UNIVERSITY OF LIFE SCIENCES "KING MIHAI I" FROM TIMISOARA
"YOUNG PEOPLE AND MULTIDISCIPLINARY RESEARCH IN APPLIED LIFE SCIENCES"
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MOLECULAR MARKERS AS TOOLS FOR DISEASE PREDICTION, DIAGNOSIS, AND PERSONALIZED MEDICINE

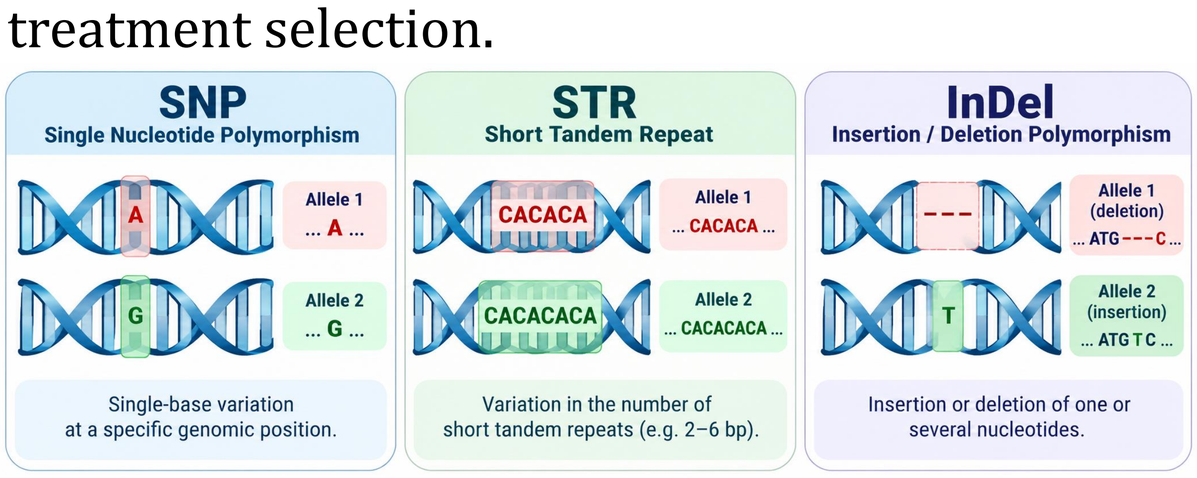
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Abstract: Molecular markers, including SNPs, STRs, and InDels, provide insights into genetic variability, disease susceptibility, and treatment response. This review explores their detection methods and applications in molecular diagnostics, oncology, and pharmacogenomics, highlighting their contribution to personalized medicine.

• Introduction

Molecular markers are identifiable DNA variations used to investigate genetic diversity and disease-associated traits. Advances in PCR-based methods and DNA sequencing have expanded their applications in molecular diagnostics & personalized medicine, supporting more precise genetic risk assessment and treatment selection.



• Material and method

The analysis focuses on SNPs, STRs, and InDels, their detection through PCR-based techniques and DNA sequencing, and selected examples from molecular diagnostics, oncology, and pharmacogenomics.

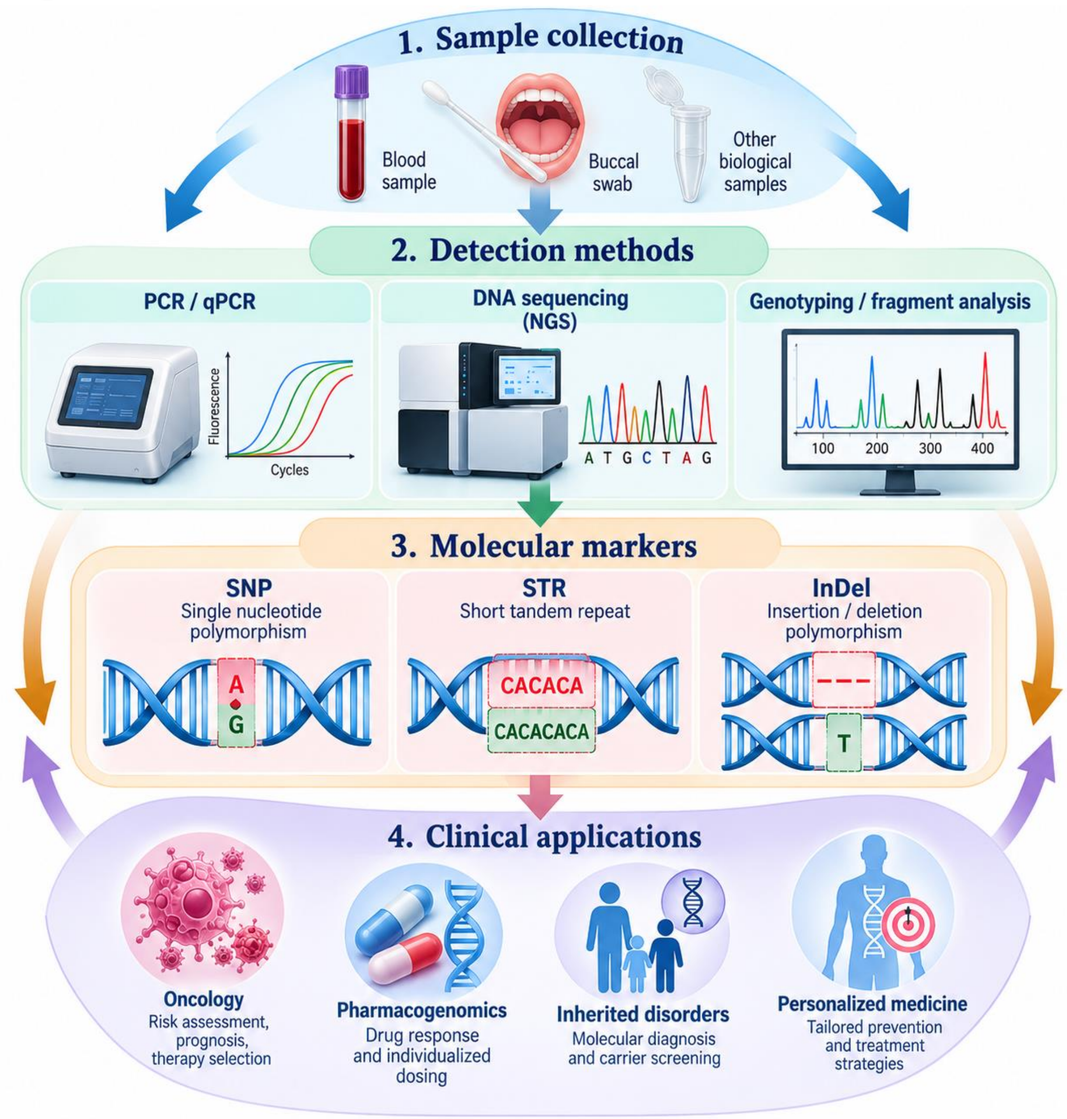
• Results and discussions

Oncology: BRCA1/BRCA2 pathogenic variants are associated with increased hereditary breast and ovarian cancer risk. Their identification supports genetic counseling, risk assessment, and clinical management.

Pharmacogenomics and treatment response: CYP2C19 genetic variants influence the metabolism of several medications and can help guide drug selection in clinical settings.

• Results and discussions(continue)

Genetic identification and inherited disorders: STRs provide highly informative genetic profiles, while disease-associated SNPs and InDels can contribute to the molecular diagnosis of inherited conditions.



• Conclussions

Cell-based therapies offer new treatment opportunities through advances in cellular biotechnology. Despite manufacturing and safety challenges, their development, supported by advanced preclinical models, may improve personalized therapeutic approaches.