Advanced Tools for Molecular Profiling and RNA Interaction Analysis

The solution is a set of innovative tools leveraging oligonucleotide-directed biolabeling for enhanced molecular profiling and RNA interaction analysis within their native cellular context.

What is the Problem?

RNA molecules form complex and dynamic networks of molecular interactions with proteins, genomic loci, and other RNA molecules. Dysregulation of these RNA interactions has been implicated in an array of pathologies. Current methods for profiling the distribution and abundance of cellular biomolecules suffer from high noise and poor reproducibility. As a result, there is a need for robust methods to characterize the molecular microenvironment within their native cellular context.

What is the Solution?

The solution is Oligonucleotide-Directed Biolabeling (ODB), which uses oligonucleotide hybridization probes and peroxidase enzymes to probe the proteins, RNAs, and genomic loci near a target RNA within their native cellular context. DNA oligonucleotide probes are hybridized to a target RNA within chemically fixed cells, where they recruit secondary oligos that are covalently linked to peroxidase enzymes. Through proximity-dependent biotinylation, the peroxidase enzymes covalently tag nearby molecules in situ with any number of chemical modifications that enable visualization, biofunctionalization, or affinity isolation. Using different combinations of peroxidase targeting and functional molecules, a set of novel molecular profiling methods have been developed that can reveal key insights into the molecular mechanisms of cell/tissue function and disease pathology.

What is the Competitive Advantage?

The competitive advantage of this technology lies in its ability to characterize patterns of biomolecule location and abundance and their subcellular interactions. This technology can be readily implemented across different RNA targets and biological samples, including clinical samples. It can also be used in conjunction with mass spectrometry or sequencing technologies to enable proteomic, transcriptomic, and genome-interaction discoveries. As the global spatial omics market is valued at $320.8 million in 2023 with an expected CAGR of 8.2%, there is a significant opportunity for this technology to advance the field of spatial transcriptomics and proteomics.

Technology ID

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Category

Selection of Available Technologies

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