

Progressing Liquid Biopsy into Decoding Transcriptional Programs from Cell-Free Chromatin

Abstract: Liquid biopsy is revolutionizing cancer diagnosis by providing a non-invasive window into the genomic landscape of tumors. However, the next leap in the field lies in moving beyond the mere identity of circulating DNA to understanding the active functional state of its tissue of origin. By analyzing cell-free chromatin (cfChIP-seq), we can now obtain accurate information on gene expression directly from a standard blood draw.

The ability to map the functional phenotype of cells enables us to address critical clinical areas beyond cancer, such as the accurate diagnosis of liver and metabolic diseases, precise monitoring of organ rejection in transplant recipients, and tracking the biological dynamics of pregnancy. Furthermore, this platform takes precision oncology to the next level by enabling the non-invasive detection of real-time tumor gene expression. By capturing the active transcriptome, cell-free chromatin liquid biopsy transforms into a high-resolution tool for quantifying disease activity and treatment response across multiple indications.