

BD Rhapsody™ TCR/BCR Next Multiomic Assays

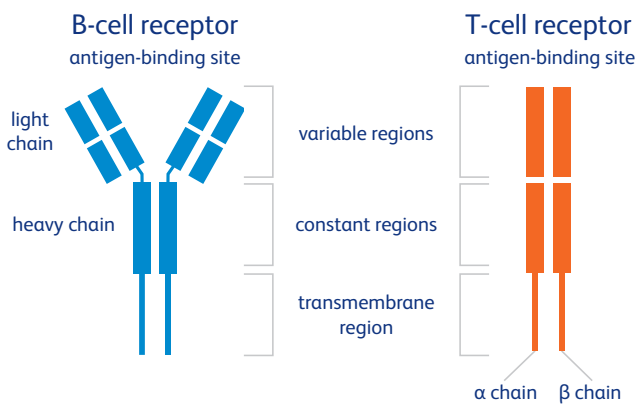
Gain an enhanced, multiomic view of immune diversity



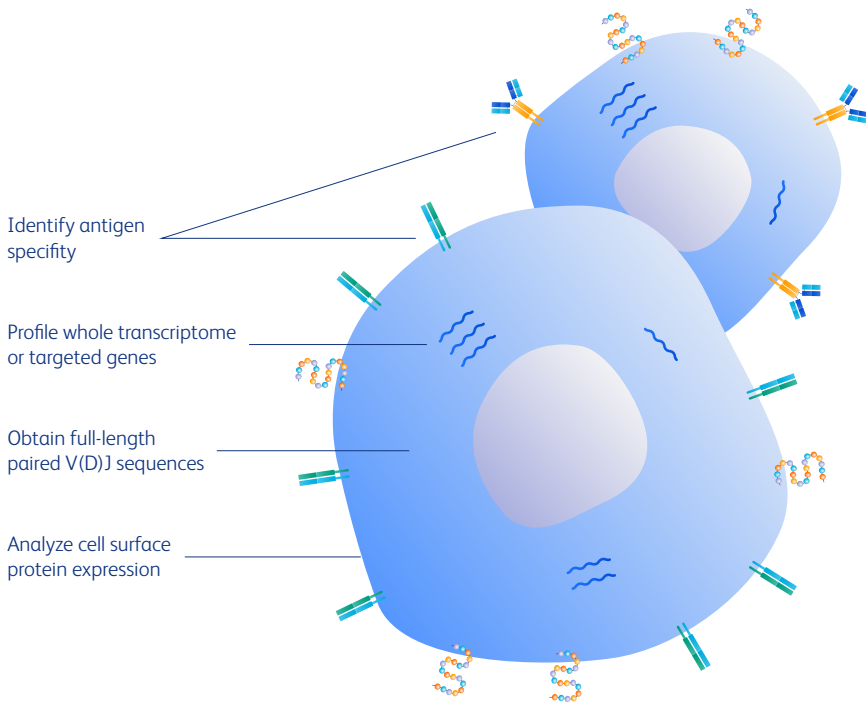
Unlock immune repertoire diversity at the single-cell level in human and mouse

Understanding the intricacies of the immune system is crucial to elucidating roles of immune cells in health and disease. This requires profiling T- and B-cell receptors, key determinants of adaptive immunity. BD Rhapsody™ TCR/BCR Next Multiomic Assays deliver a highly refined snapshot of immune receptors along with simultaneous transcriptomic and proteomic analyses.

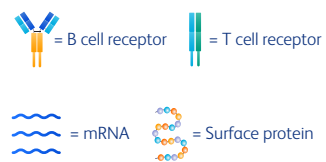
T-cell receptors (TCRs) recognize foreign peptides and trigger immune responses. B-cell receptors (BCRs) bind specific antigens, enabling antibody production. The immense diversity of TCRs and BCRs arises from V(D)J recombination and somatic hypermutation. V(D)J recombination randomly assembles variable (V), diversity (D) and joining (J) gene segments while somatic hypermutation introduces further variations in BCRs. Profiling the diverse repertoire of receptor sequences at the single-cell level identifies clonal lineages while multiomic analysis links receptors to functional activities.



B-cell receptors (BCRs) and T-cell receptors (TCRs), key molecules in the adaptive immune system.



BD Rhapsody™ TCR/BCR Next Multiomic Assays combine immune profiling with gene and protein expression analyses, enabling direct correlation of clonotype-specific phenotypes with paired receptor sequences to better elucidate cell functionality.



Key features:



Reliable performance

Superior full-length TCR and BCR pairing metrics.



Preserve for later analysis

Compatibility with preserved cells and BD® OMICS-Guard Sample Preservation Buffer.



Multiomics enabled

Simultaneous immune profiling alongside protein and gene expression analyses on the same cell.



Unbiased biology

Intuitive data analysis pipeline that provides unbiased insights about the biology of your samples.

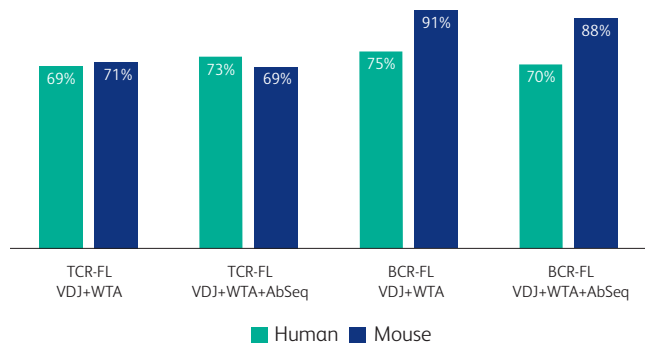
Key applications:

- Immuno-oncology: Monitor T- and B-cell clonal dynamics and phenotypes in research studies
- Vaccine biology: Characterize diversity of vaccine-induced antibody clones
- Autoimmunity: Discover autoreactive clones and pathways driving progression
- Transplantation studies: Identify immune cell populations involved in the biology of rejection or tolerance
- Microbiology and virology: Understand the breadth of immune response by mapping pathogen-reactive clones

Validated on the new BD Rhapsody™ Enhanced Cell Capture Beads V3, BD Rhapsody™ TCR/BCR Next Multiomic Assays enable a highly sensitive analysis of full-length TCR/BCR repertoires across different assay combinations for both human and mouse species.

Unravel immune repertoire complexity with great multiomic precision

A. TCR and BCR Full-Length Pairing Efficiency



B. Library Mapping for TCR and BCR

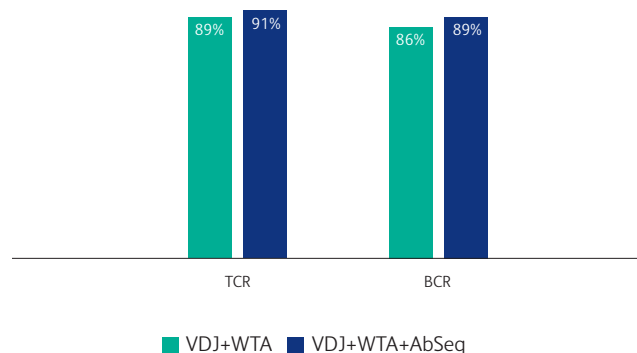
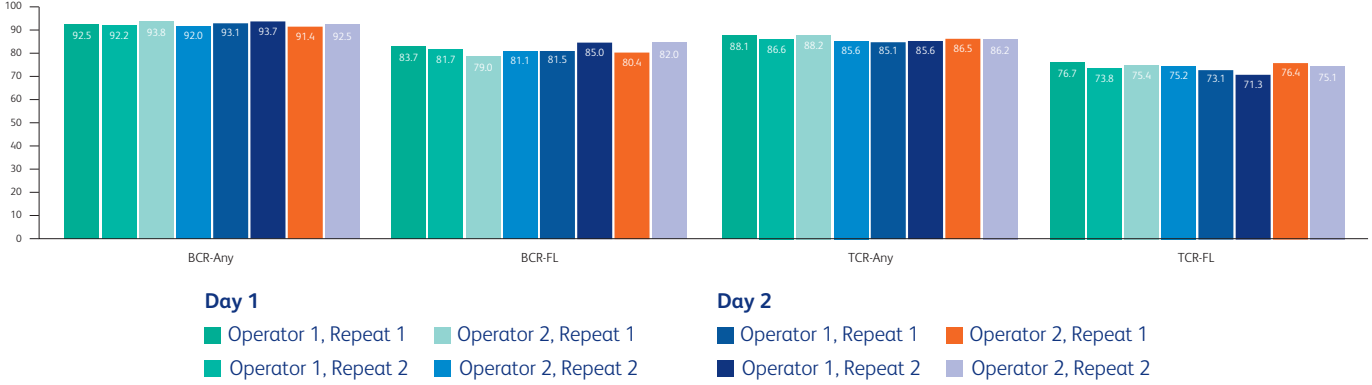


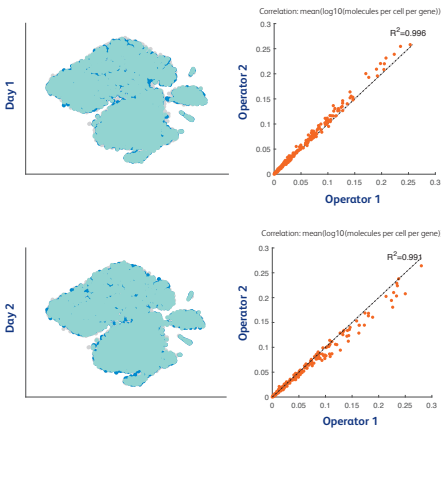
Figure 1. High sensitivity and specificity with BD Rhapsody™ TCR/BCR Next Multiomic Assays. **A.** Pairing efficiency from the BD Rhapsody™ TCR/BCR Next Profiling Assay (VDJ) + BD Rhapsody™ Whole Transcriptome Analysis (WTA) and VDJ + WTA + surface protein analysis using BD® AbSeq Antibody-Oligos (AbSeq) experiments on human PBMCs and mouse splenocytes. The sensitivity data represent values obtained after applying the high-quality filtering function on the BD Rhapsody™ Sequence Analysis Pipeline. **B.** High specificity in mapping to valid bioproduct sequences in VDJ + WTA and VDJ + WTA + AbSeq experiments on human PBMC samples. All experiments were performed on BD Rhapsody™ 8-Lane Cartridges.

Achieve high sample-to-sample reproducibility and repeatability

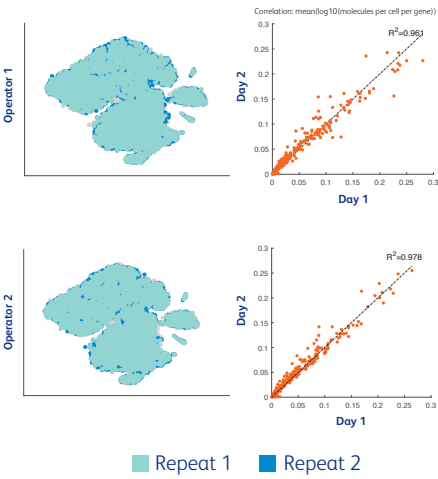
A. High-Quality Pairing Efficiency



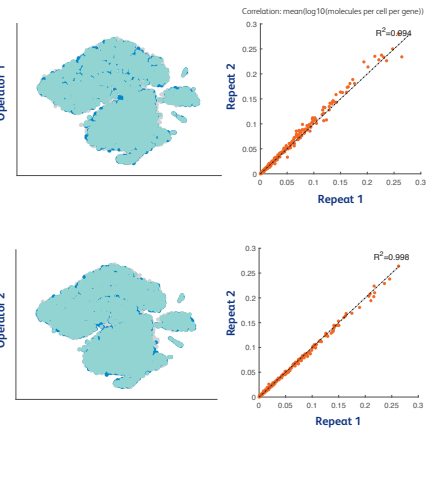
B. WTA Reproducibility: Operator $R^2 > 0.99$



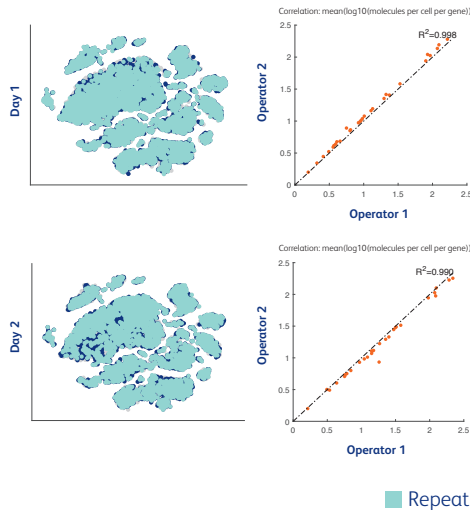
WTA Reproducibility: Day, $R^2 > 0.95$



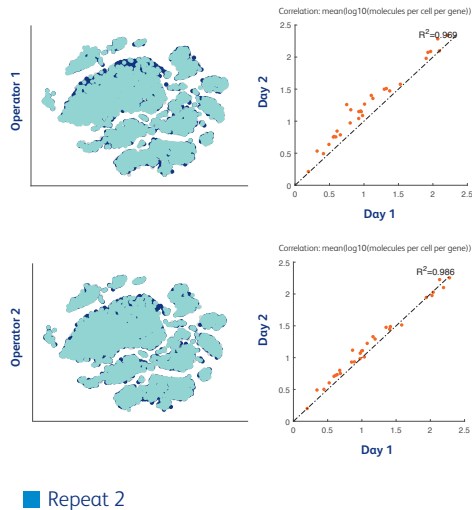
Repeatability: $R^2 > 0.99$



C. AbSeq Reproducibility: Operator $R^2 > 0.99$



AbSeq Reproducibility: Day, $R^2 > 0.95$



AbSeq Median Molecule

Day 1: Operator 1 and 2

Day 2: Operator 1 and 2

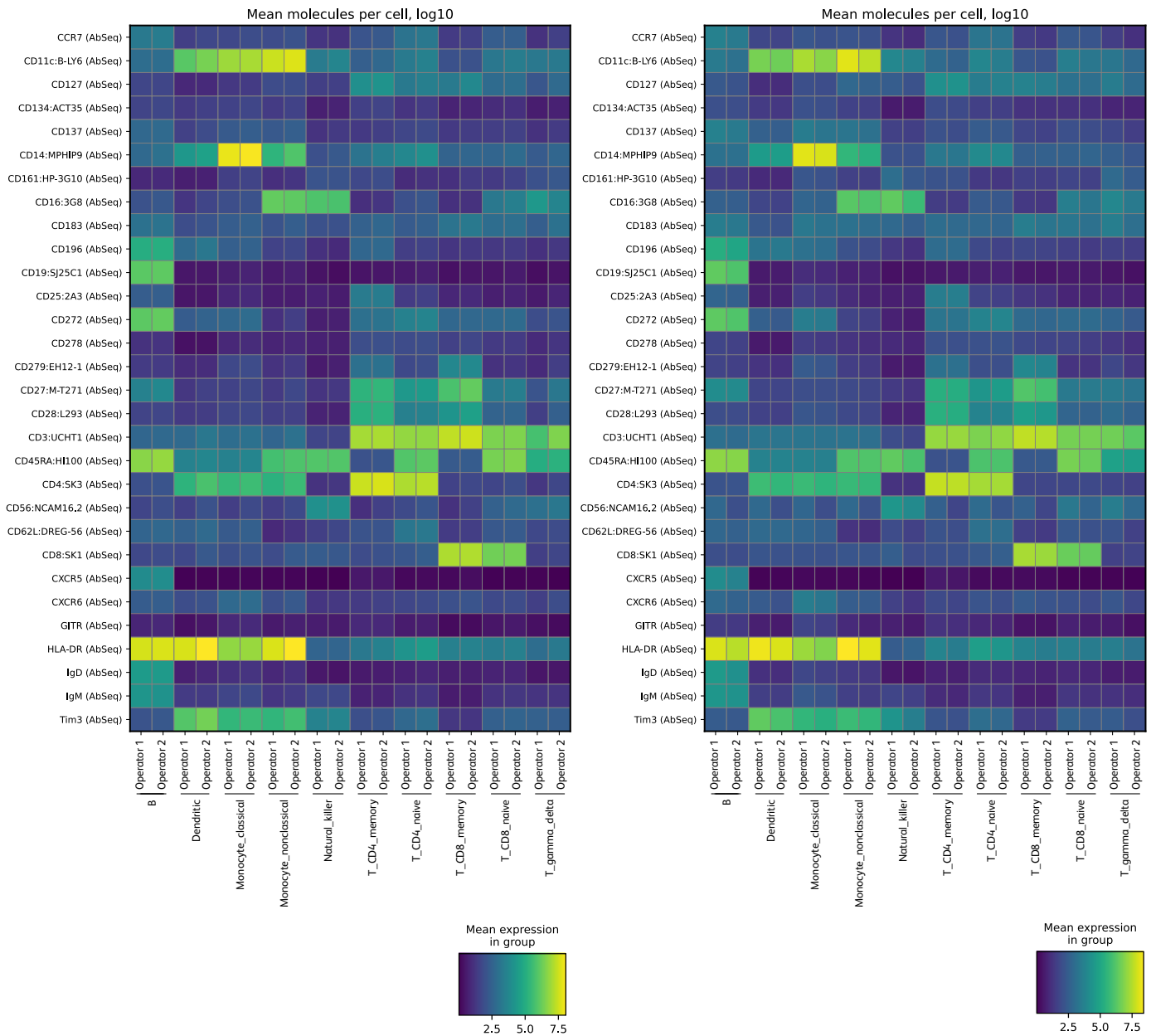
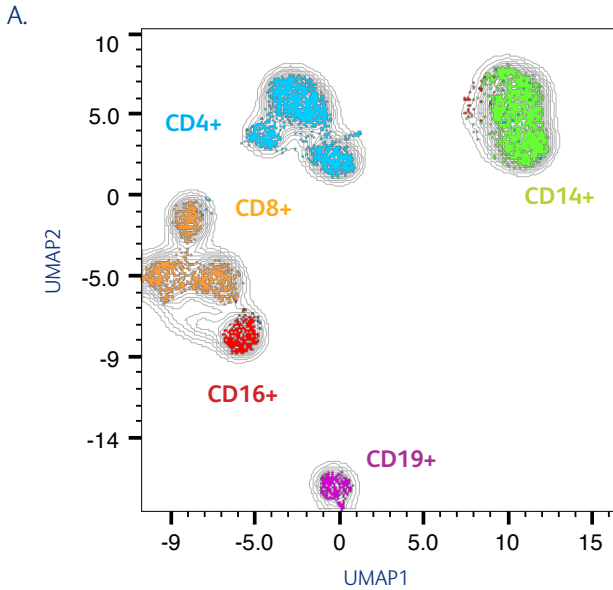


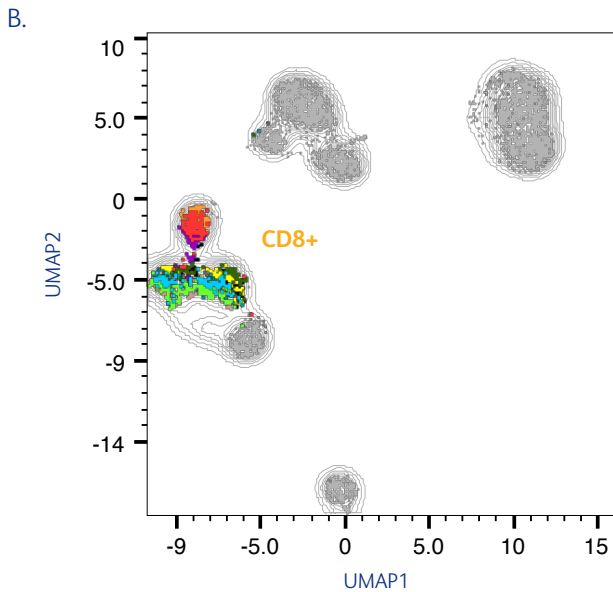
Figure 2. High reproducibility and repeatability with BD Rhapsody™ TCR/BCR Next Multiomic Assays. A. Consistent TCR/BCR full-length pairing efficiency across different operators, repeats and days, with 75% ($\sigma = 1.8\%$) for TCR and 82% ($\sigma = 1.8\%$) for BCR full-length pairing efficiency on average from VDJ + WTA + AbSeq experiments on human PBMC samples. The data represent values obtained after applying the high-quality filtering function on the BD Rhapsody™ Sequence Analysis Pipeline. BCR-Any indicates the percentage of cells of each type that had both a BCR heavy chain and BCR light chain (Kappa or Lambda) and TCR-Any indicates the percentage of cells of each type that had either TCR Alpha and TCR Beta or TCR Gamma and TCR Delta. BCR-FL indicates the percentage of cells of each type that had full-length contigs for both BCR heavy chain and BCR light chain (Kappa or Lambda) and TCR-FL indicates the percentages of cells of each type that had full length contigs for either TCR Alpha and TCR Beta or TCR Gamma and TCR Delta. **B.** Clustering and gene expression correlation analysis for the WTA assay, indicating no batch effect in libraries made across different operators, repeats and days. **C.** Clustering, expression correlation analysis and median molecules for the AbSeq assay, indicating no batch effect in libraries made across different operators and days. Overall, the high full-length pairing efficiency and robust gene and protein expression correlations demonstrated in these multiomic experiments underscore the ability of the assay to reproducibly support integrated, highly consistent multiomic workflows. All experiments were performed on BD Rhapsody™ 8-Lane Cartridges.

Decipher TCR/BCR profiles alongside CITE-seq analysis

In this sample experiment, we simultaneously analyzed TCR, BCR, whole transcriptome gene expression and cell surface proteins using the BD® AbSeq Immune Discovery Panel (IDP). Frozen PBMCs were thawed, stained with IDP and loaded onto a BD Rhapsody™ 8-Lane Cartridge. The libraries were prepared and sequenced according to the BD Rhapsody™ System TCR/BCR Next, mRNA Whole Transcriptome Analysis (WTA), and BD® AbSeq Library Preparation Protocol (Doc ID 23-24510).



Subset Name	Count	Frequency of Parent
CD4+	1852	28.5
CD8+	941	14.5
CD16+	449	6.91
CD14+	1878	28.9
CD19+	299	4.60
Quality cells	6495	95.5



Subset Name	Count	Frequency of Parent
Phenograph_6535_1	98.0	10.4
Phenograph_6535_2	87.0	9.25
Phenograph_16535_3	86.0	9.14
Phenograph_6535_4	136	14.5
Phenograph_6535_5	60.0	6.38
Phenograph_6535_6	60.0	6.38
Phenograph_6535_7	57.0	6.06
Phenograph_6535_8	63.0	6.70
Phenograph_6535_9	113	12.0
Phenograph_6535_10	62.0	6.59
Phenograph_6535_11	95.0	10.1
CD4+	1852	28.5
CD8+	941	14.5
CD16+	449	6.91
CD14+	1878	28.9
CD19+	299	4.60
Quality cells	6495	95.5

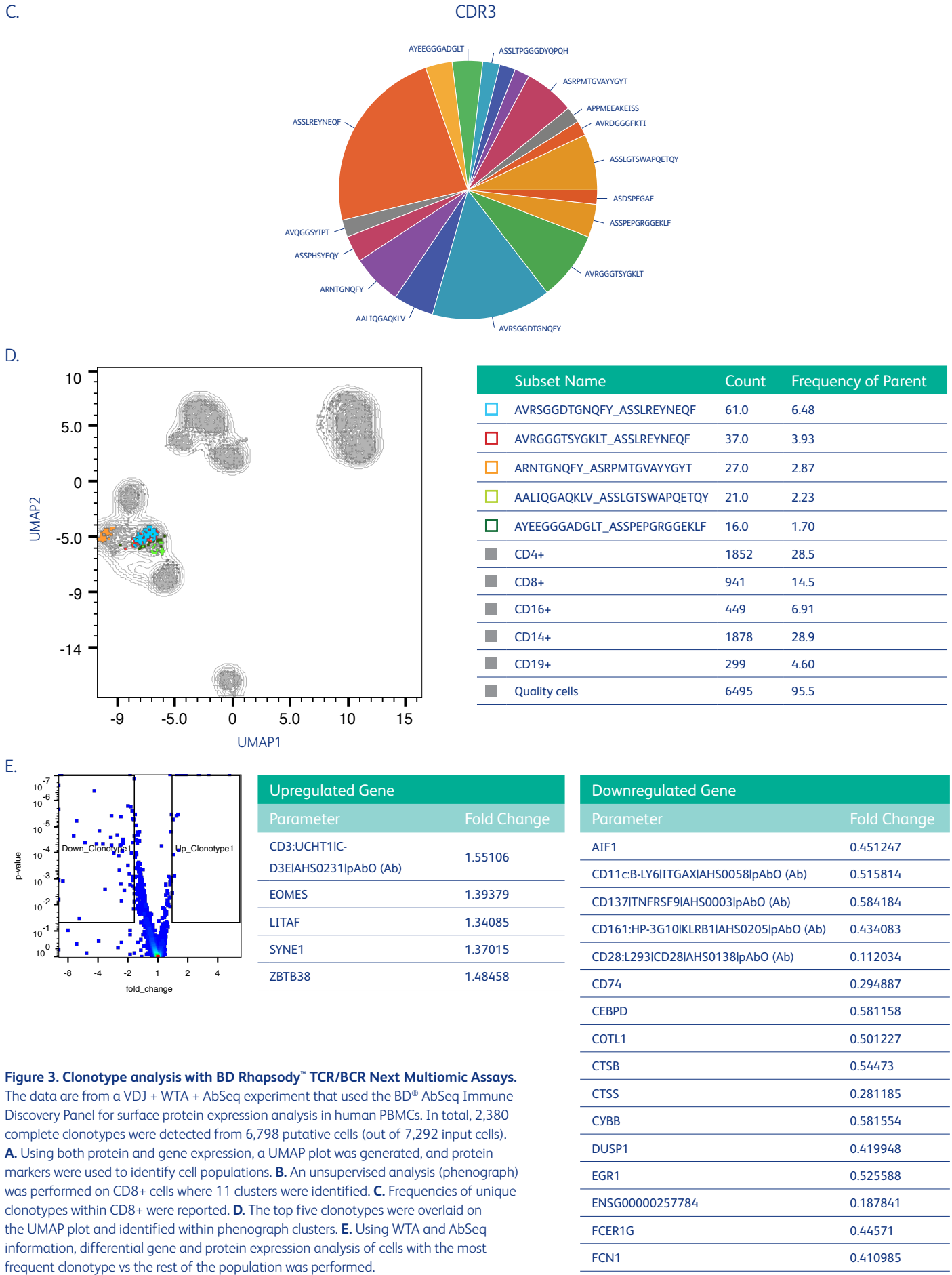


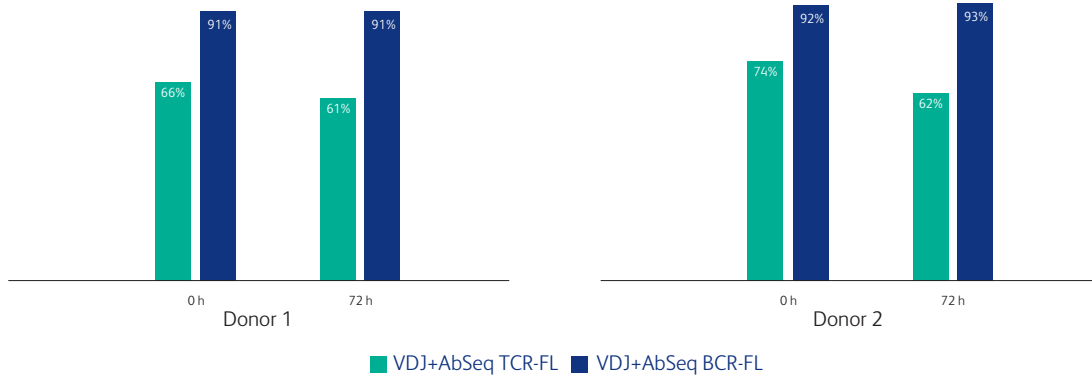
Figure 3. Clonotype analysis with BD Rhapsody™ TCR/BCR Next Multiomic Assays.

The data are from a VDJ + WTA + AbSeq experiment that used the BD® AbSeq Immune Discovery Panel for surface protein expression analysis in human PBMCs. In total, 2,380 complete clonotypes were detected from 6,798 putative cells (out of 7,292 input cells).

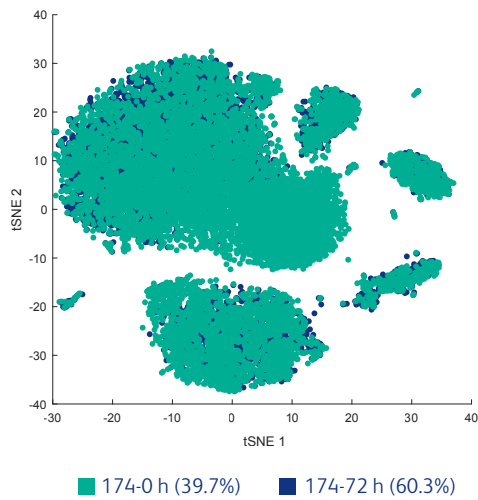
A. Using both protein and gene expression, a UMAP plot was generated, and protein markers were used to identify cell populations. **B.** An unsupervised analysis (phenograph) was performed on CD8+ cells where 11 clusters were identified. **C.** Frequencies of unique clonotypes within CD8+ were reported. **D.** The top five clonotypes were overlaid on the UMAP plot and identified within phenograph clusters. **E.** Using WTA and AbSeq information, differential gene and protein expression analysis of cells with the most frequent clonotype vs the rest of the population was performed.

Take advantage of compatibility with preserved samples

A. TCR and BCR Pairing Efficiency in Control vs Preserved Cells



B.



C.

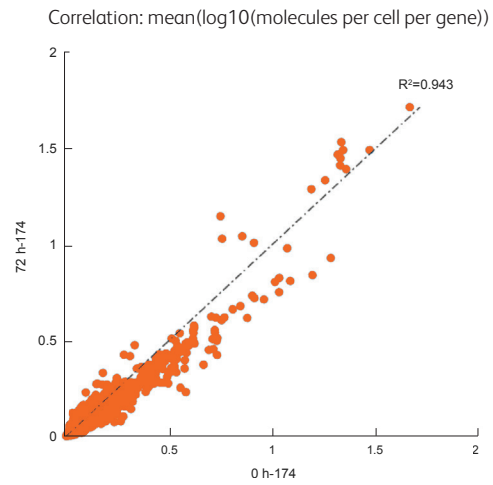
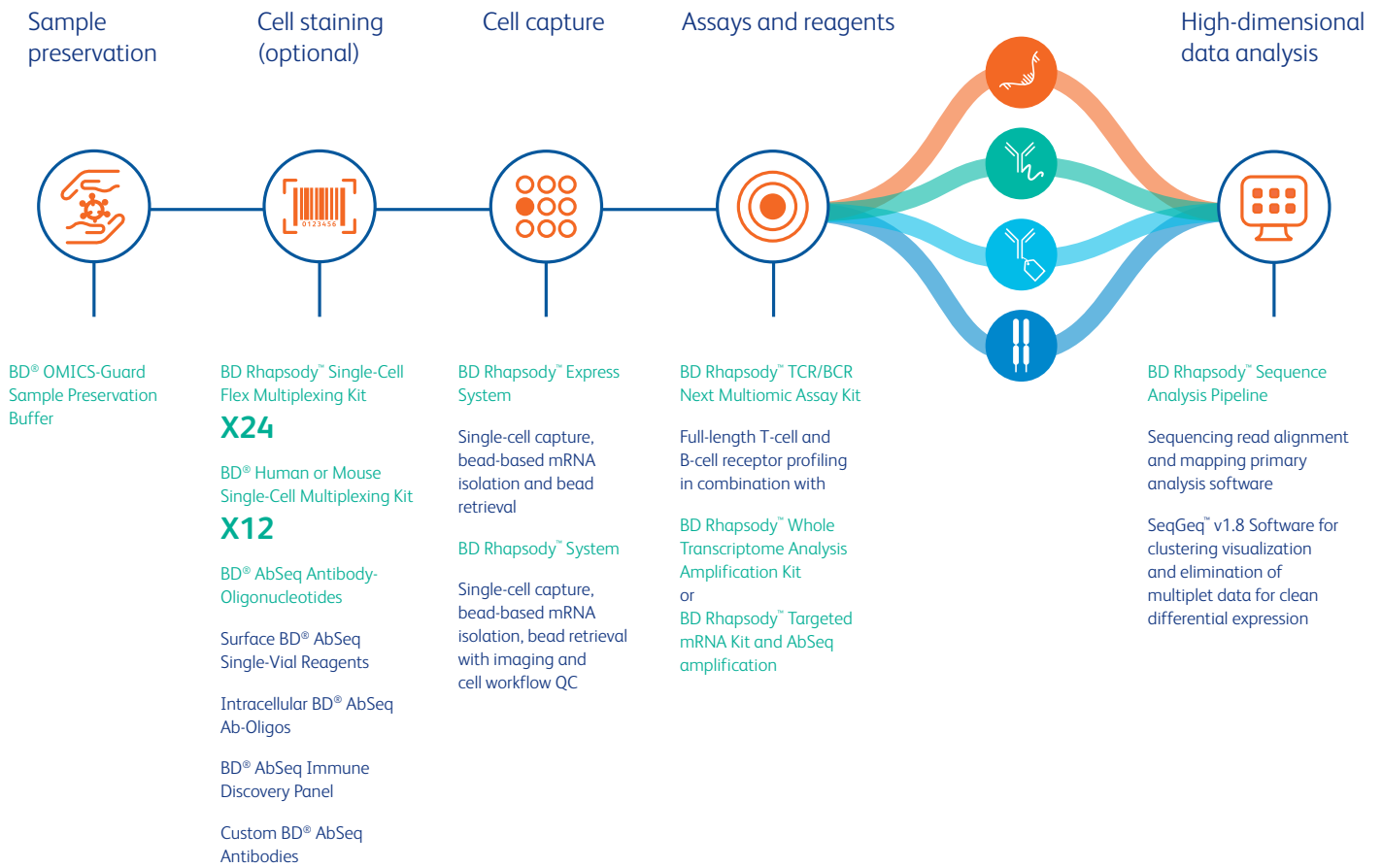


Figure 4. Cell preservation upstream of the BD Rhapsody™ TCR/BCR Next Multiomic Assay workflow. The data are from a VDJ + WTA + AbSeq experiment using two different PBMC donors with control samples at 0 hour vs samples from 72 hours of preservation with BD® OMICS-Guard Sample Preservation Buffer. **A.** Consistent TCR/BCR pairing efficiency across different duration and samples. **B** and **C.** Representative clustering and gene expression correlation analysis for the WTA assay indicates no batch effect between control and in libraries made from cells preserved for 72 hours.

Complete single-cell multiomics solution



Utilize our expertise and insights for your single-cell experiments.

Reach out to your local BD sales representative or contact our help desk at scomix@bdscmix.bd.com to learn more about using BD Rhapsody™ TCR/BCR Next Multiomic Assays.

Ordering information

Assays			
Description	Cat. No.	Human	Mouse
BD Rhapsody™ TCR/BCR Next Multiomic Assay for Targeted – 4 Pack*	667395	•	—
BD Rhapsody™ TCR/BCR Next Multiomic Assay for WTA – 4 Pack	667396	•	—
BD Rhapsody™ TCR/BCR Next Multiomic Assay for Targeted – 8 Pack*	667399	•	—
BD Rhapsody™ TCR/BCR Next Multiomic Assay for WTA – 8 Pack	667400	•	—
BD Rhapsody™ TCR/BCR Next Amplification Kit**	667058	•	—
BD Rhapsody™ Mouse TCR/BCR Next Multiomic Assay for Targeted – 4 Pack*	667397	—	•
BD Rhapsody™ Mouse TCR/BCR Next Multiomic Assay for WTA – 4 Pack	667398	—	•
BD Rhapsody™ Mouse TCR/BCR Next Assay for Targeted – 8 Pack*	667401	—	•
BD Rhapsody™ Mouse TCR/BCR Next Multiomic Assay for WTA – 8 Pack	667402	—	•
BD Rhapsody™ Mouse TCR/BCR Next Amplification Kit**	667059	—	•

Suggested companion products			
Description	Cat. No.	Human	Mouse
BD Rhapsody™ Single-Cell Analysis System	633701	•	•
BD Rhapsody™ Express Single-Cell Analysis System Package	633707	•	•
BD Rhapsody™ HT Xpress Package	666625	•	•
BD® OMICS-Guard Sample Preservation Buffer	570911	•	•
BD® AbSeq Single-Vial Reagents	Contact for more info	•	•
Custom BD® AbSeq Antibodies	Contact for more info	•	•
BD Rhapsody™ Enhanced Cartridge Reagent Kit V3**	667052	•	•
BD® AbSeq Immune Discovery Panel	625970	•	—
BD® Immune Response Panel HS	633750	•	—
BD® Hu Single Cell Sample Multiplexing Kit	633781	•	—
BD® Flex Single-Cell Multiplexing Kit	633849	•	•
	633850		
	633851		
	633852		
BD Rhapsody™ Immune Response Panel Mm	633753	—	•
BD® Ms Single Cell Sample Multiplexing Kit	633793	—	•

*Additional primer panel is required.

**Available as a standalone kit if not purchasing the bundle packs.

To request a quote or place an order, visit bdbiosciences.com or contact your local BD sales representative.



 **BD Rhapsody**

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BD Life Sciences, Milpitas, CA 95035, U.S.

bdbiosciences.com



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