



Epigenome Technologies

Paired-Tag Single-Cell Services

Single-cell Cut&Tag + RNA Multiome
For high-resolution epigenomic analyses

Paired-Tag Services: Pioneering single-cell epigenetic profiling

Limitations of bulk epigenetics

Biomedical and pharmaceutical researchers are increasingly interested in understanding how transcriptional and epigenetic changes drive biological processes such as differentiation, aging, and response to treatments. Traditional methods have required separate workflows for RNA and chromatin profiling or cell sorting to isolate specific populations, limiting insights into cell heterogeneity and dynamic processes.

The Paired-Tag Solution

Paired-Tag is a comprehensive single-cell multiomic profiling technique that simultaneously measures both transcription (RNA abundance) and

epigenetics (via Cut&Tag) in single cells. This groundbreaking service – developed by Epigenome Technologies – enables researchers to:

- Uncover cell-specific changes without the need for cell sorting, maintaining the natural cellular environment.
- Track epigenetic alterations over time, revealing crucial insights into differentiation, aging, and treatment response.
- Investigate cellular communication and identify regulatory elements along with their linked genes to better understand gene regulation.

Paired-Tag's flexibility, powered by antibody-based Cut&Tag, allows precise targeting of chromatin structures, remodelers, transcription factors, and histone post-translational modifications (PTMs), making it an indispensable tool for advancing biological discovery.



Paired-Tag Single-Cell Epigenetic Multiomic Profiling

Single-cell Cut&Tag multiomes | Epigenetics at cell resolution | Beyond open chromatin

Paired-Tag offers a revolutionary approach to epigenetic and transcriptional profiling, bringing the power of joint RNA and chromatin profiling to the single-cell level. Unlike traditional methods, which often require separate workflows for epigenetic and transcriptomic data or rely on sorted cell populations, PairedTag integrates these two critical layers of information within the same cell.

Unmatched Flexibility

PairedTag is the only solution that can profile histone modifications (such as **H3K27ac** or **H3K27me3**), transcription factors, structural

proteins, and chromatin remodelers (such as **EZH2**) in single cells. This versatility allows researchers to target specific chromatin features with unparalleled precision.

Enhanced Resolution



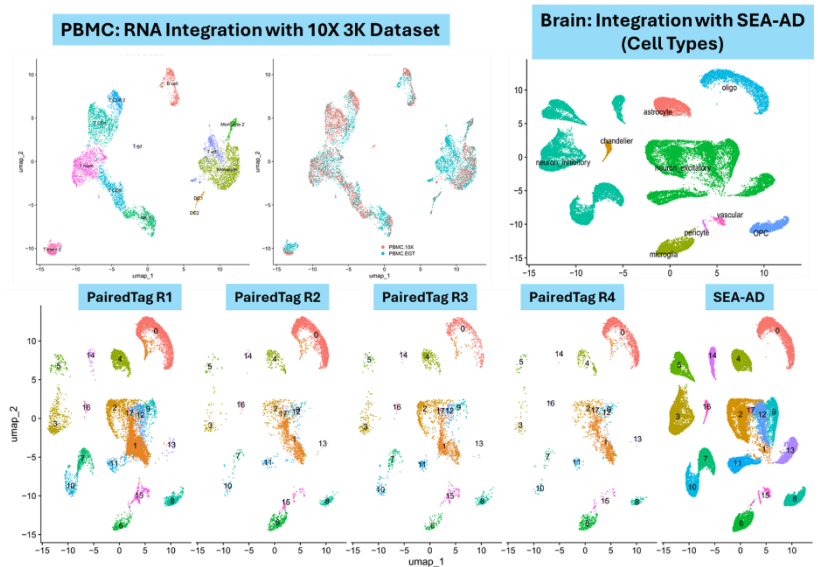
PairedTag's ability to associate each DNA fragment with a specific cell provides high-resolution insights into how epigenetic modifications correlate with cell type and function.

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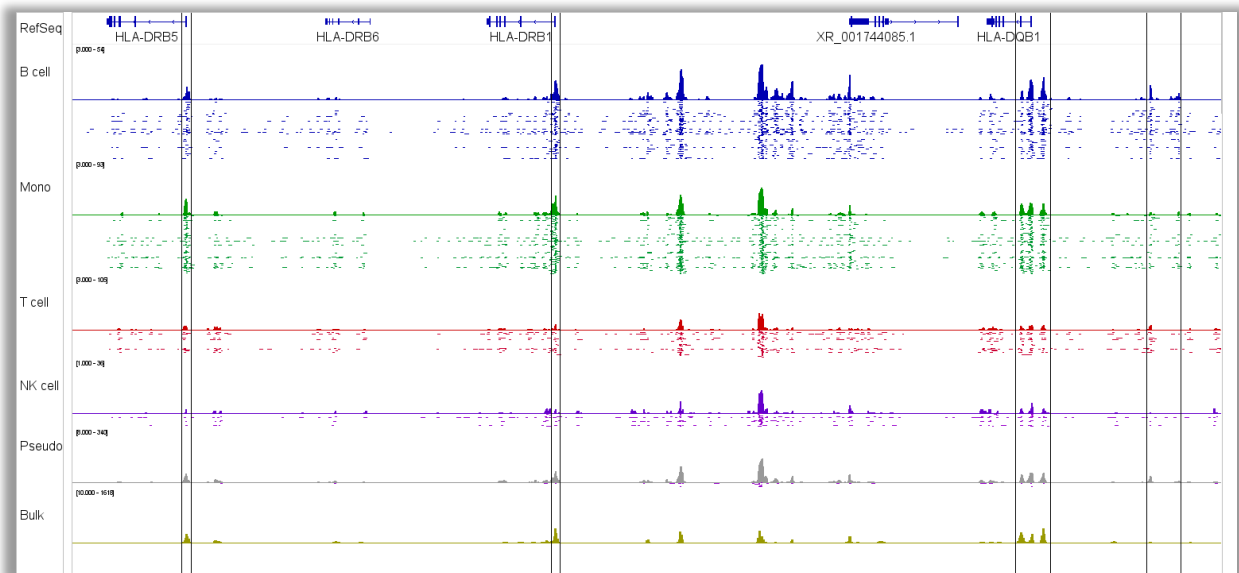
Data Integration

By profiling both RNA and epigenetic modifications simultaneously, PairedTag enables the fundamental integration of transcription and epigenetics, offering a complete picture of gene regulation and cellular activity



Cellular Precision without Sorting

PairedTag identifies cell-specific changes without the need for cell sorting, capturing the natural heterogeneity of cell populations, which is crucial for studying complex biological processes such as aging, cancer, and immune response.



By combining the flexibility of Cut&Tag with single-cell transcriptomics, PairedTag represents a leap forward in single-cell multiomic profiling, providing researchers with the tools to uncover new biological insights.

Single-Cell Epigenetic Services

Unparalleled expertise | Tailored to your insights

Single-Cell Design

10X-compatible protocol
Broad tissue compatibility
More platforms coming soon

Diverse Sample Types

Brain, PBMC, cell lines, tumors
Validated for multi-omics
Flexible & broadly applicable

Expansive Target Catalog

- * Histone PTMs
- * CTCF/Structural
- * PRC2/Remodelers
- * TFs

Scalable and Flexible

Small pilot to large-scale studies
Fresh or cryopreserved
Cells or nuclei
Biomarkers or drug response

Complete bioinformatics

Access our unique pipelines
Leverage scCut&Tag expertise
Bespoke & custom analyses

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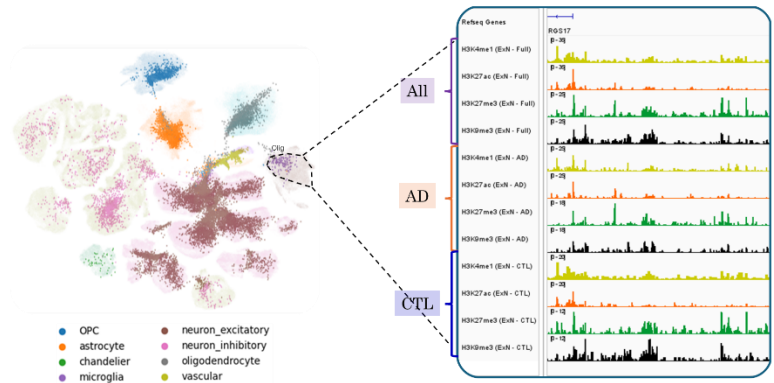
Validated Applications: Harness the Power of Paired-Tag in Complex Systems

PairedTag's unique capabilities in single-cell multiomic profiling have been successfully applied to a range of challenging and complex biological systems, providing invaluable insights into cellular processes.

Post-mortem Brain

In one of our key applications, PairedTag has been applied to profile **H3K27ac**, **H3K4me1**, **H3K9me3**, and **H3K27me3** in post-mortem human brain tissues from Alzheimer's Disease (AD) and non-AD individuals. By integrating epigenetic profiling with existing single-cell RNA (scRNA) datasets, researchers can directly map histone modifications to gene expression patterns, enabling novel insights

PairedTag enables first cell-resolution epigenetic maps of Alzheimer's Disease brain

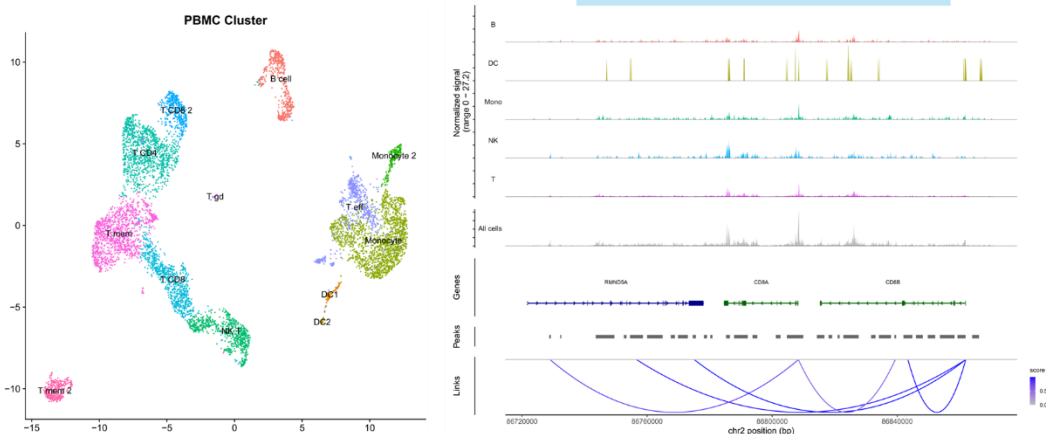


into the progression of AD and other neurodegenerative disorders. This powerful dataset reveals key regulatory elements and chromatin landscapes in disease-affected regions of the brain.

Immune system profiling using PBMCs

PairedTag has been used to profile histone lysine 27 acetylation (**H3K27ac**) in peripheral blood mononuclear cells (PBMCs) in normal individuals, providing detailed insights into the chromatin dynamics and transcriptional states of immune cells. By jointly analyzing epigenetic modifications and RNA expression, PairedTag enables a comprehensive view of immune cell regulation and differentiation. These insights are particularly valuable for understanding immune response in both healthy and disease conditions.

CD8A Activity & Enhancers



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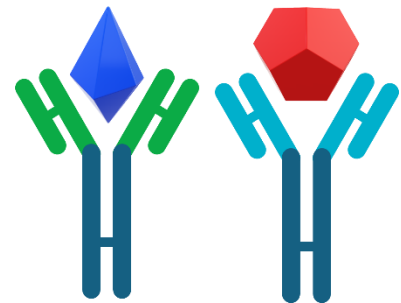
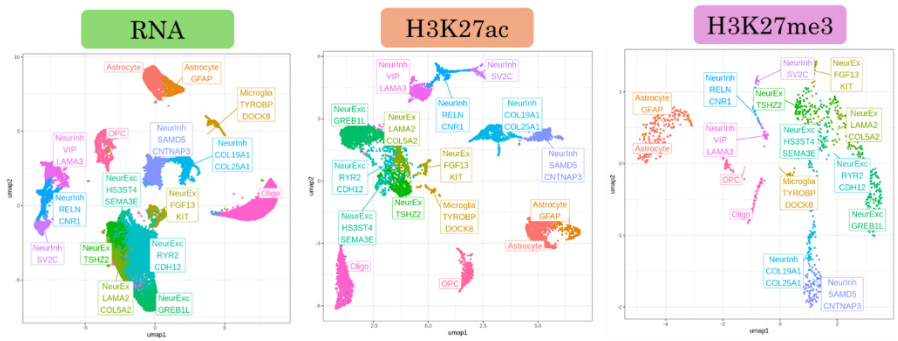
Technology Differentiation: Advancing Single-Cell Multiomic Profiling

PairedTag represents a leap forward in single-cell multiomic technology, offering unique features and unmatched flexibility to researchers.

Single-Cell Precision

PairedTag is the only profiling technology that allows researchers to simultaneously measure both RNA transcription and chromatin modification states within

individual cells. This single-cell precision enables the direct association of transcriptional activity with epigenetic modifications, offering unprecedented resolution for understanding cellular processes such as differentiation, aging, and disease progression.

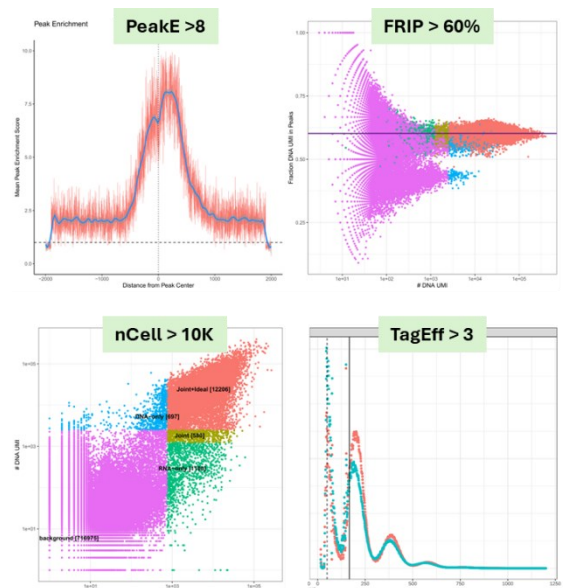


Flexible Epigenetic Targeting

PairedTag's antibody-based approach provides flexibility in targeting a wide range of chromatin features, including histone modifications, transcription factors, and structural proteins. This versatility ensures that PairedTag can adapt to various experimental needs and sample types, making it a robust tool for a broad range of biological applications.

Optimization and Quality Control

PairedTag includes comprehensive internal quality control (QC) steps within its protocol, ensuring reliable and reproducible data. Compatible with spike-in controls, PairedTag offers dedicated optimization kits and protocols for novel antibodies or tissue types. This allows researchers to confidently use PairedTag in even the most challenging experimental conditions.



Paired-Tag Single-Cell Epigenetic Multiomic Profiling

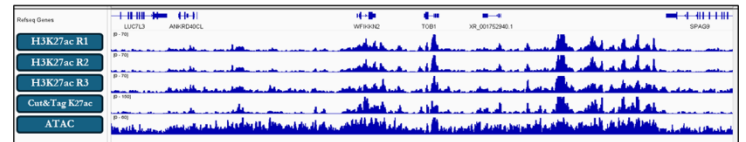
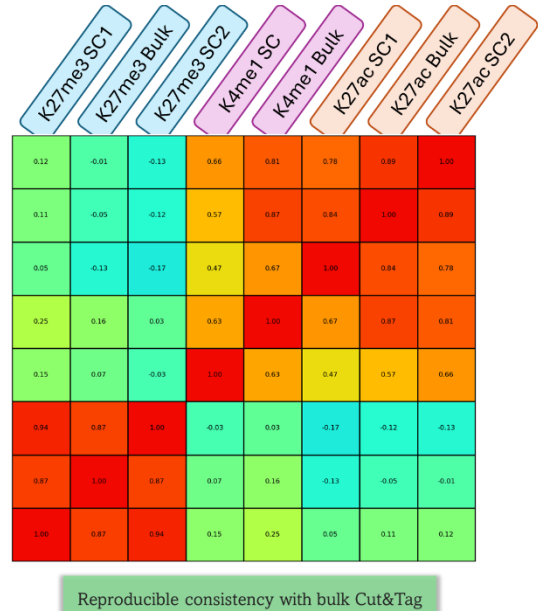
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Setting the Standard in Single-Cell Epigenetic Profiling

The PairedTag single-cell multiomic platform delivers high-quality, reproducible data, setting a new standard in epigenetic and transcriptional profiling.

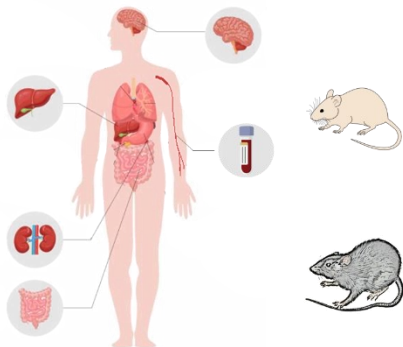
Reproducibility and Data Quality

PairedTag consistently demonstrates robust reproducibility, as evidenced by heatmaps and genome-wide correlation analyses. These metrics highlight the platform's ability to generate reliable and consistent results, even across complex sample types. Standard quality control metrics, including UMI per cell and %Fragments-in-Peaks, confirm the high signal-to-noise ratio and precision of epigenetic profiling at the single-cell level.



High correspondence to bulk assays

As the only single-cell RNA/Cut&Tag multiomic platform, PairedTag shows excellent correspondence when comparing pseudobulk Cut&Tag data to matched bulk Cut&Run or ChIP-seq profiles. This high correlation confirms that PairedTag provides a reliable representation of chromatin states, even when scaled to single-cell resolution.



Proven success across diverse applications

PairedTag has already achieved significant milestones through successful experiments across various sample types, including post-mortem brain tissue, PBMCs, tumors, and animal models. These successes demonstrate PairedTag unique ability to tackle diverse biological contexts, offering researchers unparalleled insights into gene regulation, cellular heterogeneity, and disease mechanisms.

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Core benefits of PairedTag

PairedTag is designed to meet the needs of **pre-clinical research** particularly in biomarker and MoA discovery, and core disease research. It offers unmatched capabilities for investigating the epigenetic landscape at the single-cell level: powerful tools to advance both basic research and drug discovery.



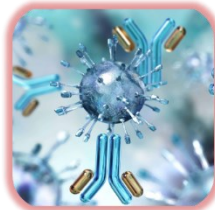
Single-cell Precision: PairedTag enables the profiling of epigenetic modifications, chromatin remodelers, and transcription factors (TFs) within individual cells. This level of detail allows researchers to interrogate the mechanisms of gene regulation within heterogeneous tissues, providing key insights into how these processes vary across different cell populations.

Cell Trajectories and Communication: the PairedTag multiomic approach reveals the regulatory elements associated with cellular differentiation, maturation, and communication. By linking epigenetic modifications to gene expression in the same cells, PairedTag offers

an integrated view of how cells transition and interact within tissues.

Scalability and flexibility: Whether applied to small-scale pilot studies or large-scale discovery projects, PairedTag is scalable and cost-effective. Its multiplexing capabilities reduce costs while still delivering high-quality, single-cell data.

Standout applications



- **Disease Research:** Investigate the epigenetic underpinnings of diseases, from cancer to neurodegeneration, by profiling chromatin changes in disease-affected tissues.
- **Aging Research:** Track how epigenetic modifications shift with age and how these changes impact gene regulation and cell function across different tissues.
- **Stem Cells:** Examine how epigenetic and transcriptional changes guide stem cell differentiation and maturation, providing crucial insights for therapeutic applications.
- **Immunology:** Understand immune cell regulation and differentiation by profiling epigenetic changes in specific immune cell populations, crucial for research on immune response and inflammation.
- **Oncology / Immuno-oncology:** Investigate the epigenetic alterations driving cancer progression and therapeutic resistance. In immuno-oncology, DoubleTag provides insights into the interactions between tumor cells and immune cells, helping to uncover novel therapeutic targets.

Paired-Tag Single-Cell Epigenetic Services

Project Workflow

Introduction

- We start by learning about your research project, discussing your goals, and exploring how PairedTag can be applied to meet your experimental needs

Experimental Design

- Together, we collaborate on a detailed Statement of Work (SOW) tailored to your research objectives and target (e.g., transcription factors, histones)

Sample Quality and Delivery

- You send us your samples, which we verify for cell viability, nuclear quality, and sample integrity. If needed, we also provide guidance on sample preparation and QC optimization.

PairedTag Experiment

- Using automated assays and defined quality controls, we conduct your experiment, ensuring high reproducibility and precision at every step of the process.

Bioinformatic Processing and Data Delivery

- After sequencing, we perform a full bioinformatic analysis using our specialized pipeline. You will receive both raw and processed data, along with a comprehensive report that includes key quality metrics and preliminary visualizations.