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Rapid detection of human herpes viruses, mumps virus and SARS-CoV-2 using a combination of polymerase chain reaction techniques and surface plasmonic-based biosensor assay

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Statement of the Problem: Viral infections, such as EBV, CMV, mumps, SARS-CoV-2, HIV, rubella and others are the most common cause of an upper Respiratory Tract Infections (RTI) with Lymphadenopathy (LP) in human population worldwide. Early and accurate detection of the viral presence in patient sample is crucial for appropriate treatment and prevention. Molecular techniques, such as conventional and real-time PCR provide rapid viral detection and are a "gold standard". Surface Plasmon Resonance (SPR) biosensors also are a promising alternative for highly sensitive and specific detection of viral infections. The purposes of this study were: 1) to assess the prevalence of CMV, EBV, mumps and SARS-CoV-2 infectious among patients with upper RTI and (LP) for one-year period (2022) by demonstrating of presence of viral DNA/RNA in Nasopharyngeal Swabs (NpS) and 2) to evaluate the performance of the SPR-based assay for diagnostic of SARS-CoV-2.

Methodology: We tested NpS samples from 85 patients, collected at 2022 with diagnosis upper RTI and LP from different hospitals of the country, with a mean age of 39 ± 13.9 years. Real-time PCR and cPCR were used to diagnose the fourth viruses. SPR-based assay was performed parallel for diagnostic of SARS-CoV-2. Findings: A positive EBV real-time PCR result was detected in 6 patient samples (7,1%), mumps virus RNA in 2 patients (2,4%), CMV DNA in 1 NpS (1,2%). The 13 patients had positive real-time PCR signal for SARS-CoV-2 (15,3%), confirmed in 10 NpS samples (77%) with SPR-based assay. No co-infection between tested viruses was observed in this study. The prevalence of SARS-CoV-2 and EBV were higher than the other tested viruses.

Conclusions: We have concluded that SPR-based biosensor assay holds huge potential for rapid viral detection. The obtained results for SARS-CoV-2 diagnosis are comparable to those of PCR, providing fast and high specific detection of SARS-CoV-2 and thereby helping in disease control.

Biography

Petia Genova Kalou received her M.S. degree in Molecular Biology from Sofia University "St. Kliment Ohridki", Bulgaria and PhD degree on SOCRATES-ERASMUS exchange program from Sofia University and University of Ioannina, Greece in the field of Virology. She has specialization of "Clinical Virology" in Medical University–Sofia. She has worked part-time at Hellenic Pasteur Institute Greece (2006–2007), at the National Hellenic Research Foundation, Greece (2007) and National Center of Infectious and Parasitic Diseases, Sofia, Bulgaria (currently). During this period she was involved in study of antiviral effect of different newly synthesized and natural compounds in cell culture, diagnostic of herpes and oncogenic viruses, epidemiology and molecular study and diagnostics of rickettsiae. She is the author and co-author of over 60 scientific articles and over 200 reports.

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