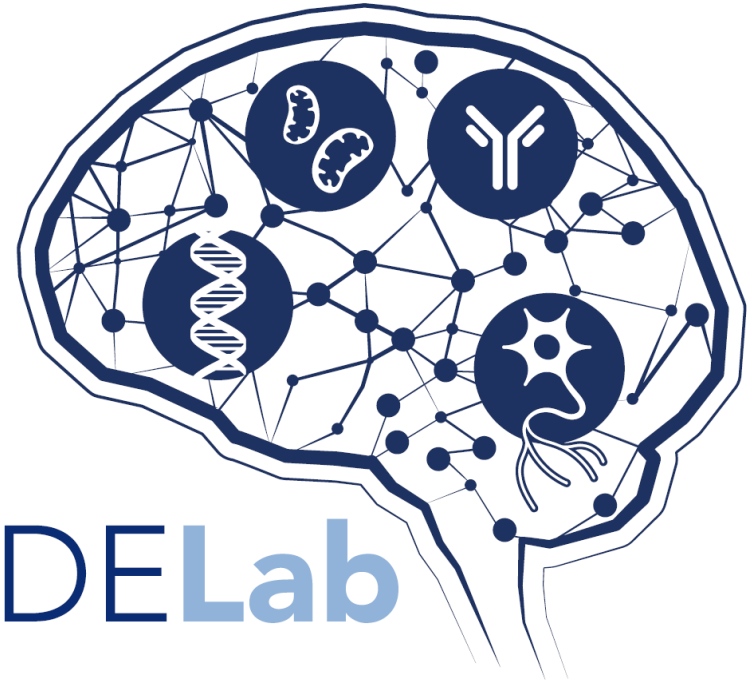
Promoting Resilience through Emerging Clinical and Evolving Determinants of Equity Biomarkers Laboratory



PRECEDELab

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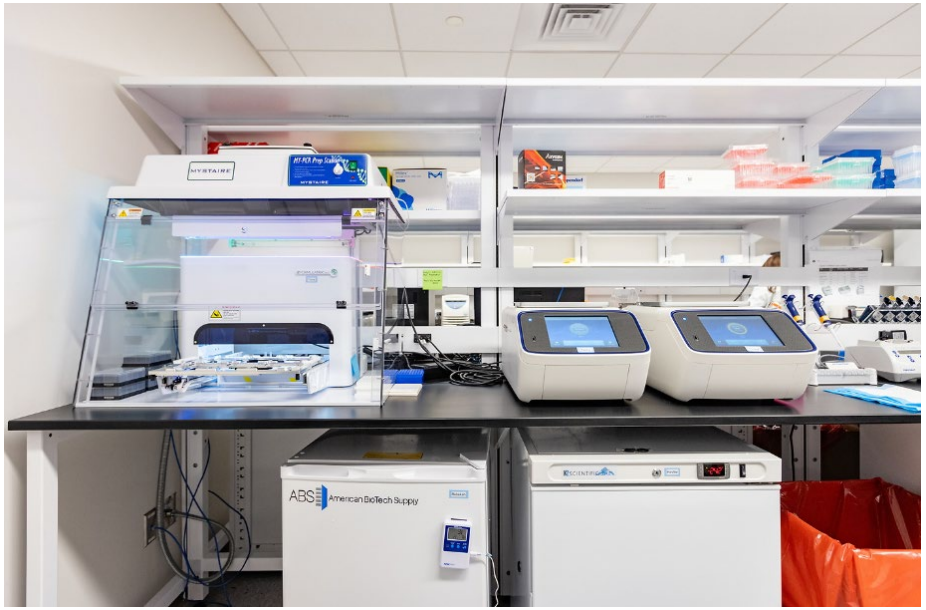
Dr. Martha Abshire Saylor
Dr. Jason Farley

FLAMMABLE
KEEP FIRE AWAY

EXIT

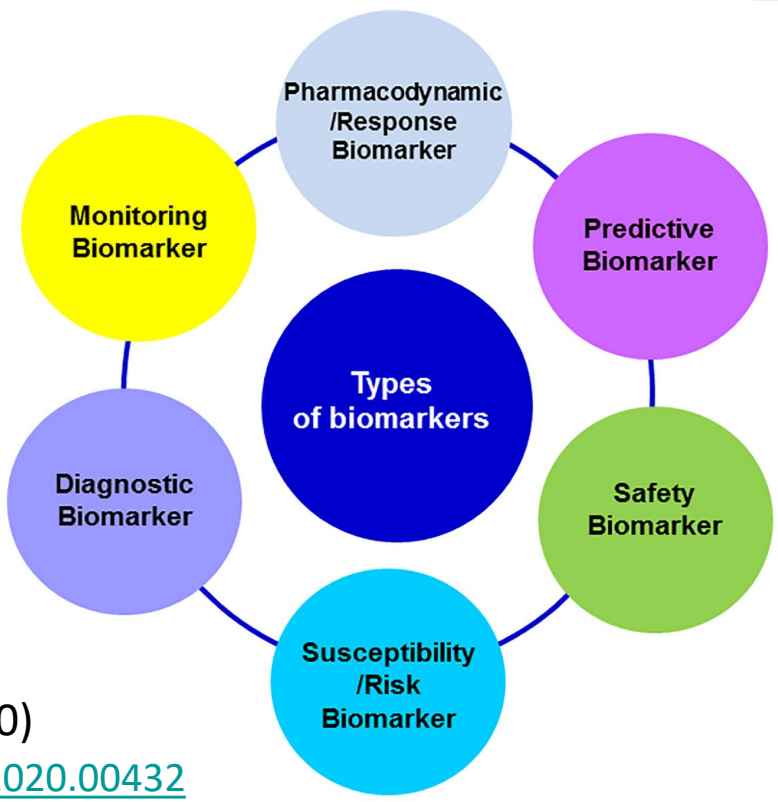
EXIT
VIP ECO
VIP ECO

MACS Quant 16
KIMTECH
Kimwipes


ABS American BioTech Supply

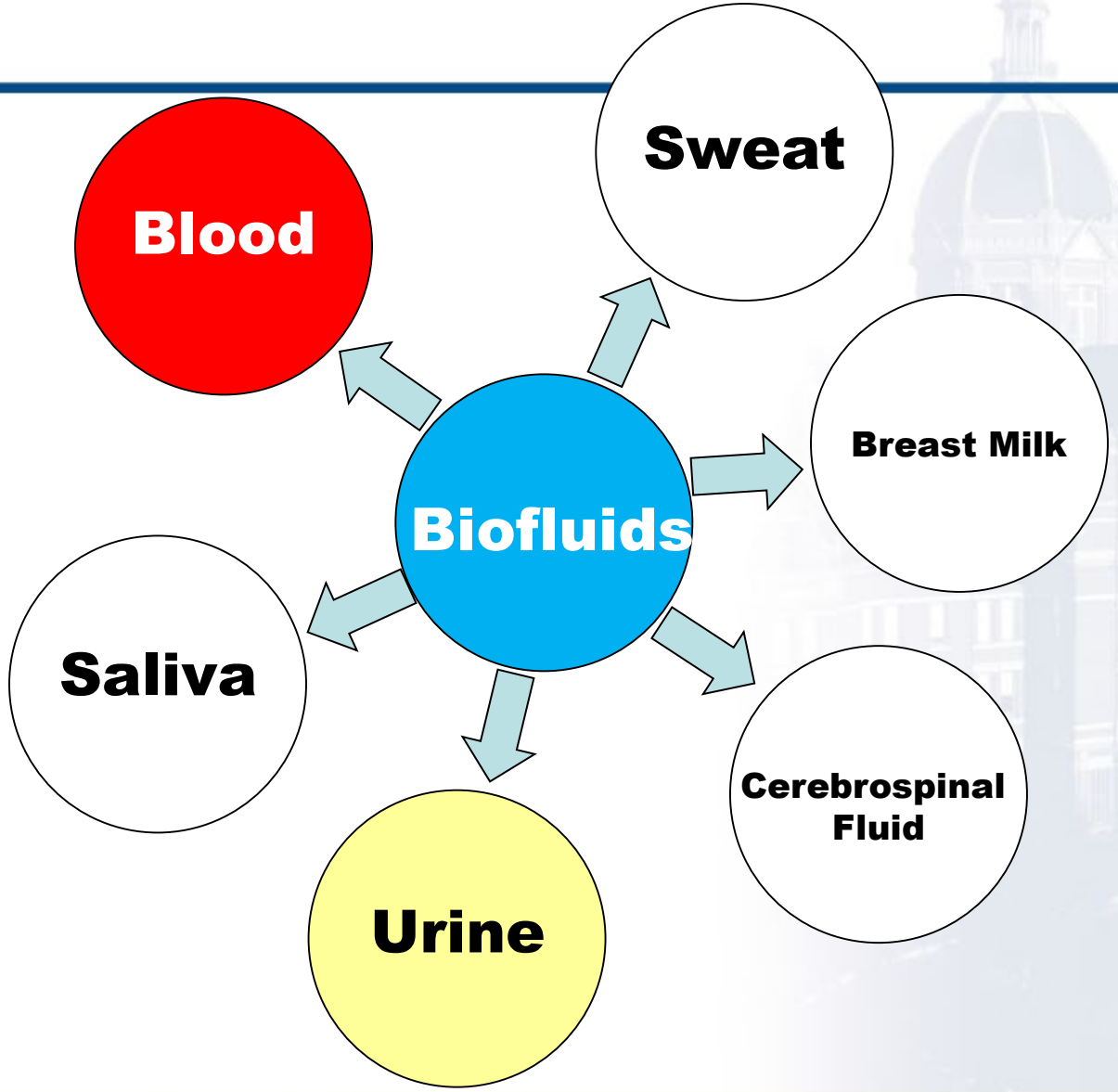
What are biomarkers?

- Biomarkers: A defined characteristic that is measured as an indicator of normal biological process, pathogenic process or response to an exposure or intervention (FDA-NIH Biomarker Working Group)



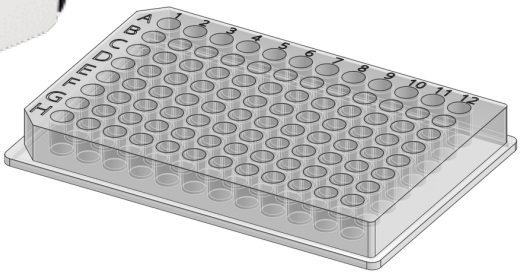
(García-Gutiérrez et al., 2020)
https://doi.org/10.3389/fpsyt.2020.00432

What can we measure?



Protein Quantification Instruments

Quanterix HD-X™ Automated Immunoassay Analyzer



96 Well Plate

Simoa HD-X Benefits

Ultra-sensitivity – Up to 1000x greater sensitivity than traditional immunoassays

Automation – Reproducibility and convenience of sample->answer workflow

Multiplexing - Measure up to 6 biomarkers in single sample at fg/ml concentrations

Flexibility – Supports both high-throughput and rapid result workflows

Efficiency – Precise control of assay conditions allows for use of stored assay calibration values

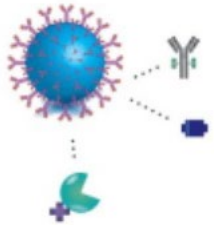
Menu – Fully compatible with 80+ assays also available on HD-1 as well as customized homebrew assays

Regulatory Compliance – Enables 21CFR Part 11 compliance with streamlined run reports and user management

Quanterix HD-X™ Automated Immunoassay Analyzer Process

1

Paramagnetic particles coupled with antibodies designed to bind to specific targets are added to the sample.

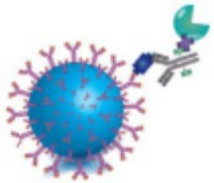


2

Detection antibodies – capable of generating fluorescent product – are added.

3

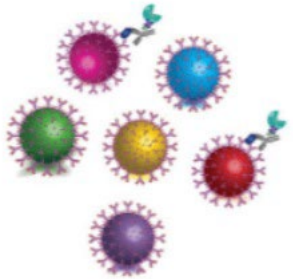
The objective is to form an immunocomplex consisting of the bead, bound protein, and detection antibody.



Quanterix HD-X™ Automated Immunoassay Analyzer Process

4

At low concentrations, each bead will contain one bound protein, or none.

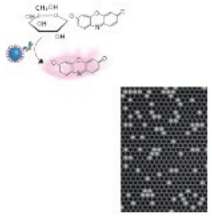


5

The sample is loaded into arrays, in the Simoa disc, consisting of more than 200,000 microwells – each large enough to hold one bead.

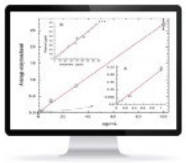
6

Enzymatic signal amplification with fluorescent substrate, fluorescence imaging and data reduction.



7

Data analysis – results can be viewed and analyzed on the board or exported to commonly used software packages or LIMS systems.



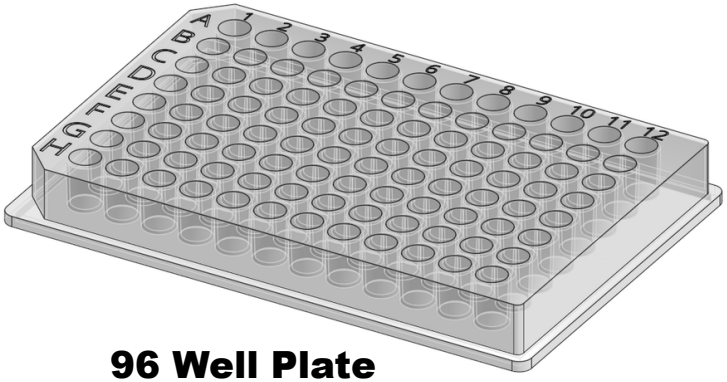
Protein Quantification Instruments

- Ultra-sensitive assay with up to 10-plex multiplexing scale and flexibility

SP-X Imaging and Analysis System™

Unleashing the power of next-generation Simoa® Planar Array technology for robust multiplex biomarker detection – even at healthy baseline levels.

1000x	10 in 1	100+
Up to 1000x greater sensitivity	Up to 10 biomarkers in a single assay	Compatible with 100+ assays



96 Well Plate

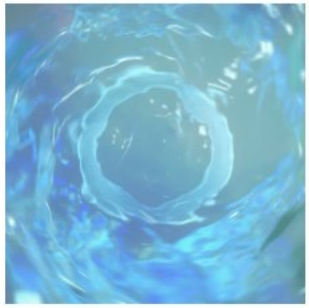
Quanterix SP-X™ Automated Immunoassay Analyzer Process

1

96-well plates are spotted at the factory with the target analyte(s) of interest

2

Diluted samples and standards added to each well and the plates are to create a unique surface chemistry and “vortex” effect



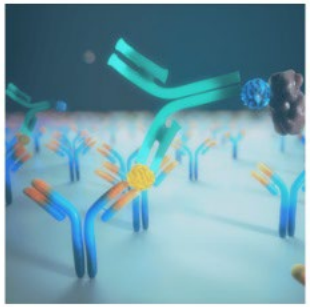
3

Biotinylated detection antibodies are added to form the other half of the immunocomplex “sandwich”

Quanterix SP-X™ Automated Immunoassay Analyzer Process

4

High sensitivity HRP enzyme-conjugated streptavidin is added in between additional shake cycles.



5

Finally, a chemiluminescent substrate is added just prior to ultra-sensitive CCD camera imaging, in order to measure the signal intensity produced by each spot.

Protein Quantification Instruments

Utilizes a very sensitive, high-resolution CCD camera and lens system to detect light emitted from MULTI-ARRAY® and MULTI-SPOT® plates.

The custom-designed lens enables highly efficient and uniform collection of electrochemiluminescence (ECL) generated light.

Broad Assay Menu

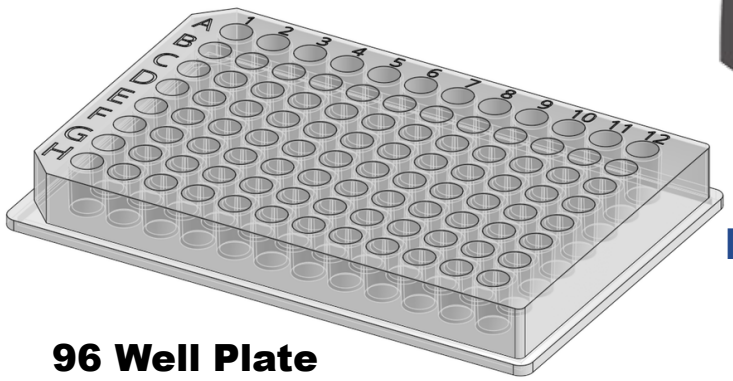
- Large menu of commercially available kits
- Full line of components for user-developed assays
- Access to all product lines for MSD® consumables

Flexibility

- Single and multiplex assays
- Compatible with all SECTOR™ and QuickPlex® products
- Special pricing for academic customers

Validated

- Developed under design control
- Microsoft Windows 10 compatible
- Simple, fast, and secure data analysis with DISCOVERY WORKBENCH® software



96 Well Plate

MESO QuickPlex SQ 120MM

Meso Scale Discovery Technology

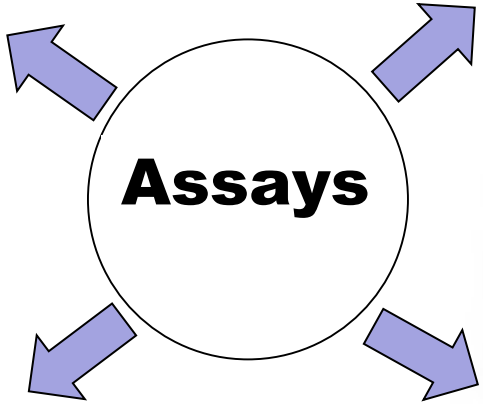
What can we measure?

Neurology

- Phosphorylated tau (i.e., 181, 231)
- Total Tau
- Neurofilament Light (NfL)
- Amyloid Beta (40, 42)
- Glial Fibrillary Acidic Protein (GFAP)

Immunology/Inflammation

- C-reactive protein (CRP)
- Cytokines Panel (TNF-alpha, IL-6, IL-10, IL-8, IL-1beta)
- VEGF



Oncology

- Programmed cell death protein 1 (PD-1 or CD279)
- Angiogenesis Factor Panel 1 (ANG-2, FGFB, HB-EGF, HGF, PLGF, VEGF)
- Osteopontin (OPN

Cardiology

- Troponin I
- Troponin T
- Myosin binding protein C
- Heart-type fatty acid binding protein

Olink Technology

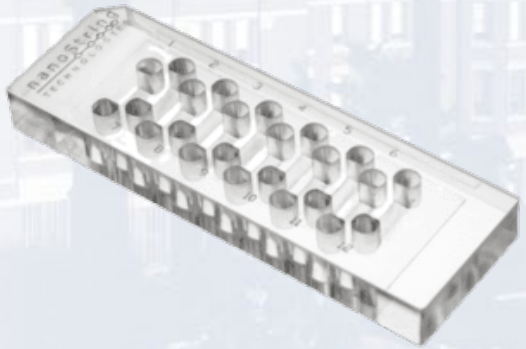
Olink Explore HT

Olink technology is a high-throughput proteomics platform that uses Proximity Extension Assay (PEA) technology to enable precise, multiplex protein biomarker analysis. By employing dual antibody binding and DNA-based detection, it offers high specificity and sensitivity, even in complex biological samples like plasma and serum. Olink's applications span biomarker discovery, disease mechanism studies, and therapeutic development, with a focus on gaining insights into areas such as oncology, neurology, cardiovascular, and immunology. Its quantitative, reproducible data empowers researchers to identify and validate protein signatures across diverse disease states, advancing precision medicine and translational research.

Olink Signature Q100- uses up to 92 carefully selected proteins across 88 samples, using just 1 µL of serum, plasma, or almost any other type of biological sample, which helps bring new insights into disease processes, improve disease detection and contribute to a better understanding of biology. Each biomarker is addressed by a matched pair of antibodies, coupled to unique, partially complementary oligonucleotides, and measured by quantitative real-time PCR. This dual recognition, DNA-coupled method provides exceptional readout specificity, since unlike in many other immunoassay formats, any antibody cross-reactivity that may occur during the multiplexed assay is excluded from the detection process. Exclusive features of protein analysis using Olink® Signature Q100 together with Olink® Target, Flex, and Focus panels.

Nucleic Acid Quantification Instruments

nCounter Pro Analysis System

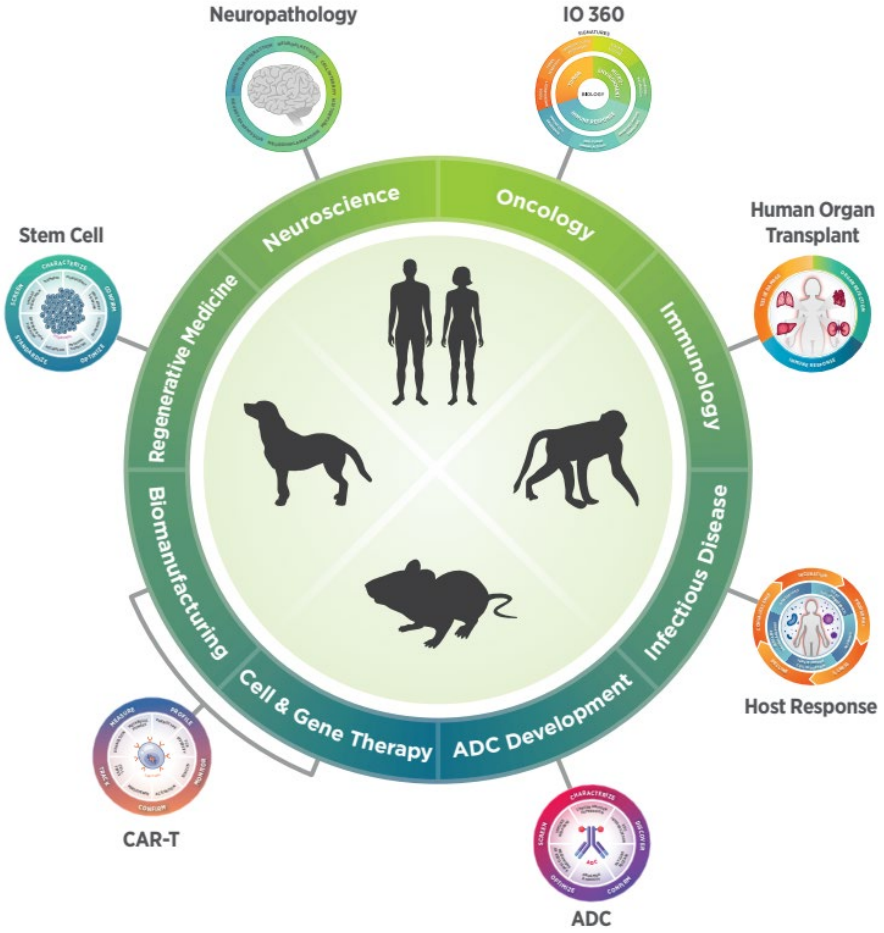


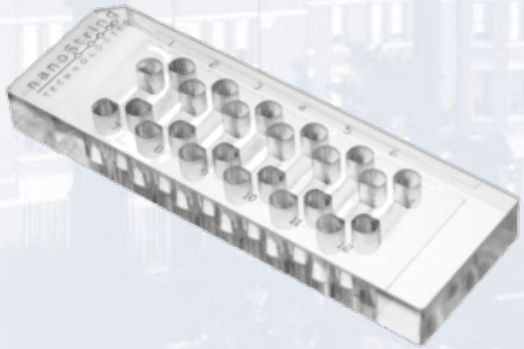
800+ targets (messenger RNA and microRNA)

12 samples per cartridge

Nucleic Acid Quantification Instruments

Panel Selection





12 samples per cartridge

Exosome Equipment

-Isolating exosomes from biological fluid, and an anti-body pull down of brain specific exosomes, microglial, and astrocyte

Evaluate using ExoView™ R200 and LabSpinner platforms:

-ExoView™ R200 pulls together fluorescence imaging and single particle interferometry to provide complete characterization of exosomes at the single-particle level

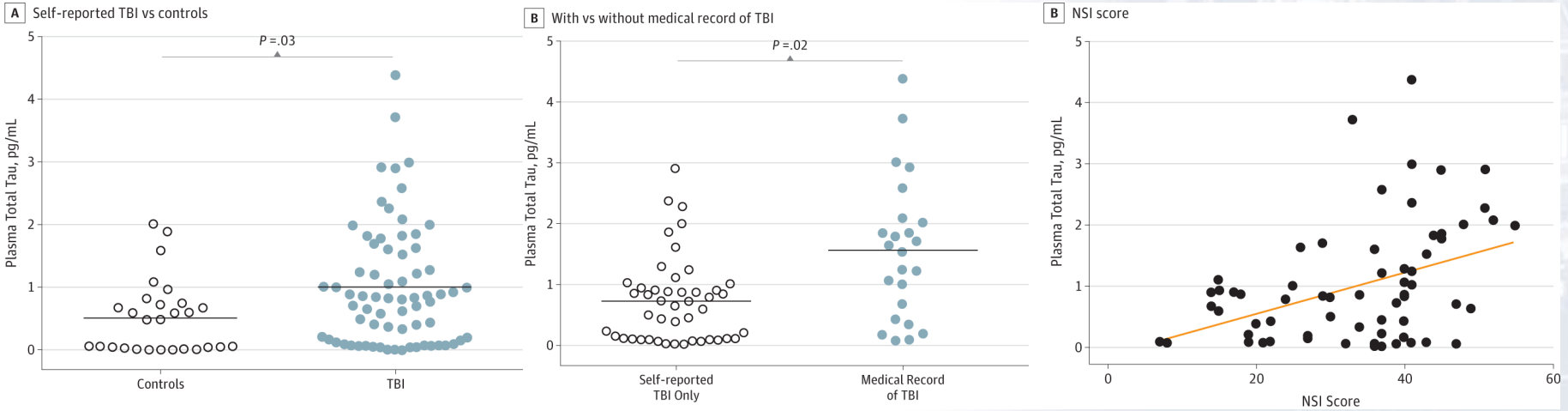
-LabSpinner ExoDiscovery instrument utilizes the lab on a chip into a lab on a disc miniaturized microfluidics into an automated fashion

Scientific Publications

Original Investigation

Peripheral Total Tau in Military Personnel Who Sustain Traumatic Brain Injuries During Deployment

Anlys Olivera, PhD; Natasha Lejbman, BS; Andreas Jeromin, PhD; Louis M. French, PsyD; Hyung-Suk Kim, PhD; Ann Cashion, PhD; Vincent Mysliwiec, MD; Ramon Diaz-Arrastia, MD, PhD; Jessica Gill, RN, PhD



Postconcussive Disorder Symptoms

JAMA Neurol. 2015;72(10):1109-1116. doi:10.1001/jamaneurol.2015.1383

Brain, Behavior, and Immunity 100 (2022) 83–87

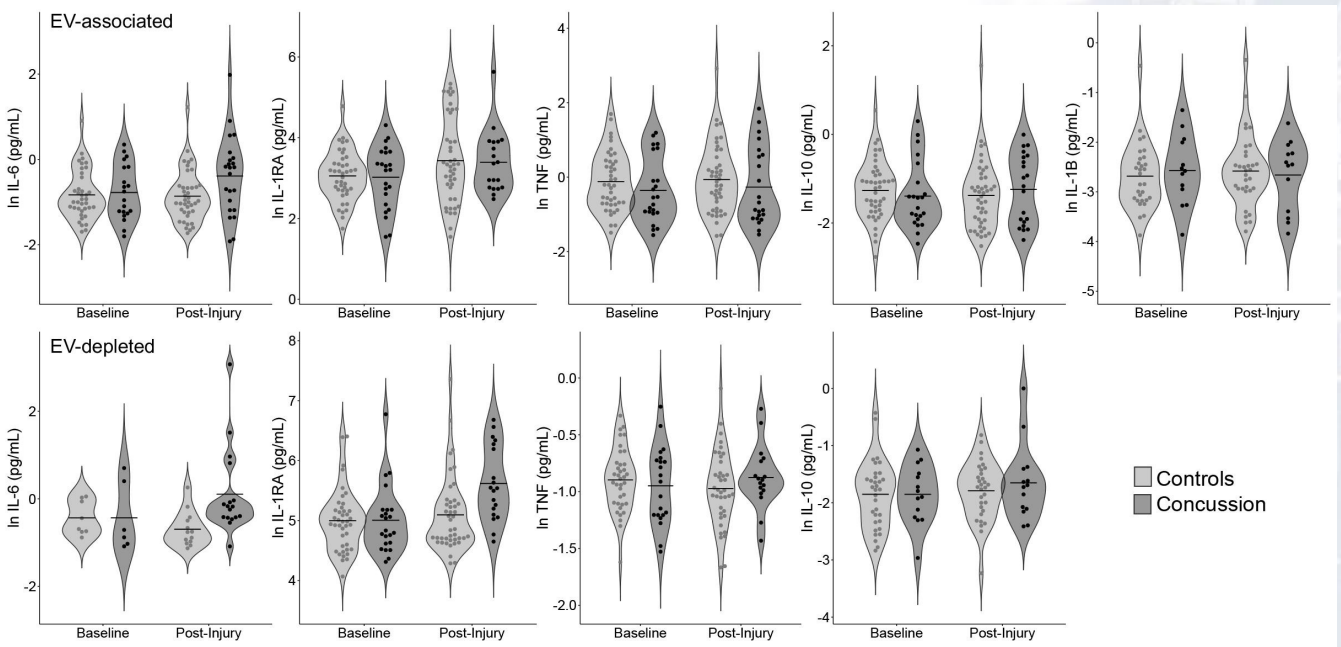
Contents lists available at ScienceDirect

Brain Behavior and Immunity

journal homepage: www.elsevier.com/locate/ybrbi

Extracellular vesicle-associated cytokines in sport-related concussion

Timothy B. Meier [a,b,c,1,*], Vivian A. Guedes [d,1], Ethan G. Smith [d], Dilorom Sass [d], Sara Mithani [d], Rany Vorn [d], Jonathan Savitz [e,f], T. Kent Teague [g,h,i], Michael A. McCrea [a,j], Jessica M. Gill [d]



Brain, Behavior, and Immunity, Volume 100, February 2022, Pages 83-87

biomedicines

MDPI

Article

Exosomal microRNA Differential Expression in Plasma of Young Adults with Chronic Mild Traumatic Brain Injury and Healthy Control

Rany Vorn [1], Maiko Suarez [2], Jacob C. White [3], Carina A. Martin [1], Hyung-Suk Kim [1], Chen Lai [1], Si-Jung Yun [4], Jessica M. Gill [5,6] and Hyunhwa Lee [7,*]

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frontiers in Pharmacology

ORIGINAL RESEARCH
published: 06 October 2021
doi: 10.3389/fphar.2021.745348

Extracellular Vesicle Proteins and MicroRNAs Are Linked to Chronic Post-Traumatic Stress Disorder Symptoms in Service Members and Veterans With Mild Traumatic Brain Injury

*Vivian A. Guedes[1], Chen Lai[1], Christina Devoto[1,2], Katie A. Edwards[1], Sara Mithani[1], Dilorom Sass[1], Rany Vorn[1], Bao-Xi Qu[1,3], Heather L. Rusch[1,2,4], Carina A. Martin[1], William C. Walker[5], Elisabeth A. Wilde[6], Ramon Diaz-Arrastia[7], Jessica M. Gill[8,9] and Kimbra Kenney[8,10]**

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