Unlocking the full potential of liquid biopsy with advanced cfdna extraction

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Abstract

Liquid biopsies are minimally invasive procedures designed to detect cancer biomarkers in body fluids such as blood, plasma, or urine. They hold great promise for early cancer diagnosis and routine monitoring. Circulating free DNA (cfDNA) is among the most established biomarkers in liquid biopsy. However, its integration into mainstream clinical practice remains limited. The major challenge lies in the extremely low abundance of tumor-derived cfDNA within the total cfDNA pool, combined with its small fragment size (60–180 bp), making it difficult to analyze. Any loss of analytes can lead to cancer misdiagnosis. Therefore, an accurate, rapid, and automatable preanalytical step for cfDNA purification is essential.

Despite its critical importance, cfDNA extraction technologies have seen little innovation. The gold standard still relies on solid-phase silica extraction with membranes and spin columns, a method first introduced in the 1970s. While this technique ensures good DNA yield and purity, it is relatively difficult to operate and automate. Magnetic particle-based extraction provides better ease of use and automation but often compromises DNA yield and purity.

To overcome these limitations, we have developed a novel cfDNA extraction technology that is fully compatible with automation and downstream molecular biology applications. Our workflow retains the simplicity of magnetic particle-based protocols while achieving excellent cfDNA yield, even for small fragments (>90%). Additionally, our innovation eliminates the need for ethanol or chaotropic salts, which can interfere with downstream analyses. We believe this breakthrough in DNA extraction technology will significantly enhance the impact of liquid biopsy, making early cancer detection and monitoring more reliable and accessible.

Do you have any conflicts of interest?

No, I do not have a conflict of interest.