Multiomics at the Frontline of Neurology Research

DDW speaksto Laura Egnash, GlobalAccountDirector at Olink (partof Thermo Fisher Scientific) and Anne-Li Lind, Lead of Neuroscience at Olink (part of Thermo Fisher Scientific) about how multi-omics is advancing neurology research in drug discovery and development.

DDW: What role does multiomics analysis currently play in drug development for neurodegenerative disorders?

Egnash: Multiomics analysis is having an increasing impact in drug development for neurodegenerative disorders. It can enable the identification of early detection biomarkers and biomarkers that can signal disease progression, target engagement, and potential adverse events. Beyond that, it opens new avenues for discovering novel drug targets by offering a comprehensive, systems-level understanding of disease mechanisms.

DDW: What unique insights can proteomics offer in the context of neurodegenerative diseases that other omics approaches might miss?

Lind: Proteomics stands out among omics approaches in that it provides real-time insights into biological processes. Protein levels and interactions can offer a quite dynamic perspective that other omics, for example genomic approaches might not capture, as our genomes are comparatively very stable over time. Proteomics allows us to explore protective and risk factors, delve into the underlying disease pathophysiology, and stratify study participants into molecular subtypes. Furthermore, most drugs target proteins, and proteomics can reveal individual treatment responses and potential adverse events, making it a critical tool for personalised medicine in neurology.

DDW: How is proteomics helping to identify novel drug targets or optimising treatments for disorders like Alzheimer's or Parkinson's disease?

Lind: We're beginning to see compelling examples of how proteomics is reshaping our understanding, and likely our treatment strategies for neurodegenerative disorders. For instance, emerging proteomic subtypes in Alzheimer's disease suggest that it may not be a single disease entity but rather a spectrum of disorders, each potentially requiring a distinct therapeutic approach. These insights will be critical to inform our development of treatments that effectively target the underlying biology of each subtype. In Parkinson's disease, the rapid and robust replication of the discovery of altered cerebrospinal fluid (CSF) DDC levels identified through Olink proteomics across multiple cohorts has triggered excitement and activity and could potentially aid the development of targeted treatments for Parkinsonian disorders and Lewy body dementia.

> "Artificial intelligence and machine learning can help with managing and interpreting these complex multiomics datasets."

DDW: In your research experience, how have you seen proteomics successfully integrated with genomics, transcriptomics, or metabolomics in neurology research?

Egnash: Overall, the integration of proteomics with other omics technologies in neurology research enables a holistic view of the molecular underpinnings of neurological diseases, facilitating the identification of novel biomarkers, therapeutic targets, and a better understanding of disease mechanisms.

DDW: What are some of the key challenges of utilising multiomics approaches in drug development for neurodegenerative disorders?

Lind: This is an important question. Clearly, despite the promise of multiomics, several challenges remain, including data harmonisation and integration across different omics layers, which require robust bioinformatics frameworks. Standardisation across studies and institutions is a work in progress. Moreover, interpreting the vast amounts of data generated is another significant hurdle,

compounded by ethical and logistical concerns around data sharing and patient privacy. Finally, translating discoveries from cerebrospinal fluid to more accessible matrices like blood or even dried blood spots, remains challenging. This includes the impact of peripheral biology on interpretability, as well as low abundance, or other dynamics in blood. Advancing biomarker findings into blood-based biomarkers is currently the focus of many substantial research efforts.

> **"Prioritise engaging with others in your direct field and adjacent, and work with people you respect and enjoy collaborating with."**

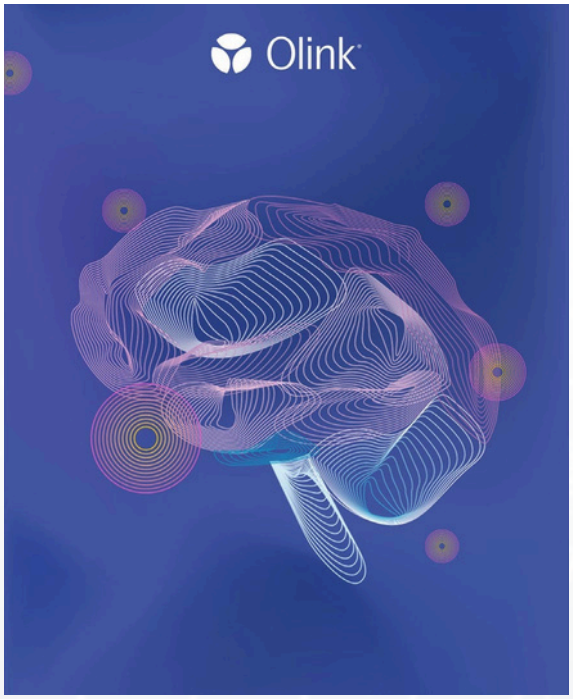
DDW: Based on your work in the pharma sphere, what roles do artificial intelligence or machine learning techniques play in extracting clinically meaningful insights from omics data?

Egnash: I would say artificial intelligence and machine learning can help with managing and interpreting these complex multiomics datasets by uncovering hidden patterns, predicting disease progression or treatment outcomes, and reveal previously unnoticed relationships, for example, for disease progression or treatment response. They also help automate data processing, making the analysis more efficient and scalable. This accelerates both the discovery and validation phases, ultimately speeding up the path from data to clinical impact.

DDW: What advice would you give to early-career researchers entering this rapidly evolving field?

Lind: That's a great question. I would say, stay connected to your own curiosity and commit to continuous learning—this field evolves quickly, and intellectual flexibility is a success factor. If you have a passion for bioinformatics, programming, or data analysis, you're well-positioned to thrive. If those aren't your strengths, don't be discouraged - I would recommend building strong collaborations with those who have that passion and expertise.

Egnash: I agree. Overall, I would encourage openness and a learner's mindset, prioritise engaging with others in your direct field and adjacent, and work with people you respect and enjoy collaborating with. Collaboration not only broadens your perspective but also amplifies your impact on this exciting and fast-moving area of research.



Biography
Laura Egnash is currently a Global Account Director representing Olink at Thermo Fisher Scientific. Prior to joining Thermo Fisher, Egnash held leadership roles at both Fortune 500 and entrepreneurial companies, including contract laboratories (Covance, Eurofins), biotech firms (Stemina Biomarker Discovery), and pharmaceutical companies (Pfizer, Parke-Davis).
Her accomplishments encompass the development and application of biomarker-based in vitro safety screening tools and clinical tests.

Biography
Anne-Li Lind, PhD, is the Lead of Neuroscience at Olink Proteomics. Lind leverages her training and research experience to support researchers in neurology and psychiatry. Anne-Li received her training in biomedical and neurobiological sciences at Uppsala University, Harvard University, and Brigham and Women's Hospital. She did her doctoral and postdoctoral work in collaboration with pharma partners at Uppsala University to identify biomarkers of chronic pain. She joined the global Olink Scientific Affairs team in 2021, supporting investigators in leveraging proteomics to advance precision medicine in neurology.

This article is part of the DDW In Focus eReport — Using multiomics for discovering new drugs and optimising therapies.

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