Imaging Mass Cytometry Publications

May 2021

This bibliography contains references to more than 80 peer-reviewed publications featuring Imaging Mass Cytometry™ through May 5, 2021. Also included are non-peer-reviewed articles (for example, articles in *bioRxiv* and *Research Square*) and selected reviews of interest.

2021 Publications

1 Bertocchi, A. et al. "Gut vascular barrier impairment leads to intestinal bacteria dissemination and colorectal cancer metastasis to liver." *Cancer Cell* 39 (2021): doi: 10.1016/j.ccell.2021.03.004.

2 Fonkoua, L.A.K. et al. "Outcomes on anti-VEGFR-2/paclitaxel treatment following progression on immune checkpoint inhibition in patients with metastatic gastroesophageal adenocarcinoma." *International Journal of Cancer* (2021): doi: 10.1002/ijc.33559.

3 Georgopoulou, D. et al. "Landscapes of cellular phenotypic diversity in breast cancer xenografts and their impact on drug response." *Nature Communications* 12 (2021): 1998.

4 Lin, Y-W.E. et al. "Graph of graphs analysis for multiplexed data with application to Imaging Mass Cytometry™." *PLOS Computational Biology* (2021): e1008741.

5 Martinez-Morilla, S. et al. "Biomarker discovery in immunotherapy-treated melanoma patients with Imaging Mass Cytometry™." *Clinical Cancer Research* 27 (2021): 1,987–1,996.

6 Peran, I. et al. "Cadherin 11 promotes immunosuppression and extracellular matrix deposition to support growth of pancreatic tumors and resistance to gemcitabine in mice." *Gastroenterology* 160 (2021): 1,359–1,372.

7 Rana, R. et al. "An iodinated DAPI-based reagent for mass cytometry." *ChemBioChem* 3 (2021): 532–538.

8 Rendeiro, A.F. "The spatial landscape of lung pathology during COVID-19 progression". *Nature* (2021): doi:10.1038/s41586-021-03475-6.

9 Sanmamed, M.F. et al. "A burned-out CD8+ T-cell subset expands in the tumor microenvironment and curbs cancer immunotherapy." *Cancer Discovery* (2021): doi:10.1158/2159-8290.

10 Schwabenland, M. et al. “Deep spatial profiling of COVID-19 brains reveals neuroinflammation by compartmentalized local immune cell interactions and targets for intervention.” *Cell* (2021): doi:10.21203/rs.3.rs-63687/v1.

11 Somarakis, A. et al. “ImaCytE: visual exploration of cellular micro-environments for Imaging Mass Cytometry™ data.” *IEEE Transactions on Visualization and Computer Graphics* 27 (2021): 98–110.

12 Somasundaram, R. et al. “Tumor-infiltrating mast cells are associated with resistance to anti-PD-1 therapy.” *Nature Communications* 12 (2021): 346.

13 Strittmatter, N. et al. “Method to investigate the distribution of water-soluble drug-delivery systems in fresh frozen tissues using Imaging Mass Cytometry™.” *Analytical Chemistry* 93 (2021): 3,742–3,749.

14 Traum, D. et al. “Highly multiplexed 2-dimensional Imaging Mass Cytometry™ analysis of HBV-infected liver.” *JCI Insight* 6 (2021): 146883.

15 Veenstra, J. et al. “Research techniques made simple: use of Imaging Mass Cytometry™ for dermatological research and clinical applications.” *Journal of Investigative Dermatology* 141 (2021): 705–712.

16 Zhu, Y. et al. “SIO: A spatioimageomics pipeline to identify prognostic biomarkers associated with the ovarian tumor microenvironment.” *Cancers* 13 (2021): 1777.

2021 Non-Peer-Reviewed Publications

1 Bortolomeazzi, M. et al. “Immunogenomic profile of colorectal cancer response to immune checkpoint blockade.” *bioRxiv* (2021): doi:10.1101/2020.12.15.422831.

2 Colombo, A. et al. “Single-cell spatial analysis of tumor immune architecture in diffuse large B cell lymphoma.” *medRxiv* (2021): doi:10.1101/2021.02.01.21250775v1.

3 Geuenich, M. et al. “Automated assignment of cell identity from single-cell multiplexed imaging and proteomic data.” *bioRxiv* (2021): doi:10.1101/2021.02.17.431633v1.

4 Ravi, V.M. et al. “Spatiotemporal heterogeneity of glioblastoma is dictated by microenvironmental interference.” *bioRxiv* (2021): doi:10.1101/2021.02.16.431475v1.

5 Van Maldegem, F. et al. “Characterisation of tumour immune microenvironment remodelling following oncogene inhibition in preclinical studies using an optimised Imaging Mass Cytometry™ workflow.” *bioRxiv* (2021): doi:10.1101/2021.02.02.429358.

6 Wu, M. et al. “Single-cell analysis of human pancreas in type 2 diabetes using multi-spectral Imaging Mass Cytometry™. *bioRxiv* (2021): doi:10.1101/2021.03.29.437504.

2021 Selected Reviews and Commentary

1 Irmisch, A. et al. “The Tumor Profiler Study: integrated, multi-omic, functional tumor profiling for clinical decision support.” *Cancer Cell* (2021): 288–293..

2 Nederlof, I. et al. “A high-dimensional window into the microenvironment of triple negative breast cancer.” *Cancers* 13 (2021): 316.

2020 Publications

1 Aguilar-Navarro, A.G. et al. “Human aging alters the spatial organization between CD34+ hematopoietic cells and adipocytes in bone marrow.” *Stem Cell Reports* 15 (2020): 317–325.

2 Ali, H.R. et al. “Imaging Mass Cytometry™ and multiplatform genomics define the phenogenomic landscape of breast cancer.” *Nature Cancer* 1 (2020): 163–175.

3 Aoki, T. et al. “Single-cell transcriptome analysis reveals disease-defining T-cell subsets in the tumor microenvironment of classic Hodgkin lymphoma.” *Cancer Discovery* 10 (2020): 406–421.

4 Batth, I.S. et al. “Rare osteosarcoma cell subpopulation protein array and profiling using Imaging Mass Cytometry™ and bioinformatics analysis.” *BMC Cancer* 20 (2020): 715.

5 Böttcher, C. et al. “Single-cell mass cytometry reveals complex myeloid cell composition in active lesions of progressive multiple sclerosis.” *Acta Neuropathologica Communications* 8 (2020): 136.

6 Chen, P.Y. et al. “Smooth muscle cell reprogramming in aortic aneurysms.” *Cell Stem Cell* 26 (2020): 542–557.

7 De Vries, N.L. et al. “Unraveling the complexity of the cancer microenvironment with multidimensional genomic and cytometric technologies.” *Frontiers in Oncology* 10 (2020): 1254.

8 Dey, P. et al. “Oncogenic KRAS-driven metabolic reprogramming in pancreatic cancer Cells utilizes cytokines from the tumor microenvironment.” *Cancer Discovery* 4 (2020): 608–625.

9 Eling, N. et al. “Visualization of highly multiplexed imaging cytometry data in R.” *Bioconductor* (2020): doi:10.18129/B9.bioc.cytomapper.

10 Flint, L.E. et al. “Characterization of an aggregated three-dimensional cell culture model by multimodal mass spectrometry imaging.” *Analytical Chemistry* 92 (2020): 12,538–12,547.

11 Grenier, L. et al. “Enabling indium channels for mass cytometry by using reinforced cyclam-based chelating polylysine.” *Bioconjugate Chemistry* 31 (2020) 2,013–2,115.

12 Guo, N. et al. “A 34-marker panel for imaging mass cytometric analysis of human snap-frozen tissue.” *Frontiers in Immunology* 11 (2020): 1466.

13 Jackson, H.W. et al. “The single-cell pathology landscape of breast cancer.” *Nature* 578 (2020): 615–620.

14 Liu, H-C. et at. “Potentiating antitumor efficacy through radiation and sustained intratumoral delivery of anti-CD40 and anti-PDL1.” *International Journal of Radiation Oncology Biology Physics* 20 (2020) 33,745–33,747.

15 Podojil, J.R. et al. “Antibody targeting of B7-H4 enhances the immune response in urothelial carcinoma.” *Oncoimmunology* 9 (2020): e1744897.

16 Savic, L.J. et al. “Molecular MRI of the immuno-metabolic interplay in a rabbit liver tumor model: a biomarker for resistance mechanisms in tumor-targeted therapy?” *Radiology* 296 (2020): 575–583.

17 Umemoto, K. et al. “The potential application of PD-1 blockade therapy for early-stage biliary tract cancer.” *International Immunology* 32 (2020): 273–281.

18 Vurgun, N. and Nitz, M. “Validation of l-tellurienylalanine as a phenylalanine isostere.” *ChemBioChem* 21 (2020): 1,136–1,139.

19 Wang C. et al. “Imaging mass cytometric analysis of postmortem tissues reveals dysregulated immune cell and cytokine responses in multiple organs of COVID-19 patients.” *Frontiers in Microbiology* 11 (2020): 600989.

20 Warren, C. et at. “Decoding mitochondrial heterogeneity in single muscle fibres by Imaging Mass Cytometry™.” *Scientific Reports* 10 (2020): 15336.

21 Xiang, H. et al. “Cancer-associated fibroblasts promote immunosuppression by inducing ROS-generating monocytic MDSCs in lung squamous cell carcinoma.” *Cancer Immunology Research* 8 (2020): 436–450.

22 Xie, S. et al. “Hyperion™ Imaging System reveals tumor microenvironment of oral squamous cell carcinoma patients at T1N0M0 stage.” *Annals of Translational Medicine* 22 (2020): 1513.

23 Yu, Y. et al. “Metal-labeled aptamers as novel nanoprobes for Imaging Mass Cytometry™.” *Analytical Chemistry* 92,9 (2020): 6,312–6,320.

24 Zanotelli, V.R. et al. “A quantitative analysis of the interplay of environment, neighborhood, and cell state in 3D spheroids.” *Molecular Systems Biology* 16 (2020): e9798.

25 Zhang, Y. et al. “Inflammatory response cells during acute respiratory distress syndrome in patients with coronavirus disease 2019 (COVID-19).” *Annals of Internal Medicine* 173 (2020): 402–404.

26 Zhang, Y. et al. “A systematic comparison of *in vitro* cell uptake and *in vivo* biodistribution for three classes of gold nanoparticles with saturated PEG coatings.” *PLoS ONE* 15 (2020): e0234916.

2020 Non-peer Reviewed Publications

1 Bortolomeazzi, M. et al. “Immunogenic profile of colorectal cancer response to immune checkpoint blockade” *bioRxiv* (2020): doi.org/10.1101/2020.12.15.422831.

2 Catena, R. et al. “Highly multiplexed molecular and cellular mapping of breast cancer tissue in three dimensions using mass tomography.” *bioRxiv* (2020): doi.org/10.1101/2020.05.24.113571.

3 Zhu, Y. et al. “Deep learning on image-omics data in identifying prognostic immune biomarkers for ovarian cancer.” *Research Square* (2020): doi:10.21203/rs.3.rs-67036/v1.

2020 Selected Reviews and Commentary

1 Fernandez-Zapata C. et al. “The use and limitations of single-cell mass cytometry for studying human microglia function.” *Brain Pathology* (2020): 1,178–1,191 .

2019 Publications

1 Arnol, D. et al. “Modeling cell-cell interactions from spatial molecular data with spatial variance component analysis.” *Cell Reports* 29 (2019): 202–211.e6.

2 Bassan, J. et al. “TePhe, a tellurium-containing phenylalanine mimic, allows monitoring of protein synthesis *in vivo* with mass cytometry.” *Proceedings of the National Academy of Sciences of the United States of America* 116 (2019): 8,155–8,160.

3 Bouzekri, A. et al. “Multidimensional profiling of drug-treated cells by Imaging Mass Cytometry™.” *FEBS Open Bio* (2019): 1,652–1,669.

4 Cao, Y. et al. “Skin platinum deposition in colorectal cancer patients following oxaliplatin-based therapy.” *Cancer Chemotherapy and Pharmacology* 84 (2019) 1,195–1,200.

5 Carvajal-Hausdorf, D.E. et al. “Multiplexed (18-plex) measurement of signaling targets and cytotoxic T cells in trastuzumab-treated patients using Imaging Mass Cytometry™.” *Clinical Cancer Research* 25 (2019): 3,054–3,062.

6 Damond, N. et al. “A map of human type 1 diabetes progression by Imaging Mass Cytometry™.” *Cell Metabolism* 29 (2019): 755–768.

7 Datar, I. et al. “Expression analysis and significance of PD-1, LAG-3, and TIM-3 in human non-small cell lung cancer using spatially resolved and multiparametric single-cell analysis.” *Clinical Cancer Research* (2019): 4,663–4,673.

8 Durand, M. et al. “Human lymphoid organ cDC2 and macrophages play complementary roles in T follicular helper responses.” *Journal of Experimental Medicine* 216 (2019): 1,561–1,581.

9 Elyada, E. et al. “Cross-species single-cell analysis of pancreatic ductal adenocarcinoma reveals antigen-presenting antigen-associated fibroblasts.” *Cancer Discovery* (2019): 1,102–1,123.

10 Guo, R. et al. “Lymphocyte mass cytometry identifies a CD3–CD4+ cell subset with a potential role in psoriasis.” *JCI Insight* 4 (2019): 125306.

11 Ijsselsteijn, M.E et al. “A 40-marker panel for high dimensional characterization of cancer immune microenvironments by Imaging Mass Cytometry™.” *Frontiers in Immunology* 10 (2019): 2534.

12 Li, N. et al. “Early-life compartmentalization of immune cells in human fetal tissues revealed by high-dimensional mass cytometry.” Frontiers in Immunology 10 (2019): 1932.

13 Li, N. et al. “Memory CD4+ T cells are generated in the human fetal intestine.” *Nature Immunology* 20 (2019): 301–312.

14 Malile, B. et al. “DNA-conjugated gold nanoparticles as high-mass probes in Imaging Mass Cytometry™.” *ACS Applied Bio Materials* 2 (2019): 4,316–4,323.

15 Park, C. et al. “The landscape of myeloid and astrocyte phenotypes in acute multiple sclerosis lesions.” *Acta Neuropathologica Communications* 7 (2019): 130.

16 Popescu, D-M. et al. “Decoding the development of the blood and immune systems during human fetal liver haematopoiesis.” *Nature* 574 (2019): 365–371.

17 Raj, D. et al. “Switchable CAR-T cells mediate remission in metastatic pancreatic ductal adenocarcinoma.” *Gut* 68 (2019): 1,052–1,064.

18 Ramaglia, V. et al. “Multiplexed imaging of immune cells in staged multiple sclerosis lesions by mass cytometry.” *eLife* 8 (2019): e48051.

19 Rana, R. et al. “Signal amplification for Imaging Mass Cytometry™.” *Bioconjugate Chemistry* 30 (2019): 2,805–2,810.

20 Singh, N. et al. “Development of a 2-dimensional atlas of the human kidney with Imaging Mass Cytometry™.” *JCI Insight* 4 (2019): 129477.

21 Somarakis, A. et al. “ImaCytE: visual exploration of cellular microenvironments for Imaging Mass Cytometry™ data.” *IEEE Transactions on Visualization and Computer Graphics* (2019): 98–110.

22 Theil, D. et al. “Imaging Mass Cytometry™ and single-cell genomics reveal differential depletion and repletion of B-cell populations following ofatumumab treatment in cynomolgus monkeys.” *Frontiers in Immunology* 10 (2019): 1340.

23 Umemoto, K. et al. “The potential application of PD-1 blockade therapy for early-stage biliary tract cancer.” *International Immunology* 32 (2019): 273–281.

24 Uraki, R. et al. “*Aedes aegypti* AgBR1 antibodies modulate early Zika virus infection of mice.” *Nature Microbiology* 4 (2019): 948–955.

25 Wang, Y.J. et al. “Multiplexed *in situ* Imaging Mass Cytometry™ analysis of the human endocrine pancreas and immune system in type 1 diabetes.” *Cell Metabolism* 29 (2019): 769–783.

26 Zhang, T. et al. “Immunocyte profiling using single-cell mass cytometry reveals EpCAM+ CD4+ T cells abnormal in colon cancer.” *Frontiers in Immunology* 10 (2019): 1571.

2018 Publications

1 Allo, B. et al. “Clickable and high sensitivity metal-containing tags for mass cytometry.” *Bioconjugate Chemistry* 29 (2018): 2,028–2,038.

2 Brahler, S. et al. “Opposing roles of dendritic cell subsets in experimental GN.” *Journal of the American Society of Nephrology* 29 (2018): 138–154.

3 Brodie, T.M. and Tosevski, V. “Broad immune monitoring and profiling of T cell subsets with mass cytometry.” *Methods in Molecular Biology* 1745 *Cellular Heterogeneity* (2018): 67–82.

4 Catena, R. et al. “Ruthenium counterstaining for Imaging Mass Cytometry™.” *The Journal of Pathology* 244 (2018): 479–484.

5 Cao, Y. et al. “Tumor platinum concentrations and pathological responses following cisplatin-containing chemotherapy in gastric cancer patients.” *Journal of Gastrointestinal Cancer* (2018): 801–807.

6 Chevrier, S. et al. “Compensation of signal spillover in suspension and Imaging Mass Cytometry™.” *Cell Systems* 6 (2018): 612–620.

7 Gerdtsson, E. et al. “Multiplex protein detection on circulating tumor cells from liquid biopsies using Imaging Mass Cytometry™.” *Convergent Science Physical Oncology* 4 (2018): 015002.

8 Malihi, P.D. et al. “Clonal diversity revealed by morphoproteomic and copy number profiles of single prostate cancer cells at diagnosis.” *Convergent Science Physical Oncology* 4 (2018): 015003.

9 Schulz, D. et al. “Simultaneous multiplexed imaging of mRNA and proteins with subcellular resolution in breast cancer tissue samples by mass cytometry.” *Cell Systems* 6 (2018): 25–36.

10 Zhao, Y. et al. “Spatiotemporal segregation of human marginal zone and memory B cell populations in lymphoid tissue.” *Nature Communications* 9 (2018): 3857.

2018 Non-peer Reviewed Publications

1 Strobl, M. et al. “Connecting the microenvironmental niche to treatment response in ovarian cancer.” *bioRxiv* (2018): doi.org/10.1101/452052.

2017 Publications

1 Chang, Q. et al. “Imaging Mass Cytometry™.” *Cytometry Part A* 91 (2017): 160–169.

2 Chang, Q. et al. “Staining of frozen and formalin-fixed, paraffin-embedded tissues with metal-labeled antibodies for Imaging Mass Cytometry™ analysis.” *Current Protocols in Cytometry* 82 (2017): 12.47.1–12.47.8.

3 Mavropoulos, A. et al. “Simultaneous detection of protein and mRNA in Jurkat and KG-1a cells by mass cytometry.” *Cytometry Part A* 91 (2017): 1,200–1,208.

4 Schapiro, D. et al. “histoCAT™: analysis of cell phenotypes and interactions in multiplex image cytometry data.” *Nature Methods* 14 (2017): 873–876.

5 Singh, M. et al. “Highly multiplexed Imaging Mass Cytometry™ allows visualization of tumor and immune cell interactions of the tumor microenvironment in FFPE tissue sections.” *Blood* 130 (2017): 2,751.

6 Straus, R.N. et al. “Analytical figures of merit for a novel tissue imaging system.” *Journal of Analytical Atomic Spectrometry* 32 (2017): 1,044–1,051.

2017 Non-peer Reviewed Publications

1 Sivakamasundari, V. et al. “Comprehensive cell type specific transcriptomics of the human kidney.” *bioRxiv* (2017): doi.org/10.1101/238063.

2016 Publications

1 Chang, Q. et al. “Biodistribution of cisplatin revealed by Imaging Mass Cytometry™ identifies extensive collagen binding in tumor and normal tissues.” *Scientific Reports* 6 (2016): 36,641.

2 Edgar, L.J. et al. “Isotopologous organotellurium probes reveal dynamic hypoxia *in vivo* with cellular resolution.” *Angewandte Chemie International Edition* 55 (2016): 13,159–13,163.

2015 Publications

1 Schüffler, P.J. et al. “Automatic single cell segmentation on highly multiplexed tissue images.” *Cytometry Part A* 87 (2015): 936–942.

2014 Publications

1 Giesen, C. et al. “Highly multiplexed imaging of tumor tissues with subcellular resolution by mass cytometry.” *Nature Methods* 11 (2014): 417–422.

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