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Development of a novel virus-trapping vaccine platform against genital herpes

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Efforts to generate an effective immuno-protective agent against recurrent genital infections caused by herpes simplex virus-2 (HSV-2) have seen only limited success. The virus can be transmitted sexually as well as from mothers to neonates. It is also a key facilitator of HIV co-acquisition. No vaccine or protective immunotherapy exists to control the viral transmission or dissemination. Here, we describe a nanoimmunotherapy approach using our uniquely designed zinc oxide tetrapod nanoparticles (ZOTEN). ZOTEN carry engineered oxygen vacancies, which allows HSV-2 to bind the nanoparticles with high affinity. As a result, ZOTEN can be used intravaginally as a microbicide that blocks HSV-2 genital infection in female BALB/c mice. The strong HSV-2 trapping ability of ZOTEN reduced local virus production, clinical symptoms of infection and effectively decreased the animal mortality rate. While preventing HSV-2 infection by virus trapping, the virus-bound ZOTEN promoted the presentation HSV-2 virions to mucosal antigen presenting cells. We demonstrate that dendritic cells can capture and process the bound virions for antigen presentation. Due to efficient processing of ZOTEN-bound virions a clear enhancement of cell and antibody-mediated responses was observed. Our results demonstrate that ZOTEN treatment can suppress not only a primary but also a re-infection by HSV-2. To conclude, we provide evidence for the protective efficacy of a virus-trapping vaccine platform against genital herpes infections.

Biography

Deepak Shukla has received his PhD in Microbiology and Immunology from the University of Illinois at Chicago (UIC) during 1990-1996. Currently, he is working as the Marion Schenk Esq. Professor of Ocular Virology in the Departments of Ophthalmology & Visual Sciences and Microbiology & Immunology at UIC College of Medicine in Chicago, IL. He is also the Director of Ocular Virology Laboratory at UIC. He serves on the Editorial Boards of prestigious journals, has been a regular Reviewer for over a dozen reputed scientific journals and has authored over 50 peer-reviewed papers including publications in top rated journals such as *Cell*, *Journal of Clinical Investigation*, *Journal of Cell Biology*, *Journal of Biological Chemistry*, etc. He has also written two book chapters and holds two international patents for his discoveries. He was the lead discoverer of 3-O sulfated heparan sulfate as the host cell membrane receptor for herpes simplex virus. He has received outstanding research awards from many organizations including American Herpes Foundation, Research to Prevent Blindness Inc.

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