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IMAGING MASS CYTOMETRY LABORATORY

The Imaging Mass Cytometry Laboratory provides cancer researchers with high-dimensional imaging analysis of tumor tissue samples at subcellular resolution.

In contrast to traditional imaging technologies, such as immunohistochemistry and immunofluorescence, which are capable of staining just two or three protein markers, imaging mass cytometry can simultaneously stain up to 40 protein markers. It is one of the leading technologies in spatial biology and provides compressive and multiparametric analyses of tissue samples at the single-cell level with spatial distribution. Imaging mass cytometry can be used for 3D imaging and can be combined with RNAscope™ technology to simultaneously detect antibody markers and mRNA transcripts.



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CONTACT CHRISTINE NEWKIRK, PROJECT MANAGER, AT IMCFNLCR@NIH.GOV FOR SERVICE REQUESTS OR QUESTIONS.

Collaboration Opportunities

All investigators with a cancer-focused project are welcome to [request a service](#) from the laboratory.

SUBMISSIONS ACCEPTED ON A ROLLING BASIS

Request our services

We work with intramural staff and extramural nonprofit research organizations interested in studying tumor heterogeneity and

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Technology to assess tissue microenvironments

The laboratory is equipped with a Standard BioTools™ Hyperion XTi™ Imaging System, a multiplexed tissue imager that uses metal-tagged antibodies, instead of fluorophores, to simultaneously and reliably acquire 40-plus protein and RNA markers, without autofluorescence interference.

Using the Hyperion XTi™ Imaging System, the IMC Laboratory performs spatial proteomics analyses of formalin-fixed, paraffin-embedded tissue samples; tissue microarrays; fresh-frozen tissues; and smeared cells on glass slides. We can stain specimens with metal-labeled antibodies and obtain high-dimensional images of up to 40 protein markers simultaneously, allowing researchers to interrogate the protein markers' expression at subcellular resolution.

Imaging mass cytometry laboratory workflow

Working with researchers, we develop metal-labeled antibody panels then validate them with positive and negative control tissue slides/tissue microarrays. Once an antibody panel is finalized, we use 4–5µm sections

of fresh-frozen or formalin-fixed, paraffin-embedded tissue, or smeared cells, then stain them with up to 40 different metal-labeled antibodies. The Regions of Interest (ROI) are ablated with the Hyperion XTi™ laser ablation unit then the content is ionized and transferred to a time-of-flight mass spectrometer, which resolves

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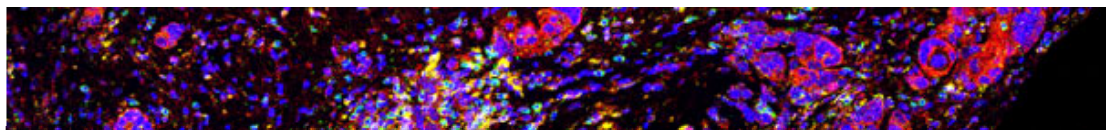
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An end-to-end workflow for multiplexed image processing and analysis. Nat Protoc 18, 3565–3613 (2023). Windhager, J., Zanotelli, V.R.T., Schulz, D. et al.

After overlaying the single isotope signals for each ROI, we generate high-dimensional images that provide spatial and subcellular resolution of the tissue samples and the raw data from the instrument is shared with the investigator’s laboratory. If requested, we provide data analysis using project-dependent cell segmentation coupled with the Bodenmiller Lab pipeline for downstream analysis.





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Our capabilities and specializations

Individualized support for investigators

We work with researchers to design customized and validate metal-labeled antibody panels and optimize the staining protocols.

We maintain a state-of-the-art pipeline for quantitative analysis of high-dimensional, single-cell data. The laboratory has developed and validated several metal-labeled antibody panels to achieve spatial and subcellular resolution of tissue samples.

-  Epithelial-to-mesenchymal transition markers (EMTs)
-  Metabolic protein markers
-  Tumor microenvironments
-  Protein markers targeted to specific cancer types
-  Proliferation markers
-  Cancer stem cell markers



Frederick National Laboratory for Cancer Research is operated by [Leidos Biomedical Research, Inc.](#) for the [National Cancer Institute](#).

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