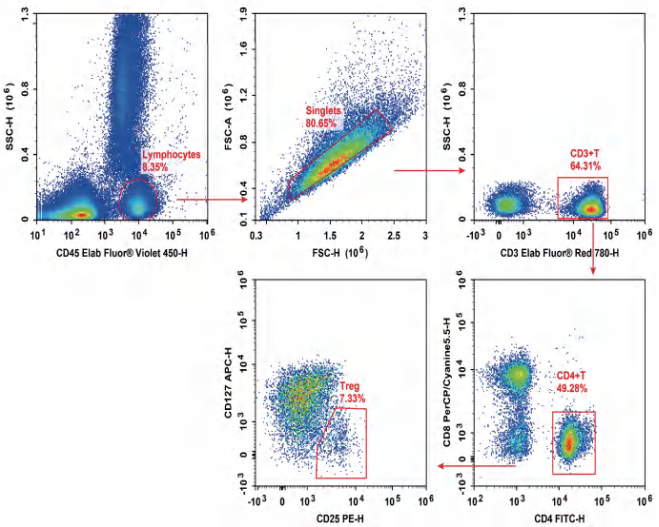


Figure 2. Immunophenotyping analysis of Treg cell subsets in human peripheral blood using Elab Fluor® Violet 450 Anti-Human CD45[HI30], Elab Fluor® Red 780 Anti-Human CD3[OKT3, FITC Anti-Human CD4[RPA-T4], PerCP/Cyanine5.5 Anti-Human CD8a[OKT-8], PE Anti-Human CD25[BC96] and Elab Fluor®647 Anti-Human CD127[A019D5].

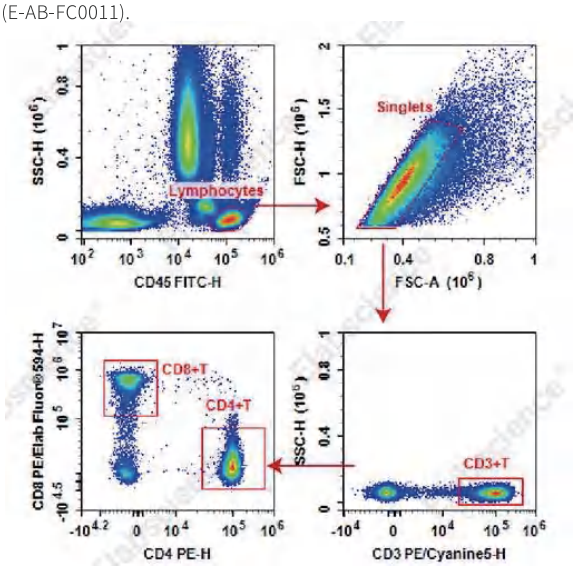


Figure 3. Analysis of CD4/CD8 T cell subset distribution within T cells in human peripheral blood mononuclear cells using Anti-Human CD45-FITC/CD3-PE/Cyanine 5/CD4-PE/CD8-PE/Elab Fluor® 594 Cocktail (E-AB-FC0029) .

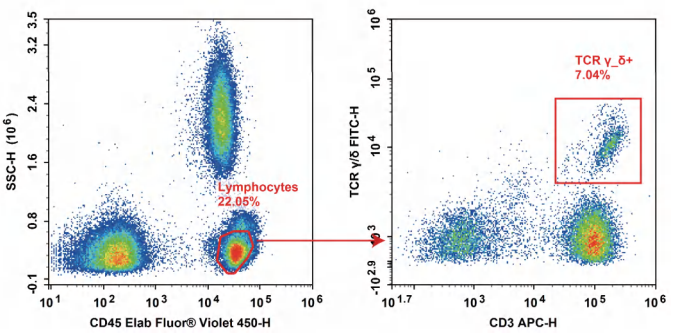
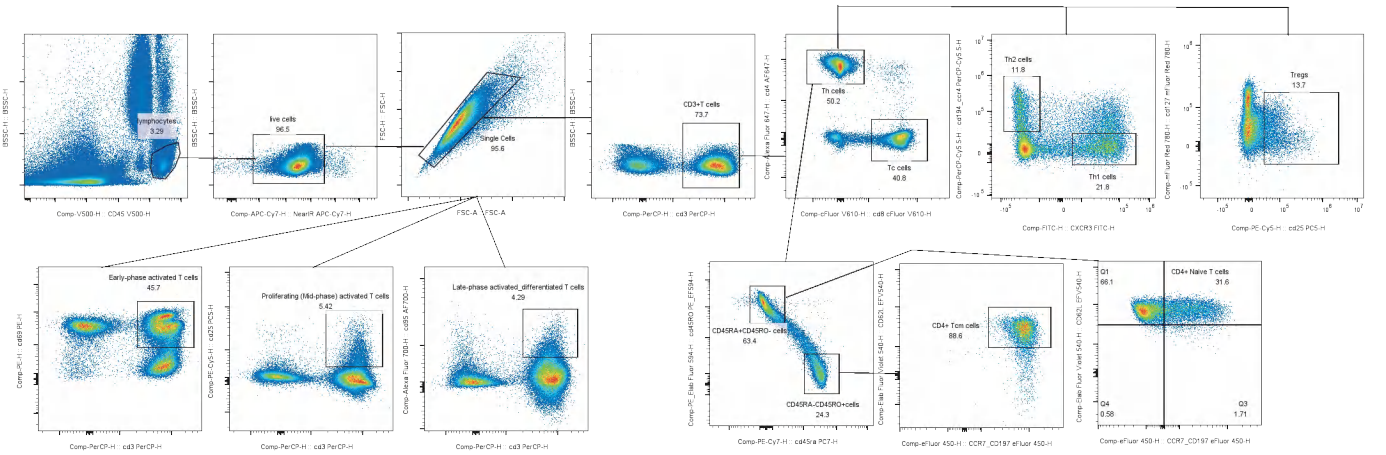
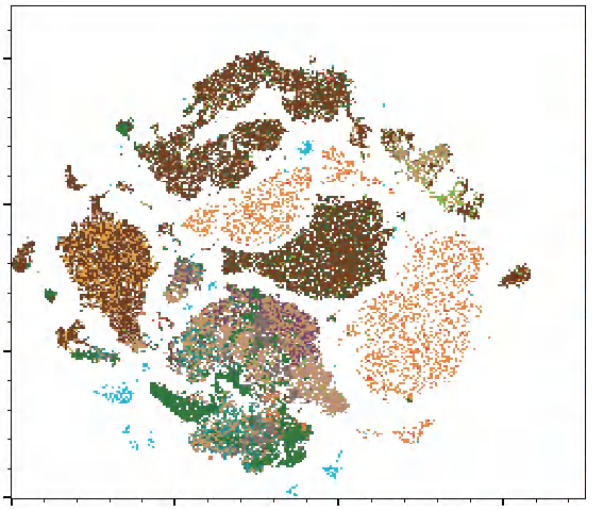


Figure 4. Detection of γδ T cells in human peripheral blood mononuclear cells using Elab Fluor® Violet 450 Anti-Human CD45 (HI30) (E-AB-F1137Q), APC Anti-Human CD3 (OKT-3) (E-AB-F1001E), and FITC Anti-Human TCR γ/δ (B1) (E-AB-F1145C).





	Subset Name	Count
	Proliferating (Mid-phase) activated T cells	4395
	Early-phase activated T cells	36999
	Late-phase activated differentiated T cells	3479
	Function T cells	46959
	CD4+ Tcm cells	6452
	CD4+ Naive T cells	6022
	Tregs	4106
	Th1 cells	6530
	Th2 cells	3526
	Th cells	30002
	Tc cells	24387
	CD3+ T cells	59721
	Single cells	81048
	Live cells	84737
	Lymphocytes	87811

Figure 5. 16-color full-spectrum analysis of T cells in human peripheral blood. T cell subsets in human peripheral blood were analyzed using a spectral flow cytometer (Agilent NovoCyte Opteon VBRY), and data were processed using FlowJo software.

The corresponding flow cytometry antibodies in figure 5 are listed below

Detection parameters	Clone No.	Fluorophore	Catalog No.
CD3	OKT-3	Percp	E-AB-F1001F
CD4	SK3	Elab Fluor® 647	E-AB-F1352M
CD8	OKT-8	Elab Fluor®Violet 610	E-AB-F1110T
CD25	BC96	PE/Cyanine5	E-AB-F1194G
CD28	CD28.2	APC	E-AB-F1195E
CD45	HI30	Elab Fluor® Violet 500	E-AB-F1137R
CD45RA	HI100	PE/Cyanine7	E-AB-F1052H
CD45RO	UCHL1	PE/Elab Fluor® 594	E-AB-F1139P
CD62L	DREG56	Elab Fluor® Violet 540	E-AB-F1051T3
CD69	FN50	PE	E-AB-F1138D
CD95	DX2	Elab Fluor®700	E-AB-F1168M1
CD127	A019D5	Elab Fluor® Red 780	E-AB-F1152S
CD183/CXCR3	G025H7	FITC	E-AB-F1156C
CD194/CCR4	L291H4	PerCP/Cyanine5.5	E-AB-F1366J
CD197/CCR7	G043H7	Elab Fluor® Violet 450	E-AB-F1159Q
Live/Dead	/	STYX™ Near-IR	E-CK-A168

FC receptor blocking and dead cell exclusion

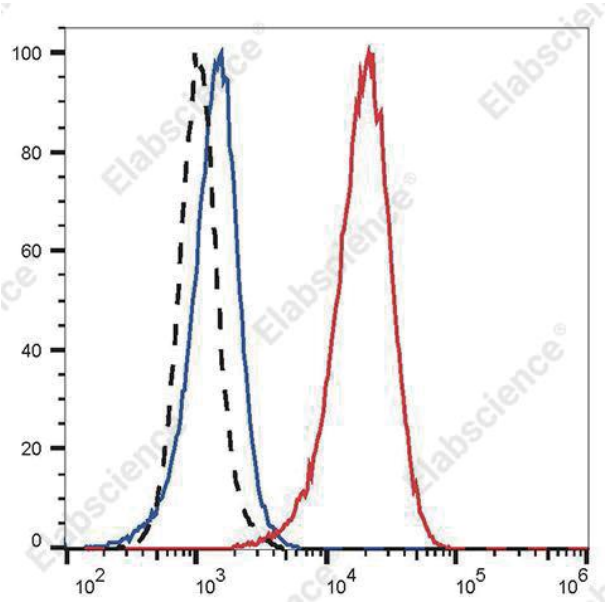


Figure 6. THP-1 cells treated with EasyStainTM Human Fc Receptor Blocking Solution (E-CK-A171) (blue) or untreated (red), stained with PE Rat IgG2b, κ Isotype Control [LTF-2] (E-AB-F09842D). The black histogram represents unstained cells.

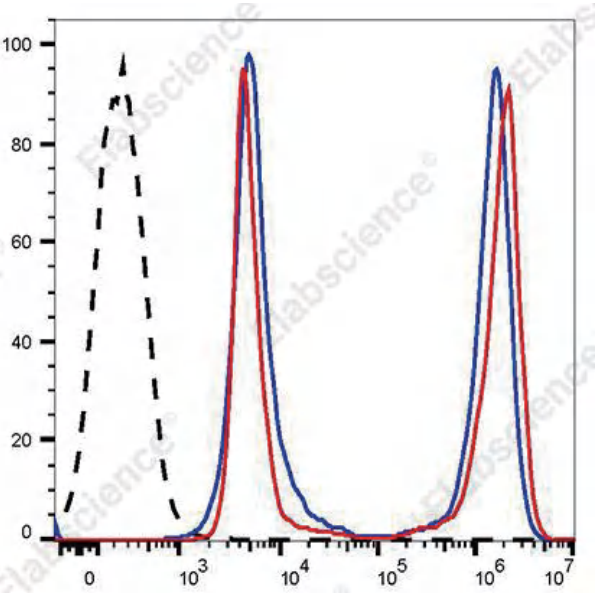


Figure 7. Heat-inactivated (1:1 mixed with viable cells) C57BL/6 mouse splenocytes stained with STYX™ Violet Fixable Viability Dye (E-CK-A167) and subsequently fixed and permeabilized using the Intracellular Fixation/ Permeabilization Buffer Kit (E-CK-A109). Samples were analyzed before fixation (blue) and after fixation (red). Unstained cells are shown in black.

Early-stage sample testing related product list

Product	Catalog No.	Application
Anti-Human CD45-FITC/CD3-PE/Cyanine5/CD56/NCAM-PE/CD19-PE/Elab Fluor® 594 Cocktail	E-AB-FC0028	Early-stage sample immunophenotyping analysis with antibody cocktails
Anti-Human CD45-FITC/CD3-PE/Cyanine5/CD4-PE/CD8-PE/Elab Fluor® 594 Cocktail	E-AB-FC0029	
Anti-Human CD3-FITC/CD19-PE Cocktail	E-AB-FC0004	
Anti-Human CD3-FITC/CD16+CD56-PE Cocktail	E-AB-FC0001	
Anti-Human CD3-APC/CD4-FITC/CD8a-PE Cocktail	E-AB-FC0008	
Anti-Human CD3-FITC/CD4-PE/CD45-PerCP-Cyanine5.5 Cocktail	E-AB-FC0003	
Anti-Human CD19-FITC/CD56-PE/CD3-PE/Cyanine7/CD45-PerCP Cocktail	E-AB-FC0011	
EasyStain™ Human Fc Receptor Blocking Solution	E-CK-A171	Relevant reagents
STYX™ Violet Fixable Viability Kit	E-CK-A167	
STYX™ Green Fixable Viability Kit	E-CK-A166	
STYX™ Yellow Fixable Viability Kit	E-CK-A169	
STYX™ Red Fixable Viability Kit	E-CK-A170	
STYX™ Near-IR Fixable Viability Kit	E-CK-A168	
PI Reagent (50μg/mL)	E-CK-A161	
DAPI Reagent (25μg/mL)	E-CK-A163	
7-AAD Reagent (100μg/mL)	E-CK-A162	
10×ACK Lysis Buffer	E-CK-A105	
10× RBC Lysis/Fixation Solution	E-CK-A106	
Cell Staining Buffer	E-CK-A107	

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CAR-T cell Isolation and Activation Culture

CAR-T manufacturing involves PBMC isolation, T cell selection/activation, transduction, expansion, and final formulation, with systematic development of critical parameters (culture systems, transduction, expansion kinetics, and cryopreservation). For thawed PBMCs or T cells with known pathogen positivity, extra validation is required to ensure safety. The final CD4/CD8 ratio is a key quality attribute, and products enriched with CD27+CD8+ memory-like or CCR7+CD27+CD45RA− central memory/stem-cell-like T cells are generally linked to better clinical outcomes.

PBMC isolation, cryopreservation, and analysis

Elabscience® provides a sterile, dedicated separation medium for human peripheral blood mononuclear cell (PBMC) isolation. This medical-grade density gradient medium features low endotoxin levels (<0.12 EU) and enables the recovery of cells suitable for downstream sterile culture and expansion.

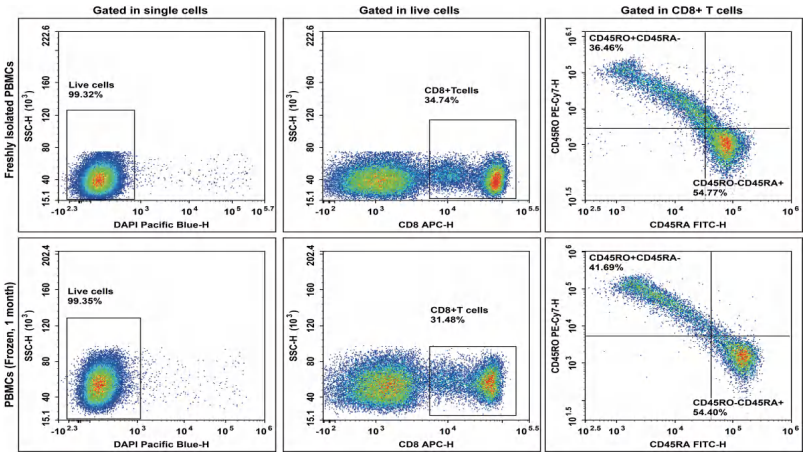
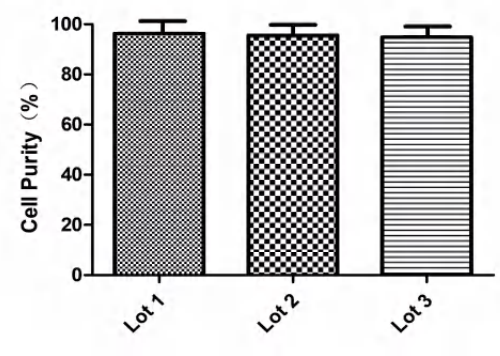


Figure 8. Human peripheral blood PBMCs isolated using Human PBMC Separation Solution (P 1.077) (E-CK-A103). The proportion of Pan naive T cells was compared between freshly isolated PBMC samples and PBMC samples cryopreserved in liquid nitrogen for one month.

Procell® provides a serum-free, programmed cryopreservation medium for immune cells (PB180440)

Inter-Assay Statistics

Analysis of cryopreservation outcomes from PBMC samples collected at different time points and from different donors indicates stable inter-batch performance after freezing. The mean cell viability exceeds 90%, with a coefficient of variation (CV) of target cell viability below 5%, demonstrating robust batch-to-batch consistency.



Lot	1	2	3
Number of Sample	n=3	n=3	n=3
Mean (Cell Viability)	92.75%	93.03%	92.61%
SD	2.70%	1.31%	1.82%
CV (%)	2.91%	1.41%	1.97%

T cell isolation

Isolation of human naïve T cells

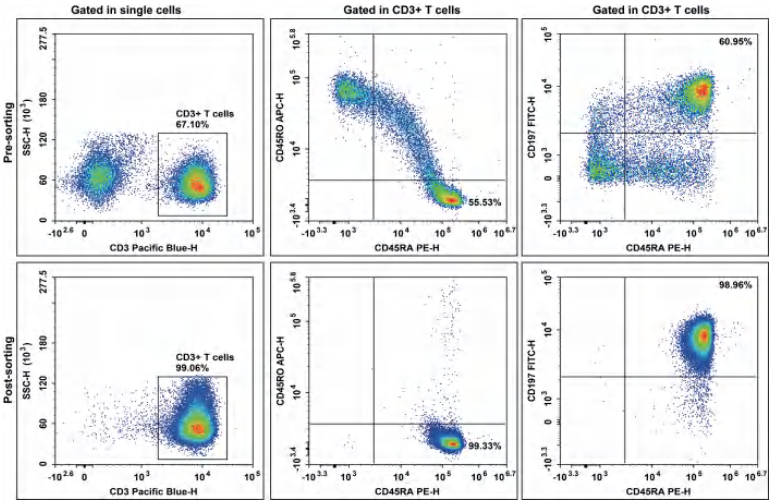
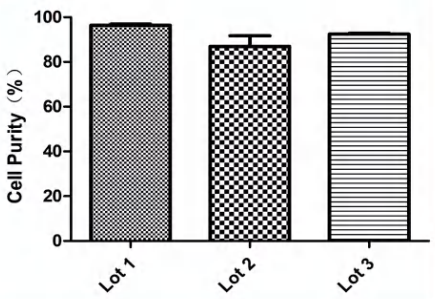


Figure 9. As shown in the left panel, the purity of human Naïve T cells (CD3+CD45RA+CD45RO−CD197+) in peripheral blood mononuclear cell (PBMC) samples from healthy donors was 22.71% before sorting and increased to 97.37% after sorting.

Inter-Assay Statistics

Based on PBMC samples collected from different time points and donors, analysis of sorting performance demonstrates stable inter-batch consistency of the EasySort™ Human Naïve Pan T Cell Isolation Kit. The coefficient of variation (CV) of the purified target cell population purity is below 10%, indicating robust and reproducible performance across batches.



Lot	1	2	3
Number of Sample	n=3	n=3	n=3
Mean (Cell Viability)	96.36%	86.93%	92.47%
SD	1.05%	8.28%	0.75%
CV (%)	1.09%	9.53%	0.81%

Intra-Assay Statistics

Based on repeated sorting experiments performed on PBMC samples from six different donors collected at different time points, the EasySort™ Human Naïve Pan T Cell Isolation Kit demonstrates robust intra-batch reproducibility. The coefficient of variation (CV) of the purified target cell population purity is below 3%, indicating excellent consistency across replicate runs.

Sample	1	2	3	4	5	6
Cell Purity (%)	95.29%	96.18%	94.62%	92.30%	95.41%	96.71%
Mean (Cell Viability)	95.09%					
SD	1.55%					
CV (%)	1.63%					

Stability Statistics

Based on PBMC samples from the same time point and identical donor sources, the stability of the EasySort™ Human Naïve Pan T Cell Isolation Kit was evaluated through sorting performance analysis. The kit demonstrated robust stability under simulated shipping conditions (7, 14, and 30 days) as well as accelerated aging conditions at 37°C for 14 days. The coefficient of variation (CV) of the purified target cell population purity was below 3%, indicating excellent reagent stability.

Groups	Positive control	7-day simulated transport	14-day simulated transport	30-day simulated transport	14-day accelerated thermal stress
Averyge Cell Purity (%)	91.41%	93.00%	93.14%	92.67%	93.71%
Mean (Cell Viability)	92.79%				
SD	0.86%				
CV (%)	0.92%				

Isolation of human naïve CD4+ T cells

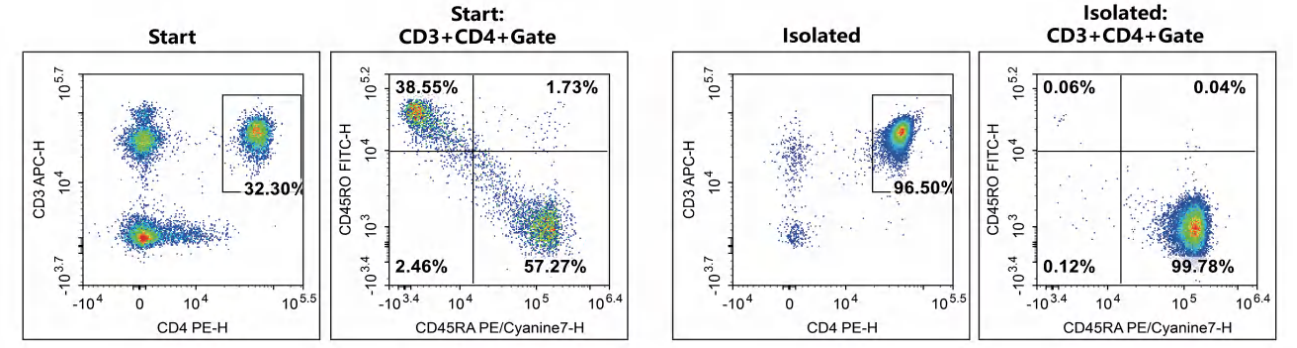
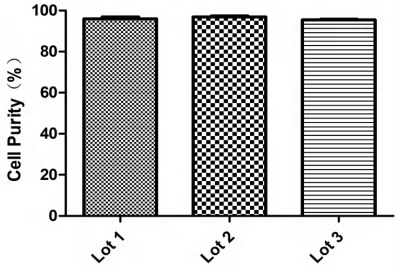


Figure 10. As shown, the purity of human naïve CD4+ T cells before and after sorting was analyzed using APC Anti-Human CD3 (OKT-3) (E-AB-F1001E), PE Anti-Human CD4 (RPA-T4) (E-AB-F1109D), FITC Anti-Human CD45RO (UCHL1) (E-AB-F1139C), and PE/Cyanine7 Anti-Human CD45RA [HI00].Naïve CD4+ T cell purity was assessed before and after sorting, showing an increase from 18.49% to 96.28%.

Inter-Assay Statistics

Based on PBMC samples collected from different time points and different donors, inter-batch performance analysis demonstrates stable consistency of the EasySort™ Human Naïve CD4+ T Cell Isolation Kit. The coefficient of variation (CV) of the purified target cell population purity is below 3%, indicating excellent batch-to-batch reproducibility.



Lot	1	2	3
Number of Sample	n=3	n=3	n=3
Mean (Cell Viability)	95.95%	96.89%	95.47%
SD	1.62%	0.88%	0.50%
CV (%)	1.69%	0.90%	0.52%

Intra-Assay Statistics

Based on repeated sorting experiments performed on PBMC samples from six different donors collected at different time points, the EasySort™ Human Naïve CD4+ T Cell Isolation Kit demonstrates strong intra-batch reproducibility. The coefficient of variation (CV) of the purified target cell population purity is below 3%, indicating excellent consistency across replicate sorting runs.

Sample	1	2	3	4	5	6
Cell Purity (%)	93.83%	93.96%	93.94%	96.38%	95.47%	96.75%
Mean (Cell Viability)	95.06%					
SD	1.32%					
CV (%)	1.39%					

Stability Statistics

Based on PBMC samples from the same time point and identical donor sources, stability evaluation of the EasySort™ Human Naïve CD4+ T Cell Isolation Kit demonstrates robust performance consistency. The kit maintained stable functionality under simulated shipping conditions (7, 14, and 30 days) as well as accelerated stress testing at 37°C for 14 days. The coefficient of variation (CV) of the purified target cell population purity was below 3%, indicating strong reagent stability and reproducibility.

Groups	Positive control	7-day simulated transport	14-day simulated transport	30-day simulated transport	14-day accelerated thermal stress
Averyge Cell Purity (%)	89.60%	93.59%	89.13%	89.83%	92.94%
Mean (Cell Viability)	91.02%				
SD	2.08%				
CV (%)	2.28%				

Isolation of human naïve CD8+ T cells

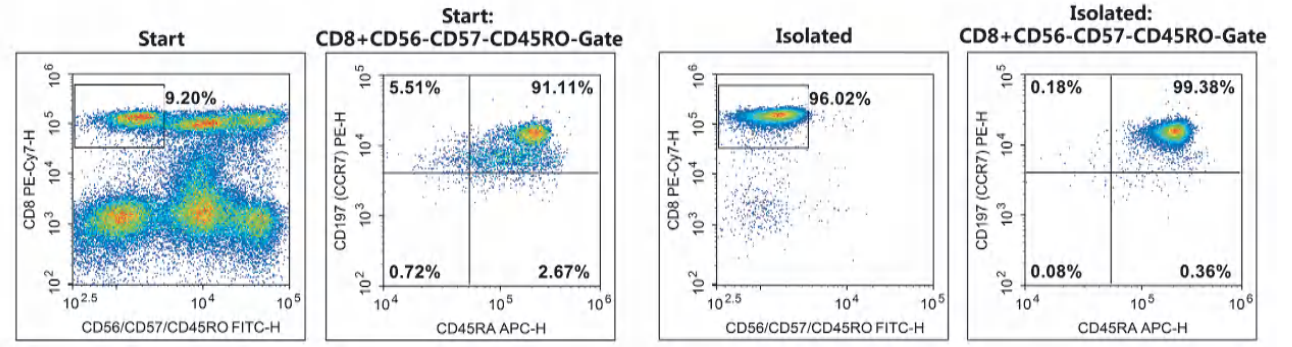
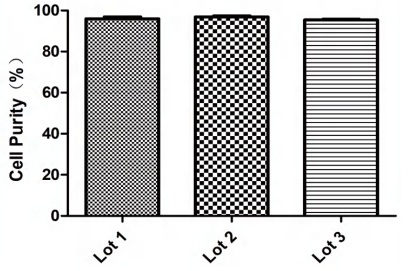


Figure 11. As shown in the panel, human peripheral blood PBMCs were processed using the EasySort™ Human Naïve CD8+ T Cell Isolation Kit to isolate CD3+ T cells. Flow cytometric analysis was performed using PE/Cyanine7 Anti-Human CD8a (OKT-8) (E-AB-F1110H), FITC Anti-Human CD56 (MY31) (E-AB-F1270C), FITC Anti-Human CD57 (HNK-1) (E-AB-F1067C), FITC Anti-Human CD45RO (UCHL1) (E-AB-F1139C), APC Anti-Human CD45RA (HI100) (E-AB-F1052E), and PE Anti-Human CD197 (G043H7) (E-AB-F1159D). Naïve CD8+ T cell purity was assessed before and after sorting, showing an increase from 8.4% to 95.4%.

Inter-Assay Statistics

Based on PBMC samples collected from different time points and multiple donor sources, performance analysis demonstrates stable batch-to-batch consistency of the EasySort™ Human Naïve CD8+ T Cell Isolation Kit. The coefficient of variation (CV) of the purified target cell population purity is below 10%, indicating reliable and reproducible performance across different production batches.



Lot	1	2	3
Number of Sample	n=3	n=3	n=3
Mean (Cell Viability)	87.63%	86.67%	89.20%
SD	4.47%	5.65%	4.60%
CV (%)	5.10%	6.51%	5.15%

Intra-Assay Statistics

Based on repeated sorting experiments performed on PBMC samples from six different donors collected at different time points, the EasySort™ Human Naïve CD8+ T Cell Isolation Kit demonstrates strong intra-batch reproducibility. The coefficient of variation (CV) of the purified target cell population purity is below 3%, indicating excellent consistency across replicate sorting runs.

Sample	1	2	3	4	5	6
Cell Purity (%)	94.75%	95.83%	93.74%	93.36%	96.25%	97.23%
Mean (Cell Viability)	95.19%					
SD	1.51%					
CV (%)	1.58%					

Stability Statistics

Based on PBMC samples from the same time point and identical donor sources, stability assessment of the EasySort™ Human Naïve CD8+ T Cell Isolation Kit demonstrates robust performance consistency. The kit was evaluated under simulated transport conditions (7, 14, and 30 days) as well as accelerated stress conditions at 37°C for 14 days. The coefficient of variation (CV) of the purified target cell population purity was below 3%, indicating strong reagent stability and high reproducibility across conditions.

Groups	Positive control	7-day simulated transport	14-day simulated transport	30-day simulated transport	14-day accelerated thermal stress
Averyge Cell Purity (%)	92.72%	96.25%	97.23%	97.23%	92.80%
Mean (Cell Viability)	95.25%				
SD	2.30%				
CV (%)	2.42%				

Isolation of human CD3+ T cells

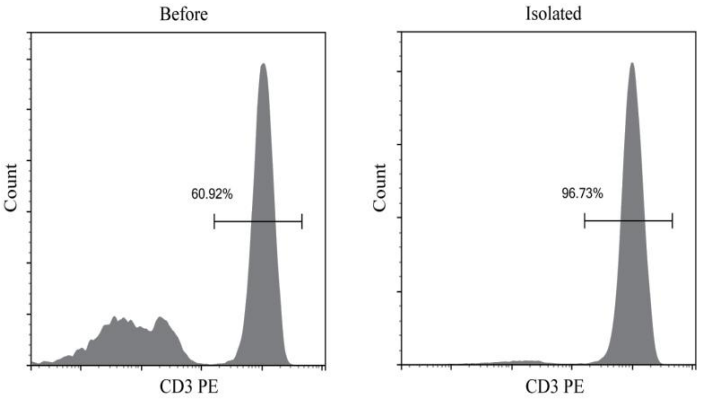
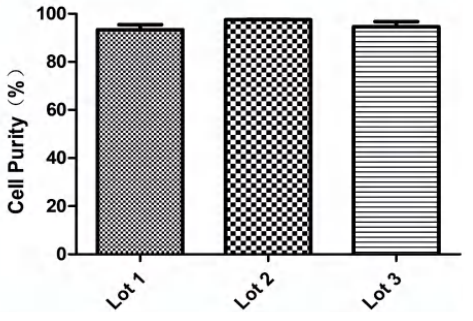


Figure 12. As shown, human peripheral blood PBMCs were processed using the EasySort™ Human CD3+ T Cell Isolation Kit for CD3+ T cell isolation and analysis. Flow cytometric evaluation of CD3+ T cell purity before and after sorting was performed using PE Anti-Human CD3 (OKT3) (E-AB-F1001D). The proportion of CD3+ T cells increased from 60.92% before sorting to 96.73% after sorting.

Inter-Assay Statistics

Based on PBMC samples collected from different time points and multiple donor sources, inter-batch performance analysis demonstrates stable consistency of the EasySort™ Human CD3+ T Cell Isolation Kit. The coefficient of variation (CV) of the purified target cell population purity is below 5%, indicating reliable and reproducible performance across different production batches.



Lot	1	2	3
Number of Sample	n=3	n=3	n=3
Mean (Cell Viability)	93.37%	97.58%	94.60%
SD	3.67%	0.12%	3.62%
CV (%)	3.93%	0.13%	3.82%

Intra-Assay Statistics

Based on repeated sorting experiments performed on PBMC samples from six different donors collected at different time points, the EasySort™ Human CD3+ T Cell Isolation Kit demonstrates strong intra-batch reproducibility. The coefficient of variation (CV) of the purified target cell population purity is below 3%, indicating excellent consistency across replicate sorting runs.

Sample	1	2	3	4	5	6
Cell Purity (%)	96.12%	98.31%	95.07%	96.67%	98.13%	97.29%
Mean (Cell Viability)	96.93%					
SD	1.24%					
CV (%)	1.28%					

Stability Statistics

Based on PBMC samples from identical donor sources collected at the same time point, stability evaluation of the EasySort™ Human CD3+ T Cell Isolation Kit demonstrates excellent reagent robustness. The kit was validated under simulated transport conditions (7, 14, and 30 days) as well as accelerated stress conditions at 37°C for 14 days. The coefficient of variation (CV) of the purified target cell population purity was below 3%, indicating outstanding stability and highly consistent performance across all tested conditions.

Groups	Positive control	7-day simulated transport	14-day simulated transport	30-day simulated transport	14-day accelerated thermal stress
Averyge Cell Purity (%)	96.80%	96.85%	97.07%	95.71%	97.97%
Mean (Cell Viability)	91.17%				
SD	0.54%				
CV (%)	0.56%				

Isolation of human naïve CD8+ T cells

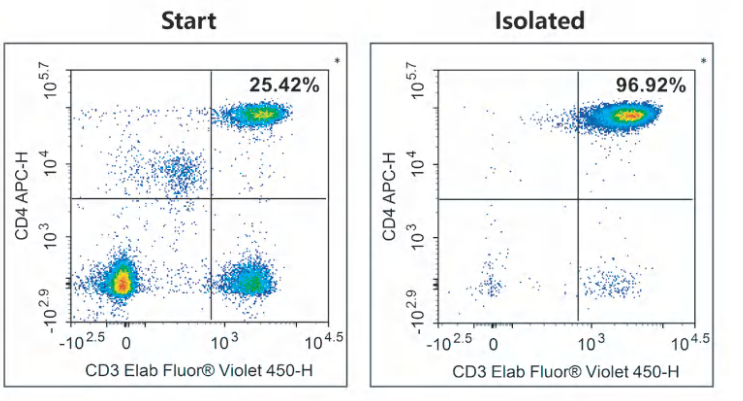
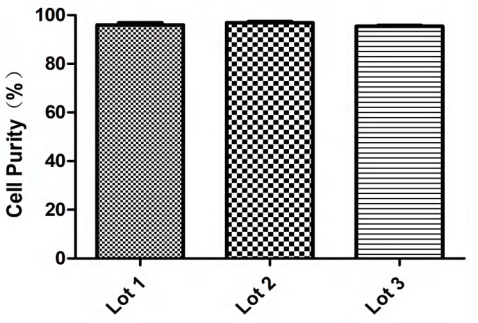


Figure 13. As shown, human peripheral blood PBMCs were processed using the EasySort™ Human CD4+ T Cell Isolation Kit for CD4+ T cell isolation and analysis. Flow cytometric evaluation of CD4+ T cell purity before and after sorting was performed using Elab Fluor® Violet 450 Anti-Human CD3 (OKT-3) (E-AB-F1001Q) and APC Anti-Human CD4 (SK3) (E-AB-F1352E). The proportion of CD3+CD4+ T cells increased from 25.42% before sorting to 96.92% after sorting.

Inter-Assay Statistics

Based on PBMC samples collected from different time points and multiple donor sources, inter-batch performance analysis demonstrates stable consistency of the EasySort™ Human CD4+ T Cell Isolation Kit. The coefficient of variation (CV) of the purified target cell population purity is below 3%, indicating excellent batch-to-batch reproducibility and reliable sorting performance.



Lot	1	2	3
Number of Sample	n=3	n=3	n=3
Mean (Cell Viability)	95.95%	96.89%	95.47%
SD	1.62%	0.88%	0.50%
CV (%)	1.69%	0.90%	0.52%

Intra-Assay Statistics

Based on repeated sorting experiments performed on PBMC samples from six different donors collected at different time points, the EasySort™ Human CD4+ T Cell Isolation Kit demonstrates excellent intra-batch reproducibility. The coefficient of variation (CV) of the purified target cell population purity is below 3%, indicating highly consistent sorting performance across replicate runs.

Sample	1	2	3	4	5	6
Cell Purity (%)	97.30%	96.55%	96.54%	96.73%	96.80%	96.97%
Mean (Cell Viability)	96.82%					
SD	0.29%					
CV (%)	0.30%					

Stability Statistics

Based on PBMC samples from identical donor sources collected at the same time point, stability evaluation of the EasySort™ Human CD4+ T Cell Isolation Kit demonstrates excellent reagent robustness. The kit was validated under simulated transport conditions (7, and 14 days) as well as accelerated stress conditions at 37°C for 14 days. The coefficient of variation (CV) of the purified target cell population purity was below 3%, indicating outstanding stability and highly consistent sorting performance across all tested conditions.

Groups	Positive control	7-day simulated transport	14-day simulated transport	14-day accelerated thermal stress
Averyge Cell Purity (%)	97.30%	97.30%	97.10%	96.97%
Mean (Cell Viability)	97.17%			
SD	0.16%			
CV (%)	0.17%			

Isolation of human CD8+ T cells

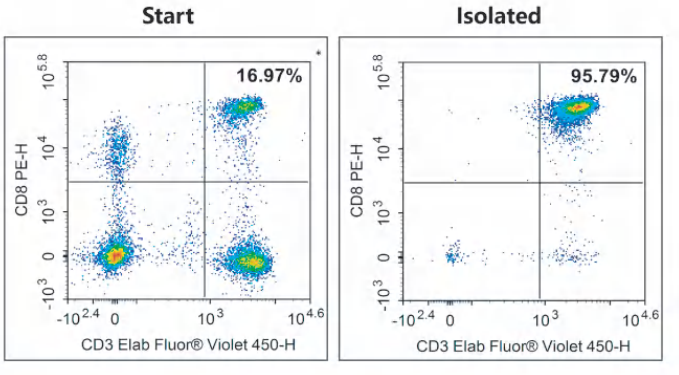
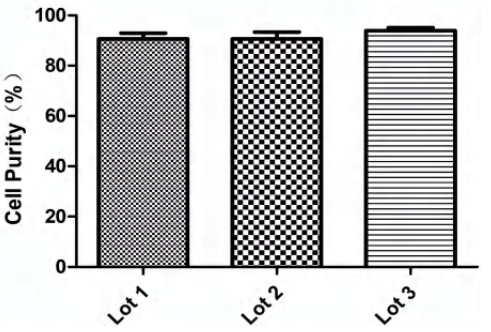


Figure 14. As shown, human peripheral blood PBMCs were processed using the EasySort™ Human CD8+ T Cell Isolation Kit for CD8+ T cell isolation and analysis. Flow cytometric evaluation of CD8+ T cell purity before and after sorting was performed using Elab Fluor® Violet 450 Anti-Human CD3 (OKT-3) (E-AB-F1001Q) and PE Anti-Human CD8a (HIT8a) (E-AB-F1271D). The proportion of CD3+CD8+ T cells increased from 16.97% before sorting to 95.79% after sorting.

Inter-Assay Statistics

Based on PBMC samples collected from different time points and multiple donor sources, inter-batch performance analysis demonstrates stable consistency of the EasySort™ Human CD8+ T Cell Isolation Kit. The coefficient of variation (CV) of the purified target cell population purity is below 10%, indicating reliable batch-to-batch reproducibility and consistent sorting performance.



Lot	1	2	3
Number of Sample	n=3	n=3	n=3
Mean (Cell Viability)	90.59%	90.62%	93.99%
SD	4.09%	4.83%	2.01%
CV (%)	4.51%	5.33%	2.13%

Intra-Assay Statistics

Based on repeated sorting experiments performed on PBMC samples from six different donors collected at different time points, the EasySort™ Human CD8+ T Cell Isolation Kit demonstrates strong intra-batch reproducibility. The coefficient of variation (CV) of the purified target cell population purity is below 3%, indicating excellent consistency across replicate sorting runs.

Sample	1	2	3	4	5	6
Cell Purity (%)	95.60%	94.26%	94.04%	94.02%	95.99%	95.92%
Mean (Cell Viability)	94.97%					
SD	0.96%					
CV (%)	1.01%					

Stability Statistics

Based on PBMC samples from identical donor sources collected at the same time point, stability evaluation of the EasySort™ Human CD8+ T Cell Isolation Kit demonstrates excellent reagent robustness. The kit was validated under simulated transport conditions (7, and 14 days) as well as accelerated stress conditions at 37°C for 14 days. The coefficient of variation (CV) of the purified target cell population purity was below 3%, indicating outstanding stability and highly consistent sorting performance across all tested conditions.

Groups	Positive control	7-day simulated transport	14-day simulated transport	14-day accelerated thermal stress
Averyge Cell Purity (%)	95.60%	95.50%	95.70%	95.77%
Mean (Cell Viability)	95.64%			
SD	0.12%			
CV (%)	0.12%			

Isolation of human memory CD4+ T cells

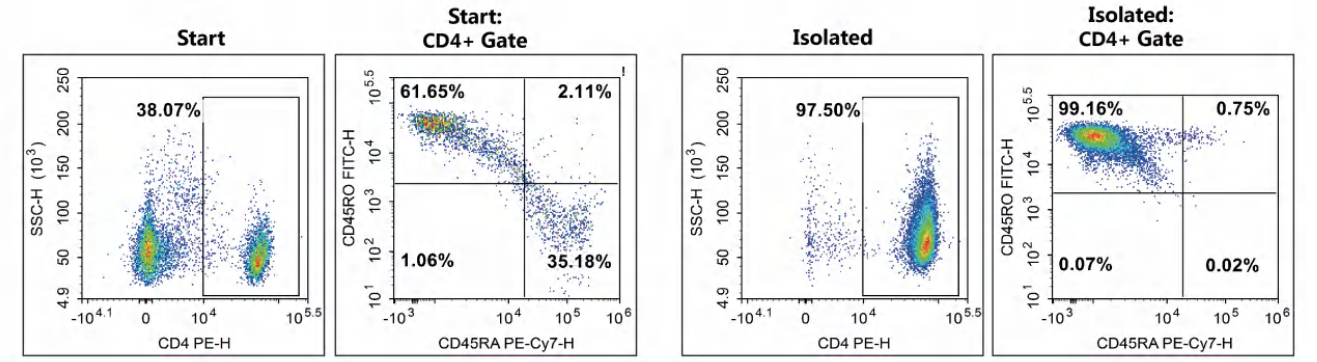
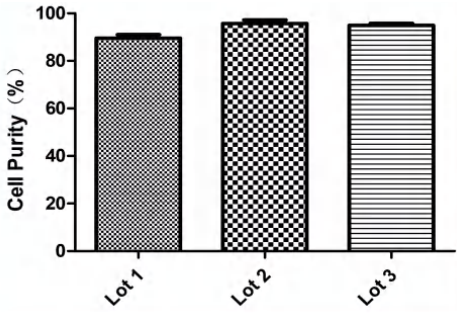


Figure 15. As shown, human peripheral blood PBMCs were processed using the EasySort™ Human CD4+ T Cell Isolation Kit for CD4+ T cell isolation and analysis. The proportion of memory T cells in human peripheral blood PBMCs increased from 23.05% before sorting to 96.54% after sorting.

Inter-Assay Statistics

Based on PBMC samples collected from different time points and multiple donor sources, inter-batch performance analysis demonstrates stable consistency of the EasySort™ Human Memory CD4+ T Cell Isolation Kit. The coefficient of variation (CV) of the purified target cell population purity is below 3%, indicating reliable batch-to-batch reproducibility and consistent sorting performance.



Lot	1	2	3
Number of Sample	n=3	n=3	n=3
Mean (Cell Viability)	89.52%	95.73%	94.94%
SD	2.62%	2.60%	1.44%
CV (%)	2.92%	2.71%	1.52%

Intra-Assay Statistics

Based on repeated sorting experiments performed on PBMC samples from six different donors collected at different time points, the EasySort™ Human Memory CD4+ T Cell Isolation Kit demonstrates strong intra-batch reproducibility. The coefficient of variation (CV) of the purified target cell population purity is below 3%, indicating excellent consistency across replicate sorting runs.

Sample	1	2	3	4	5	6
Cell Purity (%)	96.54%	94.11%	89.73%	92.35%	93.47%	91.29%
Mean (Cell Viability)	93.57%					
SD	2.29%					
CV (%)	2.45%					

Stability Statistics

Based on PBMC samples from identical donor sources collected at the same time point, stability evaluation of the EasySort™ Human Memory CD4+ T Cell Isolation Kit demonstrates excellent reagent robustness. The kit was validated under simulated transport conditions (7, 14, and 30 days) as well as accelerated stress conditions at 37°C for 14 days. The coefficient of variation (CV) of the purified target cell population purity was below 3%, indicating excellent stability and highly consistent sorting performance across all tested conditions.

Groups	Positive control	7-day simulated transport	14-day simulated transport	30-day simulated transport	14-day accelerated thermal stress
Averyge Cell Purity (%)	93.45%	93.73%	92.41%	93.70%	92.80%
Mean (Cell Viability)	93.22%				
SD	0.59%				
CV (%)	0.63%				

Isolation of human memory CD8+ T cells

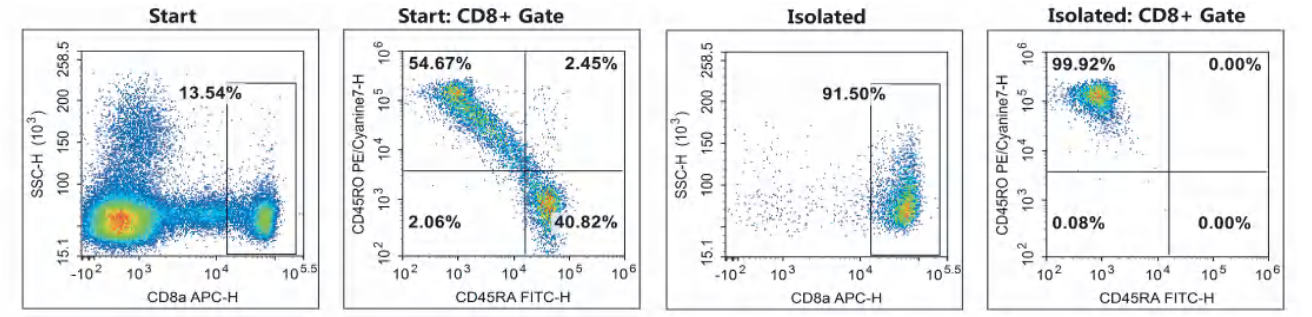
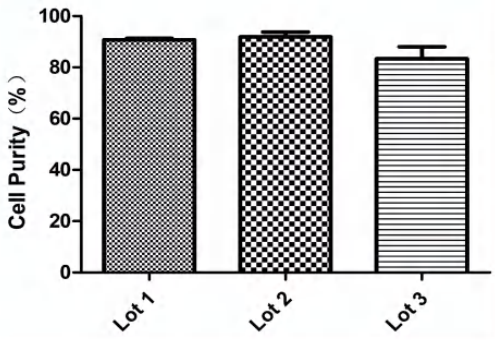


Figure 16. As shown, human peripheral blood PBMCs were processed using the EasySort™ Human Memory CD8+ T Cell Isolation Kit for memory CD8+ T cell isolation and analysis. Flow cytometric analysis of Memory CD8+ T cell purity before and after sorting showed that the proportion of Memory CD8+ T cells increased from 7.4% before sorting to 91.4% after sorting.

Inter-Assay Statistics

Based on PBMC samples collected from different time points and multiple donor sources, inter-batch performance analysis demonstrates stable consistency of the EasySort™ Human Memory CD8+ T Cell Isolation Kit. The coefficient of variation (CV) of the purified target cell population purity is below 10%, indicating reliable batch-to-batch reproducibility and consistent sorting performance.



Lot	1	2	3
Number of Sample	n=3	n=3	n=3
Mean (Cell Viability)	90.69%	91.91%	83.38%
SD	1.09%	3.30%	8.14%
CV (%)	1.21%	3.59%	9.77%

Intra-Assay Statistics

Based on repeated sorting experiments performed on PBMC samples from six different donors collected at different time points, the EasySort™ Human Memory CD8+ T Cell Isolation Kit demonstrates strong intra-batch reproducibility. The coefficient of variation (CV) of the purified target cell population purity is below 3%, indicating excellent consistency across replicate sorting runs.

Sample	1	2	3	4	5	6
Cell Purity (%)	91.43%	91.49%	89.62%	87.73%	89.96%	85.70%
Mean (Cell Viability)	89.32%					
SD	2.25%					
CV (%)	2.52%					

Stability Statistics

Based on PBMC samples from identical donor sources collected at the same time point, stability evaluation of the EasySort™ Human Memory CD8+ T Cell Isolation Kit demonstrates excellent reagent robustness. The kit was validated under simulated transport conditions (7, 14, and 30 days) as well as accelerated stress conditions at 37°C for 14 days. The coefficient of variation (CV) of the purified target cell population purity was below 3%, indicating excellent stability and highly consistent sorting performance across all tested conditions.

Groups	Positive control	7-day simulated transport	14-day simulated transport	30-day simulated transport	14-day accelerated thermal stress
Averyge Cell Purity (%)	87.83%	90.99%	90.37%	88.01%	85.59%
Mean (Cell Viability)	88.56%				
SD	2.17%				
CV (%)	2.45%				

Isolation and analysis of cryopreserved PBMCs

Isolation and analysis of cryopreserved PBMCs using EasySort™ Human CD3+ T Cell Isolation Kit

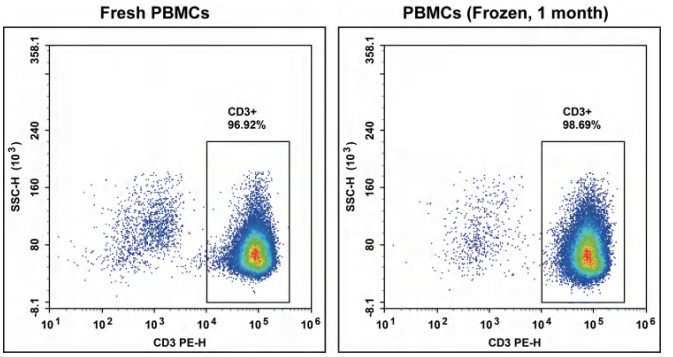


Figure 17. As shown, the EasySort™ Human CD3+ T Cell Isolation Kit was used to isolate CD3+ T cells from fresh human PBMCs and PBMCs cryopreserved in liquid nitrogen for 1 month. The sorted cells were analyzed by flow cytometry using PE Anti-Human CD3 (OKT3) (E-AB-F1001D). The proportion of isolated CD3+ T cells was 96.92% in the fresh sample and 98.69% in the cryopreserved sample.

Isolation and analysis of cryopreserved PBMCs using EasySort™ Human CD8+ T Cell Isolation Kit

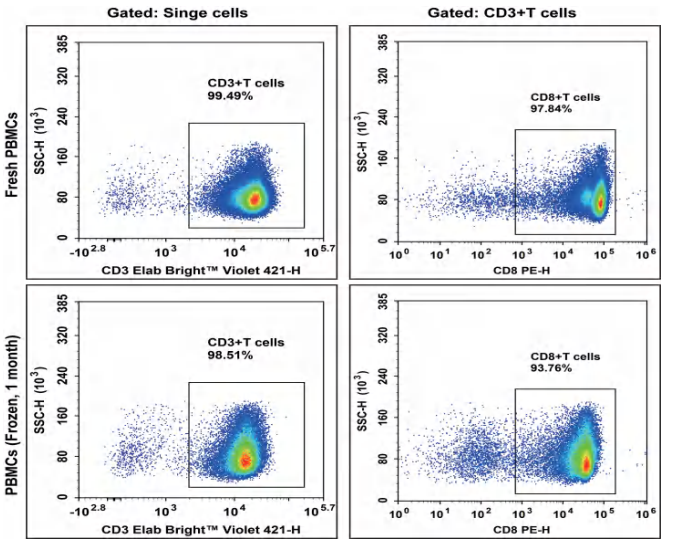


Figure 18. As shown, the EasySort™ Human CD8+ T Cell Isolation Kit was used to isolate CD8+ T cells from fresh human PBMCs and PBMCs cryopreserved in liquid nitrogen for 1 month. The sorted cells were analyzed by flow cytometry using Elab Bright™ Violet 421 Anti-Human CD3 (UCHT1) (E-AB-F1230Q2) and PE Anti-Human CD8a (HIT8a) (E-AB-F1271D). The proportion of isolated CD8+ T cells was 97.34% in the fresh sample and 92.36% in the cryopreserved sample.

Isolation and analysis of cryopreserved PBMCs using EasySort™ Human Naïve Pan T Cell Isolation Kit

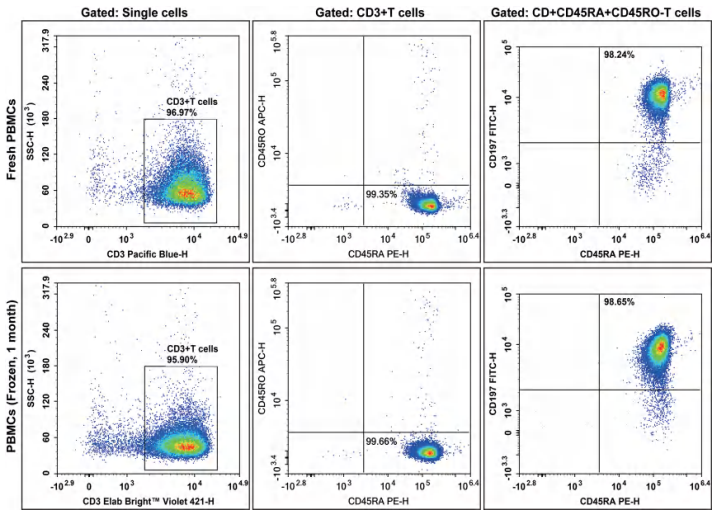


Figure 19. As shown, the EasySort™ Human Naïve Pan T Cell Isolation Kit was used to isolate naïve Pan T cells from fresh human PBMCs and PBMCs cryopreserved in liquid nitrogen for 1 month. The sorted cells were analyzed by flow cytometry using Elab Bright™ Violet 421 Anti-Human CD3 (UCHT1) (E-AB-F1230Q2), PE Anti-Human CD45RA (E-AB-F1052D), APC Anti-Human CD45RO (E-AB-F1139E), and FITC Anti-Human CD197 (E-AB-F1159C). The purity of isolated human naïve T cells (CD3+CD45RA+CD45RO—CD197+) was 94.64% in the fresh sample and 94.28% in the cryopreserved sample.

In vitro activation of T cells

T cell activation strategy — CD3/CD28 bead-mediated activation

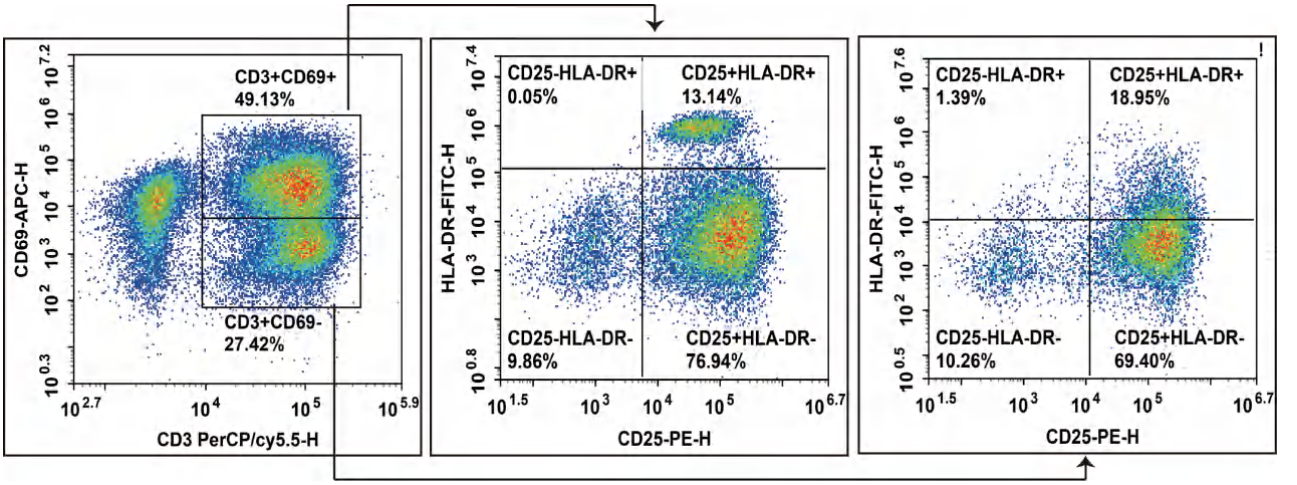


Figure 20. Human peripheral blood samples were processed to isolate PBMCs, which were then activated using CD3/CD28 beads and cultured for 48 hours. T cell activation status was subsequently evaluated.

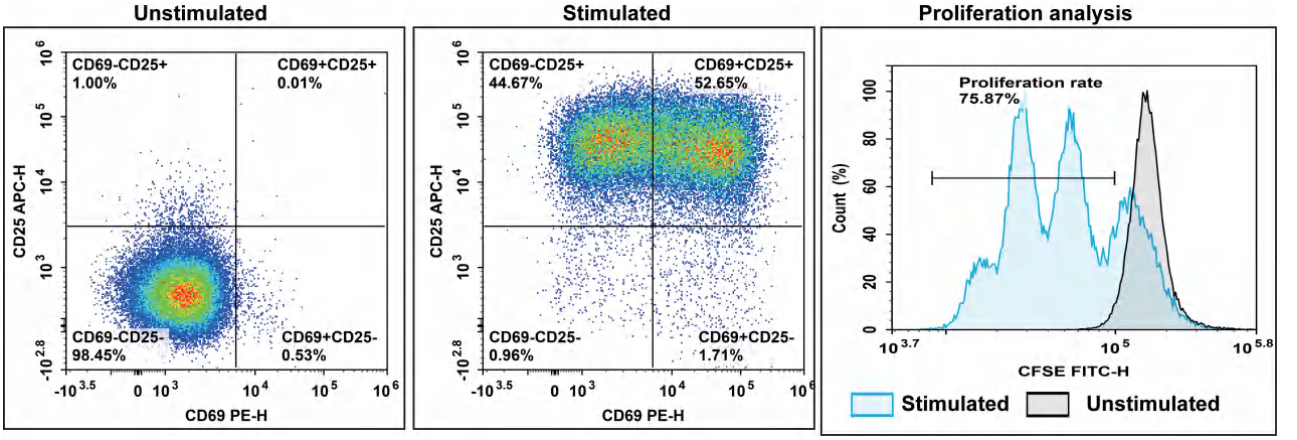


Figure 21. Fresh human PBMCs were used to isolate CD3+ T cells with the EasySort™ Human CD3+ T Cell Isolation Kit. After activation with Human CD3/CD28 T Cell Activation Beads and culture for 3 days, flow cytometric analysis was performed to evaluate CD69, CD25, and CFSE expression.

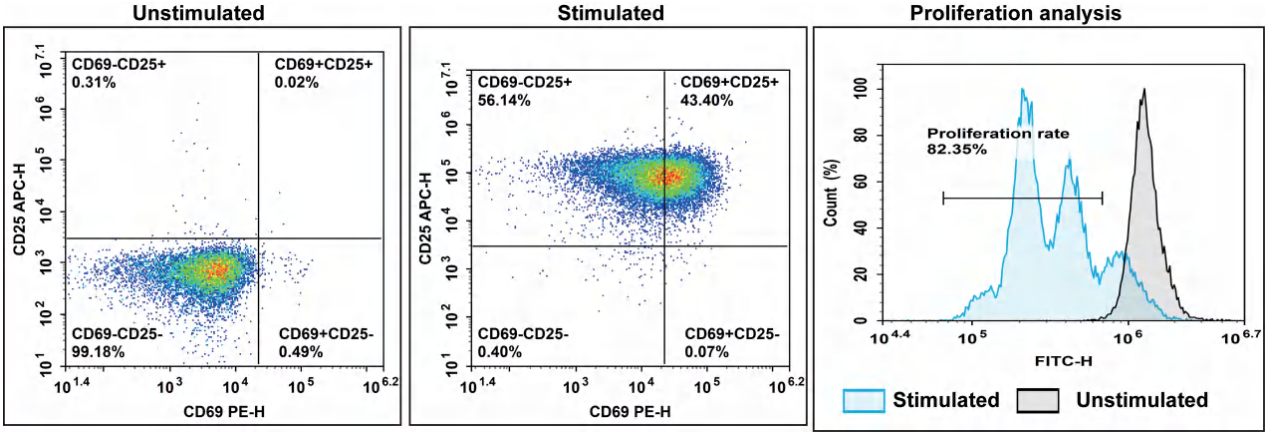


Figure 22. Fresh human PBMCs were used to isolate CD8+ T cells with the EasySort™ Human CD8+ T Cell Isolation Kit. After activation with Human CD3/CD28 T Cell Activation Beads and culture for 3 days, flow cytometric analysis was performed to evaluate CD69, CD25, and CFSE expression.

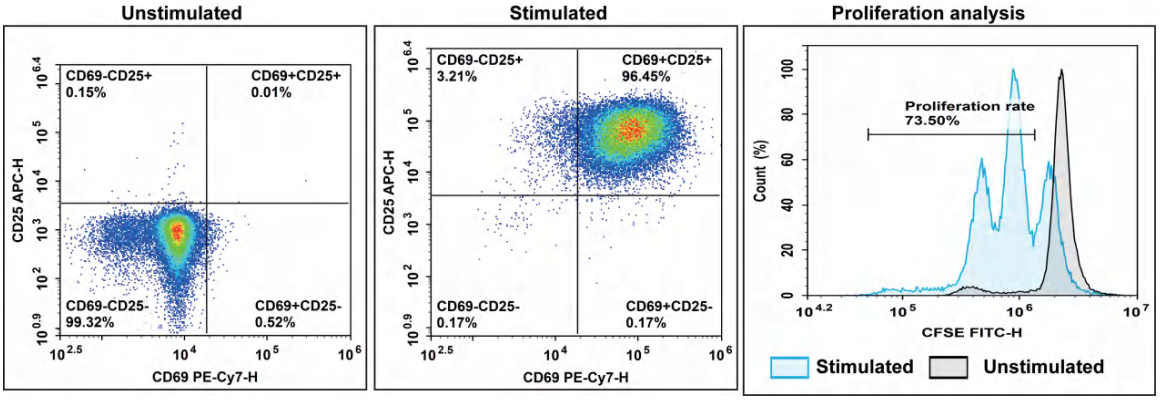


Figure 23. Fresh human PBMCs were used to isolate naïve CD8+ T cells with the EasySort™ Human Naïve CD8+ T Cell Isolation Kit. After activation with Human CD3/CD28 T Cell Activation Beads and culture for 3 days, flow cytometric analysis was performed to evaluate CD69, CD25, and CFSE expression.

T cell activation strategy — activator-mediated activation

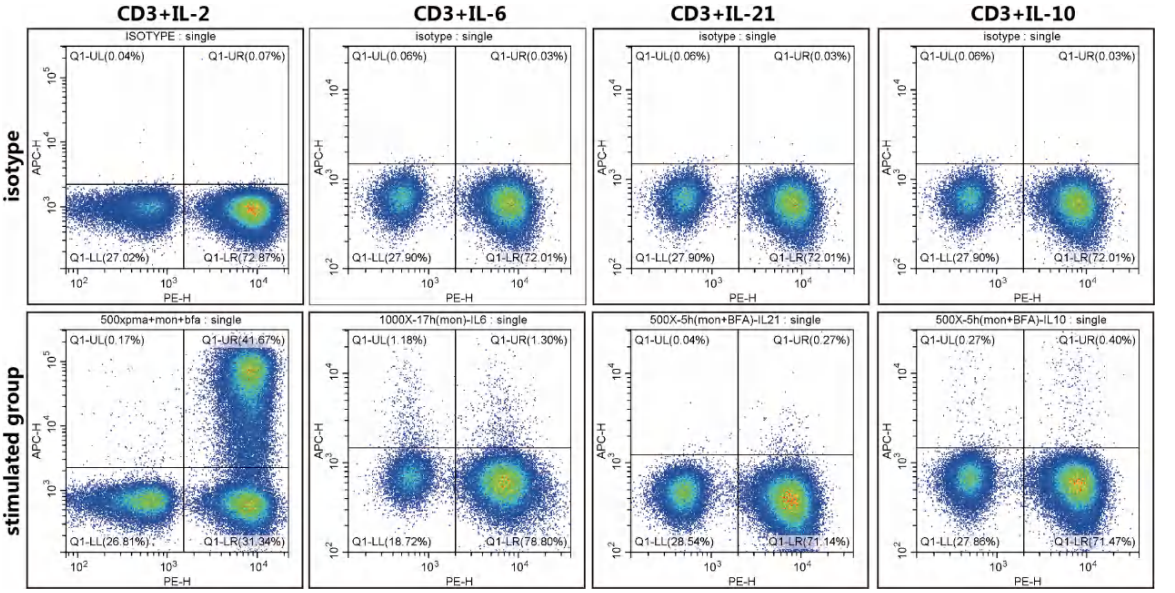


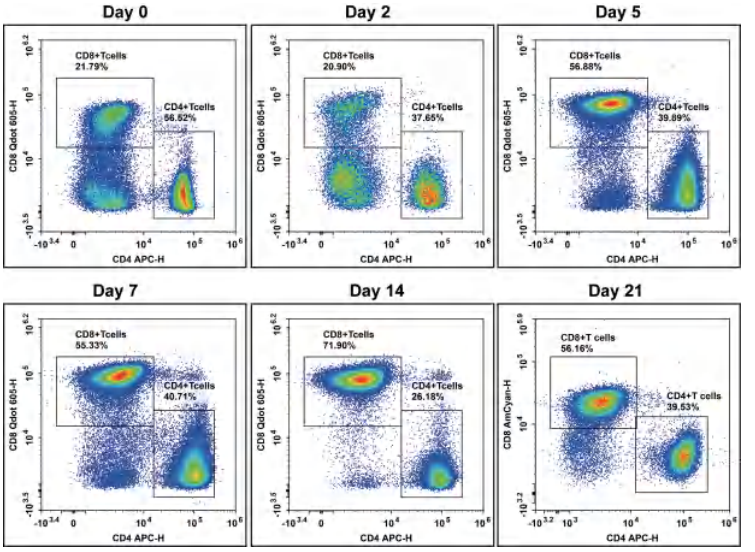
Figure 24. Fresh human PBMCs were stimulated using the Cell Stimulation and Protein Transport Inhibitor Kit (E-CK-A091) for 4 hours to induce activation and block cytokine secretion. Flow cytometric analysis was then performed to evaluate intracellular IL-2, IL-6, IL-21, and IL-10 production in T cells.

T cell activation-related products

Product	Catalog No.
Human CD3/CD28 T Cell Activation Beads	MIH002A
Cell Stimulation and Protein Transport Inhibitor Kit	E-CK-A091
EasyStain™ Human Fc Receptor Blocking Solution	E-CK-A171
Intracellular Fixation/Permeabilization Buffer Kit	E-CK-A109
PerCP/Cyanine5.5 Anti-Human CD3 [UCHT1]	E-AB-F1230J
PE Anti-Human CD25 Antibody[BC96]	E-AB-F1194D
APC Anti-Human CD69 [FN50]	E-AB-F1138E
FITC Anti-Human HLA-DR [L243]	E-AB-F1111C
CFSE Cell Division Tracker Kit	E-CK-A345

In vitro expansion and long-term culture of T cells

Long-term culture and assessment of PBMCs



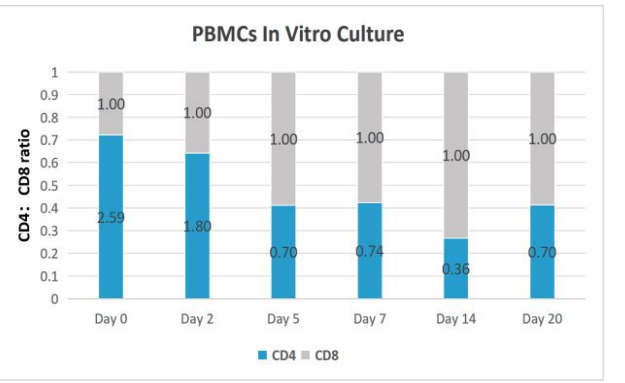
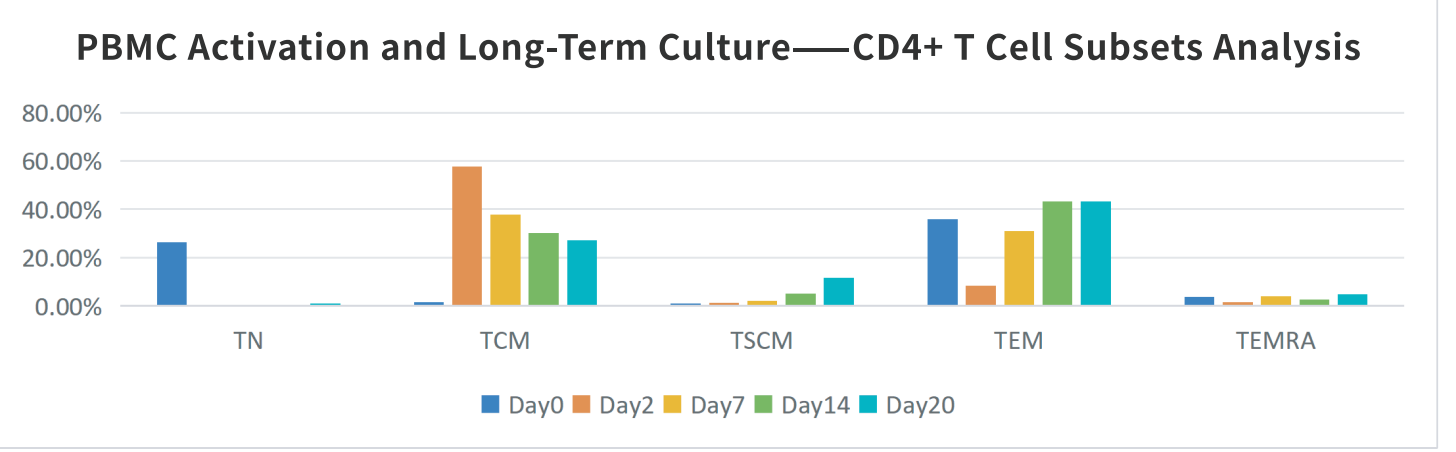


Figure 25. Fresh human peripheral blood samples were used to isolate PBMCs, which were activated using Human CD3/CD28 T Cell Activation Beads. After 5 days of activation, beads were magnetically removed, and cells were further cultured for 20 days. Changes in the CD4+:CD8+ ratio were analyzed during long-term culture.



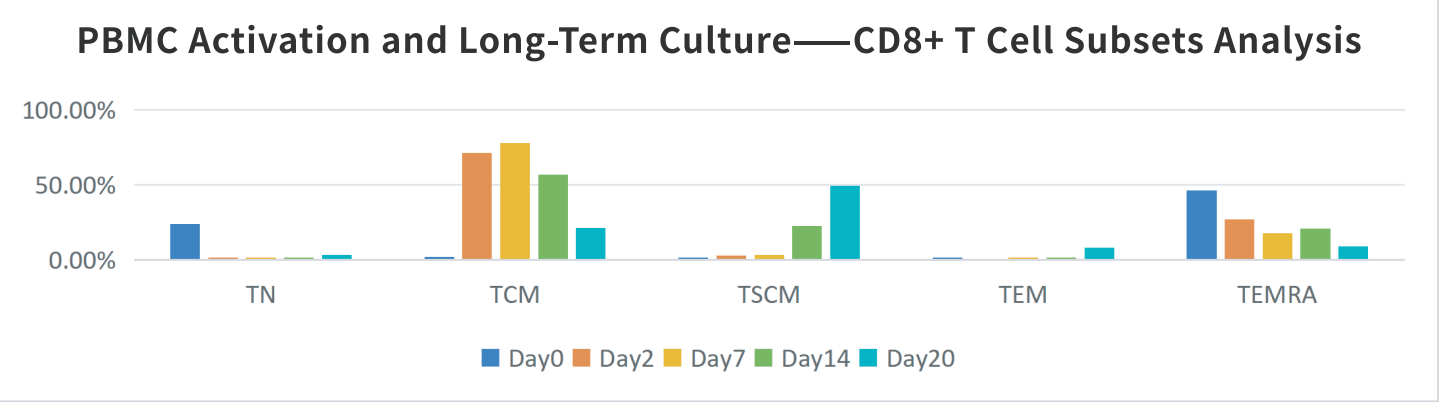
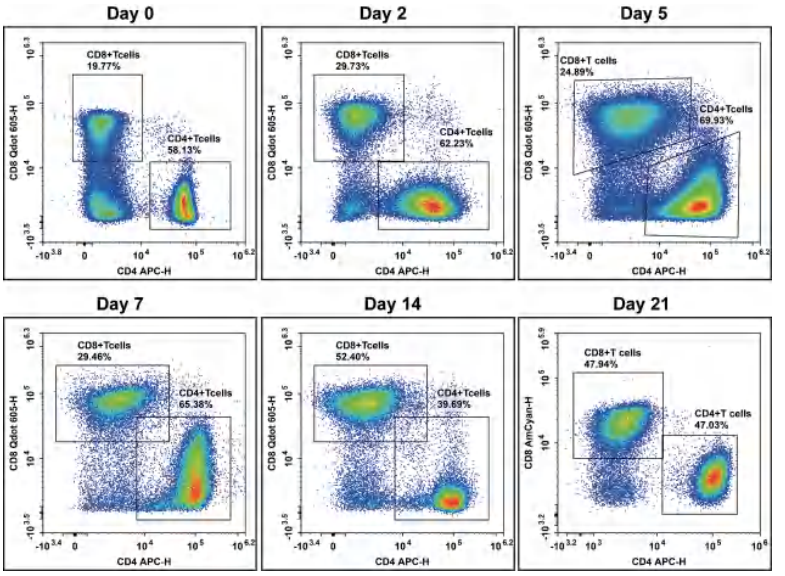


Figure 26. Fresh human peripheral blood samples were used to isolate PBMCs, which were activated using Human CD3/CD28 T Cell Activation Beads and cultured for 5 days. After magnetic removal of beads, cells were further cultured for 20 days. During long-term culture, dynamic changes in T cell subsets (TN, TCM, TSCM, TEM, and TEMRA) within CD4+ and CD8+ populations were analyzed.

Long-term culture analysis of CD3-sorted T cells



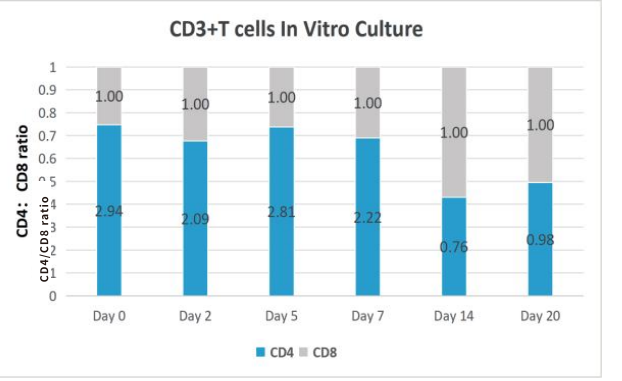
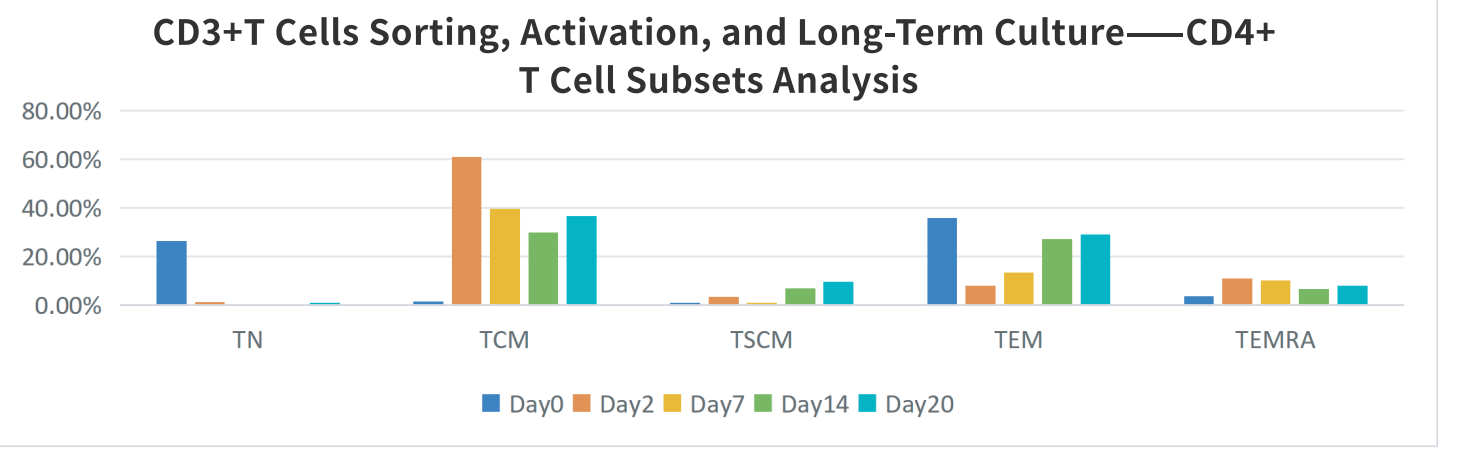


Figure 27. Fresh human PBMCs were used to isolate CD3+ T cells using a sorting kit. Cells were activated with Human CD3/CD28 T Cell Activation Beads and cultured for 5 days, followed by magnetic removal of beads and continued culture for 20 days. Changes in the CD4+:CD8+ ratio were monitored during the culture period.



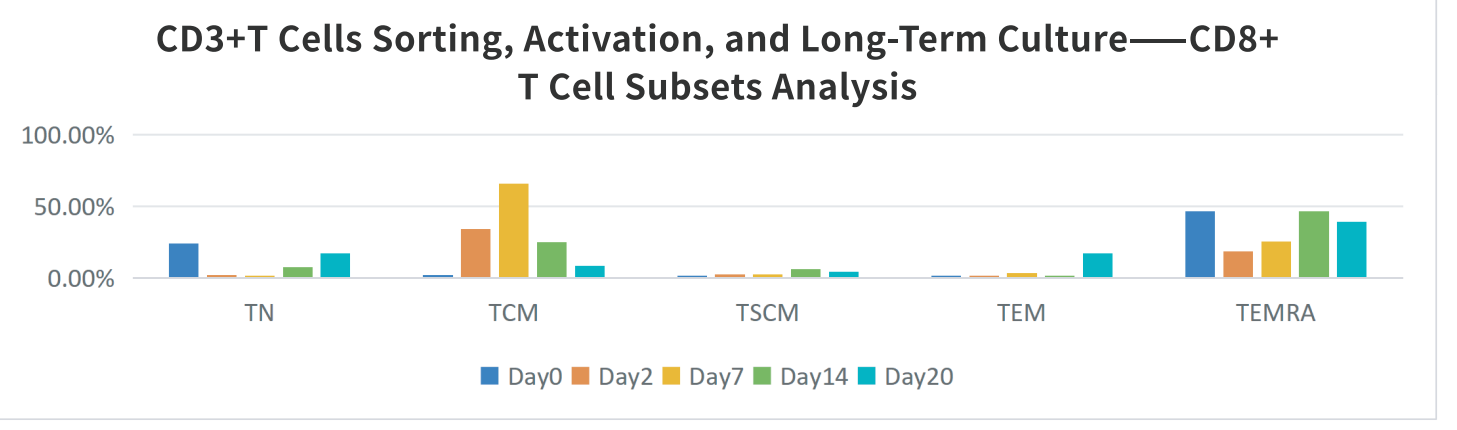
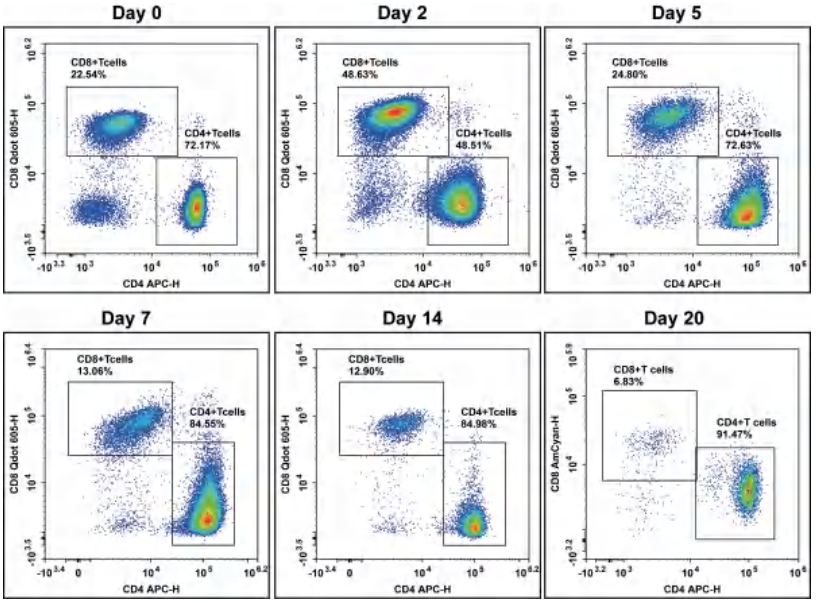


Figure 28. Fresh human PBMCs were used to isolate CD3+ T cells using a sorting kit. Cells were activated with Human CD3/CD28 T Cell Activation Beads and cultured for 5 days, followed by magnetic removal of beads and continued culture for 20 days. During long-term culture, changes in T cell subsets (TN, TCM, TSCM, TEM, and TEMRA) within CD4+ and CD8+ populations were analyzed.

Long-term culture analysis of naïve T cell sorting and assessment



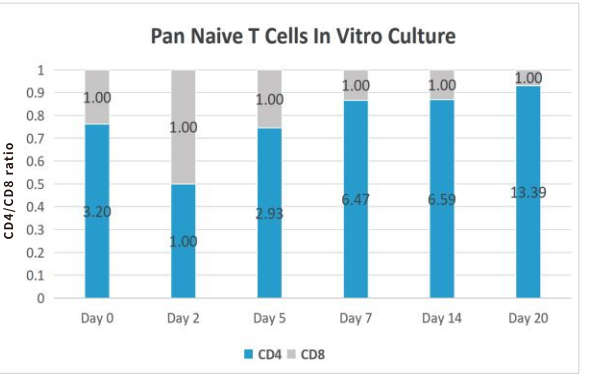
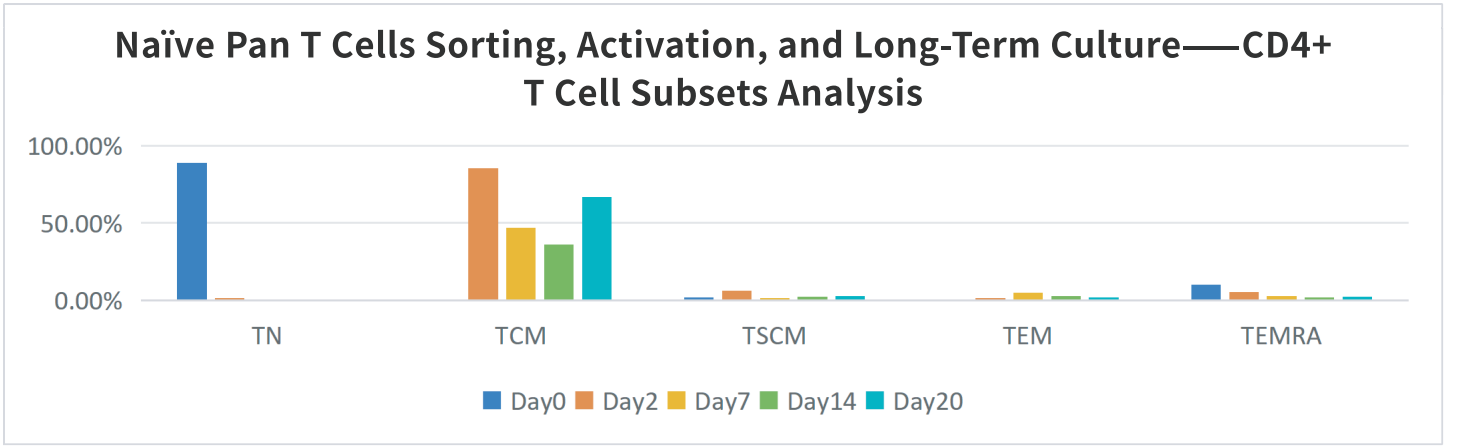


Figure 29. Fresh human PBMCs were used to isolate Pan naïve T cells using a sorting kit. Cells were activated with Human CD3/CD28 T Cell Activation Beads and cultured for 5 days, followed by magnetic removal of beads and continued culture for 20 days. Changes in the CD4+:CD8+ ratio were monitored during the culture period.



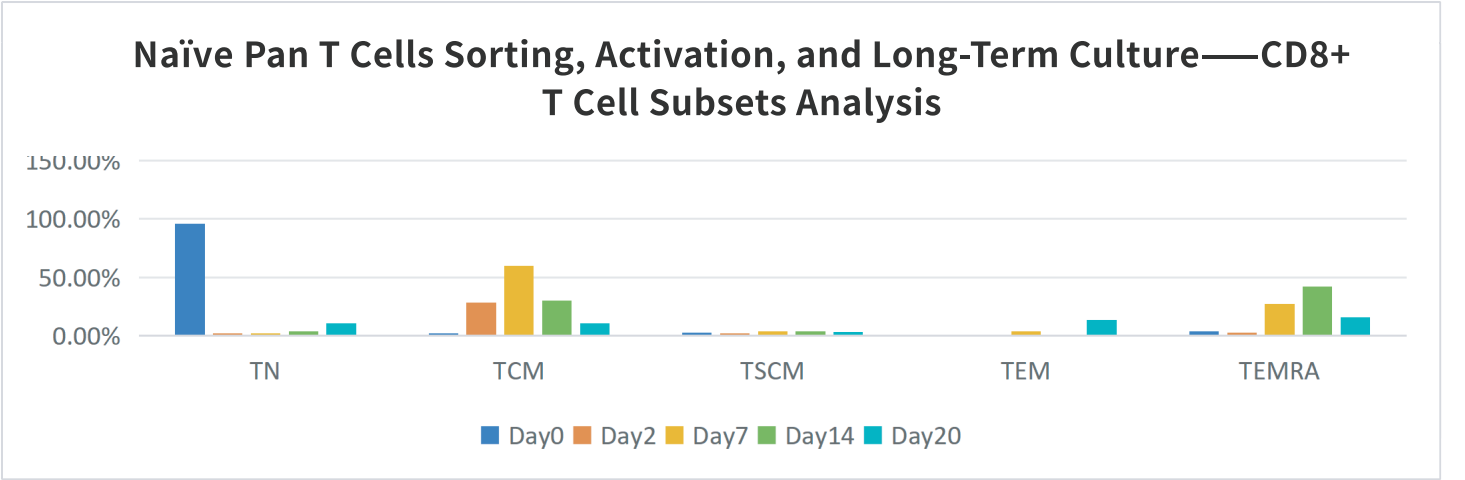


Figure 30. Fresh human PBMCs were used to isolate Pan naïve T cells using a sorting kit. Cells were activated with Human CD3/CD28 T Cell Activation Beads and cultured for 5 days, followed by magnetic removal of beads and continued culture for 20 days. During long-term culture, the proportions of T cell subsets (TN, TCM, TSCM, TEM, and TEMRA) within CD4+ and CD8+ populations were analyzed.

Related product list

Products	Catalog No.
EasySort™ Human CD3+T Cell Isolation Kit	MIH001N
EasySort™ Human CD4+ T Cell Isolation Kit	MIH002N
EasySort™ Human CD8+ T Cell Isolation Kit	MIH003N
EasySort™ Human Naïve Pan T Cell Isolation Kit	MIH006N
EasySort™ Human Naïve CD4+T Cell Isolation Kit	MIH007N
EasySort™ Human Naïve CD8+T Cell Isolation Kit	MIH008N
EasySort™ Human Memory CD4+T Cell Isolation Kit	MIH009N
EasySort™ Human Memory CD8+T Cell Isolation Kit	MIH010N
EasySort™ Human B Cell Isolation Kit	MIH004N
EasyStain™ Human Fc Receptor Blocking Solution	E-CK-A171
CFSE Cell Division Tracker Kit	E-CK-A345
Cell Staining Buffer	E-CK-A107
Cell Stimulation and Protein Transport Inhibitor Kit	E-CK-A091
10×ACK Lysis Buffer	E-CK-A105
10×RBC Lysis/Fixation Solution	E-CK-A106
Human PBMC Separation Solution(P 1.077)	E-CK-A103
Intracellular Fixation/Permeabilization Buffer Kit	E-CK-A109
STYX™ Violet Fixable Viability Kit	E-CK-A167
STYX™ Yellow Fixable Viability Kit	E-CK-A169
STYX™ Green Fixable Viability Kit	E-CK-A166
STYX™ Red Fixable Viability Kit	E-CK-A170
STYX™ Near-IR Fixable Viability Kit	E-CK-A168
PI Reagent (50μg/mL)	E-CK-A161
DAPI Reagent (25μg/mL)	E-CK-A163
7-AAD Reagent (100μg/mL)	E-CK-A162
Human Th1/Th2 Flow Cytometry Staining Kit	XJH001
Human Th17 Flow Cytometry Staining Kit	XJH002
PerCP Anti-Human CD3 Antibody[OKT-3]	E-AB-F1001F
APC Anti-Human/Monkey CD4 Antibody[SK3]	E-AB-F1352E
Elab Fluor® Violet 610 Anti-Human CD8a Antibody[OKT-8]	E-AB-F1110T
PE/Cyanine7 Anti-Human CD25 Antibody[BC96]	E-AB-F1194H
PE/Cyanine7 Anti-Human CD45RA Antibody[HI100]	E-AB-F1052H
FITC Anti-Human CD45RO Antibody[UCHL1]	E-AB-F1139C
Elab Fluor® Violet 540 Anti-Human CD62L Antibody[DREG56]	E-AB-F1051T3
PE Anti-Human CD69 Antibody[FN50]	E-AB-F1138D
Elab Fluor® 700 Anti-Human CD95/Fas Antibody[DX2]	E-AB-F1168M1
Elab Fluor® Violet 450 Anti-Human CD197/CCR7 Antibody[G043H7]	E-AB-F1159Q
APC Anti-Human CD279/PD-1 Antibody[EH12.2H7]	E-AB-F1229E
AF/LE Purified Anti-Human CD366 Antibody[F38-2E2]	AN009710
Elab Fluor® Violet 450 Anti-Human HLA-DR Antibody[L243]	E-AB-F1111Q

CAR-T Cell Quality Control Testing

CAR-T cell therapy product quality control studies and analytical testing items generally include: cell number and viability assessment, immunophenotypic characterization, CAR-positive rate determination, biological potency evaluation, cell expansion and survival capability assessment, cellular homogeneity and purity analysis, and process-related residual testing (e.g., potentially hazardous magnetic bead residues, cytokine residues, and Retronectin residues).

Cell expansion and viability assessment

Ability to distinguish different cell viability states (e.g., live, dead, and apoptotic cells), establish cell number and viability criteria based on validated counting methods, and define upper and lower acceptance limits for cell counts. The viability of cells prior to use should be no less than 70%.

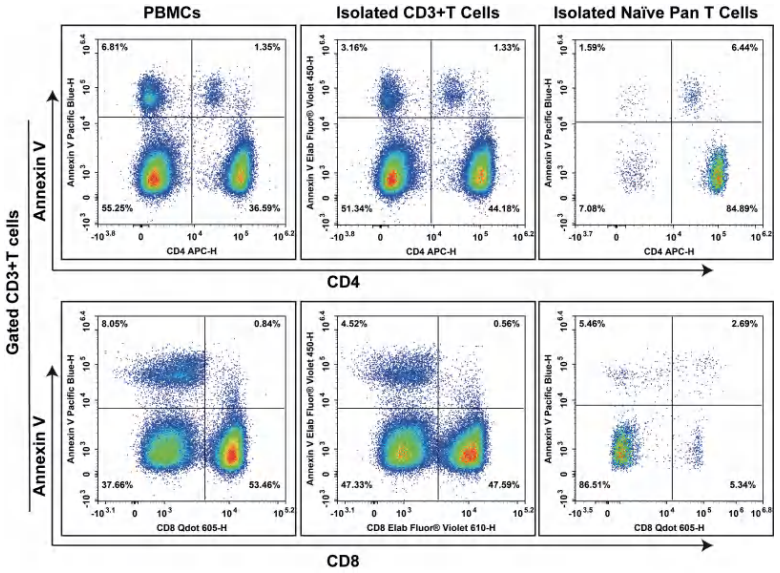


Figure 31. PBMCs, CD3+ T cells, and naïve Pan T cells were used as starting populations and activated with Human CD3/CD28 T Cell Activation Beads (MIH001A) for 5 days, followed by continuous culture for 20 days. Apoptosis within the cultured cell populations was assessed using PerCP Anti-Human CD3 (E-AB-F1230F), Elab Fluor® Violet 610 Anti-Human CD8a (E-AB-F1110T), APC Anti-Human CD4 (E-AB-F1352E), and Annexin V–Elab Fluor® Violet 450 Reagent (E-CK-A133). The culture medium contained 50 U/mL Human IL-2 active protein.

Cell expansion and viability assessment related product list

Products	Catalog No.
Annexin V-FITC/PI Apoptosis Kit	E-CK-A211
Annexin V-Elab Fluor® Violet 450/PI Apoptosis Kit	E-CK-A233
Mitochondrial Membrane Potential Assay Kit (with JC-1)	E-CK-A301
One-step TUNEL Flow Cytometry Apoptosis Kit (Blue, Elab Fluor® Violet 450)	E-CK-A423
Calcein AM/PI Double Staining Kit	E-CK-A354
E-Click EdU Cell Proliferation Flow Cytometry Assay Kit (Red, Elab Fluor® 647)	E-CK-A373
Enhanced Cell Counting Kit 8 (WST-8/CCK8)	E-CK-A362
Caspase 1 Activity Detection Substrate for Flow Cytometry	E-CK-A481
Caspase 3/7 Activity Detection Substrate for Flow Cytometry	E-CK-A483
Caspase 4 Activity Detection Substrate for Flow Cytometry	E-CK-A484

Products	Catalog No.
Caspase 6 Activity Detection Substrate for Flow Cytometry	E-CK-A486
Caspase 8 Activity Detection Substrate for Flow Cytometry	E-CK-A488
Caspase 9 Activity Detection Substrate for Flow Cytometry	E-CK-A489
Caspase 3/7 and Annexin V Double Staining Apoptosis Kit	E-CK-A831
Caspase 3/7 and PI Double Staining Kit	E-CK-A832
Caspase 3/7 and DAPI Double Staining Kit	E-CK-A833
STYX™ Violet Fixable Viability Kit	E-CK-A167
STYX™ Near-IR Fixable Viability Kit	E-CK-A168
7-AAD Reagent (100 μg/mL)	E-CK-A162

Cell homogeneity and purity analysis

Purity assessment case study

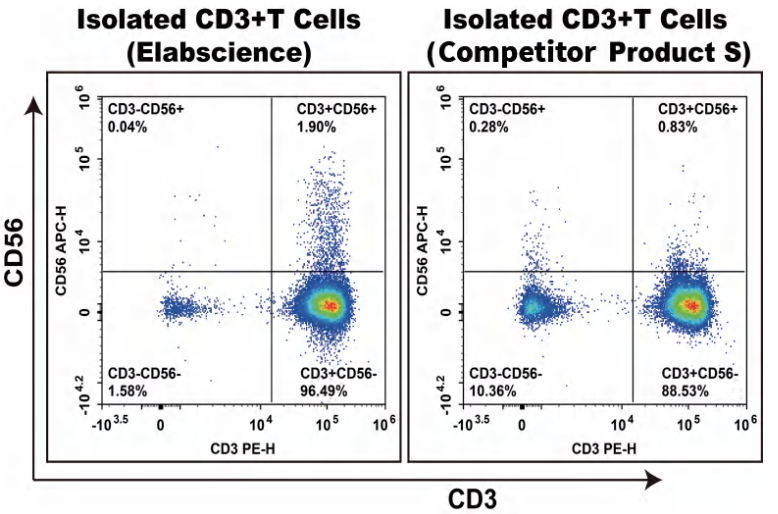


Figure 32. T cells were isolated and compared with a competitor product from supplier S. The proportions of NK cells and other non-target cell populations within the sorted cell fraction were analyzed.

Products	Catalog No.
EasySort™ Human CD3+T Cell Isolation Kit	MIH001N
PE Anti-Human CD3 [OKT-3]	E-AB-F1001D
APC Anti-Human CD56/NCAM [5.1H11]	E-AB-F1239E

Biological potency assessment

In early-stage development, researchers often use *in vitro* cytokine expression as a surrogate indicator for potency assessment.

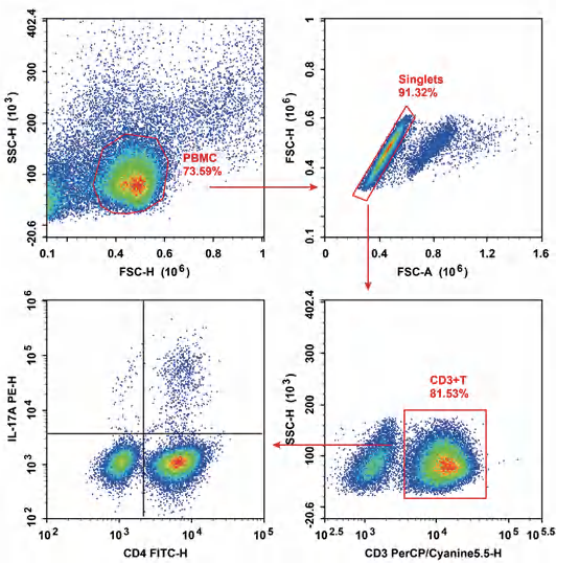


Figure 33. Human peripheral blood PBMCs were assessed for Th17 cytokine secretion following activation.

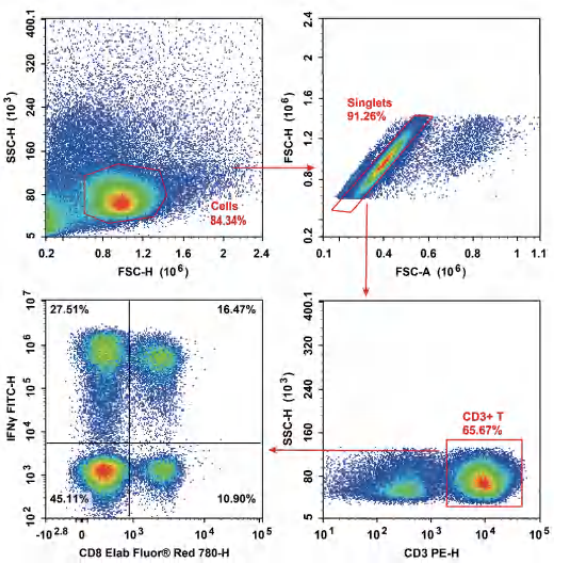


Figure 34. Human peripheral blood PBMCs were evaluated for cytokine secretion by Tc1 and Tc2 cells following activation.

Biological potency assessment related product list

Flow cytometry products

Products	Catalog No.
APC Anti-Human IFN-γ Antibody[B27]	E-AB-F1196E
APC Anti-Human IL-1 alpha Antibody[364/3B3-14]	AN00839E
APC Anti-Human IL-1 beta Antibody[CRM56]	AN00842E
APC Anti-Human IL-2 Antibody[MQ1-17H12]	E-AB-F1200E
APC Anti-Human IL-4 Antibody[MP4-25D2]	E-AB-F1203E
APC Anti-Human IL-6 Antibody[MQ2-13A5]	E-AB-F1206E
APC Anti-Human IL-10 Antibody[JES3-9D7]	E-AB-F1198E
APC Anti-Human IL-17A Antibody[BL168]	E-AB-F1173E
APC Anti-Human IL-12/IL-23 p40 Antibody[C8.6]	AN00843E
PE Anti-Human CD3 Antibody[OKT-3]	E-AB-F1001D
PE Anti-Human CD3 Antibody[UCHT1]	E-AB-F1230D
PE Anti-Human CD4 Antibody[RPA-T4]	E-AB-F1109D
PE Anti-Human/Monkey CD4 Antibody[SK3]	E-AB-F1352D
PE Anti-Human CD8a Antibody[OKT-8]	E-AB-F1110D
PE Anti-Human CD8 Antibody[UCHT-4]	AN00427D
PE Anti-Human CD8a Antibody[HIT8a]	E-AB-F1271D
Human Th1/Th2 Flow Cytometry Staining Kit	XJH001
Human Th17 Flow Cytometry Staining Kit	XJH002

Multiplex detection

Products	Biomarkers	Catalog No.
Aptplex™Human Covid-19 8-Plex Panel	IL-6; IL-1β; TNF-α; IFN-γ; CXCL10; MCP-1; IL-8; IL-10	MPA001
Aptplex™Human Immunosuppression 5-Plex Panel	IL-6; IL-10; TNF-α; PD-L1; IL-1RA	MPA002
Aptplex™Human Immunosuppression 6-Plex Panel	IFN-γ; CXCL9; CXCL10; IL-2RA; PD-L2; VEGF	MPA003
Aptplex™Human Tumor 5-Plex Panel	VEGF; MMP-9; IL-8; RANTES; TGF-β1	MPA004
Aptplex™Human Autoimmune 6-Plex Panel	IL-6; TNF-α; IL-17A; IL-1β; MMP-9; sICAM-1	MPA005
Aptplex™Human Neuroinflammation 5-Plex Panel	IL-1β; TNF-α; MCP-1; IL-6; CXCL10	MPA007
Aptplex™Human Neuroinflammation 5-Plex Panel	ST2;IL-18;TGF-β1;MMP-9;G-CSF	MPA008
Aptplex™ Human Inflammation 14-Plex Panel	IL-6;IL-1β;TNF-α;IFN-γ;CCL2;CXCL10;CXCL9;IL-8;IL-10;IL-18;MMP-9;sICAM-1; ST2;VEGF	MPA009
Aptplex™Human Tumor 13-Plex Panel	VEGF;MMP-9;TGF-β1;CXCL9;CXCL10;IL-6;IL-8;IL-10;IL-17A;IL-2RA;PD-L2; RANTES;IFN-γ	MPA010
Aptplex™ Human Th1/Th17 12-Plex Panel	IL-17A;IL-6;TNF-α;IFN-γ;IL-12p70;IL-10;RANTES;CXCL10;IL-1β;IL-18;sICAM-1; IL-2RA	MPA011
Aptplex™Human Immune Tolerance 12-Plex Panel	IFN-γ;IL-2;IL-4;IL-5;IL-10;IL-2RA; CXCL10;CCL5;CCL3;CCL4;sICAM-1;ST2	MPA012
Aptplex™Human Neuroimmunology 12-Plex Panel	CCL2;CXCL10;IL-6;TNF-α;IL-1β;IL-17A;IL-10; sVCAM-1;sICAM-1;MMP-9; VEGF;TGF-β1	MPA013
Aptplex™ Human Th1/Th2/Th17 12-Plex Panel	IL-1β;IL-2;IL-4;IL-5;IL-6;IL-8;IL-10;IL-17;IL-12p70A;TNFα;IFN-γ;IFN-α	MPA014
Aptplex™ Human Th1/Th2 7-Plex Panel	IFNγ, IL-2, IL-4, IL-5, IL-6, IL-10, TNFα	MPA015
Aptplex™ Human Cytokine 6-Plex Panel	IL-1β, IL-6, IL-8, IL-10, IL-12p70, TNFα	MPA019

If no pre-configured multiplex panel matches your research needs, customized services are available to combine selected analytes of interest, enabling the design of a tailored detection panel specific to your experimental requirements.

In Vitro Functional Characterization of CAR-T Cells

In vitro cytotoxicity assessment of CAR-T cells

The *in vitro* cytotoxic activity of CAR-T cells represents the most **direct evidence** of their therapeutic potential. At its core, this process reflects the **engineered T cells' precise recognition and efficient elimination of target cells**. Mechanistically, target cell killing is primarily mediated through two pathways: the granzyme/perforin-dependent cytotoxic pathway and the death receptor–mediated signaling pathway.

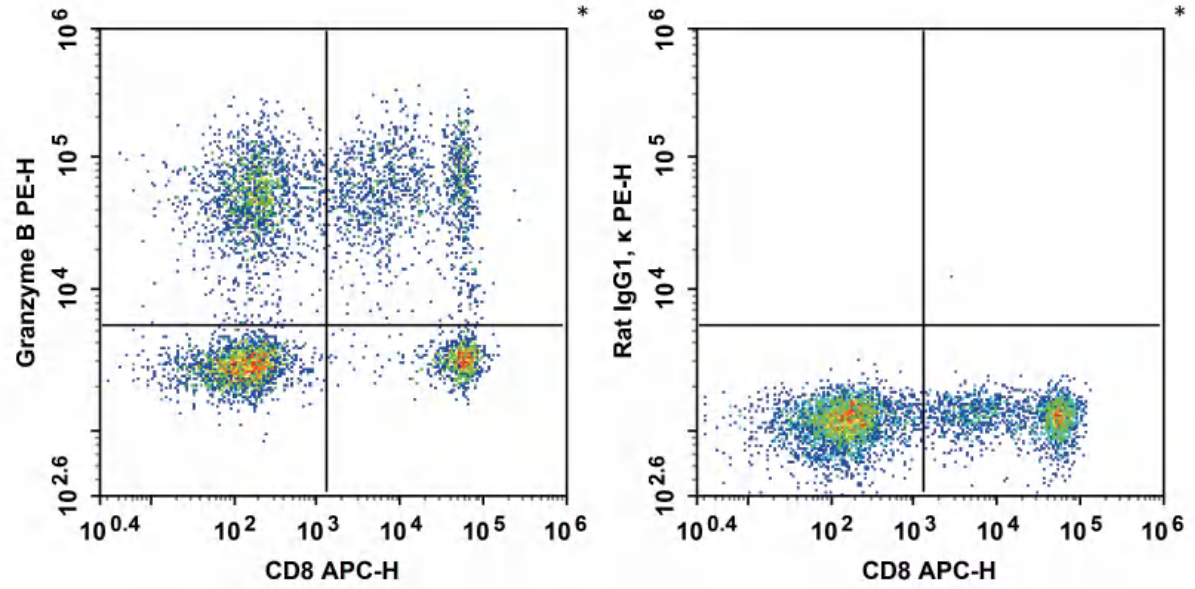


Figure 35. Peripheral blood cells from healthy human donors were analyzed by flow cytometry using APC Anti-Human CD8a Antibody (OKT-8) and PE Anti-Human Granzyme B Antibody (QA18A28) (left), or PE Rat IgG1, κ Isotype Control (right).

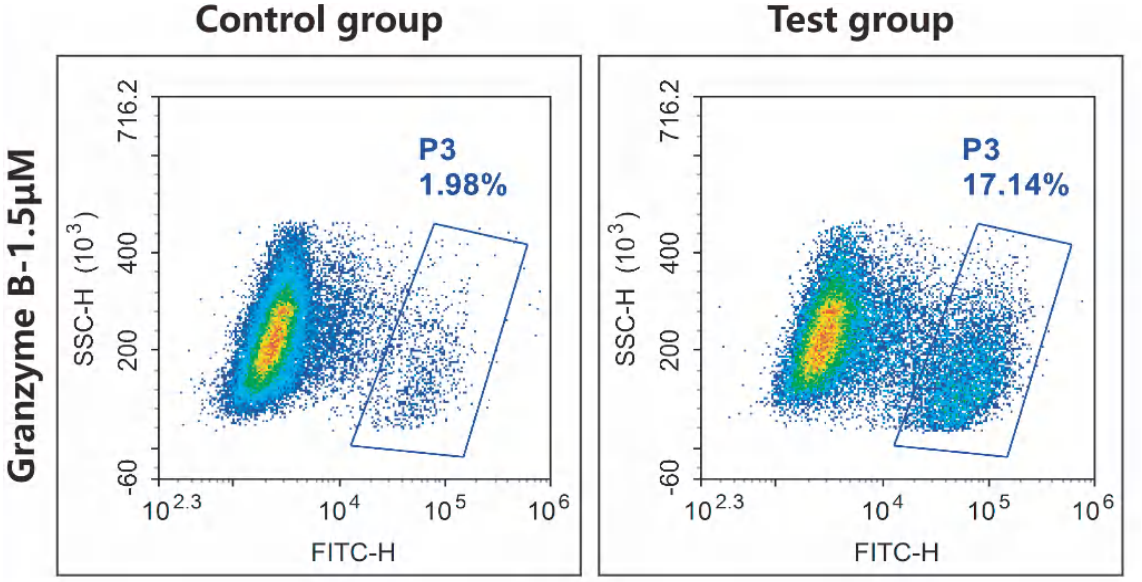


Figure 36. Granzyme B activity in Jurkat cells was evaluated using a Granzyme B activity assay substrate. Jurkat cells (human T lymphocyte leukemia cell line) were analyzed for intracellular Granzyme B enzymatic activity. In the control group, Jurkat cells were cultured without treatment. In the experimental group, cells were stimulated with 1× Cell Stimulation Mix to induce Granzyme B activation.

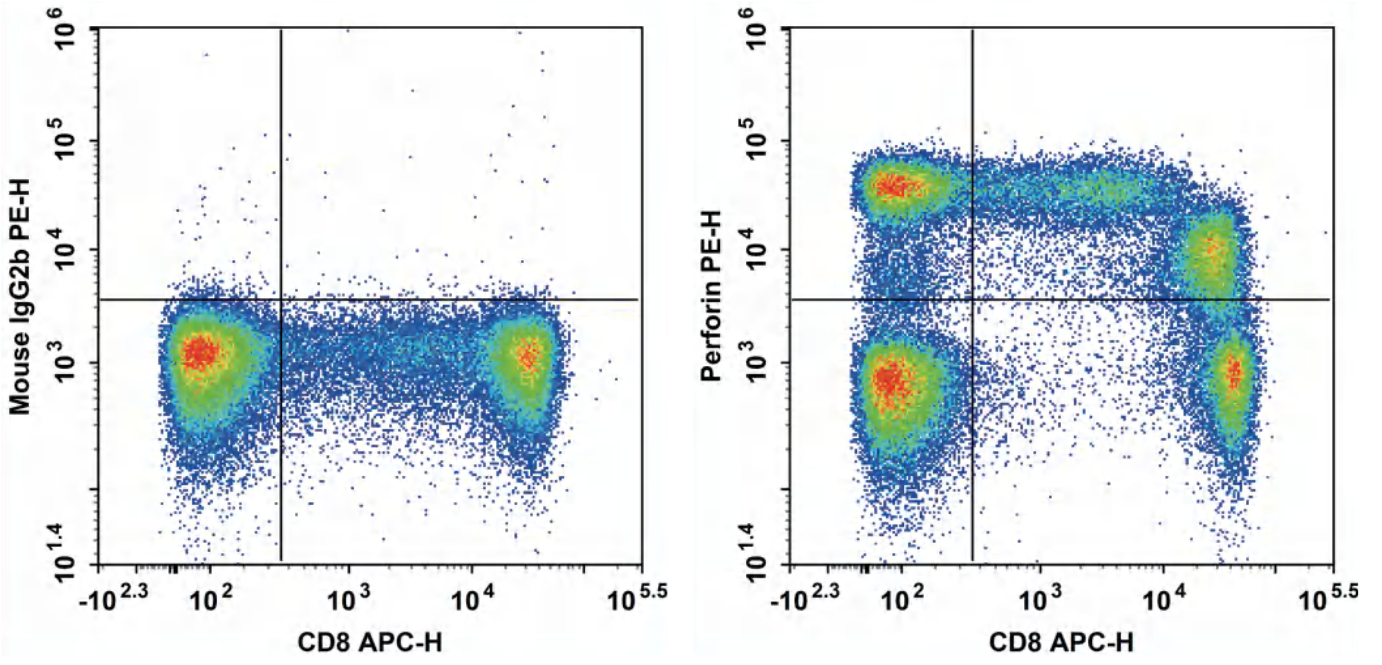


Figure 37. Peripheral blood cells from healthy human donors were analyzed by flow cytometry using APC Anti-Human CD8a Antibody (OKT-8) and PE Anti-Human Perforin Antibody (DG9) (right), or PE Mouse IgG2b, κ Isotype Control (left).

T cell cytotoxicity and toxicity assessment related products

Products	Catalog No.
FITC Anti-Human Granzyme B Antibody[QA18A28]	AN00961C
PE Anti-Human Granzyme B Antibody[QA18A28]	AN00961D
PE Anti-Human Perforin Antibody[DG9]	AN00987D (pending launch, available for trial application)
PE/Elab Fluor® 594 Anti-Human Perforin Antibody[DG9]	AN00987P (pending launch, available for trial application)
Human GzmB(Granzyme B) ELISA Kit	E-EL-H1617
Human PRF1(Perforin 1) ELISA Kit	E-EL-H1123
Mini Sample Human GzmB (Granzyme B) ELISA Kit	E-MSEL-H0019
Uncoated Human GzmB (Granzyme B) ELISA Kit	E-UNEL-H0304
Calcein AM/PI Double Staining Kit	E-CK-A354
Enhanced Cell Counting Kit 8 (WST-8/CCK8)	E-CK-A362
E-Click EdU Cell Proliferation Imaging Assay Kit (Green, Elab Fluor® 488)	E-CK-A376
Lactate Dehydrogenase (LDH) Activity Assay Kit (WST-8 method)	E-BC-K766-M
Lactate Dehydrogenase (LDH) Cytotoxicity Colorimetric Assay Kit	E-BC-K771-M
MTT Cell Proliferation and Cytotoxicity Assay Kit	E-CK-A341

Procell System® provide cell lines for quality inspection

In CAR-T cell product quality control (QC) systems, standardized target cell lines play a pivotal role. They are primarily employed in potency assays, for *in vitro* simulation of the physiological tumor microenvironment, and for evaluating the tumor-killing capability of CAR-T cells, serving as a core release-critical quality attribute. Target cells are generally categorized into negative control cells, antigen-positive target cells, and universal target cell models.

Cell line	Catalog No.	Target antigen	Application scenarios
Raji	CL-0189	CD19+	The "gold standard" target cells for anti-CD19 CAR-T systems. A core model for evaluating the *in vitro* cytotoxic potency of CD19-targeting CAR-T cell products.
NALM-6	CL-0701	CD19+	Specific target cells, also widely used for potency evaluation of anti-CD19 CAR-T cells and for establishing tumor-bearing animal models.
K562	CL-0130		Universal negative control target cells, commonly used to assess whether CAR-T cells exhibit non-specific cytotoxic activity.
Reh	CL-0484	CD19+	Specific target cells used to evaluate the potency of CD19-targeting CAR-T cells (e.g., Yescarta).
HL60	CL-0110	CD33+	Used as target cells for evaluating the potency of CAR-T cells targeting other antigens (e.g., CD33) or dual-target CAR-T cell products.
MOLM-13	CL-0681	CD19-	Negative control target cells. Used in the evaluation of anti-CD19 CAR-T cells to verify antigen-specific cytotoxic activity.
Jurkat, Clone E6-1	CL-0129		T cell signaling transduction and CAR functional validation. Highly transfectable, making it an ideal model cell line for investigating how CAR structural components (e.g., co-stimulatory domains) influence downstream signaling pathways.
Jurkat clone A3[A3]	CL-0315		
U266 [U266B1]	CL-0510	BCMA+ CD138+	Multiple myeloma (MM) research. Commonly used as target cells for evaluating the efficacy of CAR-T cells targeting antigens such as BCMA and CD138.
MV-4-11	CL-0572	CD33+ CD123+	Acute myeloid leukemia (AML) research. Used to evaluate the cytotoxic efficacy of CAR-T or CAR-NK cells targeting CD33 or CD123.
MOLT-4	CL-0160	CD7+ CD5+	A key target cell model in preclinical CAR-T studies targeting antigens such as CD7 and CD5. Widely used in research on T-ALL cell proliferation, apoptosis, and signaling pathways.
CCRF-CEM	CL-0058	CD7+	Widely used in preclinical CAR-T therapy research and serves as an important model for drug screening and resistance mechanism studies.
Daudi	CL-0072	CD19+/CD20+	CD19/CD20 dual-target CAR-T functional validation and lymphoma model establishment.
NCI-H929	CL-0509	BCMA+ CD38+	BCMA CAR-T basic research and preclinical efficacy evaluation of multiple myeloma; considered a gold-standard model for pharmacodynamic assessment.
RPMI 8226	CL-0564	BCMA+/CD38+	CD38-targeted CAR-T and bispecific CAR-T functional validation.
THP-1	CL-0233	CD123+/B7H3+/CD33+	CD123, B7H3, and CD33 CAR-T target screening.
BT-474	CL-0040	HER2+	HER2-targeted CAR-T *in vitro* cytotoxicity against solid tumors.
SK-BR-3	CL-0211	HER2+	Efficacy validation of CAR-T therapy against HER2-overexpressing tumors.
MDA-MB-231	CL-0150	TROP2(+) MSLN(+) HER2(-)	TROP2/MSLN-targeted CAR-T research.
SK-OV-3	CL-0215	MSLN(+) HER2(+)	Mesothelin (MSLN) and HER2-targeted CAR-T for ovarian cancer.
Hep G2	CL-0103	GPC3(+)	GPC3-targeted CAR-T in vitro and in vivo hepatocellular carcinoma models.
PANC-1	CL-0184	MSLN(+) TROP2(+)	MSLN/TROP2-targeted CAR-T research in pancreatic cancer.
U251	CL-0237	EGFRvIII(+) B7H3(+)	EGFRvIII and B7H3 CAR-T experimental studies in brain tumors.

For more cell requirements, please visit the official website or consult your local distributor.

Cytokine release assay detection

During long-term culture of CAR-T cells, the cytokine secretion profile serves as a critical indicator for evaluating cellular activity, functional status, and overall performance. The levels of these secreted factors are closely associated with CAR-T cell proliferation, cytotoxic potency, persistence, and potential toxicity.

Cytokine ELISA assay detection

CellaQuant™ ELISA kits are immunoassay products independently developed by Elabscience® for the precise quantitative detection of target proteins in cell-based samples. Focusing on the field of cellular analysis, Elabscience® addresses the rapidly growing demand for high-performance detection solutions. Through extensive validation across diverse cell models, these kits deliver accurate, stable, and reliable data support for cellular experiments. Built-in quality controls are included, and select targets incorporate core calibrators traceable to international standards, ensuring data accuracy and global comparability. This makes them an ideal choice for cell-based analytical applications.

Precise cytokine capture

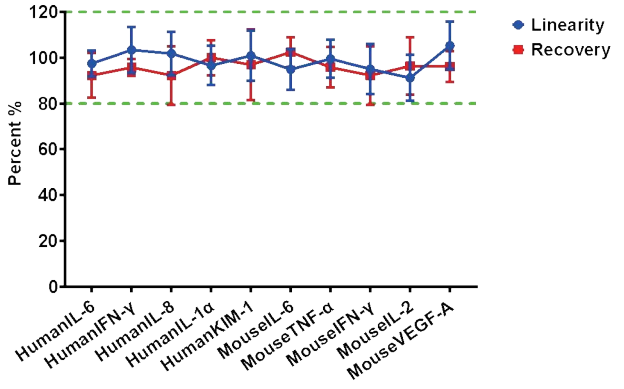


Figure 38. In cell matrices of varying complexity, dilution linearity and spike recovery rates consistently remained within the optimal range of 80%–120%, demonstrating excellent analytical performance.

Excellent background control

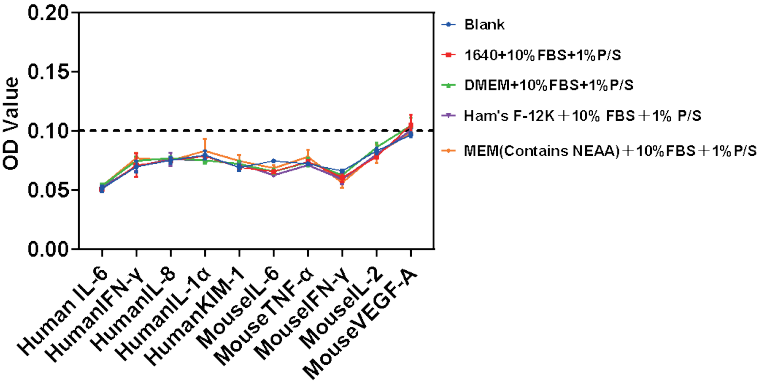


Figure 39. Broad validation across different complete culture media significantly reduces matrix interference and improves signal-to-noise ratio.

Benchmarking against international brands

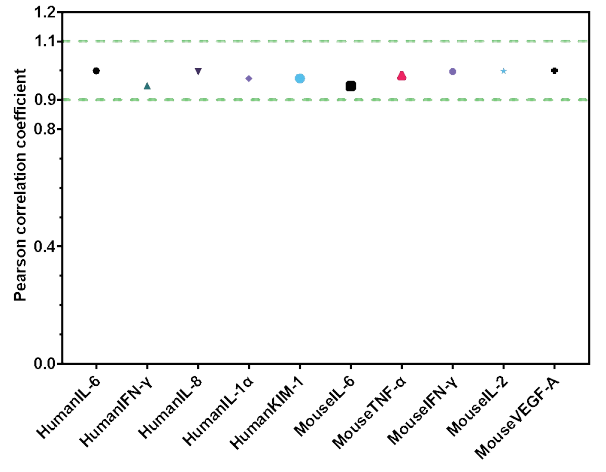


Figure 40. Measured key performance parameters show strong correlation with leading imported brands, with $R^2 > 0.9$, demonstrating excellent cost-effectiveness.

Dual assurance of quality control and traceability

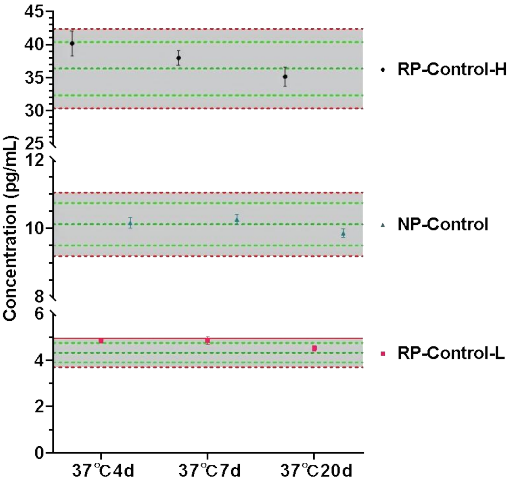


Figure 41. Each production batch undergoes quality control in accordance with clinical standards, with key parameters traceable to national reference standards, ensuring consistent performance. Core raw materials demonstrate excellent stability in accelerated stability studies, ensuring controlled lot-to-lot variability of the kit.

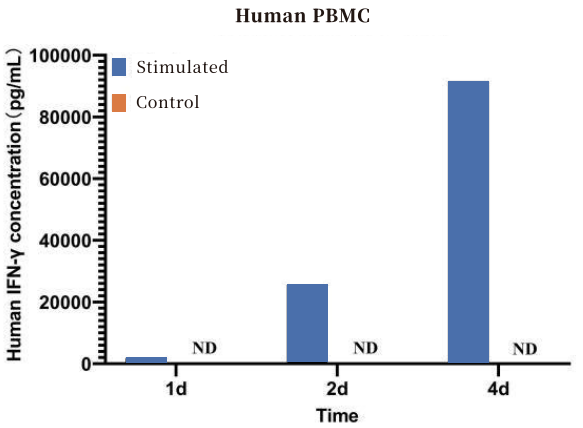


Figure 42. Human PBMCs were stimulated with 10 μg/mL anti-CD3 monoclonal antibody and 1 μg/mL anti-CD28 monoclonal antibody for 1 day, 2 days, and 4 days, and compared with unstimulated cells to measure IFN-γ levels in the culture supernatant.

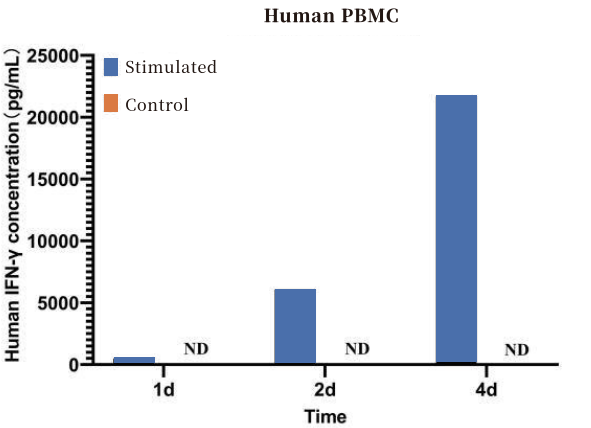


Figure 43. Human PBMCs were stimulated with 10 μg/mL PHA for 1 day, 2 days, and 4 days, and compared with unstimulated cells to measure IFN-γ levels in the culture supernatant.

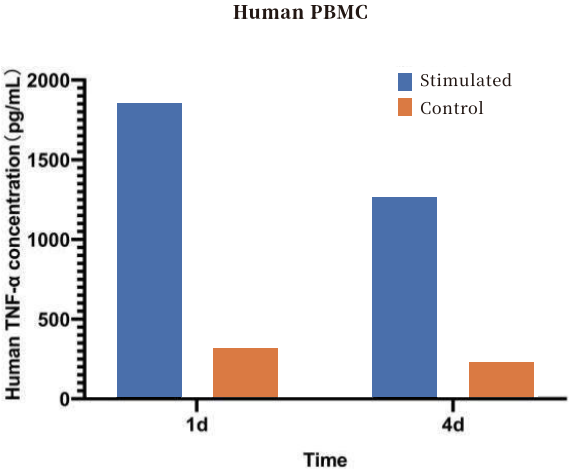


Figure 44. Human PBMCs were stimulated with 10 μg/mL anti-CD3 monoclonal antibody and 1 μg/mL anti-CD28 monoclonal antibody for 1 day and 4 days, compared with unstimulated cells, to measure TNF-α levels in the culture supernatant.

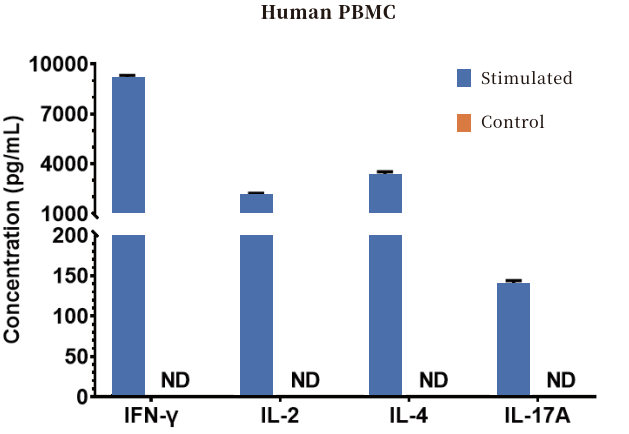


Figure 45. Human PBMCs (1 × 10^6 cells/mL) were either left untreated or stimulated with 10 μg/mL PHA + 10 ng/mL PMA, or PMA (50 ng/mL) + ionomycin (500 ng/mL), and cultured for 1 day. IFN-γ, IL-2, IL-4, and IL-17A levels in the culture supernatants were quantified by ELISA.

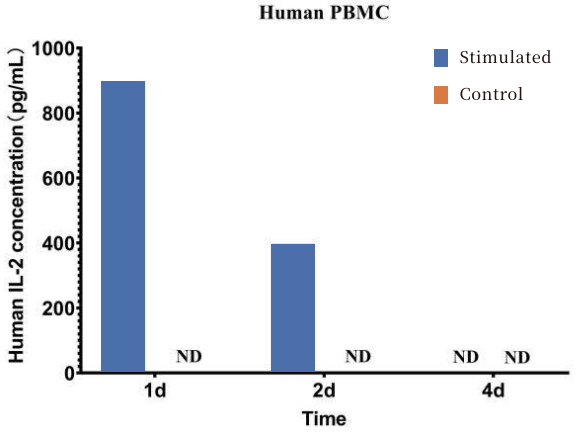


Figure 46. Human PBMCs were stimulated with 10 μg/mL anti-CD3 antibody for 1 day, 2 days, and 4 days, and compared with unstimulated cells to measure IL-2 levels in the culture supernatant.

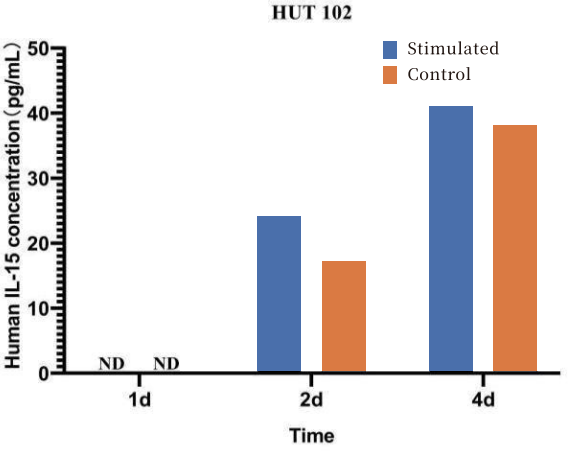


Figure 47. HUT 102 cells were cultured in RPMI 1640 supplemented with 10% fetal bovine serum and 1% penicillin-streptomycin (double antibiotics) with 100–200 U/mL recombinant IL-2, or in DMEM/Ham' s F-12 supplemented with ITS-G and a chemically defined lipid concentrate, for 1, 2, and 4 days. IL-15 levels in the culture supernatants were measured.

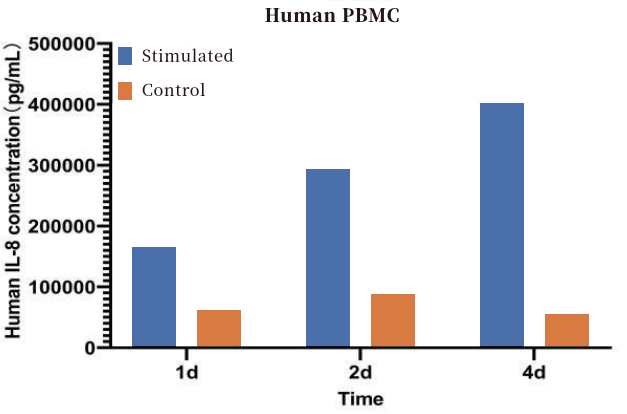


Figure 48. Human PBMCs were stimulated with 10 μg/mL PHA for 1 day, 2 days, and 4 days, and compared with unstimulated cells to measure IL-8 levels in the culture supernatant.

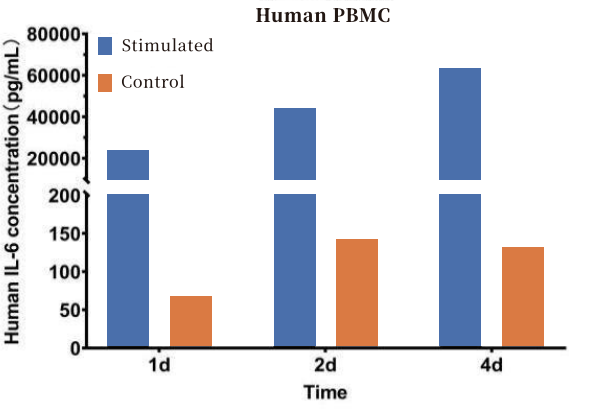


Figure 49. Human PBMCs were stimulated with 2 μg/mL PHA for 1 day, 2 days, and 4 days, and compared with unstimulated cells to measure IL-6 levels in the culture supernatant.

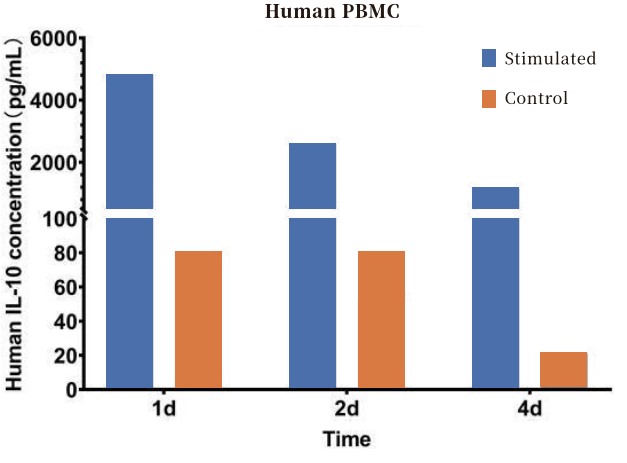


Figure 50. Human PBMCs were stimulated with 10 μg/mL PHA for 1 day, 2 days, and 4 days, and compared with unstimulated cells to measure IL-10 levels in the culture supernatant.

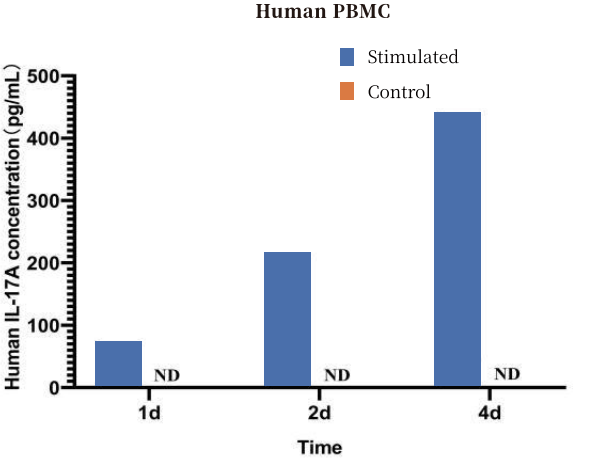


Figure 51. Human PBMCs were stimulated with 10 μg/mL anti-CD3 antibody and 1 μg/mL anti-CD28 antibody for 1 day, 2 days, and 4 days, and compared with unstimulated cells to measure IL-17A levels in the culture supernatant.

Cytokine ELISA assay related product list

Products	Catalog No.
CellaQuant™ Human IFN-γ (Interferon Gamma) ELISA Kit	CQH003
CellaQuant™ Human IL-1α (Interleukin 1 Alpha) ELISA Kit	CQH005
CellaQuant™ Human IL-1β (Interleukin 1 Beta) ELISA Kit	CQH015
CellaQuant™ Human IL-2 (Interleukin 2) ELISA Kit	CQH008
CellaQuant™ Human IL-6 (Interleukin 6) ELISA Kit	CQH001
CellaQuant™ Human IL-8 (Interleukin 8) ELISA Kit	CQH004
CellaQuant™ Human IL-10 (Interleukin 10) ELISA Kit	CQH002
CellaQuant™ Human IL-15 (Interleukin 15) ELISA Kit	CQH021
CellaQuant™ Human IL-17A (Interleukin 17A) ELISA Kit	CQH010
CellaQuant™ Human IL-18 (Interleukin 18) ELISA Kit	CQH007
CellaQuant™ Human IL-23 (Interleukin 23) ELISA Kit	CQH013
CellaQuant™ Human IL-33 (Interleukin 33) ELISA Kit	CQH020
CellaQuant™ Human TNF-α (Tumor Necrosis Factor Alpha) ELISA Kit	CQH014
CellaQuant™ Human VEGF-A (Vascular Endothelial Cell Growth Factor A) ELISA Kit	CQH016

Cytokine ELISPOT assay detection

ELISPOT (enzyme-linked immunospot assay) is a highly sensitive technique capable of detecting and quantifying cytokine secretion by T cells (e.g., IFN-γ, IL-2, IL-4, IL-17) at the single-cell level. Each spot generated in an ELISPOT assay represents one cytokine-secreting T cell, enabling absolute quantification of the magnitude of the immune response and accurately reflecting the number of antigen-responsive T cells within a population. This feature makes ELISPOT a powerful tool for precisely assessing immune response strength and comparing immune status across different groups or time points. It not only confirms the presence of T cells but also directly and sensitively measures their functional immune responses.

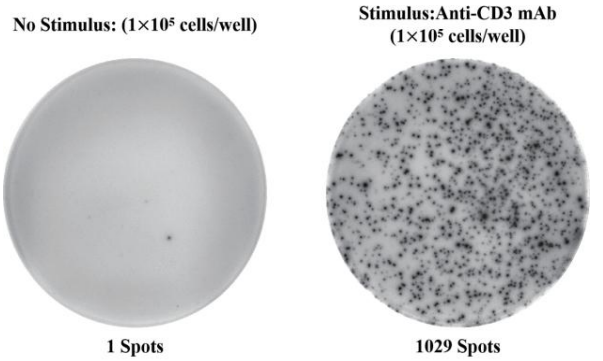


Figure 52. Human PBMCs (1 × 10^5 cells/well) were incubated in the absence or presence of the stimulant anti-CD3 monoclonal antibody (1:500 dilution) for 20 hours. The number of spots represents the number of IFN-γ-secreting cells.

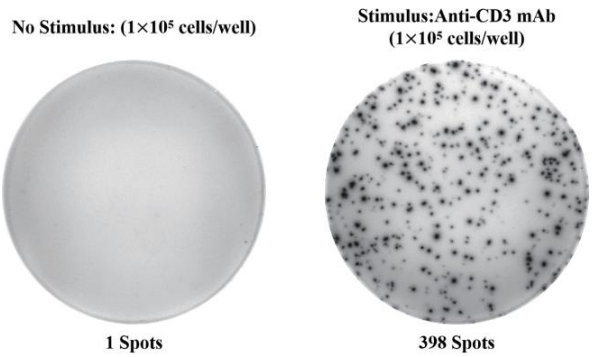


Figure 53. Human PBMCs (1 × 10^5 cells/well) were incubated in the absence or presence of the stimulant anti-CD3 monoclonal antibody (1:500 dilution) for 20 hours. The number of spots represents the number of IL-17A-secreting cells.

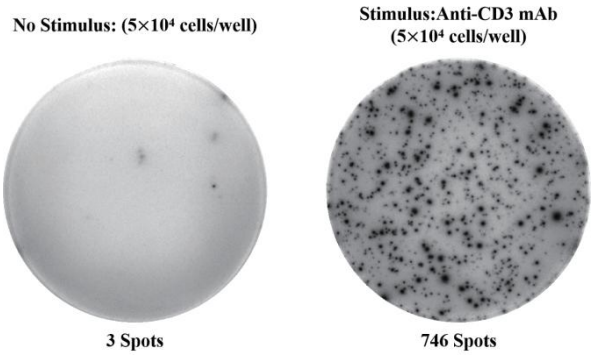


Figure 54. Human PBMCs (5 × 10^4 cells/well) were incubated in the absence or presence of the stimulant anti-CD3 monoclonal antibody (500 ng/mL) for 20 hours. The number of spots represents the number of IL-2-secreting cells.

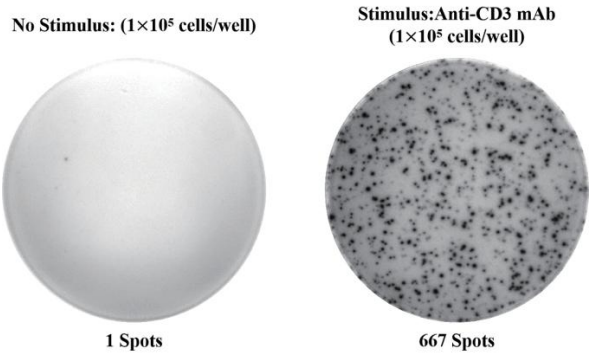


Figure 55. Human PBMCs (1 × 10^5 cells/well) were incubated in the absence or presence of the stimulant anti-CD3 monoclonal antibody (500 ng/mL) for 20 hours. The number of spots represents the number of IL-4-secreting cells.

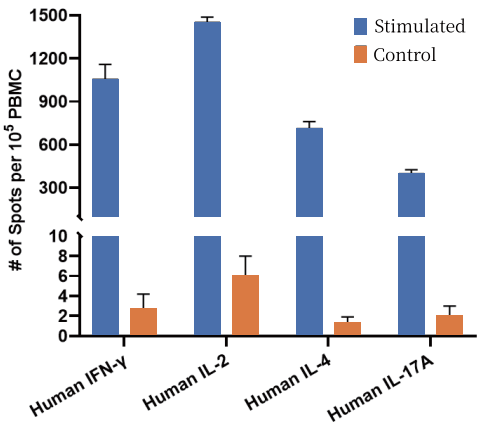


Figure 56. ELISPOT assay for T cell function. PBMCs were incubated in the absence or presence of the stimulant anti-CD3 monoclonal antibody (500 ng/mL) for 20 hours. ELISPOT was used to detect the expression of T cell–related cytokines IFN-γ, IL-2, IL-4, and IL-17A.

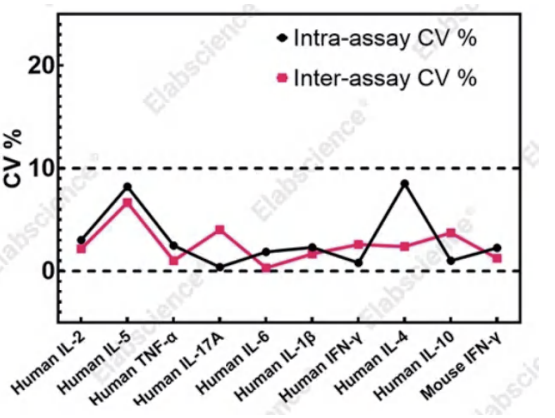


Figure 57. Intra- and inter-assay variability of each parameter: both intra- and inter-assay variation were <10%, with clearly defined, easily interpretable spots and high data reproducibility.

Cytokine ELISPOT assay related product list

Products	Catalog No.
Human IFN-γ (Interferon Gamma) ELISPOT Kit	ESP-H0002
Human IL-1β (Interleukin 1β) ELISPOT Kit	ESP-H0005
Human IL-2 (Interleukin 2) ELISPOT Kit	ESP-H0006
Human IL-4 (Interleukin 4) ELISPOT Kit	ESP-H0007
Human IL-5 (Interleukin 5) ELISPOT Kit	ESP-H0008
Human IL-6 (Interleukin 6) ELISPOT Kit	ESP-H0009
Human IL-10 (Interleukin 10) ELISPOT Kit	ESP-H0003
Human IL-17A (Interleukin 17A) ELISPOT Kit	ESP-H0004
Human TNF-α (Tumor Necrosis Factor Alpha) ELISPOT Kit	ESP-H0010

Cell metabolic function assay detection

Metabolic profiling is a core technique for deciphering CAR-T cell fate, function, and efficacy. By systematically monitoring glycolysis, oxidative phosphorylation, amino acid and lipid metabolism, and mitochondrial function, it precisely links metabolic reprogramming to activation, proliferation, differentiation, stemness maintenance, and exhaustion.

In preclinical settings, metabolic assays guide optimization of culture conditions, co-stimulatory domains, and genetic modifications, thereby improving expansion efficiency, memory phenotype, and resistance to exhaustion. Clinically, metabolic parameters serve as predictive biomarkers for in vivo persistence, infiltration, and antitumor activity, supporting product quality assessment and dosing strategies.

Overall, metabolic testing is not only a mechanistic tool but also essential for CAR-T standardization, quality control, and clinical translation, offering significant value for developing next-generation CAR-T cells with enhanced persistence and functionality.

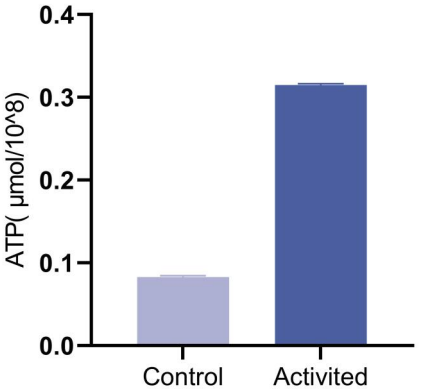


Figure 58. Fresh human PBMCs were sorted using the EasySort™ Human CD3+ T Cell Isolation Kit to obtain CD3+ T cells. After activation and culture with CD3/CD28 beads for 3 days, ATP levels in cells were compared with the control group (unstimulated cells).

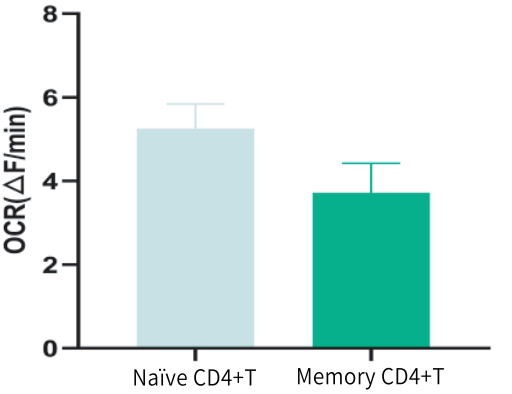


Figure 59. Human PBMCs were sorted using the Human Naïve CD4+ T Cell Isolation Kit and Human Memory CD4+ T Cell Isolation Kit to obtain the corresponding T cell subsets. Oxygen consumption rate (OCR) was measured using the OCR assay kit (E-BC-F070).

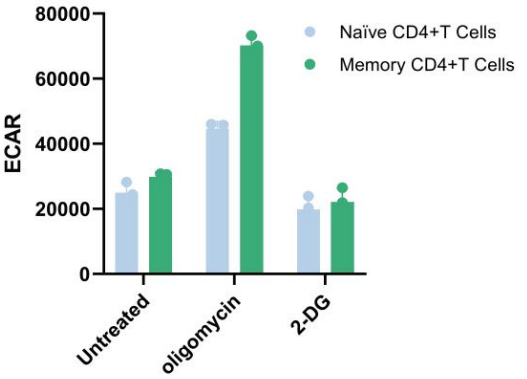


Figure 60. Human PBMCs were sorted using the Human Naïve CD4+ T Cell Isolation Kit and Human Memory CD4+ T Cell Isolation Kit to obtain the corresponding T cell subsets. Extracellular acidification rate (ECAR) was measured using the ECAR assay kit (E-BC-F069). The ECAR level of memory CD4+ T cells was higher than that of naïve CD4+ T cells.

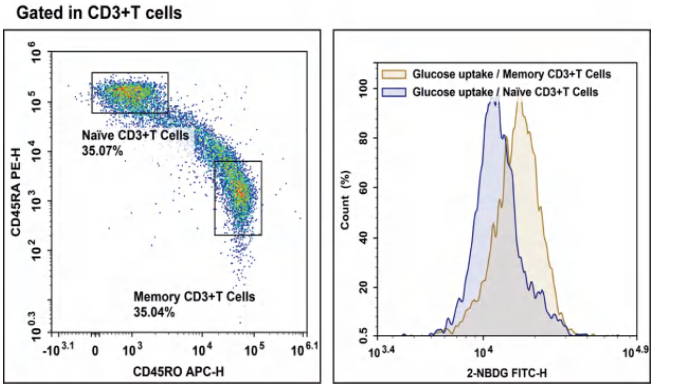


Figure 61. Human PBMCs were sorted using the Human Naïve CD4+ T Cell Isolation Kit and Human Memory CD4+ T Cell Isolation Kit to obtain the corresponding T cell subsets. Glucose uptake capacity of memory and naïve T cells was measured using the 2-NBDG Glucose Uptake Cell-Based Kit (E-CK-A441).

Cell metabolic assay related product list

Products	Catalog No.
2-NBDG Glucose Uptake Cell-Based Kit	E-CK-A441
Alanine Aminotransferase (ALT/GPT) Activity Colorimetric Assay Kit	E-BC-K1300-M
Aspartate Aminotransferase (AST/GOT) Activity Colorimetric Assay Kit	E-BC-K1301-M
Arginase Activity Colorimetric Assay Kit	E-BC-K848-M
β-Hydroxybutyrate (Ketone Body) Colorimetric Assay Kit	E-BC-K785-M
Cholesterol Uptake Fluorometric Assay Kit	E-BC-F089
Cysteine (Cys) Colorimetric Assay Kit	E-BC-K352-M
Enhanced ATP Chemiluminescence Assay Kit	E-BC-F201
Enhanced Oxygen Consumption Rate (OCR)Fluorometric Assay Kit	E-BC-F070
Extracellular Acidification Rate (ECAR)Fluorometric Assay Kit	E-BC-F069
Fatty Acid Uptake Fluorometric Assay Kit	E-BC-F067
Fatty Acid Oxidation (FAO) Colorimetric Assay Kit	E-BC-K784-M
Glucose (GLU) Fluorometric Assay Kit	E-BC-F037
Glutamine (Gln) Colorimetric Assay Kit	E-BC-K853-M
Glutaminase (GLS) Activity Assay Kit	E-BC-K660-M
Glycolysis Stress Fluorometric Assay Kit	E-BC-F084
Homocysteine (Hcy) Colorimetric Assay Kit	E-BC-K854-M
L-Arginine (L-Arg) Colorimetric Assay Kit	E-BC-K850-M
Lactate Dehydrogenase (LDH) Cytotoxicity Colorimetric Assay Kit	E-BC-K771-M
L-Lactic Acid (LA) Colorimetric Assay Kit	E-BC-K044-M
Mitochondrial Membrane Potential Assay Kit (with JC-1)	E-CK-A301
Mitochondrial Stress Fluorometric Assay Kit	E-BC-F078
MitoBright Green Probe Assay Kit	E-CK-A401
MitoBright Red Probe Assay Kit	E-CK-A402
MitoBright Deep Red Probe Assay Kit	E-CK-A403
NADP+/NADPH Colorimetric Assay Kit (WST-8)	E-BC-K803-M

References

1.Vardhana S A, Hwee M A, Berisa M, et al. Impaired mitochondrial oxidative phosphorylation limits the self-renewal of T cells exposed to persistent antigen[J]. *Nature immunology*, 2020, 21(9): 1022-1033.

2.McPhedran S J, Carleton G A, Lum J J. Metabolic engineering for optimized CAR-T cell therapy[J]. *Nature Metabolism*, 2024, 6(3): 396-408.

3.Gamal W, Goedhart N B, Simon-Molas H, et al. Mitigating T-cell mitochondrial dysfunction in CLL to augment CAR T-cell therapy: evaluation in an immunocompetent model[J]. *Blood Advances*, 2025, 9(10): 2511-2529.

4.Markowitz G J, Ban Y, Tavarez D A, et al. Deficiency of metabolic regulator PKM2 activates the pentose phosphate pathway and generates TCF1+ progenitor CD8+ T cells to improve immunotherapy[J]. *Nature immunology*, 2024, 25(10): 1884-1899.

In Vivo Pharmacodynamic and Safety Evaluation of CAR-T Cells

CAR-T cells are human-derived cellular products. If directly transplanted into immunocompetent animals, they will trigger immune rejection, leading to rapid clearance of the human cells and preventing the acquisition of clinically meaningful efficacy and safety data. Therefore, depending on the specific research objectives, appropriate animal species (such as mice, non-human primates, etc.) are selected for in vivo pharmacodynamic and pharmacological evaluations.

Analysis of tumor-bearing mouse model samples

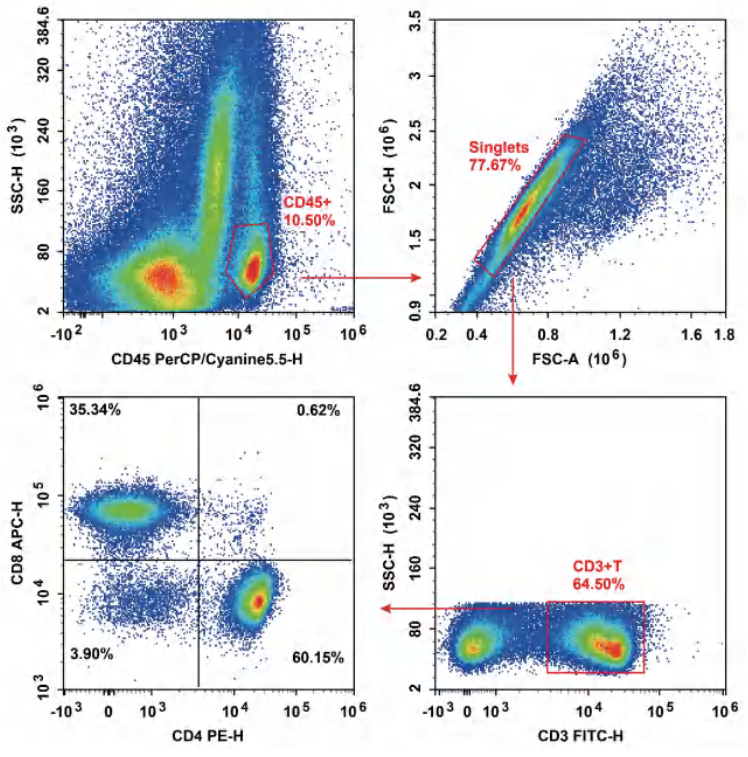


Figure 62. Tumor T cell subset analysis. BALB/c mice bearing subcutaneous 4T1 tumors (7 days) were processed into single-cell suspensions using tissue dissociation buffer. Tumor-infiltrating lymphocytes were analyzed by flow cytometry using PerCP/Cyanine5.5 anti-mouse CD45 (30-F11, E-AB-F1136J), FITC anti-mouse CD3 (17A2, E-AB-F1013C), PE anti-mouse CD4 (GK1.5, E-AB-F1097D), and APC anti-mouse CD8a (53-6.7, E-AB-F1104E), to determine the proportions of CD4+ and CD8+ T cells within the tumor.

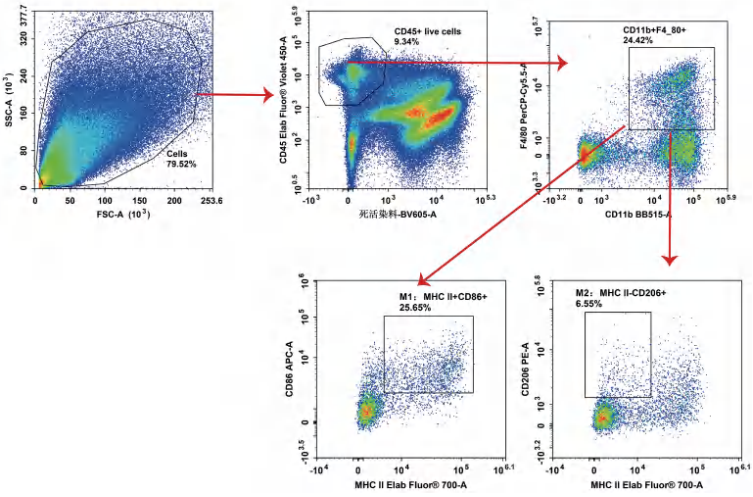


Figure 63. Tumor-infiltrating lymphocyte subset analysis. BALB/c mice bearing subcutaneous 4T1 tumors (13 days) were processed into single-cell suspensions using tissue dissociation buffer. Tumor samples were analyzed by flow cytometry using Elab Fluor™ Violet 450 anti-mouse CD45 (30-F11, E-AB-F1136Q), PerCP/Cyanine5.5 anti-mouse F4/80 (CI:A3-1, E-AB-F0995J), FITC anti-mouse/human CD11b (M1/70, E-AB-F1081C), Elab Fluor™ 700 anti-mouse MHC II (M5/114, E-AB-F0990M1), PE anti-mouse CD206 (C068C2, E-AB-F1135D), and APC anti-mouse CD86 (GL-1, E-AB-F0994E) to determine the proportions of M1 and M2 macrophages within the tumor microenvironment.

Related product list

Products	Catalog No.
Anti-Whitlow/218 Linker Antibody	Under development, available for trial use
FITC Anti-Human CD274/PD-L1 Antibody[29E.2A3]	E-AB-F1133C
PE Anti-Mouse CD274/PD-L1 Antibody[10F.9G2]	E-AB-F1132D
PE Anti-Human CD279/PD-1 Antibody[EH12.2H7]	E-AB-F1229D
Purified Anti-Human CD366 Antibody[F38-2E2]	AN009710P
PE Anti-Mouse CD366/Tim-3 Antibody[RMT3-23]	E-AB-F1192D
EasyStain™ Human Fc Receptor Blocking Solution	E-CK-A171
STYX™ Red Fixable Viability Kit	E-CK-A170
STYX™ Yellow Fixable Viability Kit	E-CK-A169

Analysis of samples from non-human primate models

Elabscience® provides flow cytometry antibodies validated for non-human primate samples specifically designed for the detection and analysis of primate model specimens.

Non-human primate model sample detection case studies

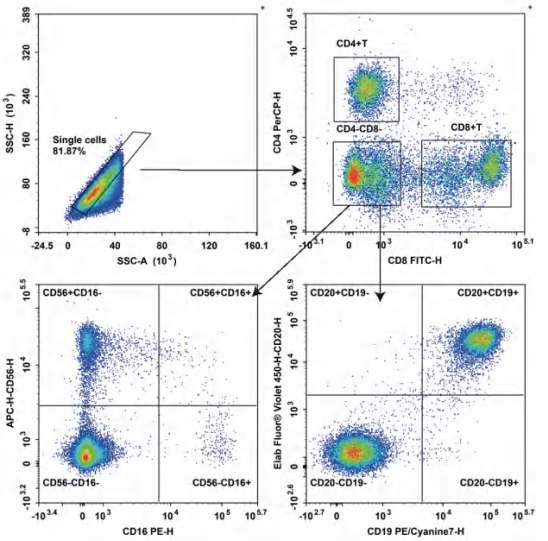


Figure 64. TBNK subset analysis in peripheral blood of female cynomolgus monkeys.

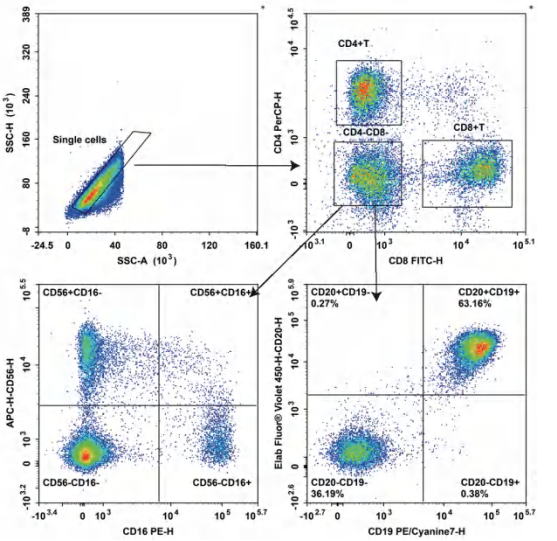


Figure 65. TBNK subset analysis in peripheral blood of male cynomolgus monkeys.

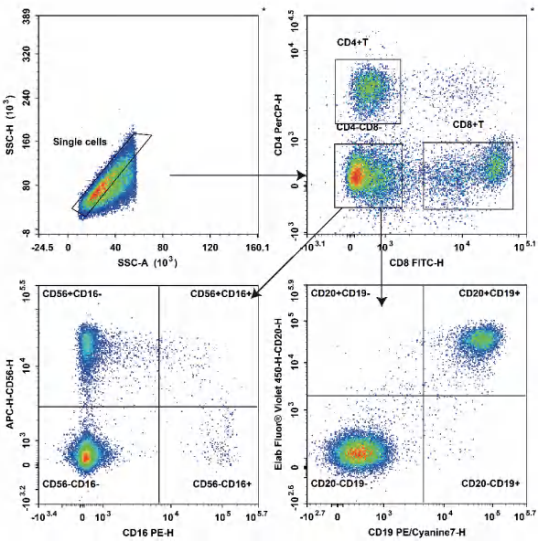


Figure 66. TBNK subset analysis in peripheral blood of female rhesus monkeys.

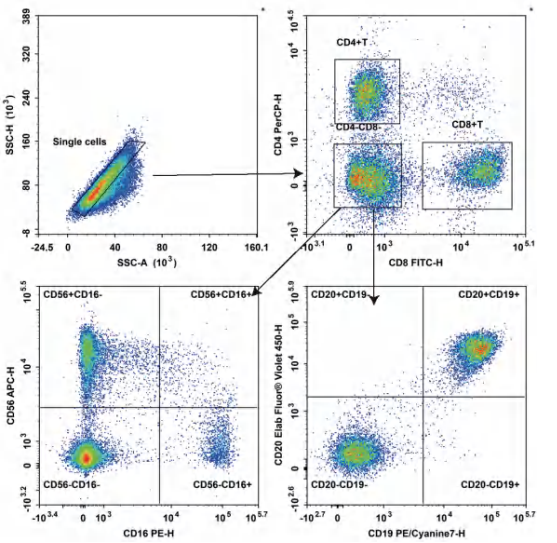


Figure 67. TBNK subset analysis in peripheral blood of male rhesus monkeys.

Flow cytometry antibody product list for non-human primate model sample analysis

Products	Catalog No.
FITC Anti-Human/Monkey CD4 Antibody[SK3]	E-AB-F1352C
PE Anti-Human/Monkey CD4 Antibody[SK3]	E-AB-F1352D
APC Anti-Human/Monkey CD4 Antibody[SK3]	E-AB-F1352E
PerCP Anti-Human/Monkey CD4 Antibody[SK3]	E-AB-F1352F
PE/Cyanine5 Anti-Human/Monkey CD4 Antibody[SK3]	E-AB-F1352G
PE/Cyanine7 Anti-Human/Monkey CD4 Antibody[SK3]	E-AB-F1352H
Elab Fluor® 488 Anti-Human/Monkey CD4 Antibody[SK3]	E-AB-F1352L
Elab Fluor® 647 Anti-Human/Monkey CD4 Antibody[SK3]	E-AB-F1352M
PE/Elab Fluor® 594 Anti-Human/Monkey CD4 Antibody[SK3]	E-AB-F1352P
Elab Fluor® Violet 450 Anti-Human/Monkey CD4 Antibody[SK3]	E-AB-F1352Q
Elab Fluor® Violet 500 Anti-Human/Monkey CD4 Antibody[SK3]	E-AB-F1352R
Elab Fluor® Violet 610 Anti-Human/Monkey CD4 Antibody[SK3]	E-AB-F1352T
Elab Fluor® Violet 540 Anti-Human/Monkey CD4 Antibody[SK3]	E-AB-F1352T3
FITC Anti-Human/Monkey CD8 Antibody[SK1]	E-AB-F00337C
Biotin Anti-Human/Monkey CD16 Antibody[3G8]	E-AB-F1236B
PE Anti-Human/Monkey CD16 Antibody[3G8]	E-AB-F1236D
APC Anti-Human/Monkey CD16 Antibody[3G8]	E-AB-F1236E
PerCP Anti-Human/Monkey CD16 Antibody[3G8]	E-AB-F1236F
PE/Cyanine7 Anti-Human/Monkey CD16 Antibody[3G8]	E-AB-F1236H
PE/Cyanine5.5 Anti-Human/Monkey CD16 Antibody[3G8]	E-AB-F1236I
Elab Fluor® 488 Anti-Human/Monkey CD16 Antibody[3G8]	E-AB-F1236L
Elab Fluor® 647 Anti-Human/Monkey CD16 Antibody[3G8]	E-AB-F1236M
Elab Fluor® 700 Anti-Human/Monkey CD16 Antibody[3G8]	E-AB-F1236M1
PE/Elab Fluor® 594 Anti-Human/Monkey CD16 Antibody[3G8]	E-AB-F1236P
Elab Fluor® Red 780 Anti-Human/Monkey CD16 Antibody[3G8]	E-AB-F1236S
Elab Fluor® Violet 610 Anti-Human/Monkey CD16 Antibody[3G8]	E-AB-F1236T
Elab Fluor® Violet 540 Anti-Human/Monkey CD16 Antibody[3G8]	E-AB-F1236T3
Biotin Anti-Human/Monkey CD19 Antibody[CB19]	E-AB-F1004B
FITC Anti-Human/Monkey CD19 Antibody[CB19]	E-AB-F1004C
APC Anti-Human/Monkey CD19 Antibody[CB19]	E-AB-F1004E
PE/Cyanine7 Anti-Human/Monkey CD19 Antibody[CB19]	E-AB-F1004H
Elab Fluor® 488 Anti-Human/Monkey CD19 Antibody[CB19]	E-AB-F1004L
Elab Fluor® 700 Anti-Human/Monkey CD19 Antibody[CB19]	E-AB-F1004M1
PE/Elab Fluor® 594 Anti-Human/Monkey CD19 Antibody[CB19]	E-AB-F1004P
Elab Fluor® Violet 450 Anti-Human/Monkey CD19 Antibody[CB19]	E-AB-F1004Q
Elab Fluor® Violet 500 Anti-Human/Monkey CD19 Antibody[CB19]	E-AB-F1004R
Elab Fluor® Violet 540 Anti-Human/Monkey CD19 Antibody[CB19]	E-AB-F1004T3
FITC Anti-Human/Monkey CD20 Antibody[2H7]	E-AB-F1212C
PE Anti-Human/Monkey CD20 Antibody[2H7]	E-AB-F1212D
APC Anti-Human/Monkey CD20 Antibody[2H7]	E-AB-F1212E
PE/Cyanine5 Anti-Human/Monkey CD20 Antibody[2H7]	E-AB-F1212G
PE/Cyanine7 Anti-Human/Monkey CD20 Antibody[2H7]	E-AB-F1212H

Products	Catalog No.
PerCP/Cyanine5.5 Anti-Human/Monkey CD20 Antibody[2H7]	E-AB-F1212J
Elab Fluor® 488 Anti-Human/Monkey CD20 Antibody[2H7]	E-AB-F1212L
Elab Fluor® 647 Anti-Human/Monkey CD20 Antibody[2H7]	E-AB-F1212M
Elab Fluor® 700 Anti-Human/Monkey CD20 Antibody[2H7]	E-AB-F1212M1
Elab Fluor® Violet 450 Anti-Human/Monkey CD20 Antibody[2H7]	E-AB-F1212Q
FITC Anti-Human/Monkey CD56/NCAM Antibody[B-A19]	E-AB-F1305C
PE Anti-Human/Monkey CD56/NCAM Antibody[B-A19]	E-AB-F1305D
APC Anti-Human/Monkey CD56/NCAM Antibody[B-A19]	E-AB-F1305E
PE/Cyanine7 Anti-Human/Monkey CD56/NCAM Antibody[B-A19]	E-AB-F1305H
PE/Cyanine5.5 Anti-Human/Monkey CD56/NCAM Antibody[B-A19]	E-AB-F1305I
PerCP/Cyanine5.5 Anti-Human/Monkey CD56/NCAM Antibody[B-A19]	E-AB-F1305J
Elab Fluor® 647 Anti-Human/Monkey CD56/NCAM Antibody[B-A19]	E-AB-F1305M
Elab Fluor® 700 Anti-Human/Monkey CD56/NCAM Antibody[B-A19]	E-AB-F1305M1

Note: For additional non-human primate application products and customization inquiries, please consult Elabscience® sales.

Safety evaluation

Non-clinical safety studies of CAR-T cell products and related clinical findings indicate that the primary safety risks include cytokine release syndrome (CRS), reversible neurotoxicity, B cell aplasia, and on-target, off-tumor toxic effects. Accordingly, the main focus of non-clinical safety assessment is to systematically evaluate key risks such as CRS, neurotoxicity, and target-related off-tumor toxicity in a scientifically robust manner.

Elabscience® provides high-sensitivity ELISA kits for in vivo pharmacodynamic studies and safety evaluation of CAR-T cells, with a focus on cytokine detection. These kits offer a 2–10-fold increase in sensitivity and are capable of detecting protein concentrations at the femtogram level.

Products	Catalog No.
High Sensitivity Human IFN-γ (Interferon Gamma) ELISA Kit	E-HSEL-H0007
High Sensitivity Human IL-1β (Interleukin 1 Beta) ELISA Kit	E-HSEL-H0001
High Sensitivity Human IL-2 (Interleukin 2) ELISA Kit	E-HSEL-H0002
High Sensitivity Human IL-6 (Interleukin 6) ELISA Kit	E-HSEL-H0003
High Sensitivity Human IL-8 (Interleukin 8) ELISA Kit	E-HSEL-H0004
High Sensitivity Human IL-10 (Interleukin 10) ELISA Kit	E-HSEL-H0005
High Sensitivity Human TNF-α (Tumor Necrosis Factor Alpha) ELISA Kit	E-HSEL-H0008
High Sensitivity Mouse IFN-γ (Interferon Gamma) ELISA Kit	E-HSEL-M0007
High Sensitivity Mouse IL-1β (Interleukin 1 Beta) ELISA Kit	E-HSEL-M0001
High Sensitivity Mouse IL-4 (Interleukin 4) ELISA Kit	E-HSEL-M0002
High Sensitivity Mouse IL-6 (Interleukin 6) ELISA Kit	E-HSEL-M0003
High Sensitivity Mouse IL-10 (Interleukin 10) ELISA Kit	E-HSEL-M0004
High Sensitivity Mouse IL-18 (Interleukin 18) ELISA Kit	E-HSEL-M0006
High Sensitivity Mouse TNF-α (Tumor Necrosis Factor Alpha) ELISA Kit	E-HSEL-M0009
High Sensitivity Rat IL-1β (Interleukin 1 Beta) ELISA Kit	E-HSEL-R0002
High Sensitivity Rat IL-6 (Interleukin 6) ELISA Kit	E-HSEL-R0004
High Sensitivity Rat IL-10 (Interleukin 10) ELISA Kit	E-HSEL-R0005
High Sensitivity Rat IL-12 (Interleukin 12) ELISA Kit	E-HSEL-R0006
High Sensitivity Rat TNF-α (Tumor Necrosis Factor Alpha) ELISA Kit	E-HSEL-R0001

Related Products

Table 1. Recommended flow cytometry antibody panel and fluorochrome combinations for comprehensive immune cell profiling.

Application categories	Biomarkers	Clone No.	Fluorophore	Catalog No.
Lymphocyte subset detection Panel 1	CD45	HI30	PE/Cyanine7	E-AB-F1137H
	CD3	UCHT1	FITC	E-AB-F1230C
	CD4	SK3	PerCP	E-AB-F1352F
	CD8	OKT-8	APC	E-AB-F1110E
	CD56	5.1H11	Elab Fluor® Red 780	E-AB-F1239S
Lymphocyte subset detection Panel2	CD45	HI30	PerCP	E-AB-F1137F
	CD3	OKT-3	FITC	E-AB-F1001C
	CD19	CB19	PE	E-AB-F1004D
	CD16	3G8	PE	E-AB-F1236D
	CD56	5.1H11	PE	E-AB-F1239D
Lymphocyte subset detection Panel3	CD45	HI30	PerCP	E-AB-F1137F
	CD3	OKT-3	FITC	E-AB-F1001C
	CD4	RPA-T4	APC	E-AB-F1109E
	CD8	UCHT-4	PE	AN00427D
Leukocyte detection	CD45	HI30	FITC	E-AB-F1137C
	CD34	581	PE	E-AB-F1143D
γ/δ T cell detection	CD3	UCHT1	APC	E-AB-F1230E
	TCR γ/δ	B1	FITC	E-AB-F1145C
Regulatory CD4+ T cell detection	CD4	RPA-T4	FITC	E-AB-F1109C
	CD25	BC96	PE	E-AB-F1194D
	CD127	A019D5	APC	E-AB-F1152E
Myeloid-derived suppressor cell (MDSC) detection	CD14	M5E2	FITC	E-AB-F1209C
	HLA-DR	L243	APC	E-AB-F1111E
Cytotoxic / suppressor lymphocyte detection	CD3	UCHT1	FITC	E-AB-F1230C
	CD8	UCHT-4	PerCP	AN00427F
	CD28	CD28.2	PE	E-AB-F1195D
Allergy response detection	CD3	HIT3b	FITC	AN00644C
	CD19	HI19a	PE	E-AB-F1304D
	CD23	EBVCS2	APC	E-AB-F1382E
Expression detection of activating and inhibitory receptors on immune cells	CD3	UCHT1	FITC	E-AB-F1230C
	PD-1	EH12.2H7	PE	E-AB-F1229D
	CD152/CTLA-4	BNI3	APC	Under development, available for trial use
	CD3	HIT3b	FITC	AN00644C
	CD16	3G8	PE	E-AB-F1236D
	CD56	5.1H11	PE	E-AB-F1239D

Application categories	Biomarkers	Clone No.	Fluorophore	Catalog No.
Expression detection of activating and inhibitory receptors on immune cells	NKG2D	1D11	PerCP	Under development, available for trial use
	CD335/NKP46	9E2	APC	Under development, available for trial use
HLA detection	HLA-A,B,C	W6/32	APC	E-AB-F1130E
	HLA-A2,B7	BB7.6	FITC	AN00634C
	HLA-DR	L243	PE	E-AB-F1111D
T cell activation state detection	CD3	HIT3b	FITC	AN00644C
	CD25	BC96	PE	E-AB-F1194D
	CD69	FN50	APC	E-AB-F1138E
	HLA-DR	L243	PerCP	E-AB-F1111F
Platelet activation detection	CD42b	HIP1	/	E-AB-F1327A
	CD62P	HI62P	/	AN008350P
T cell differentiation phenotype detection Panel 1	CD3	UCHT1	FITC	E-AB-F1230C
	CD4	SK3	PerCP	E-AB-F1352F
	CCR7	G043H7	PE	E-AB-F1159D
	CD45RA	HI100	APC	E-AB-F1052E
T cell differentiation phenotype detection Panel 2	CD3	UCHT1	FITC	E-AB-F1230C
	CD8	UCHT-4	PerCP	AN00427F
	CCR7	G043H7	PE	E-AB-F1159D
	CD45RA	HI100	APC	E-AB-F1052E
Th cell subset phenotyping detection (7-color)	CD45	HI30	Elab Fluor®Violet 540	E-AB-F1137T3
	CD4	RPA-T4	EV450	E-AB-F1109Q
	CD3	OKT-3	PerCP/Cyanine5.5	E-AB-F1001J
	CXCR3	G025H7	APC	E-AB-F1156E
	CCR4	L291H4	Elab Fluor® Violet 450	E-AB-F1366
	CCR6	G034E3	PE	E-AB-F1158
	CXCR5	J252D4	FITC	E-AB-F1287C
T cell TN, TEM, and TCM subset detection Panel 1	CD8	OKT-8	Elab Fluor®Violet 610	E-AB-F1110T
	CCR7/CD197	G043H7	Elab Fluor® Violet 450	E-AB-F1159Q
	CD3	UCHT1	FITC	E-AB-F1230C
	CD4	SK3	PerCP	E-AB-F1352F
	CD45RA	HI100	PE/Cyanine7	E-AB-F1052H
	CD45	HI30	Elab Fluor® Red 780	E-AB-F1137S
	CD28	CD28.2	APC	E-AB-F1195E
	CD69	FN50	PE	E-AB-F1138D
T cell TN, TEM, and TCM subset detection Panel 2	CD3	OKT-3	FITC	E-AB-F1001C
	CD4	SK3	PerCP	E-AB-F1352F
	CD8	OKT-8	APC	E-AB-F1110E
	CD45RO	UCHL1	PE	E-AB-F1052D
	CD197/CCR7	G043H7	APC	E-AB-F1159E
	CD62L	DX2	PE/Cyanine7	E-AB-F1168H
NK cell detection	CD16	3G8	FITC	E-AB-F1236C
	HLA-DR	L243	PE	E-AB-F1111D
	CD3	OKT-3	PerCP/Cyanine5.5	E-AB-F1001J
	CD56	B-A19	APC	E-AB-F1305E

Application categories	Biomarkers	Clone No.	Fluorophore	Catalog No.
Tumor metastasis-related detection	CD4	RPA-T4	FITC	E-AB-F1109C
	CXCR4/CD184	12G5	PE	E-AB-F1157D
Th17 cell detection	CD3	OKT-3	PerCP/Cyanine5.5	E-AB-F1001J
	CD4	SK3	Elab Fluor® 488	E-AB-F1352L
	IL-17A	BL168	PE	E-AB-F1173D
Th1/Th2 cell detection	CD3	OKT-3	PerCP/Cyanine5.5	E-AB-F1001J
	CD4	SK3	Elab Fluor® 488	E-AB-F1352L
	IFN-γ	B27	APC	E-AB-F1196E
	IL-4	MP4-25D2	PE	E-AB-F1203D
Dendritic cell detection	HLA-DR	L243	APC	E-AB-F1111E
	CD123	6H6	PerCP/Cyanine5.5	E-AB-F1117J
	CD11c	BU15	PE	E-AB-F1118D
	CD3	HIT3b	FITC	AN00644C
	CD19	SJ25C1	FITC	AN00334C
	CD20	2H7	FITC	E-AB-F1212C
	CD56	B-A19	FITC	E-AB-F1305C
	CD14	M5E2	FITC	E-AB-F1209C
	CD16	3G3	FITC	E-AB-F1236C
	CD11b	M1/70	FITC	E-AB-F1081C

Table 2. Other related reagents and products

Products	Catalog No.
ATP/ADP Ratio Chemiluminescence Assay kit	E-BC-F004
Ca2+-ATPase Activity Assay Kit	E-BC-K212-M
Cell Viability Chemiluminescence Assay Kit	E-BC-F200
High-Density Lipoprotein Cholesterol (HDL-C) Colorimetric Assay Kit (Double Reagents)	E-BC-K221-M
Low-Density Lipoprotein Cholesterol (LDL-C) Colorimetric Assay Kit (Double Reagents)	E-BC-K205-M
Na+k+-ATPase Activity Assay Kit	E-BC-K539-M
Reactive Oxygen Species (ROS) Fluorometric Assay Kit (Red)	E-BC-F005
Total Glutathione (T-GSH)/Oxidized Glutathione (GSSG) Colorimetric Assay Kit	E-BC-K097-M
Total Glutathione (T-GSH) And Reduced Glutathione (GSH) Fluorometric Assay Kit	E-BC-F045
Human ARG1(Arginase 1) ELISA Kit	E-EL-H0497
Human Cyr61(Cysteine Rich Protein, Angiogenic Inducer 61) ELISA Kit	E-EL-H1285
Uncoated Human Cyr61 (Cysteine Rich Protein; Angiogenic Inducer 61) ELISA Kit	E-UNEL-H0285
EasySort™ Mouse CD3+T Cell Isolation Kit	MIM001N
EasySort™ Mouse CD4+T Cell Isolation Kit	MIM002N
EasySort™ Mouse CD8+T Cell Isolation Kit	MIM003N
EasySort™ Mouse Pan-Naïve T Cell Isolation Kit	MIM006N
EasySort™ Mouse Naïve CD4+T Cell Isolation Kit	MIM007N
EasySort™ Mouse Naïve CD8+T Cell Isolation Kit	MIM008N
EasySort™ Mouse B Cell Isolation Kit	MIM004N
EasySort™ Mouse NK Cell Isolation Kit	MIM005N
Mouse Th1/Th2 Flow Cytometry Staining Kit	XJM001
Mouse Th17 Flow Cytometry Staining Kit	XJM002
Mouse Bone Marrow-derived Dendritic Cells (BMDC) Culture and Identification Kit	XJM003
RAW 264.7 Polarized M1 Macrophage Induction and Identification Kit	XJM004

Citations

Citations of Elabscience® products in CAR-T cell research studies

1.Ni H, Reitman Z J, Zou W, et al. FLASH radiation reprograms lipid metabolism and macrophage immunity and sensitizes medulloblastoma to CAR-T cell therapy[J]. *Nature cancer*, 2025, 6(3): 460-473. IF=23.5

Cited Products:Human PPAR-γ(Peroxisome Proliferator Activated Receptor Gamma) ELISA Kit (Cat: .E-EL-H1361), and Human OxLDL(Oxidized Low Density Lipoprotein) ELISA Kit (Cat: E-EL-H6021)

2.Li J, Wu R, Jin X, et al. FNDC4 Drives Metastasis and Immune Evasion in Pancreatic Cancer[J]. *Cancer research*, 2026, 86(2): 349-366. IF=16.6

Cited Product:Mouse RANTES(Regulated On Activation, Normal T-Cell Expressed and Secreted) ELISA Kit (Cat: E-EL-M0009)

3.Yin Z, Huang Y, Zhu Y, et al. Identification and analysis of microplastic aggregation in CAR-T cells[J]. *Journal of Hazardous Materials*, 2024, 480: 136351. IF=12.2

Cited Products:Annexin V-FITC/PI Apoptosis Kit (Cat: E-CK-A211)、One-step TUNEL In Situ Apoptosis Kit (Green, FITC) (Cat: E-Ck-A320) and Anti-Human CD3-APC/CD4-FITC/CD8a-PerCP-Cyanine5.5 Cocktail (Cat: E-AB-FC0002)

4.Dai Y, Liu Y, An L, et al. Afatinib boosts CAR-T cell antitumor therapeutic efficacy via metabolism and fate reprogramming[J]. *Journal for Immunotherapy of Cancer*, 2024, 12(11): e009949. IF=10.3

Cited Products:Extracellular Acidification Rate (ECAR) Fluorometric Assay Kit (Cat: E-BC-F069) and Enhanced Oxygen Consumption Rate (OCR)Fluorometric Assay Kit (Cat: E-BC-F068)

5.Tang D, Zhao L, Yan F, et al. Expression of VISTA regulated via IFN-γ governs endogenous T-cell function and exhibits correlation with the efficacy of CD19 CAR-T cell treated B-malignant mice[J]. *Journal for ImmunoTherapy of Cancer*, 2024, 12(6): e008364. IF=10.1

Cited Product:PE/Cyanine5 Anti-Mouse CD3ε Antibody (Cat: E-AB-F1103G)

6.Qing Y, Jiang K, Jiang H, et al. CLDN18. 2 CAR‐derived Extracellular Vesicle Immunotherapy Improves Outcome in Murine Pancreatic Cancer[J]. *Advanced healthcare materials*, 2025, 14(16): 2500546. IF=10.1

Cited Product:High Sensitivity Mouse IL-6 (Interleukin 6) ELISA Kit (Cat:E-HSEL-M0003)

7.Markelov V, Arabuli K V, Gaponenko I, et al. Scalable and ultrafast CAR-T cell production using microfluidics[J]. *Lab on a Chip*, 2025, 25(12): 3005-3015. IF=9.1

Cited Products:FITC Anti-Human CD3 Antibody (Cat: E-AB-F1230C) and Elab Fluor® Violet 450 Anti-Human CD8a Antibody (Cat: E-AB-F1110Q)

8.Zhao L, Yan F, Tang D, et al. The transition between M1 and M2 macrophage phenotypes is associated with the disease status following CD19 CAR-T therapy for B cell lymphoma/leukemia[J]. *Cell death & disease*, 2025, 16(1): 275. IF=8.1

Cited Products:Elab Fluor® Violet 450 Anti-Mouse CD3 Antibody (Cat: E-AB-F1013UQ)、PE Anti-Mouse CD80 Antibody (Cat: E-AB-F0992UD)、APC Anti-Mouse CD206/MMR Antibody (Cat: E-AB-F1135UE) and PE/Cyanine7 Anti-Mouse CD86 Antibody (Cat: E-AB-F0994UH)

9.Huang Y, Yin Z, Xu R, et al. Gas Vesicle-Assisted Ultrasound Imaging for Effective Anti-Tumour CAR-T Cell Immunotherapy Efficacy in Mice Model[J]. *International Journal of Nanomedicine*, 2025: 4849-4862. IF=8.0

Cited Products:Annexin V-FITC/PI Apoptosis Kit (Cat: E-CK-A211) and Recombinant Human Interleukin-2/IL-2 Protein (Cat: PKSH034200)



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