GeoMx® Mouse Protein Assays

Spatially Profile Protein Targets with Next-Generation Sequencing Readout

Profile 130+ protein targets simultaneously with spatial resolution in any region of interest from a single tissue section using the GeoMx Digital Spatial Profiler (DSP). With a modular design, the GeoMx Mouse Protein Assays with NGS readout provide validated content for immunology, immuno-oncology, and neuroscience research.

Product Highlights

- Validated, multiplex antibodies designed for immunology, immuno-oncology, and neuroscience research
- Quantify 130+ protein targets by selecting 10-plex modules to add to the GeoMx Mouse Protein Core
- Customizable with up to 10 additional antibodies of interest
- For use with Illumina next-generation sequencer (NGS) readout
- Utilize the GeoMx Data Center for interactive analysis

GeoMx Protein Assay Design

The GeoMx Mouse Protein Assays with NGS readout allow you to profile 130+ protein targets simultaneously with spatial resolution using NGS platforms and pipelines. The four-plex GeoMx Protein Core for NGS, which includes necessary controls for GeoMx DSP experiments, can be run with any selection of modules that each contain probes for 7-10 proteins.. GeoMx protein assays contain validated antibodies conjugated to unique DNA indexing-oligonucleotides via a UV-photocleavable linker. DNA oligonucleotide sequences contain region of interest (ROI) indices mapping them back to their tissue location, a protein target identification sequence matching them to their antibody, and a unique molecular identifier (UMI) to deduplicate reads. After selecting ROIs on GeoMx DSP, the DNA oligonucleotides are UV cleaved and then sequenced on an Illumina sequencer. Sequenced oligonucleotides are processed and then imported back into the GeoMx DSP platform for integration with the slide images and ROI selections for spatially-resolved protein expression.

Validated Content for Immunology, Immuno-Oncology, and Neuroscience

Immune	Oncology	Neuro	Mouse Protein Core for NGS			
+	+	+	Mouse Protein Core for NGS	Includes markers for immune cells (CD45), proliferation (Ki-67), vasculature (CD31), transgenes (GFP), and the controls needed to run any GeoMx DSP experiment.	CD45	Rb IgG
					Ki-67	Rt IgG2a
					GFP	Rt IgG2b
					CD31	Histone H3
						S6
						GAPDH
			Mouse Protein Modules for NGS - *Compatible with Illumina Systems*			
+	+		Immune Cell Typing	Includes key immuno-oncology targets and markers of immune cell types, including T cells, B cells, macrophages, NK cells, and stroma.	BatF3	CD4
					CD19	CD8a
					CD28	FOXP3
					CD34	Fibronectin
					CD3e	GZMB
+	+		Immune Activation Status	Includes additional checkpoint molecules and other markers of activated or memory T cells.	CD86	CD44
					CD127/IL7RA	ICOS
					CD27	PD-1
					CD40L	PD-L1
+	+		IO Drug Target	Includes drug targets in development within the immuno-oncology space, including checkpoint molecules and metabolic mediators of immune function.	B7-H3	OX40L
					CTLA4	Tim-3
					GITR	VISTA
					LAG3	
	+		Pan-Tumor	Includes markers for detecting EMT or cells of epithelial origin, and an expanded set of targets for detecting specific tumor types, including ER+/HER2+ breast tumors, hematopoietic malignancies, and melanoma.	AR	IFNGR
					AhR	PanCk
					ER	Pmel17
					EpCAM	SMA
					Her2	
+	+	+	Cell Death	Includes protein mediators of immunogenic and programmed cell death.	BAD	Perforin
					BCLXL	Neurofibromin
					BIM	P21
					Cleaved Caspase 3	p53
					gamma-H2AX	PARP
+	+	+	MAPK Signaling	Includes key proteins involved in MAPK signal transduction, and phosphorylated protein products that measure pathway activation.	BRAF	Phospho-p44/42 MAPK ERK1/2 (T202/Y204)
					EGFR	Phospho-p90 RSK (T359/S363)
					MEK1	p38 MAPK
					Phospho-JNK (T183/Y185)	p44/42 MAPK ERK1/2
					Phospho-MEK1 (S217/S221)	pan-RAS

Immune	Oncology	Neuro	Mouse Protein Modules for NGS - *Compatible with Illumina Systems*			
+	+	+	PI3K/AKT Signaling	Includes key proteins involved in PI3K-AKT signal transduction, and phosphorylated protein products that measure pathway activation	MET	Phospho-GSK3A (S21)/ Phospho-GSK3B (S9)
					PLCG1	Phospho-PRAS40 (T246)
					Pan-AKT	Phospho-S6 (S235/ S236)
					Phospho-AKT1 (S473)	
					Phospho-AMPK-alpha (T172)	
+	+	+	Myeloid	Includes proteins expressed by myeloid cells generally or specific subsets, including macrophages, dendritic cells, and microglia.	CD11b	CD40
					CD11c	CD68
					CD14	F4/80
					CD163	Ly6G/Ly6C
					CD39	MHC II
+	+	+	Autophagy	Includes proteins involved in the regulation and process of autophagy.	ATG12	P62
					ATG5	PLA2G6
					BAG3	TFEB
					Beclin-1	ULK1
					LC3B	VPS35
		+	Neural Cell Typing	Includes relevant markers of neurons, oligodendrocytes, astrocytes, and microglia.	Neurofilament light	MAP2
					Synaptophysin	Myelin basic protein
					TMEM119	NeuN
					GFAP	Olig2
					IBA1	
		+	Alzheimer's Disease Pathology	Includes proteins and protein products that are associated with Alzheimer's pathology and risk in the literature, including beta-amyloid, Tau, and ApoE.	Amyloid-Beta 1-42	Phospho-Tau (S404)
					APOE	Tau
					Amyloid Precursor Protein	Tdp-43
					P2RX7	Ubiquitin
		+	Alzheimer's Disease Pathology Extended	Includes proteins and protein products that are associated with Alzheimer's pathology and risk in the literature, including increased coverage of phosphorylated Tau and amyloid processing proteins.	BACE1	Phospho-Tau (S199)
					IDE	Phospho-Tau (S214)
					NRGN	Phospho-Tau (S396)
					Neprilysin	Phospho-Tau (T231)
					PSEN1	
		+	Parkinson's Disease Pathology	Includes proteins associated with Parkinson's pathology and risk in the literature, including several Parkin genes and alpha-synuclein.	Phospho-Alpha-synuclein (S129)	PINK1
					Alpha-synuclein	Park5
					ApoA-I	Park7
					Calbindin	Tyrosine Hydroxylase
					LRRK2	
		+	Glial Cell Subtyping	Includes key markers of all glial cell subtypes, including microglia, astrocytes, and oligodendrocytes.	CSF1R	MSR1
					Aldh1l1	Mertk
					CD9	S100B
					Ctsd	SPP1
					GPNMB	Vimentin

Validated Assays Ready for Use

All GeoMx Protein Assays undergo extensive validation to ensure high quality GeoMx DSP data.

Ordering Screen
IHC validation of off-the-shelf antibody in control tissue(s)

Post-Conjugation Screen
IHC testing of conjugated antibody for post-conjugation specificity

Sensitivity/ Specificity Screen
Quantitative assessment on control FFPE cell pellets

Interaction Screen
Performance comparison of antibodies alone or in high-plex cocktail

TMA Screen
Analysis of normal and tumor tissue microarrays to confirm performance in tissue

Spatial Protein Profiling with High Specificity

Protein detection shows high specificity pre- and post-oligonucleotide conjugation **(Figure 1)**. Additionally, spike-in of each module to the Immune Cell Profiling Core does not alter specificity of the antibodies, demonstrating robust multiplex performance **(Figure 2)**.

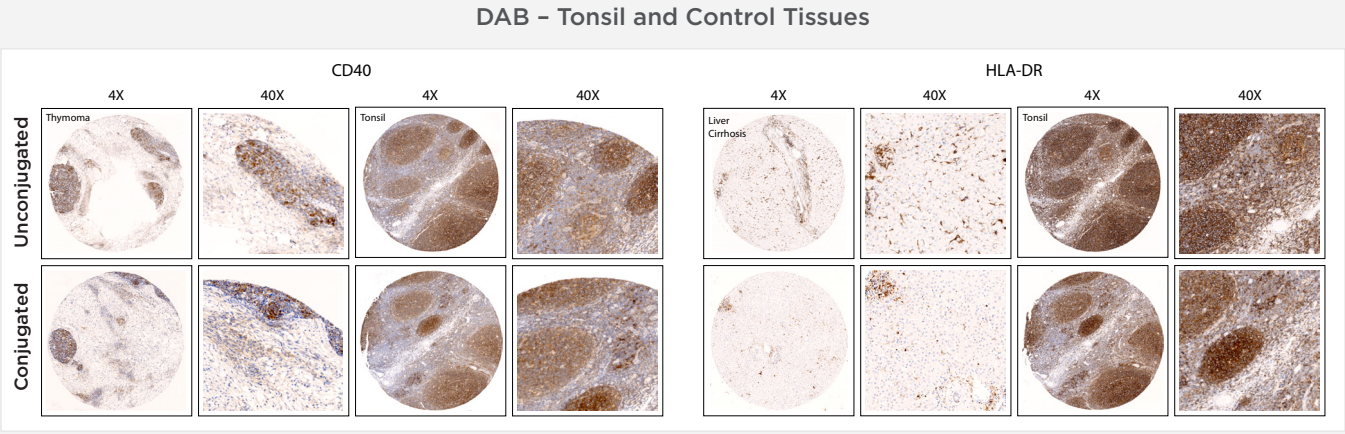

FIGURE 1: Example CD40 and HLA-DR from the GeoMx® Myeloid Module are tested for specific staining pre- and post-conjugation to a specific indexing-oligonucleotide to ensure conjugation does not alter specificity.

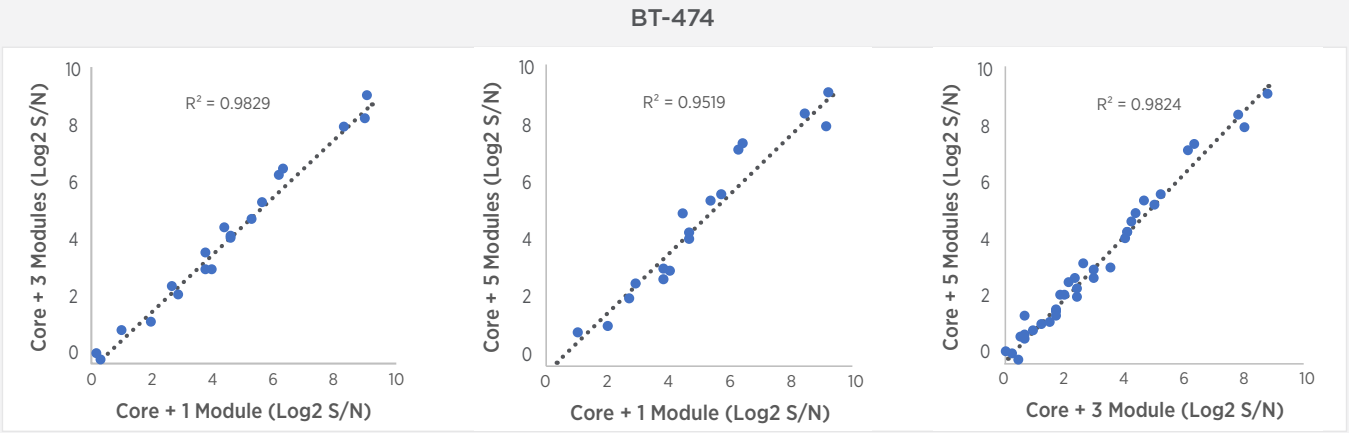

FIGURE 2: Example signal for the GeoMx® Human Protein Core for NGS is compared to the GeoMx® Human Protein Core for NGS plus individual Modules to ensure no antibody-antibody interference in BT-474 cell lines.

Reveal Tissue Heterogeneity

Analysis of mixed tumor and tumor microenvironment ROI from colorectal cancer (CRC) show distinct protein expression profiles in each segment respectively **(Figure 3)**.

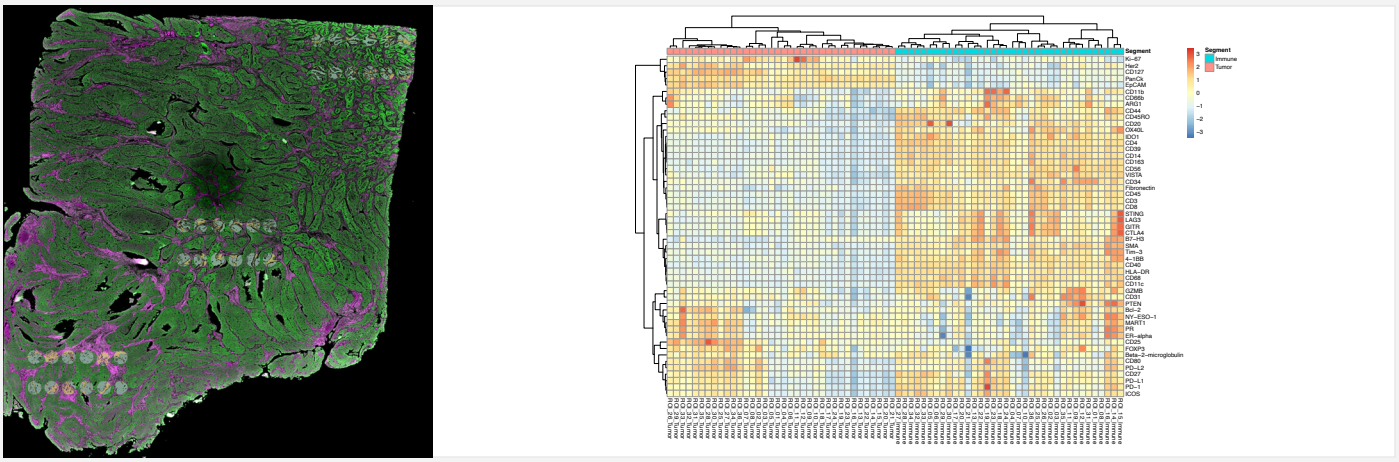

FIGURE 3: ROIs were selected with mixed tumor and tumor microenvironment (immune) segments in CRC FFPE tissue. ROIs were segmented based on PanCK/CD45 morphology stain. Protein expression shows strong clustering by compartment.

GeoMx® Data Analysis

Unique GeoMx software combines whole tissue visualization with advanced ROI selection to enable comprehensive spatial profiling of tissue sections. The fully integrated workflow tracks image data to corresponding profiling data, allowing users to easily go from data collection to data analysis and to interact with either dataset in real time.

The data analysis module assesses the quality of the raw data and provides a number of options to normalize data sets. Moreover, a variety of data visualization formats are enabled to export publication-quality figures. Visualization plots include: heatmap, cluster, bar graph, box plot, scatter plot, line/trend plot, strip plot, volcano plot, and PCA.

To view the Protein probe list, visit: nanostring.com/geomx-protein-assays

To view GeoMx publications, visit: nanostring.com/GeoMxPubs

Ordering Information

GeoMx Mouse Protein Assays for NGS			
Product	**Product Description**	**Quantity**	**Catalog Number**
GeoMx Mouse Protein Core for NGS*	Protein core including targets for immune cells (CD45), proliferation (Ki-67), vasculature (CD31), and transgenes (GFP), plus positive and negative controls. Includes AbMix for Illumina NGS readout.	12 slides	GMX-PROCO-NGS-MCORE-12
GeoMx Immune Cell Typing Panel †	Protein module including 10 targets for mouse immune cell typing. Includes AbMix for Illumina NGS readout. Must be run with a protein core.	12 slides	GMX-PROMOD-NGS-MICT-12
GeoMx IO Drug Target Panel †	Protein module including 7 targets for mouse immuno-oncology drug targets. Includes AbMix for Illumina NGS readout. Must be run with a protein core.	12 slides	GMX-PROMOD-NGS-MIODT-12
GeoMx Immune Activation Status Panel †	Protein module including 8 targets for mouse immune activation status. Includes AbMix for Illumina NGS readout. Must be run with a protein core.	12 slides	GMX-PROMOD-NGS-MIAS-12
GeoMx Pan-Tumor Panel †	Protein module including 9 targets for mouse pan-tumor analysis. Includes AbMix for Illumina NGS readout. Must be run with a protein core.	12 slides	GMX-PROMOD-NGS-MPT-12
GeoMx Cell Death Panel	Protein module including 10 targets for mouse cell death. Includes AbMix for Illumina NGS readout. Must be run with a protein core.	12 slides	GMX-PROMOD-NCT-MCD-12
GeoMx Myeloid Panel †	Protein module including 10 targets for myeloid cells. Includes AbMix for Illumina NGS readout. Must be run with a protein core.	12 slides	GMX-PROMOD-NGS-MMY-12
GeoMx MAPK Signaling Panel †	Protein module including 10 targets for mouse MAPK signaling. Includes AbMix for Illumina NGS readout. Must be run with a protein core.	12 slides	GMX-PROMOD-NGS-MMAPK-12
GeoMx PI3K/AKT Signaling Panel †	Protein module including 8 targets for mouse PI3K/AKT signaling. Includes AbMix for Illumina NGS readout. Must be run with a protein core.	12 slides	GMX-PROMOD-NGS-MPI3K-12
GeoMx Neural Cell Typing Panel †	Protein module including 9 targets for mouse neural cell typing. Includes AbMix for Illumina NGS readout. Must be run with a protein core.	12 slides	GMX-PROMOD-NGS-MNCT-12
GeoMx Alzheimer's Pathology Panel †	Protein module including 8 targets for mouse AD pathology. Includes AbMix for Illumina NGS readout. Must be run with a protein core.	12 slides	GMX-PROMOD-NGS-MADP-12
GeoMx Alzheimer's Pathology Extended Panel	Protein module including 9 targets for mouse AD pathology. Includes AbMix for Illumina NGS readout. Must be run with a protein core.	12 slides	GMX-PROMOD-NCT-MADEP-12
GeoMx Parkinson's Pathology Panel	Protein module including 9 targets for mouse Parkinson's pathology. Includes AbMix for Illumina NGS readout. Must be run with a protein core.	12 slides	GMX-PROMOD-NCT-MPDP-12
GeoMx Glial Cell Subtyping Panel	Protein module including 10 targets for mouse glial cells. Includes AbMix for Illumina NGS readout. Must be run with a protein core.	12 slides	GMX-PROMOD-NCT-MGCS-12
GeoMx Morphology Kits			
GeoMx Solid Tumor TME Morphology Kit ‡	Morphology kit for visualization of mouse solid tumors and the tumor microenvironment. For use with protein assays. Includes fluorescent antibodies against Pan-CK, CD45, and a nuclear stain.	12 slides	GMX-PRO-MORPH-MST-12
GeoMx Melanoma TME Morphology Kit ‡	Morphology kit for visualization of mouse melanoma and the tumor microenvironment. For use with protein assays. Includes fluorescent antibodies against S100B/PMEL17, CD45, and a nuclear stain.	12 slides	GMX-PRO-MORPH-MMEL-12
GeoMx Alzheimer's Morphology Kit §	Morphology kit for visualization of human and mouse AD or other brain samples. For use with protein assays. Includes fluroescent antibodies against amyloid-beta, Iba1, and a nuclear stain.	12 slides	GMX-PRO-MORPH-HAD-12
GeoMx Parkinson's Morphology Kit §	Morphology kit for visualization of human and mouse PD or other brain samples. For use with protein assays. Includes fluroescent antibodies against alpha-synuclein, MAP-2, and a nuclear stain.	12 slides	GMX-PRO-MORPH-HPD-12
Additional Assay Reagents			
GeoMx Seq Code Pack†	NGS readout reagents for GeoMx DSP RNA and protein analysis. Includes two Seq Code primer plates (choice of A&B, C&D, E&F, or G&H) and two universal enzyme master mixes.	192 AOI	GMX-NGS-SEQ-AB
GeoMx Protein Slide Prep Kit	Sample prep reagents for GeoMx DSP protein analysis. Includes Buffer W and Buffer S.	12 slides	GMX-PREP-PRO-FFPE-12
GeoMx DSP Collection Plate	Barcoded collection plates for use on the GeoMx DSP. Required for AOI tracking. Kit includes 4 plates covering 384 AOI.	1 Pack	GMX-DSP-COLL-PLT-4
GeoMx DSP Instrument wBuffer Kit	Buffer kit for the GeoMx DSP. Includes Buffer S and Buffer H. Sufficient for ~48 samples with ~18 AOI each. Volume requirements may vary based on experimental design.	1 Kit	GMX-DSP-BUFF-KIT

* Compatible with Illumina Systems. † Mouse Protein Module for NGS, compatible with Illumina Systems. ‡ Mouse Protein Compatible. § Human & Mouse Protein Compatible.

For more information, please visit nanostring.com/GeoMxDSP

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