

Multiplex Bulk and Single Cell Cytokine Profiling

Director: Leiqing Zhang, MD, MSc



Overview

Multiplex cytokine profiling from laboratory or patient blood samples has been popular among cancer center investigators over the last 3 years. A custom-made panel of over 60 cytokines, chemokines, and growth factors supported multiple publications. In 2021, we set up single cell cytokine profiling for the first time in Rhode Island. Polyfunctionality strength index and t-SNE plots are provided.

Key Services

- Multiplex bulk protein panels detect targets from human, mouse, primate, porcine, rat, and other species
- Sample types may include cell culture supernatants, tissue lysates, serum, plasma, saliva urine, and breast milk
- IsoCode Chip detecting 30+ cytokines per cell, measuring the functional phenotype of each immune cell, including innate and adaptive immune

Value Added

- Clinical trial patient's samples (only 25ul of serum or plasma needed);
- The same precious samples could be used by the other purposes

Major Equipment /Technologies

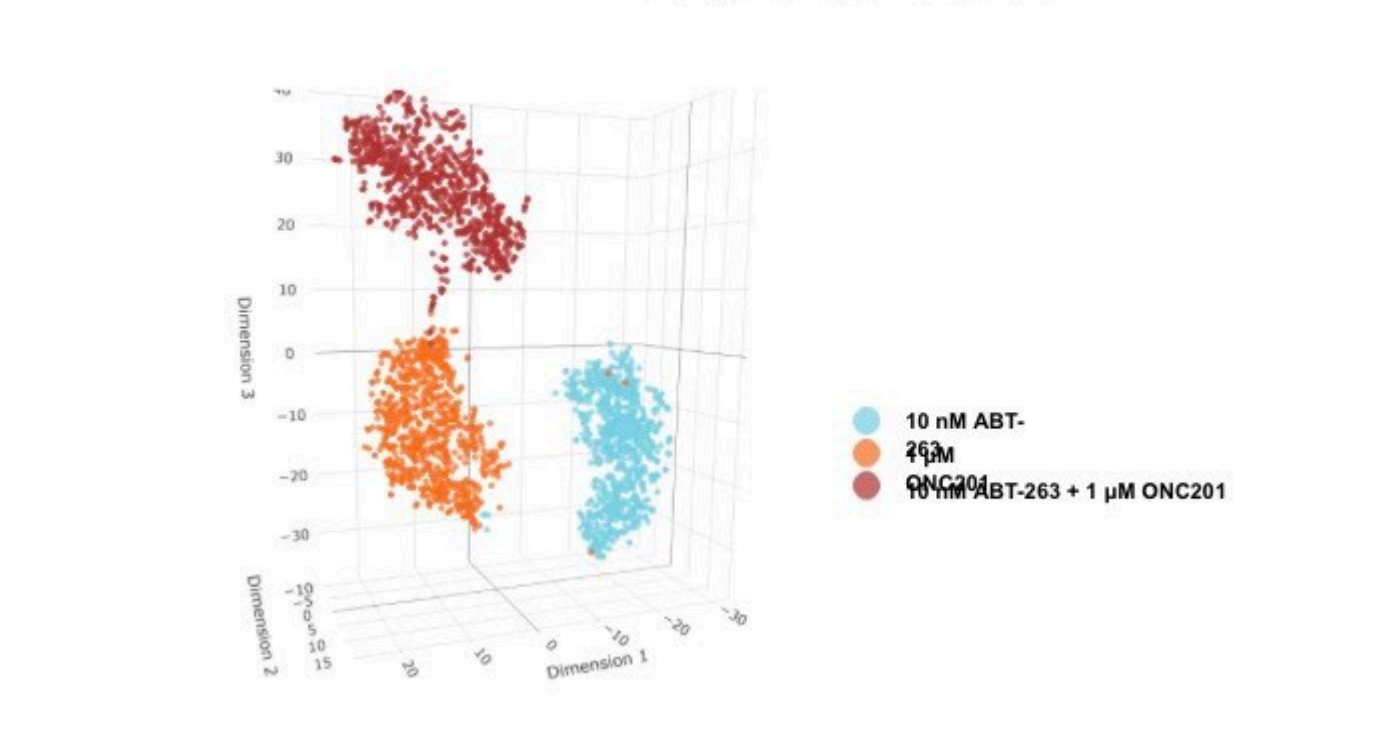
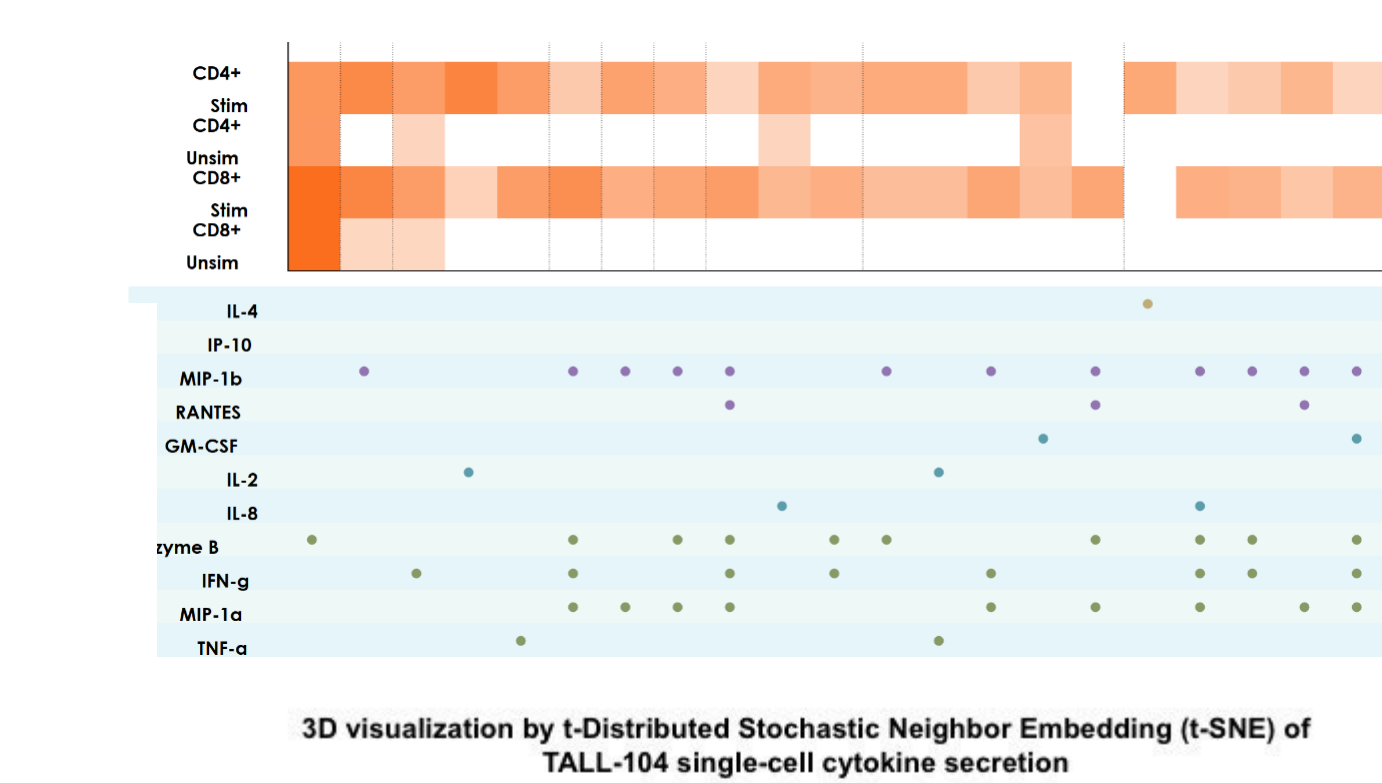
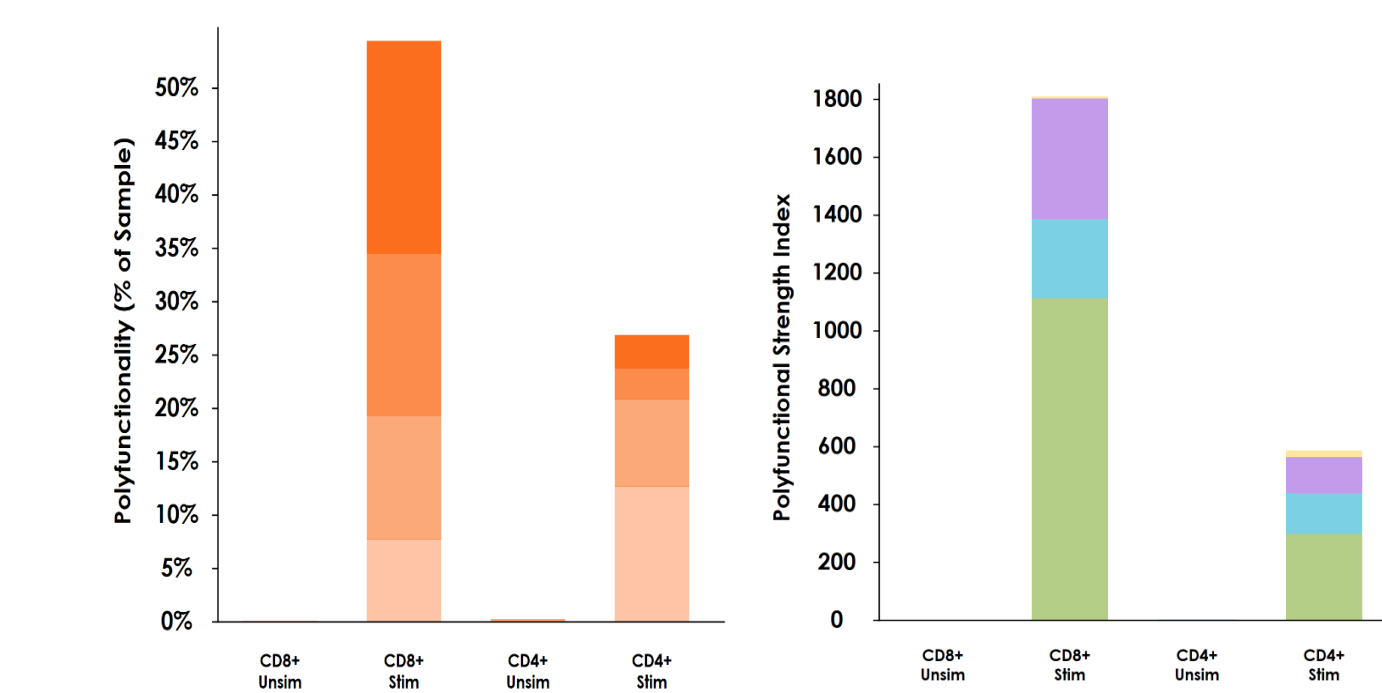
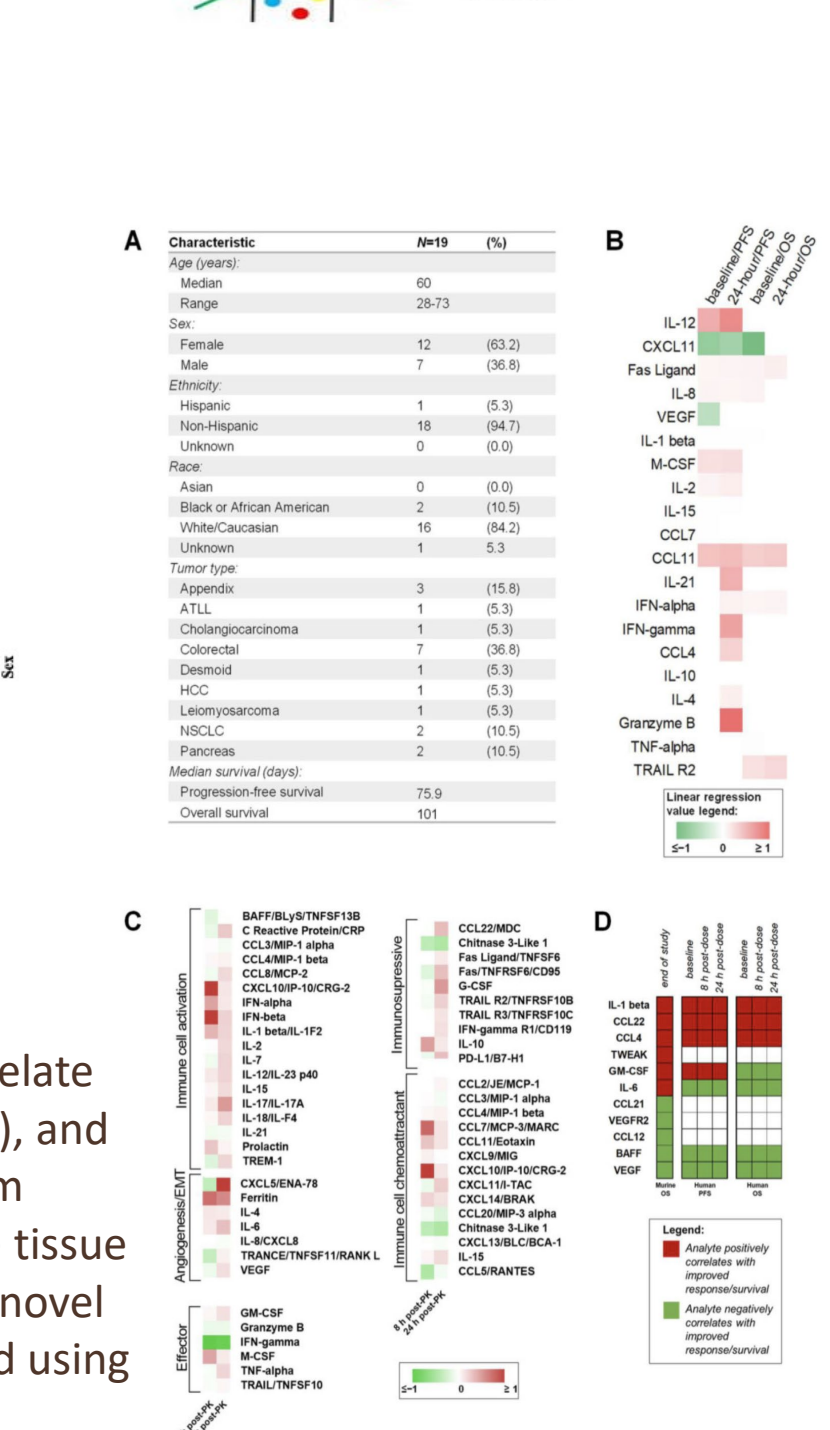
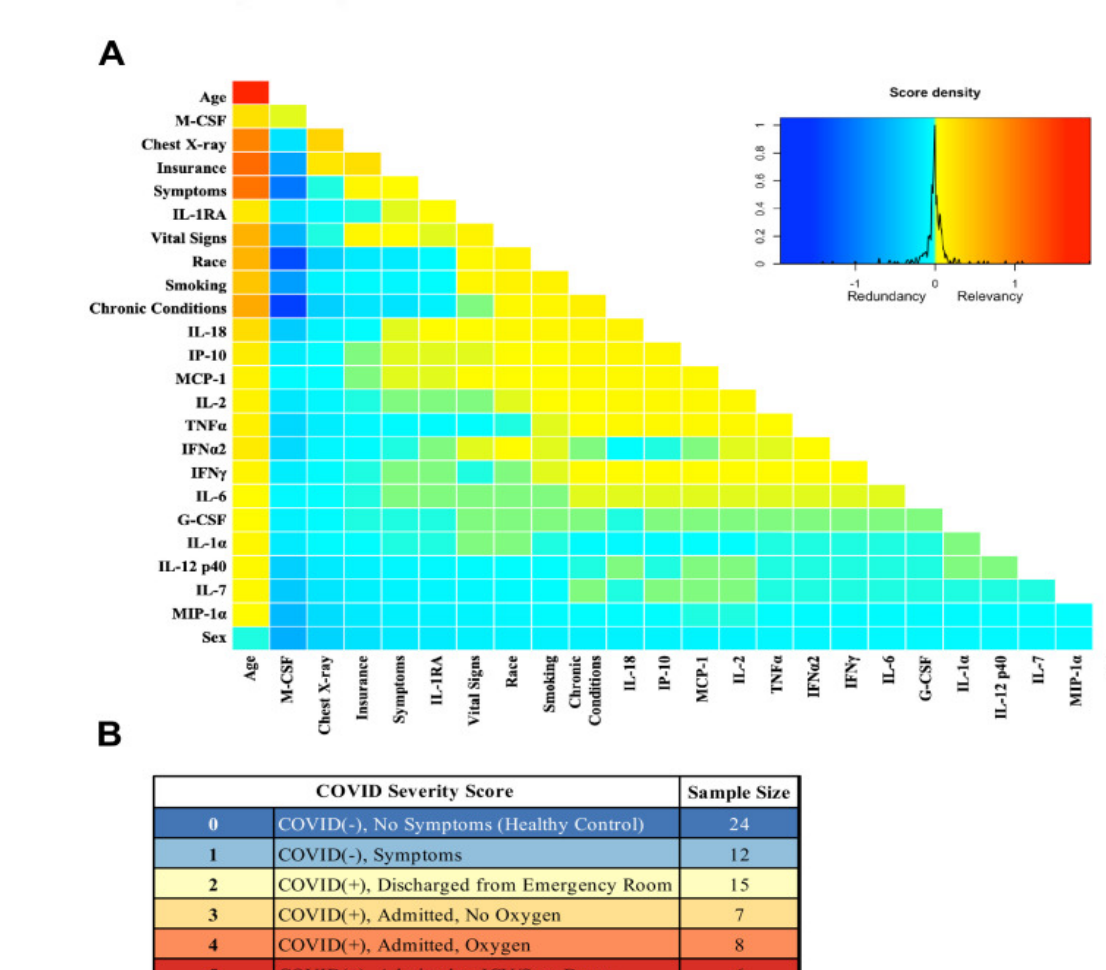
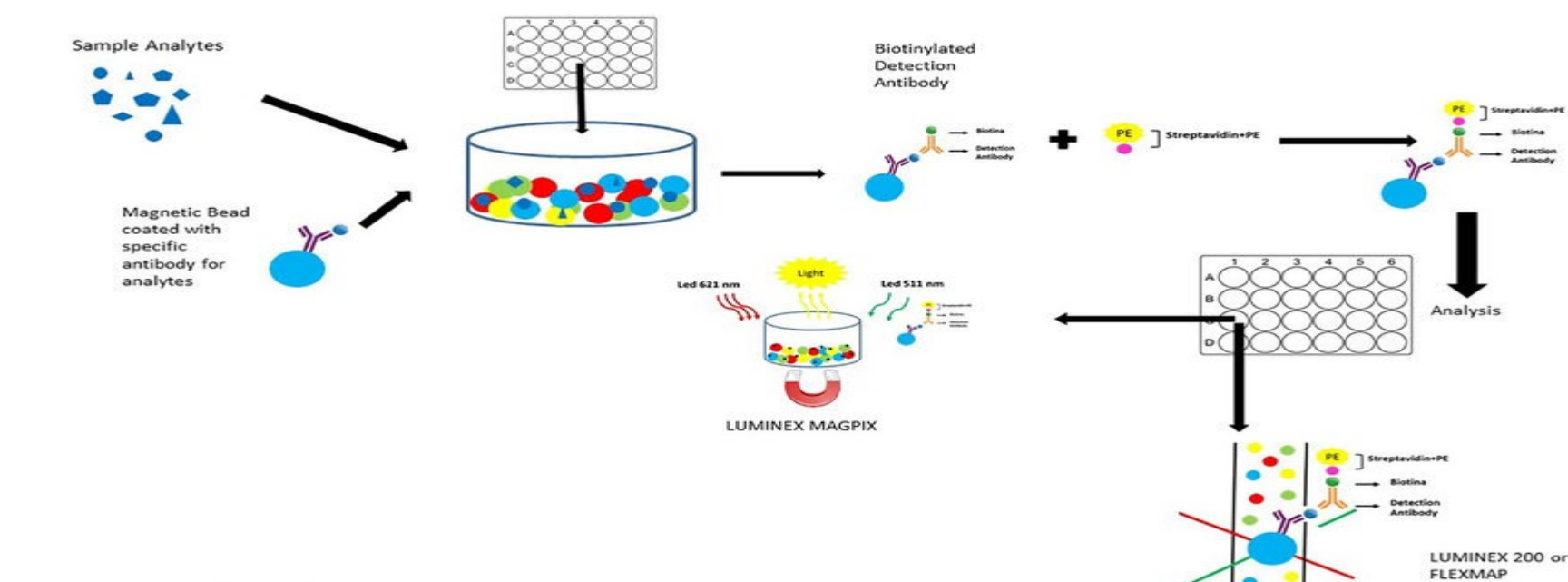
- Luminex® 200:** the Luminex 200 RUO System is a flow-based bead reader that allows for the multiplexing of up to 100 analyte per sample
- Isoplexis:** the breakthrough Single-Cell Intracellular Proteome Solution allows users to analyze signaling cascades of many phosphoproteins directly from each single cell

Key Personnel

- Leiqing Zhang, Director,
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- Associate director to be announced

Example of Scientific Impact

Analyte	Region	Cocktail	Standard (pg/ml)	Serum	Plasma	Cell Culture	Sensitivity (pg/ml)
Angiotensin-1	54 J	94.7-230	150	102	102	102	9.43
Angiotensin-2	26 D	94.7-230	102	102	102	102	17.1
beta 2-Microglobulin	13 K	74.1-1801-4,000	1,4,000	102	102	102	17.2
C-Reactive Protein/CRP	62 B	119-2900	0.180556	0.180556	102	102	116
CCL2/IL/MCP-1	25 A	30.9-750	102	102	102	102	9.9
CCL3/MIP-1 alpha	35 A	90.5-220	102	102	102	102	16.2
CCL4/MIP-1 beta	37 A	123-300	102	102	102	102	5.8
CCL13/MCP-4	38 D	4.94-120	102	102	102	102	0.4
CCL19/MIP-3 beta	42 L	10.3-250	102	102	102	102	0.765
CCL20/MIP-3 alpha	33 D	8.23-200	102	102	102	102	3.4
CCL22/MDC	36 I	53.5-130	102	102	102	102	8.5
CD27/TNFRSF7	67 E	103-2500	102	102	102	102	4.8
CD40/TNFRSF5	76 E	20.6-500	102	102	102	102	2.1
Chitinase 3-like 1	20 C	412-1000	102	102	102	102	3.3
Cigro	19 C	45.3-110	102	102	102	102	14.3
CK1CS/ENA-78	53 B	52.3-125	102	102	102	102	8.2
CK1L1/TAC	63 B	24.7-600	102	102	102	102	7.8
CK1L3/ILC/GA-1	28 D	18.5-450	102	102	102	102	11.5
Dcr3/TNFRSF8	54 E	453-1100	102	102	102	102	55.9
DR3/TNFRSF25	72 E	510-1250	102	102	102	102	58.6
Fas/TNFRSF6/CD95	73 E	144-3500	102	102	102	102	3.2
Fas Ligand/TNFRSF	39 D	8.23-200	102	102	102	102	1.2
GDF-15	65 C	18.5-450	102	102	102	102	1.2
GM-CSF	46 B	12.3-300	102	102	102	102	4.1
Gracyme B	57 L	19.3-470	102	102	102	102	1.42
IFN-beta	21 R	14.1-3451	102	102	102	102	0.476
IFN-gamma	29 A	49.4-120	102	102	102	102	0.4
IFN-gamma R1/CD119	55 E	2.88-700	102	102	102	102	0.1
IL-2	43 B	30.9-750	102	102	102	102	1.8
IL-4	75 B	17.3-420	102	102	102	102	9.3
IL-6/CKL8	18 A	4.12-100	102	102	102	102	1.8
IL-10	22 A	4.12-100	102	102	102	102	1.6
IL-12 p70	56 B	144-3500	102	102	102	102	20.2
IL-18/IL-1F4	78 C	7.12-1.73	102	102	102	102	1.93
PD-L1/B7-H1	14 K	4.53-110	102	102	102	102	4.53
TNF-alpha	12 A	8.23-200	102	102	102	102	1.2
TRAIL R2/TNFRSF10B	44 I	20.6-500	102	102	102	102	2.2
TRAIL R3/TNFRSF10C	74 E	56.8-140	102	102	102	102	1.7
TRANCE/TNFRSF11/PANK L	48 I	33.7-820	102	102	102	102	4.7
VEGF	61 A	8.23-200	102	102	102	102	2.1
CCL5/RANTES	76 A	20.6-500	150	150	102	102	1.8
CK1L10/IP-10/CRG-2	21 C	1.65-400	102	102	102	102	1.18



Users Profile

- Total samples: 2120
- Aaron Maxwell, MD, Director of Interventional Oncology at The Warren Alpert Medical School of Brown University and Director of the Brown Image-Guided Therapies Research Laboratory, total 328 samples;
 - Michelle Dawson, PhD, an Assistant Professor in the Department of Molecular Biology, Cellular Biology and Biochemistry at Brown University, total 82 samples;
 - Hongwei Yao, MD, PhD, an Associate Professor (Research) of Molecular Biology, Cell Biology & Biochemistry at Brown University Warren Alpert Medical School, total 82 samples;
 - Phyllis A Denney, MD, the Sylvia Kay Hassenfeld Chair of Pediatrics at the Warren Alpert School of Medicine of Brown University, total 82 samples;
 - Sheldon L Holder, MD, PhD, a Physician Scientist in the Cancer Center at Brown University, 82 samples;
 - Sean Lawler, PhD, Associate Professor of Pathology and Laboratory Medicine, total 82 samples;
 - Diane Hoffman-Kim, PhD, an associate Professor of Medical Science and Engineering in the Department of Molecular Pharmacology, Physiology, and Biotechnology and the Center for Biomedical Engineering, total 82 samples;
 - Benedito A Carneiro, MD, Associate Professor of Medicine, total 118 samples;
 - Andrew Mazar, Actuate Therapeutics, total 1182 samples.

Key Publications

- Yao H, et al. Timing and cell specificity of senescence drives postnatal lung development and injury. *Nat Commun.* 17;14(1):273. PMID: 36650158
- Huntington KE, et al. Cytokine ranking via mutual information algorithm correlates cytokine profiles with presenting disease severity in patients infected with SARS-CoV-2. *Elife.* 10:e64958. PMID: 33443016

Future Plans

- Increase user base
- Expand number of consultations provided to researchers and clinicians
- Develop budgetary operations