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The analysis of antiviral effect of photoreactive surfaces

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The pandemic situations pointed out the vulnerability of population to infectious diseases. Reactive plasmonic titanium dioxide-based polymeric nanocomposite film was prepared with a thickness of 1-1.5 μm, which produces Reactive Oxygen Species (ROS) under visible light irradiation (λ≥435 nm) [1]. These species are suitable for photooxidation of adsorbed organic molecules (e.g., benzoic acid) on the nanocomposite surface. Moreover, high molecular weight proteins are also degraded or partially oxidized in this process on the composite surface. Since the Ag0-TiO_2/polymer composite film used showed excellent reactivity in the formation of OH• radicals, the photocatalytic effect on high molecular weight (M=~66.000 Da) Bovine Serum Albumin (BSA) protein was investigated [2]. This film showed obvious antibacterial properties against Staphylococcus aureus, Enterococcus faecium, Pseudomonas aeruginosa, Acinetobacter baumannii, or Methicillin-Resistant Staphylococcus Aureus (MRSA) [3,4]. The focus of our studies is to analyze photoreactive composite film surfaces that may have antiviral effects upon illumination. Viruses are unable to propagate on lifeless surfaces, they can retain their infectivity and spread further on contact with these surfaces. We tested this antiviral effect using an afirborne-transmitted Pseudorabies virus. As a result, we obtained a drastic decrease in infection capability of the virus on the photoreactive surface compared to the control surface.

Conclusion: The synthetized plasmonic Ag-TiO_2 photocatalyst containing composite layers are able to produce enough surface ROS to eliminate viable viruses. We demonstrated the antiviral effect illuminated photoreactive surfaces exerts antiviral effect in liquid and dried states too.

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Biography

Zsolt Csabai, PhD, Biologist Senior lecturer in Department of Medical Biology, University of Szeged. He was born in Senta, Serbia. He began his studies at the University of Szeged, Hungary. Bachelor of Biology 2011, Master of Biology (molecular-, immune-, and microbiology) 2013. He had finished his PhD studies in 2018 and gained experience in transcriptome analysis of viruses ("Multiplatform analysis of herpesvirus transcriptomes"). During the past 12 years he worked on the description of several virus transcriptomes (HSV1, hCMV, EBV, PRV, ASFV, VZV, VACV, AcMNPV, PERV, PCV1). He also had a wide range of experience in sequencing technologies like Oxford Nanopore Technologies (ONT), Pacific Biosciences Technologies (PacBio) MiSeq Illumina platform.

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