



# Flexible and Comprehensive Phenotyping of Tumor and Peripheral Blood Mononuclear Cells in Endometrial Carcinoma

Connie Inlay, Deeqa Mahamed, Geneve Awong, Jennifer Frahm  
Standard BioTools Inc., Markham, ON, Canada

CYTO 2025

## Introduction

Cancer biomarkers have revolutionized management and treatment of the disease, leading to remarkable advancements in personalizing medicine and determining optimal therapeutic combinations. However, researchers face significant challenges in identifying biomarkers in the context of extreme biological heterogeneity, a common feature of many cancers. While immune profiling of peripheral blood is a common approach, many critical disease processes are only evident within the tumor environment. These processes can provide valuable prognostic and diagnostic insights or reveal therapeutic targets that are not detectable in the peripheral immune system.

Endometrial carcinoma (EC) is the most prevalent form of uterine cancer, with its incidence rising in developed countries due to factors such as population aging and increasing obesity rates. Despite a relatively favorable prognosis, with an 80% survival rate at 5 years post-diagnosis, the primary curative treatment remains the total removal of the uterus, ovaries and fallopian tubes. This underscores the need for identifying biomarkers that can lead to more personalized medicine approaches and the development of immunotherapies, particularly for aggressive EC subtypes.

Mass cytometry is a high-plex proteomic technology that simultaneously resolves phenotypic and functional markers, enabling researchers to implement large-scale immunophenotyping strategies that span biological heterogeneity and sample types. A combination of immune and functional profiling is key to elucidating disease mechanisms and revealing predictive biomarkers. Mass cytometry conducted on the CyTOF™ XT PRO system uniquely enables higher-parameter, precise immunophenotyping at greater throughput without the data artifacts introduced by compensation and spectral deconvolution. The ability to easily and rapidly design and modify 50-plus-marker panels, along with flexible sample staining and acquisition workflows and the use of sample multiplexing, makes mass cytometry the premier choice for large and complex clinical studies and drug discovery programs.

## Objective

To provide a means to achieve deep phenotyping and functional characterization of multiple clinical samples in a single tube by leveraging modular, ready-to-use Flex-Fit™ panels and the enhanced throughput of the CyTOF XT PRO system. By showcasing characterization of both immune and non-immune cells in tumor tissue and PBMC, this method highlights a rapid, high-plex workflow that provides valuable insights for cancer research and potential therapeutic targets from minimal sample amounts.

### Key advantages of mass cytometry on the CyTOF XT PRO system for clinical research

- Capturing phenotypic and functional variation in a single CyTOF panel generates unique biomarkers that can reveal mechanisms of disease activity, drug response and prognostic potential
- Pre-optimized modular panels** combined with the enhanced throughput of the CyTOF XT PRO system enables fast implementation of large-scale immune profiling studies
- Sample multiplexing** using a variety of barcoding reagents (Pd, CD45, TeMal) is a powerful method to harmonize sample sets, reduce batch effects, and improve standardization in multi-site and longitudinal studies
- The CyTOF XT PRO system addresses regulatory requirements with **21 CFR Part 11 compliance-enabling software** ensuring user management, user audit trails and integrity of output files

## Materials and methods

Name	Target	Clone	Host	Isotyping/Species	Part Number
Human Tumor-informed CyTOF Panel, 5 Antibodies (201348)	CD45	HI30	SVT	Cytoskeletal	201348
	CD38	NCAM14.2	1A9	Surface	2014021
	CD3	UCHL1	1D6	Cytoskeletal	201348
	CD19	HB9	2A9	Surface	2014021
	CD4	HR23	1A9	Surface	2014021
	CD80	019F5	1D6	Surface	2014021
	CD4	SK1	1A9	Cytoskeletal	2014021
	CD45RA	HI30	1A9	Surface	2014021
	CD45RO	HI30	1A9	Surface	2014021
	CD45	UCHL1	1D6	Surface	2014021
Human T-cell Profiling CyTOF Panel, 10 Antibodies (201348)	CD38	UCHL1	1D6	Surface	2014021
	CD3	UCHL1	1D6	Surface	2014021
	CD4	HR23	1A9	Surface	2014021
	CD80	019F5	1D6	Surface	2014021
	CD4	SK1	1A9	Cytoskeletal	2014021
	CD45RA	HI30	1A9	Surface	2014021
	CD45RO	HI30	1A9	Surface	2014021
	CD45	UCHL1	1D6	Surface	2014021
	CD38	UCHL1	1D6	Surface	2014021
	CD3	UCHL1	1D6	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	2014021
	PD-1	29A.22	1A9	Surface	2014021
	CD272	BT.1A	1A9	Surface	2014021
Human Immune Checkpoint Expression CyTOF Panel, 3 Antibodies (201348)	CTLA-4	9A11	1A9	Surface	