Development of custom morphology markers for NanoString GeoMx Digital Spatial Profiler enables better tissue stratification to study tumor heterogeneity

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Understanding tissue heterogeneity is a key goal in oncology research and new spatial biology technologies are now available to address this. These platforms provide spatial context about cells and their interactions within a tissue or tumor sample while also producing high-plex gene expression data. The NanoString® GeoMx® Digital Spatial Profiler platform combines spatial and molecular profiling technologies and uses fluorescently labeled morphology markers to guide selection of regions of interest on tissue samples. These markers broadly target tumor and immune cells within tissue, while the probes from these regions of interest are collected and analyzed to generate gene expression profiles for each sample. To evaluate the capability of this technology to selectively enrich specific cell types, we validated markers specific to several tissue types to aid in tumor subtyping yielding better molecular profiling. Markers such as p40 and TTF-1 were used to differentiate between squamous cell carcinoma and adenocarcinoma subtypes of NSCLC. CD8+ and CD4+ tonsil tissue revealed significant alterations in RNA expression for various types of T-cell indicators. Gene expression profiles were mapped for other immune cell markers including CD3 and CD20 for T cells and B cells respectively to further support the hypothesis that specific markers provide better gene expression profile data than the broader morphology marker kits provided by the manufacturer. The data support the use of custom morphology markers for cell type stratification in tumor subtypes, providing more meaningful gene expression analysis. Ongoing work continues to explore the utility of this technology for cell type-specific gene expression analysis within different tumor subtypes.