Multiplex Panels for Neurobiology – Biomarkers for Neuroinflammation, Neurodegeneration and Brain Injury

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INTRODUCTION

Neurological disorders comprise highly complex, multifaceted diseases that affect the central nervous system (CNS) and/or the peripheral nervous system. They are among the main causes for disability and mortality worldwide and can impair the brain, the spinal cord, peripheral nerves or neuromuscular function (1-3). In addition, as the world's population steadily ages, health conditions related to ageing such as dementia have become a major public health concern. Neurodegenerative diseases such as Alzheimer's disease (AD) result in the most prevalent type of age-related dementia, characterized by neuronal death, cognitive decline and loss of motor function. Neuronal loss in neurodegenerative diseases is attributed to the formation and deposition of pathogenic protein aggregates forming "incidental" plaques, tangles and Lewy bodies, which can arise either spontaneously or due to inherited mutations.

The ability to measure and track more than one biomarker over time opens up the avenue of a deeper and more thorough understanding of mechanism underlying neuroinflammation and neurodegenerative diseases. Multiplexed immunoassays offer one such possibility allowing for the detection of biomarkers to help distinguish diseased from non-disease states and/or between different neurodegenerative diseases.

AIM

Provide comprehensive multiplex assay panels based on the established Luminex xMAP® technology for the investigation of biomarkers for neurobiology including neuroinflammation, neurodegeneration, blood-brain-barrier integrity and neurotrophic factors.

CANDIDATE BIOMARKERS FOR NEUROBIOLOGY
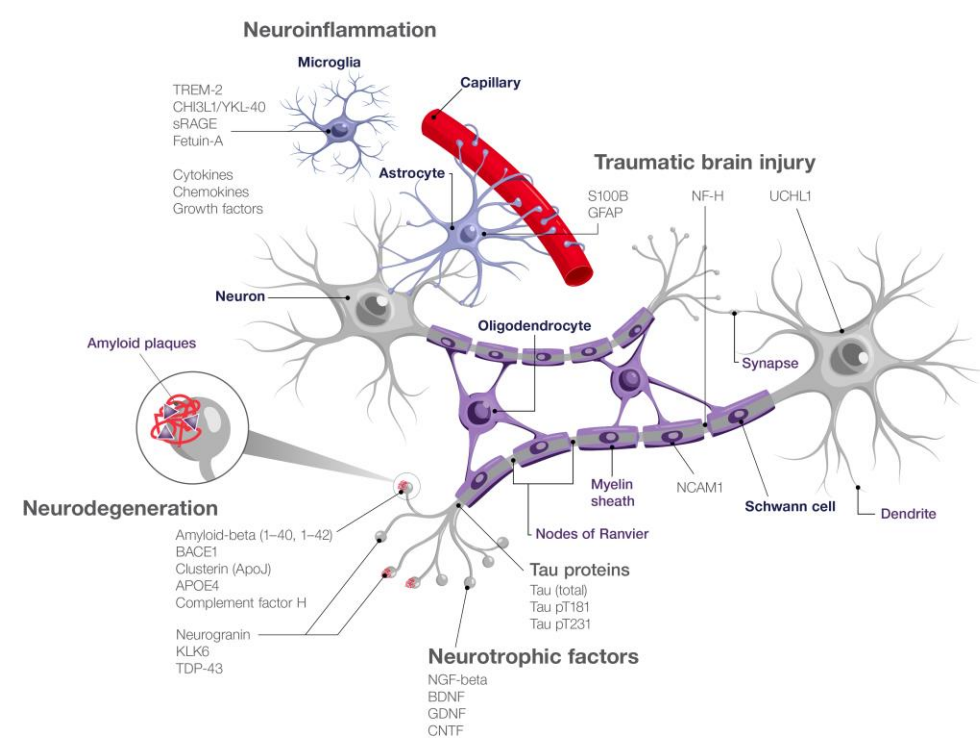
COMPREHENSIVE MULTIPLEX NEURODEGENERATION PANEL

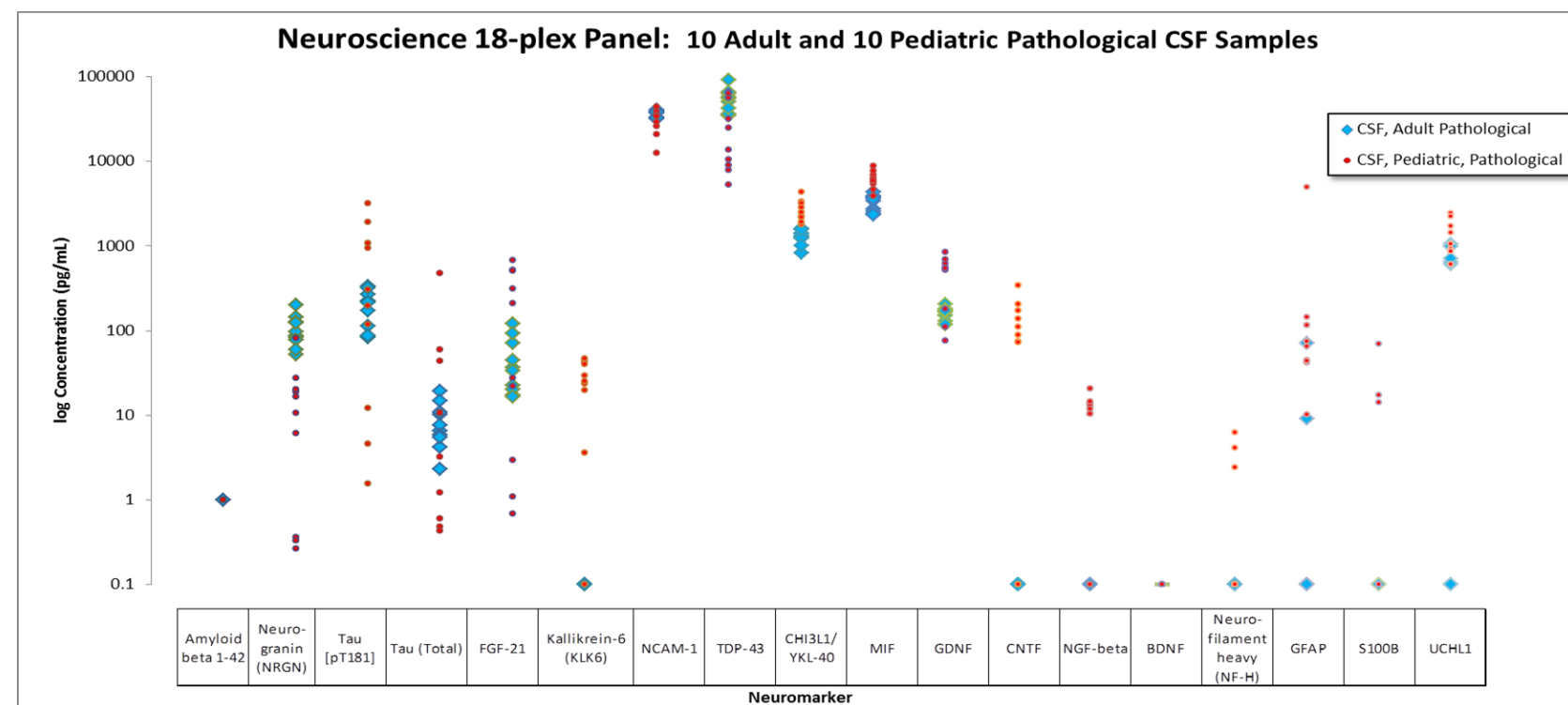| Human Neuroscience Panel - 18plex			
Cat No: **EPX180-15837-901**			
Tau (Total)	Tau [pT181]	Amyloid beta 1-42	Neurogranin (NRGN)
CHI3L1/YKL-40	Neurofilament heavy (NF-H)	Kallikrein-6 (KLK6)	NCAM-1
FGF-21	TDP-43	GFAP	UCHL1
S100B	GDNF	CNTF	BDNF
NGF-beta	MIF		

DETECTION OF NEURONAL MARKERS IN CSF

Figure 2: Quantification of neuronal biomarker in cerebrospinal fluid. Levels of 18 biomarkers from 10 ungrouped human adult and 10 human pediatric patient cerebrospinal fluid samples were tested using the ProcartaPlex™ 18plex Human Neuroscience Panel (Cat No: EPX180-15837-901). Results of the ungrouped human samples are shown for all targets.

Data provided by The Washington University Bursky Center for Human Immunology and Immunotherapy Programs (CHiiPs) Immunomonitoring Laboratory
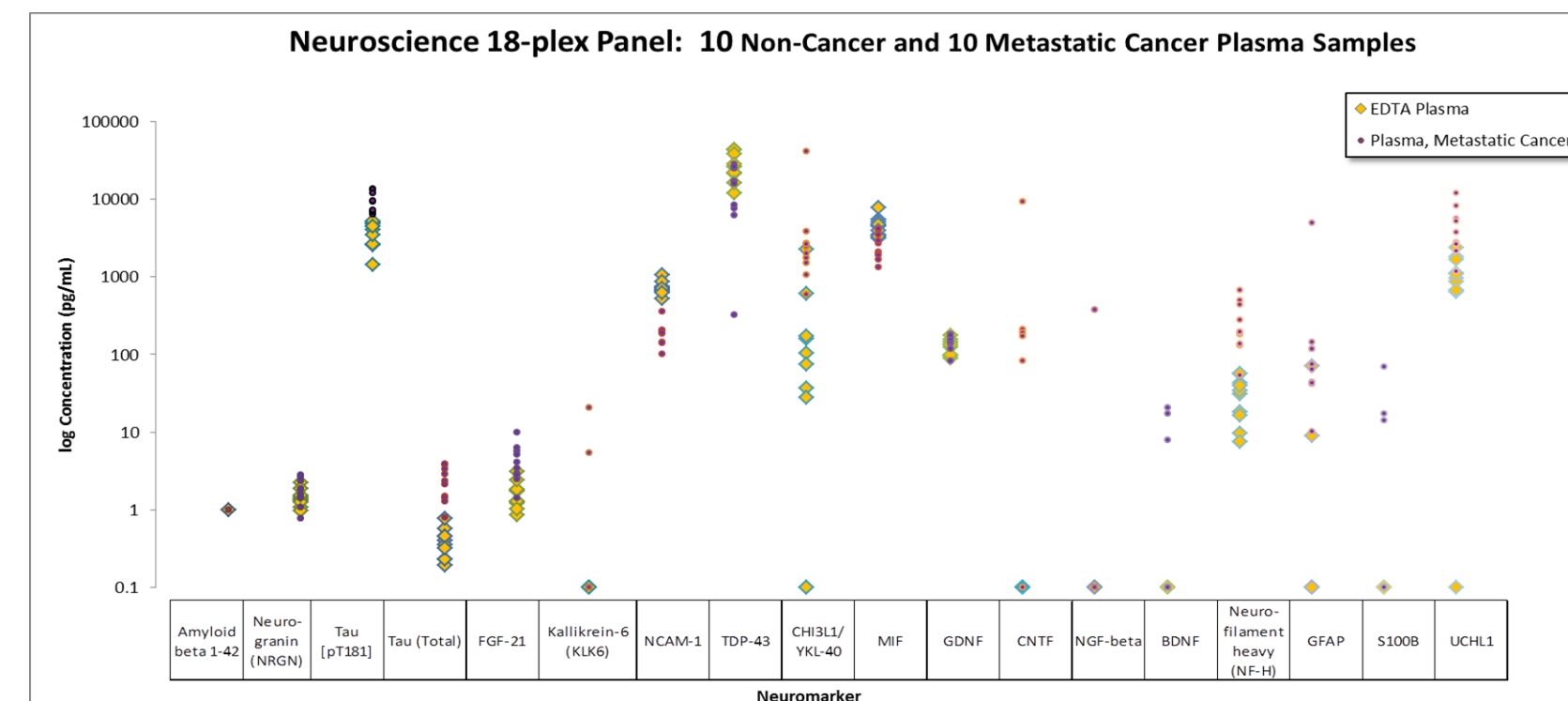
DETECTION OF NEURONAL MARKERS IN PLASMA

Figure 3: Quantification of neuronal biomarker in plasma. Levels of 18 biomarkers from 10 ungrouped human adult patients with metastatic brain cancer and 10 human adult control patient plasma (EDTA) samples were tested using the ProcartaPlex™ 18plex Human Neuroscience Panel (Cat No: EPX180-15837-901). Results of the ungrouped human samples are shown for all targets.

Data provided by The Washington University Bursky Center for Human Immunology and Immunotherapy Programs (CHiiPs) Immunomonitoring Laboratory

NOVEL LUMINEX PANELS FOR NEUROBIOLOGY RESEARCH

Human Neurodegeneration Panel 1 - 9plex			
Cat No: **EPX090-15836-901**			
Tau (Total)	Tau [pT181]	Amyloid beta 1-40	Amyloid beta 1-42
Neurogranin (NRGN)	TDP-43	Kallikrein-6 (KLK6)	NCAM-1
FGF-21			

Human Neurodegeneration Panel 2 (4 plex)			
Cat No: **EPX040-15832-901**			
Apolipoprotein E4	Clusterin (Apo-J)	Complement Factor H	Fetuin-A

Human Brain Injury Panel (4 plex)			
Cat No: **EPX040-15827-901**			
Neurofilament heavy (NF-H)	GFAP	UCHL1	S100B

Human Neurotrophic Factors Panel (4 plex)			
Cat No: **EPX040-15828-901**			
GDNF	CNTF	BDNF	NGF-beta

Human Neuroinflammation Panel (6 plex)			
Cat No: **EPX060-15833-901**			
IL34	BLC (CXCL13)	MIF	Soluble RAGE
TREM-2	CHI3L1/YKL-40		

Human ProcartaPlex™ Simplex Kits		
BACE1 (Beta-secretase 1)	Cat No: **EPX010-12358-901**	
Tau [pT231]	Cat No: **EPX010-12359-901**	

EXPAND YOUR ANALYSIS

Cytokines, chemokines and growth factors are also involved in CNS tissue homeostasis and neuroinflammation. How these factors can affect tissue injury and repair or help to identify and stratify neurodegenerative diseases can now be explored. We have validated the ProcartaPlex™ 45-plex cytokines/chemokines/growth factor panel (Cat No: EPX450-12171-901) with the new marker panels for neurobiology to offer the broadest menu of highly relevant biomarkers. Analyte combinability can be determined using our configurator tool at : **thermofisher.com/order/luminex/**

Cytokine/Chemokine/Growth Factor 45-Plex Human ProcartaPlex™ Panel 1			
Cat No: **EPX450-12171-901**			
BDNF	Eotaxin/CCL11	EGF	FGF-2
GM-CSF	GRO alpha/CXCL1	HGF	NGF beta
LIF	IFN alpha	IFN gamma	IL-1 beta
IL-1 alpha	IL-1RA	IL-2	IL-4
IL-5	IL-6	IL-7	IL-8/CXCL8
IL-9	IL-10	IL-12 p70	IL-13
IL-15	IL-17A	IL-18	IL-21
IL-22	IL-23	IL-27	IL-31
IP-10/CXCL10	MCP-1/CCL2	MIP-1 alpha/CCL3	MIP-1 beta/CCL4
RANTES/CCL5	SDF-1 alpha/CXCL12	TNF alpha	TNF beta/LTA
PDGF-BB	PLGF	SCF	VEGF-A
VEGF-D			

CONCLUSIONS

The new Invitrogen™ ProcartaPlex™ Neurobiology panels provide a unique tool for measuring novel and established CNS-specific markers in conjunction with other factors involved in neuroinflammation and neurodegeneration.

Thermo Fisher Scientific offers researchers a comprehensive Neuroscience panel and five additional panels based on the Luminex® xMAP® technology for CSF, serum and plasma.

REFERENCES

1. World Health Organization, "Fact sheet N° 362: Dementia," WHO, Geneva, 2015.
2. World Health Organization, "Chapter V(F): Mental and Behavioural Disorders" in The ICD-10 Classification, WHO, Geneva, 2013.
3. World Health Organization, "Fact sheet N° 396: Mental disorders" WHO, Geneva, 2015.
4. Sun B. et al., Characterization and Biomarker Analyses of Post-COVID-19 Complications and Neurological Manifestations. **Cells 2021, 10, 386**. https://doi.org/10.3390/cells10020386

TRADEMARKS/LICENSING

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