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Harnessing Proteoforms through IN3: A Convergent Platform for Discovering and Engineering Translational Biomarkers

Abstract

IN3[®] is a tri-modal innovation engine that integrates *in silico*, *in vitro*, and *in/ex vivo* methodologies into a unified translational framework. Leveraging high-resolution proteomics and deep proteoform profiling, IN3[®] enables mechanistic insight into biological systems, while empowering drug repurposing, advanced material bioengineering and multi-omics-driven biomarker discovery.

A central component of the IN3[®] platform is the exploitation of proteoforms as both molecular sensors and functional effectors. Their structural and regulatory diversity provides a rich landscape for identifying digital and molecular biomarkers with high specificity and translational relevance. IN3[®], also, emphasises extracellular vesicles/ particles (EVs/EPs), which serve simultaneously as biomarkers, carriers of proteoform information and functional tools in bioengineering and biocompatibility assessment.

By embedding proteoform-centric analytics within pipelines for drug repurposing, EV engineering and advanced materials design, IN3[®] offers a convergent platform for addressing unmet needs in translational precision medicine and device-tissue interface research. Selected case studies will illustrate how this framework advances both discovery science and translational innovation.