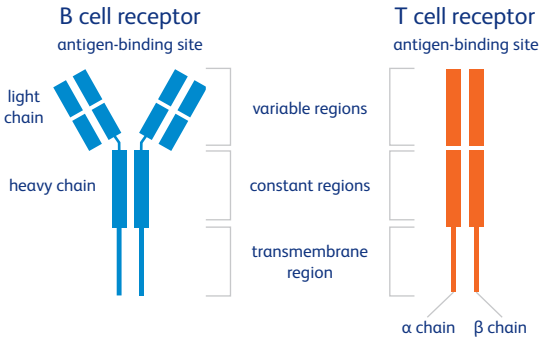
BD Rhapsody™ TCR/BCR Multiomic Assay

A full-length T cell and B cell receptor profiling tool for single-cell studies in human and mouse

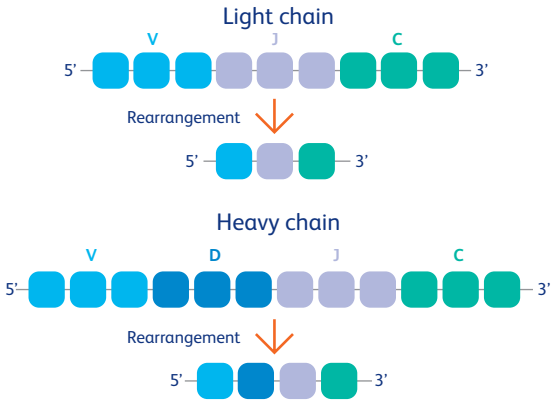
BD

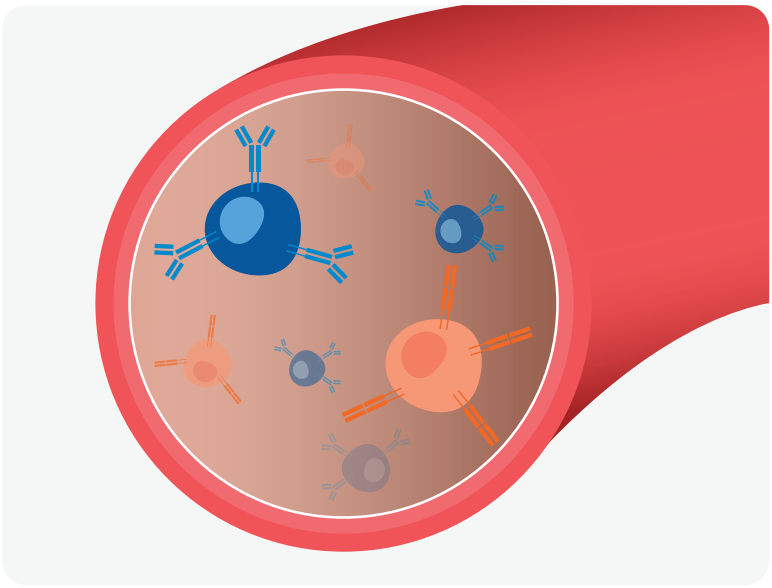
Profile full-length B cell and T cell receptors in combination with cell surface protein staining and targeted or whole transcriptome mRNA analysis

The immune system is complex, consisting of numerous cell types that interact and work together to defend an organism against foreign infectious or damaging agents. Understanding the immune landscape and the role these immune cells play in defending and balancing the challenges faced from the external environment is critical.



B cell receptors (BCR) and T cell receptors (TCR) are key molecules that play a large role in the adaptive immune system, responsible for recognizing and binding specific antigens.





Broad coverage of antigen specificity requires highly diverse TCR and BCR repertoires, which are generated by recombination of the variable (V), diversity (D), and joining (J) gene segments in individual cells, as well as somatic hypermutation of BCR. This diversity can make profiling of specific TCR and BCR sequences challenging and typically requires analysis at the single-cell level.

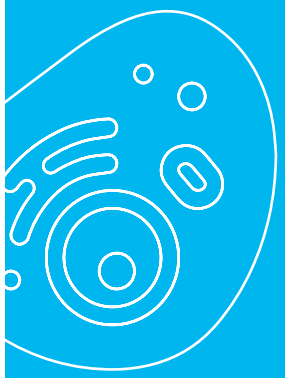
Understand the intricacies of your cell populations by assembling the full-length TCR and BCR sequences in combination with RNA and cell surface protein characterization at single-cell resolution

The BD Rhapsody™ TCR/BCR Multiomic Assays for human or mouse is a full multiomics solution that enables scientists to get a comprehensive understanding of immune cell function, providing critical insight for immunology and immuno-oncology applications.

Research applications of interest

- Screen for antigen-specific cells in response to infectious diseases
- Profile the immune repertoire of tumor infiltrating lymphocytes
- Develop vaccines and evaluate their efficacy
- Understand transplant rejection or tolerance
- Discover biomarkers for immunotherapy
- Pinpoint and characterize new approaches for cell therapies

Confidence in every run with the BD Rhapsody™ TCR/BCR Multiomic Assay



Multiomics enabled

Full-length B cell and T cell receptor profiling of human or mouse samples compatible with BD Rhapsody™ Single-Cell Analysis System capabilities include:

- BD Rhapsody™ Targeted Amplification Kit using the BD Rhapsody™ Immune Response Panels for human or mouse species
- BD Rhapsody™ Whole Transcriptome Analysis Amplification Kit
- BD® AbSeq Immune Discovery Panel
- BD® Abseq Antibody-Oligonucleotides

Easily design your experiments with validated protocols and products and find everything you need from your trusted partner

Full-length assay

Single-cell analysis of full-length B and T cell receptors including framework regions 1–4 and CDR regions 1–3.

Uncover clonal diversity and function of full-length V(D)J sequences for T and B cells at the single-cell level.

- **Understand clonotype information from cell type of interest**
- **Gain insight into basic biology of these clonotypes and their disease states**
- **Profile TCR and BCR being expressed in disease states and during clonal expansion**

3' gene expression enabled with V(D)J expression

Compare data across multiple experiments with and without V(D)J sequencing

Detection of rare cell types

Rare cell type profiling including gamma delta T cells

Unveil distinct characteristics of rare cell populations that contribute to the function of other cell types or disease state

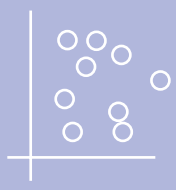
Sample multiplexing

Multiple samples can be multiplexed in one workflow

Increase sample throughput and save cost, minimize batch effects and reduce time to discovery

Save on sequencing costs

Recommended sequencing depth of BCR and TCR libraries is 5,000 reads per cell



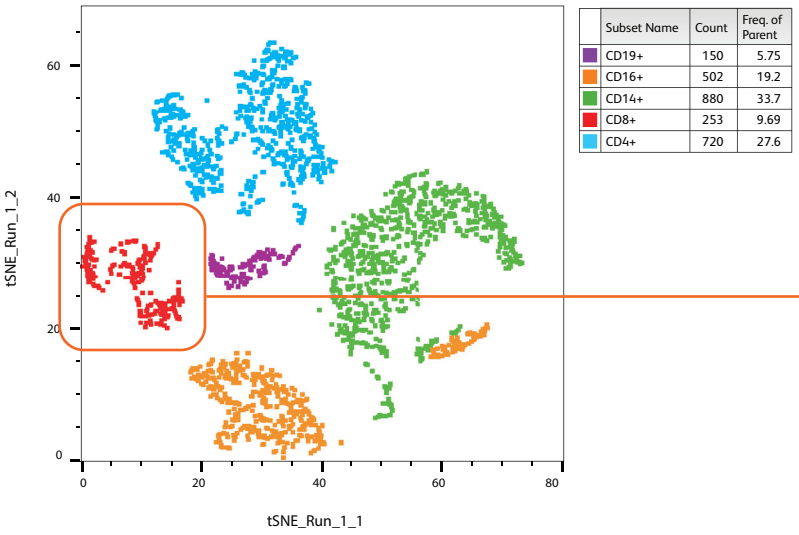
Confidence in your data to answer biological questions

High specificity and sensitivity of V(D)J chain detection

A single workflow profiling TCR and BCR designed to work alongside targeted mRNA or WTA and protein analysis for multiplexed samples

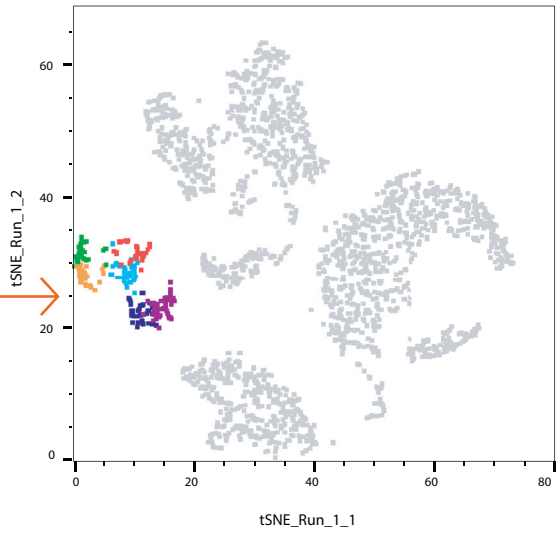
In this study, we simultaneously analyzed TCR, BCR, whole transcriptome gene expression as well as cell surface proteins in two multiplexed samples. Resting PBMCs, stained with the BD® AbSeq Immune Discovery Panel (IDP) + 4 BD® AbSeq Antibody drop-ins, were multiplexed with enriched T cells from a different donor, stained with a 15-plex BD® AbSeq Panel.

Step 1: Using both protein and gene expression a tSNE plot was generated and protein markers were used to identify cell populations



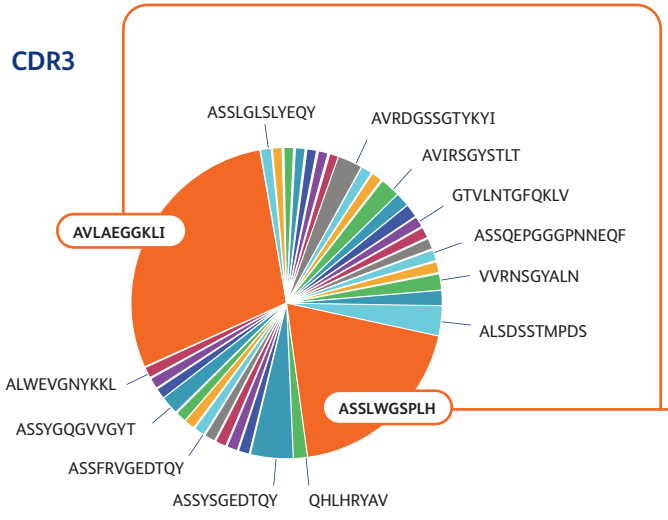
Subset Name	Count	Freq. of Parent
CD19+	150	5.75
CD16+	502	19.2
CD14+	880	33.7
CD8+	253	9.69
CD4+	720	27.6

Step 2: An unsupervised analysis (phenograph) was performed on CD8+ cells where six clusters were identified

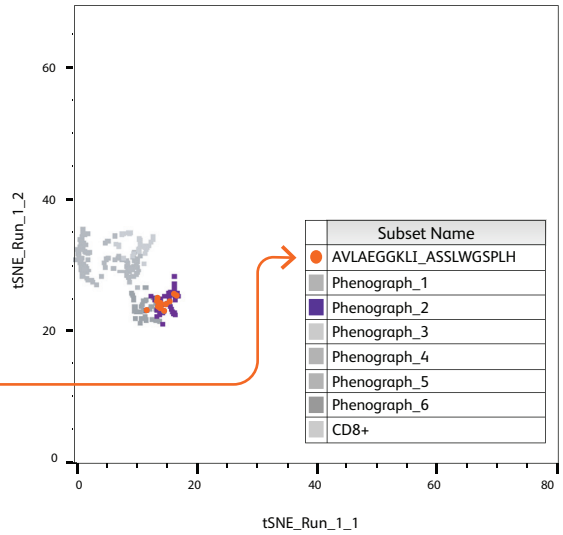


Subset Name
Phenograph_1
Phenograph_2
Phenograph_3
Phenograph_4
Phenograph_5
Phenograph_6
CD19+
CD16+
CD14+
CD8+
CD4+

Step 3: Frequencies of unique clonotypes within clusters were reported

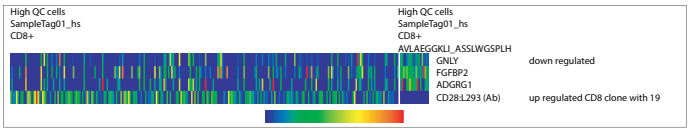


Step 4: The highest frequency clonotype was overlaid on the tSNE plot and identified within cluster two



Subset Name
AVLAEGGKLI_ASSLWGSPLH
Phenograph_1
Phenograph_2
Phenograph_3
Phenograph_4
Phenograph_5
Phenograph_6
CD8+

Step 5: Using AbSeq and WTA information, differential gene and protein expression analysis of cells with the most frequent clonotype vs the rest of the population was performed



Step 6: Cell IDs and chain information were obtained from pipeline output files

Cell index	Chain type	CDR3 translation dominant
54044	TCR_Alpha	AVLAEGGKLI
54044	TCR_Beta	ASSLWGSPLH
123296	TCR_Alpha	AVLAEGGKLI
123296	TCR_Beta	ASSLWGSPLH
123563	TCR_Alpha	AVLAEGGKLI
123563	TCR_Beta	ASSLWGSPLH
147961	TCR_Alpha	AVLAEGGKLI
147961	TCR_Beta	ASSLWGSPLH

Step 7: VDJ and C gene information were determined for the clonotype of interest

Cell index	Chain type	V gene dominant	D gene dominant	J gene dominant	C gene dominant	Full-length	Productive
54044	TCR_Alpha	TRAV20*01		TRAJ23*01	TRAC	TRUE	TRUE
54044	TCR_Beta	TRBV27*01	TRBD1*01	TRBJ1-6*02	TRBC1	TRUE	TRUE
123296	TCR_Alpha	TRAV20*01		TRAJ23*01	TRAC	TRUE	TRUE
123296	TCR_Beta	TRBV27*01	TRBD1*01	TRBJ1-6*02	TRBC1	TRUE	TRUE
123563	TCR_Alpha	TRAV20*01		TRAJ23*01	TRAC	TRUE	TRUE
123563	TCR_Beta	TRBV27*01	TRBD1*01	TRBJ1-6*02	TRBC1	TRUE	TRUE
147961	TCR_Alpha	TRAV20*01		TRAJ23*01	TRAC	TRUE	TRUE
147961	TCR_Beta	TRBV27*01	TRBD1*01	TRBJ1-6*02	TRBC1	TRUE	TRUE

Step 8: Full-length sequence of the clonotype was obtained (nucleotide sequence also available) from pipeline output

Cell index	VDJ translation trimmed
54044	EDQVTQSPEALRLQEGESSSLNCSYTVSGLRGLFWYRQDPGKGPEFLFTLYSAGEEKEKERLKATLTKKESFLHITAPKPEDSATYLCAVLAEGGKLIFGQGTELSVKP
54044	EAQVTQNPRYLITVTGKKLTVTCSQNMNHEYMSWYRQDPGLGLRQIYYSMNVEVTDKGDVPEGYKVSRKEKRNFPLILESPSPNQTSLYFCASSLWGSPLHFGNGTRLTVT
123296	EDQVTQSPEALRLQEGESSSLNCSYTVSGLRGLFWYRQDPGKGPEFLFTLYSAGEEKEKERLKATLTKKESFLHITAPKPEDSATYLCAVLAEGGKLIFGQGTELSVKP
123296	EAQVTQNPRYLITVTGKKLTVTCSQNMNHEYMSWYRQDPGLGLRQIYYSMNVEVTDKGDVPEGYKVSRKEKRNFPLILESPSPNQTSLYFCASSLWGSPLHFGNGTRLTVT
123563	EDQVTQSPEALRLQEGESSSLNCSYTVSGLRGLFWYRQDPGKGPEFLFTLYSAGEEKEKERLKATLTKKESFLHITAPKPEDSATYLCAVLAEGGKLIFGQGKELSVKP
123563	EAQVTQNPRYLITVTGKKLTVTCSQNMNHEYMSWYRQDPGLGLRQIYYSMNVEVTDKGDVPEGYKVSRKEKRNFPLILESPSPNQTSLYFCASSLWGSPLHFGNGTRLTVT
147961	EDQVTQSPEALRLQEGESSSLNCSYTVSGLRGLFWYRQDPGKGPEFLFTLYSAGEEKEKERLKATLTKKESFLHITAPKPEDSATYLCAVLAEGGKLIFGQGTELSVKP
147961	EAQVTQNPRYLITVTGKKLTVTCSQNMNHEYMSWYRQDPGLGLRQIYYSMNVEVTDKGDVPEGYKVSRKEKRNFPLILESPSPNQTSLYFCASSLWGSPLHFGNGTRLTVT

TCR alpha

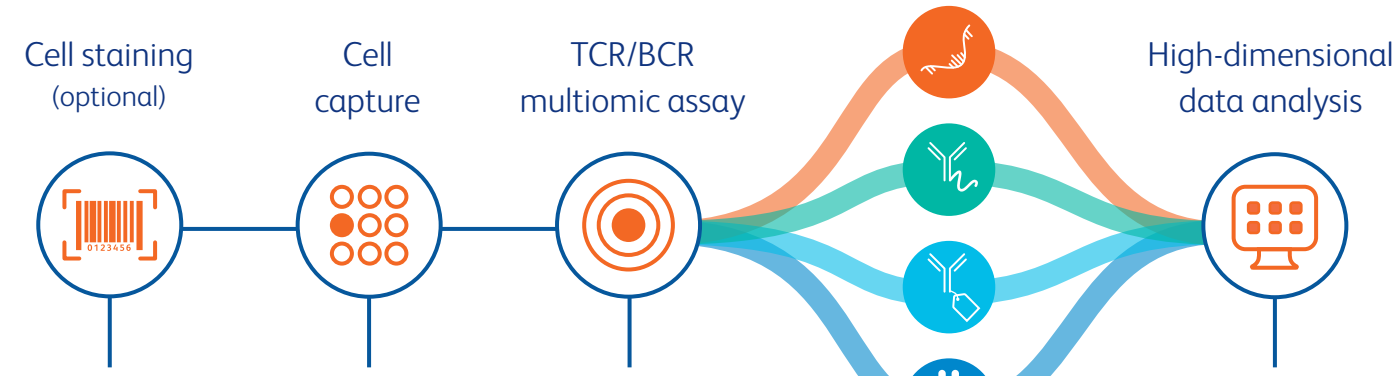
EDQVTQSPEALRLQEGESSSLNCSYTVSGLRGLFWYRQDPGKGPEFLFTLYSAGEEKEKERLKATLTKKESFLHITAPKPEDSATYLCAVLAEGGKLIFGQGTELSVKP

TCR beta

EAQVTQNPRYLITVTGKKLTVTCSQNMNHEYMSWYRQDPGLGLRQIYYSMNVEVTDKGDVPEGYKVSRKEKRNFPLILESPSPNQTSLYFCASSLWGSPLHFGNGTRLTVT

● FR1 ● CDR1 ● FR2 ● CDR2 ● FR3 ● CDR3 ● FR4

The BD Rhapsody™ TCR/BCR Multiomic Assay for human or mouse groups is part of the broad portfolio of reagents, instruments and software designed to support your single-cell research



BD Rhapsody™ Single-Cell Multiplexing Kit

X12

BD® AbSeq Antibody-Oligonucleotides

BD® AbSeq Single-Vial Reagents

BD® AbSeq Immune Discovery Panel

Custom BD® AbSeq Antibodies

BD Rhapsody™ Express System

Single-cell capture, bead-based mRNA isolation and bead retrieval

BD Rhapsody™ System

Single-cell capture, bead-based mRNA isolation, bead retrieval with imaging and cell workflow QC

BD Rhapsody™ TCR/BCR Multiomic Assay Kit

Full-length T cell and B cell receptor profiling

In combination with BD Rhapsody™ Whole Transcriptome Analysis Amplification Kit

or

BD Rhapsody™ Targeted mRNA Kit and AbSeq amplification

Bioinformatics

Sequencing read alignment and mapping primary analysis software

SeqGeq™ v1.8 Software for clustering visualization and elimination of multiplet data for clean differential expression

Targeted RNA-seq/Whole transcriptome amplification

Protein expression analysis

Sample multiplexing

TCR/BCR repertoire analysis

Utilize our expertise and insights for your single-cell experiments. Reach out to your local BD sales representative or contact our help desk **scomix@bdscomix.bd.com** to learn more about using the BD Rhapsody™ TCR/BCR Multiomic Assays.


BD Rhapsody
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Prepare
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Ordering Information

Human assay	
Description	Cat. no.
BD Rhapsody™ TCR/BCR Multiomic Assay for Targeted mRNA Analysis*	665828
BD Rhapsody™ TCR/BCR Multiomic Assay for Whole Transcriptome Analysis	665829
Mouse assay	
Description	Cat. no.
BD Rhapsody™ Mouse TCR/BCR Multiomic Assay for Targeted mRNA Analysis*	666280
BD Rhapsody™ Mouse TCR/BCR Multiomic Assay for Whole Transcriptome Analysis	666281
Suggested companion instruments (compatable with both assays)	
Description	Cat. no.
BD Rhapsody™ Single-Cell Analysis System	633701
BD Rhapsody™ Express Single-Cell Analysis System	633702
Human species suggested companion products	
Description	Cat. no.
BD® AbSeq Single-Vial Reagents	Contact for more info
BD® AbSeq Immune Discovery Panel	625970
BD® Immune Response Panel HS	633750
BD® Human Single-Cell Sample Multiplexing Kit	633781
Custom BD® AbSeq Antibodies	Contact for more info
Mouse species suggested companion products	
Description	Cat. no.
Ms Single Cell Sample Multiplexing Kit	633793
BD Rhapsody™ Immune Response Panel Mm	633753
BD® AbSeq Single-Vial Reagents	Contact for more info
Custom BD® AbSeq Antibodies	Contact for more info

*Additional primer panel is required

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