

Molecular Diagnosis of COVID-19: Recent Advances and Research Needs

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The unprecedented global demands for rapid, reliable, and widely accessible molecular diagnosis of COVID-19 and testing of SARS-CoV-2 require developments and improvements of analytical techniques for the detection of nucleic acids and proteins. Tremendous progress has been made and many assays have been developed in a very short time. However, challenges remain throughout the entire diagnostic process, from the collection and treatment of specimens to the detection of viral RNA and proteins, and the validation of clinical sensitivity and specificity. We highlight main issues surrounding molecular diagnosis of COVID-19. We discuss recent advances and critical research needs, such as isothermal amplification of nucleic acids and CRISPR technology for point-of-care (POC) testing. Rapid, easy-to-implement, and validated diagnostic assays and tools are needed for on-site applications and resource-limited settings. Along with diagnostics, environmental surveillance or wastewater-based epidemiology help reveal infection on the community level through analyses of viral components in community's wastewater. Further advances in analytical technology and research through multidisciplinary collaboration will improve our understanding of SARS-CoV-2 at the molecular level and contribute to the development of preventive measures, therapeutics, and vaccines.