Article type: Review
Home Page URL: https://www.alliedacademies.org/pathology-and-disease-biology/

Novel Biomarkers for Early Detection of Hepatocellular Carcinoma.

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Received: *27-May-2025, Manuscript No. AAPDB-25-169600;* ***Editor assigned:*** *01-Jun-2025, PreQC No. AAPDB-25-169600 (PQ);* ***Reviewed:*** *15- Jun-2025, QC No. AAPDB-25-169600;* ***Revised:*** *22- Jun-2025, Manuscript No. AAPDB-25-169600 (R);* ***Published:*** *29- Jun-2025, DOI:10.35841/AAPDB-9.1.183*

Introduction

Hepatocellular carcinoma (HCC) is the most prevalent primary liver cancer, ranking as the sixth most common malignancy worldwide and a leading cause of cancer-related deaths. Its high mortality rate is largely attributed to late-stage diagnosis, as early HCC often presents asymptomatically and is difficult to detect using conventional methods such as ultrasound or serum alpha-fetoprotein (AFP) testing [1, 2, 3, 4, 5].

Recent advances in molecular diagnostics have led to the identification of novel biomarkers with higher sensitivity and specificity, offering hope for improved early detection, prognosis, and treatment outcomes. Biomarkers such as des-γ-carboxy prothrombin (DCP), glypican-3 (GPC3), osteopontin (OPN), and circulating tumor DNA (ctDNA) have emerged as promising candidates. Additionally, advances in multi-omics approaches—including proteomics, genomics, and metabolomics—are enabling the discovery of biomarker panels that outperform single-marker assays.

This article discusses emerging biomarkers for HCC detection and their potential role in transforming clinical practice.

Conclusion

The discovery of novel biomarkers for hepatocellular carcinoma has the potential to revolutionize early detection, enabling timely intervention and improving survival rates. While AFP remains a widely used tool, its limitations underscore the necessity for more reliable and sensitive diagnostic markers. Biomarkers such as DCP, GPC3, OPN, and ctDNA, particularly when integrated into multi-marker panels, offer significant promise in enhancing screening accuracy.

Future research should focus on large-scale validation studies, standardization of detection techniques, and integration of biomarkers into artificial intelligence-assisted screening programs to optimize patient care. With these advancements, early detection of HCC could become a realistic and routine goal, ultimately reducing the global burden of this deadly disease.

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Citation: Ramesh P. Novel Biomarkers for Early Detection of Hepatocellular Carcinoma. J Pathol Dis Biol. 2025; 9(1):183

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Citation: Ramesh P. Novel Biomarkers for Early Detection of Hepatocellular Carcinoma. J Pathol Dis Biol. 2025; 9(1):183