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# Decoding KRAS Oncogene Activity in Various Cancers: Detection Techniques and Prognostic Significance

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**Structured Abstract**

**Background:** The *KRAS* gene is a prominent oncogene with a high mutation rate in various cancers. The *KRAS* gene in humans is a homolog of a retroviral oncogenes found in rodent sarcoma virus genes and is classified in the rat sarcoma viral oncogene (RAS) family. The *KRAS* gene encodes the KRAS protein that is critical in various intracellular signalling pathways that are responsible for cell proliferation, growth, differentiation, and apoptosis. KRAS is a membrane-bound regulatory protein where it binds with guanine nucleotides from the family of guanosine triphosphatases (GTPases).

**Methods:** KRAS serves as a binary switch that regulates vital signal transduction such as RAF-MEK-ERK and P13K-AKT-mTOR pathways. Activation and deactivation of KRAS protein affects the downstream signalling pathway which regulates the cell life activities. In the event of mutations, KRAS undergoes conformational changes and sustained activation of downstream signalling pathways which leads to continuous cell life activities like cell proliferation that increases the number of cells. Abnormal number of cell counts can lead to formation of cancer cells or tumours. Mutations of KRAS have been shown to cause various cancers such as pancreatic ductal adenocarcinoma (PDAC), colorectal cancer (CRC), and lung cancer with the most mutations occurring at the codon 12 of KRAS.

**Results:** Mutant subtypes of KRAS have been proved as a reliable biomarker and indicator of patients' prognosis. Accurate and precise detection of KRAS mutations is crucial for diagnosis, treatment planning, and clinical decision making. In recent years, there have been many developments of KRAS mutation detection techniques such as digital PCR, multiplex PCR, and mass spectrometry as alternatives and improvements to previous laboratory techniques like nucleic acid sequencing, real-time PCR, and allele-specific PCR.

**Conclusion**: As early detection of cancer is crucial for patient's prognosis, it is important to ensure the reliability and accuracy of KRAS mutation detection in clinical settings. Thus, this study will be assessing the latest developments of detection techniques to detect KRAS mutations for better accuracy, reliability, and practicality in the clinical settings.

**Keywords:** Cancer, Detection Techniques, KRAS Mutation, Mutant Subtypes, PCR

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