Luminex® A DiaSorin Company + bio-techne® R&D SYSTEMS

White Paper

The Role of Proteomics in Early Cancer Detection: A Look at Six Core Benefits

Introduction

The advent of multi-omic approaches has improved early cancer detection by integrating diverse molecular data to gain a more complete understanding of early disease processes. While advances in genomic testing have led to progress in developing tools for early diagnosis, many current tests lack the sensitivity required to detect cancers early enough to improve long-term survival.

In recent years, new proteomic-based technologies have enabled the identification of potential biomarkers that can be used to better detect cancers and tumor progression. To move robust biomarker panels closer toward clinical utility, however, research trials need sensitive and highly reproducible immunoassay systems that can simultaneously interrogate large numbers of targets per sample in a short time. That's where Luminex's xMAP® Technology has emerged as a valuable tool. Incorporating multiple non-tumor biomarkers on the xMAP platform into a multiomic early cancer detection assay can potentially enhance sensitivity, specificity, and accuracy, improving early detection and leading to earlier intervention and better patient outcomes.

Here are six key benefits of integrating protein biomarkers into the development of early cancer detection assays:

1. Protein Patterns

As cancer progresses quantitative profiling of numerous proteins and monitoring the patterns of protein expression over time can assist in identifying biomarkers that effectively track disease progression and the response to therapy. These biomarkers can potentially detect the patient's immune response to early cancer processes, even before any cancer-specific biomarker is detectable in the bloodstream. By focusing on the immune response, which can occur prior to the release of traditional cancer biomarkers, we can potentially detect and intervene in cancer at an earlier stage.[3,6,7]

2. High Sensitivity

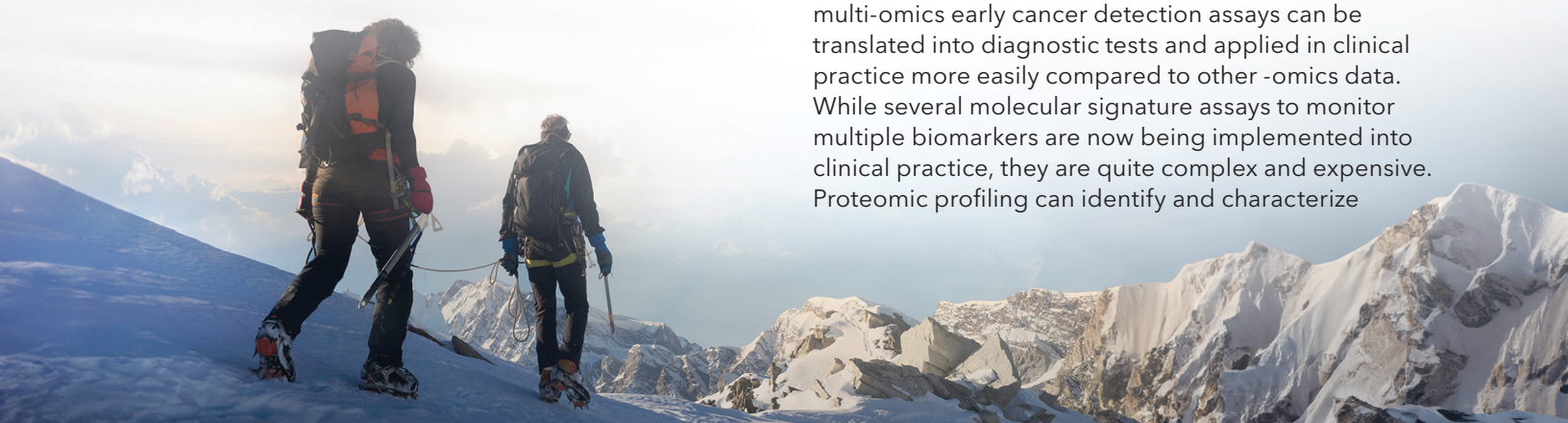
Recent studies have demonstrated the increased sensitivity of adding proteomic algorithmic signature data to multi-cancer early detection studies. Proteomics techniques allow for the detection of minute changes in protein expression levels that can occur during the early stages of cancer development. These changes may not be easily detectable through other diagnostic methods. Proteomic analysis can help identify specific protein biomarkers associated with different types of cancer, providing highly sensitive detection and potential early warning signs of the disease.[6]

3. Non-invasive Sampling

Many protein biomarkers can be detected non-invasively through bodily fluids like blood, urine, or saliva. This allows for convenient and relatively non-invasive sample collection, making it feasible to perform regular screenings and monitor high-risk individuals more effectively. Non-invasive tests also reduce patient discomfort and increase compliance with screening programs, allowing for more frequent monitoring and early cancer detection.

4. Practical Implementation

Protein biomarkers that show promising results in multi-omics early cancer detection assays can be translated into diagnostic tests and applied in clinical practice more easily compared to other -omics data. While several molecular signature assays to monitor multiple biomarkers are now being implemented into clinical practice, they are quite complex and expensive. Proteomic profiling can identify and characterize



proteins that are indicative of early-stage cancer and can readily serve as targets for diagnostic tests or potential therapeutic interventions. Incorporating protein biomarkers into multi-omics assays increases the potential for practical implementation in routine clinical settings.[1,3,6,7]

5. Early Intervention

Recent advances in proteomic-based technologies have led to progress in developing tools for early diagnosis, including valuable prognostic and predictive information. Certain protein signatures can help predict the likelihood of disease progression, response to specific treatments, or even the risk of recurrence after initial treatment.

Protein biomarkers and tumor-derived nucleic acids complement each other in early cancer detection, wherein nucleic acid-based tests detect specific genetic alterations, and protein biomarkers reveal functional consequences such as changes in pathways, interactions, and modifications. The integration of both protein and nucleic acid biomarkers enhances the sensitivity, specificity, and accuracy of multi-omics approaches, which can guide personalized treatment decisions and enable early intervention strategies.[3,4,5,6]

6. Protein Abundance

Protein biomarkers can be derived from multiple sources, including tumor cells, tumor microenvironment, or other tissues affected by cancer. When released into the bloodstream or other bodily fluids, these protein biomarkers provide a broader range of potential targets for early cancer detection. In contrast, tumor-derived nucleic acids are specifically released by cancer cells and carry genetic alterations specific to the tumor. While they provide direct information about the presence of cancer-related mutations, their limited abundance and potential dilution in non-tumor-derived genetic material make their detection more challenging.[3,4,5,6]

Gaining an Edge in Early Cancer Detection

Both protein biomarkers and tumor-derived nucleic acids offer valuable information in early cancer detection, and their integration in multi-omics approaches can provide a more comprehensive understanding of cancer biology and help make diagnostic testing more accurate and actionable. This is precisely the overarching goal of the partnership between Luminex Corporation and R&D Systems.

Luminex has established a solid reputation for providing high-quality multiplex assay systems to research and clinical diagnostic laboratories worldwide, so commercializing an xMAP assay through Luminex means associating with a reputable company with a proven track record in the industry.

Furthermore, R&D Systems' Luminex-based multiplex assays combine high-quality reagents and over 30 years of industry-leading immunoassay experience to create a powerful solution to advance early cancer detection strategies.

This innovative partnership combines the world's leading antibody, protein, and ELISA manufacturer with the world's leading platform for multiplex proteomics—with the joint mission to accelerate the development and commercialization of early cancer detection.

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