Complementary Diagnostics for Infectious Disease

Development of a Sustainable Diagnostic Toolbox for Serosurveillance of West African Infectious Diseases

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Purpose: The spread of infectious disease continues to present a challenge for modern global public health initiatives, as was evidenced by the recent Ebola outbreak in West Africa. In order to understand emerging and re-emerging pathogens and risk of exposure, overseas laboratories need access to sustainable and reliable immunodiagnostic assays. Methods and Materials: We designed a multiplexed immunoassay centered on coupling recombinant proteins and/or virus-like particles to magnetic beads to detect IgM and IgG in a serum sample for EBOV, LASV, MARV, CCHFV, RVFV, alphaviruses, and flaviviruses. This flexible, immunoassay system, based on the MAGPIX® platform, improves sensitivity by up to 2-logs and has faster sample-to-answer time over traditional methods. Assays were developed and verified with animal models and human samples of known etiology prior to screening patient sera from Nigeria and Ghana, through an acute febrile illness (AFI) study collaboration with the Joint West Africa Research Group (JWARG). Results: Greater than 50% IgG prevalence for alphaviruses and flaviviruses was observed in both Nigeria and Ghana, which is expected as it is known these families of viruses circulate in these regions. Less than 10% IgG prevalence rates were observed for MARV, EBOV, LASV, and RVFV. Notably, we observed around 52% CCHFV IgG prevalence rate in samples tested. Conclusions: Understanding the seroprevalence of emerging infectious diseases can give us a window into the risk of potential outbreaks and give us insight into force health protection in areas where our warfighters are deployed. We aim to transition these assays on to more point-of-care platforms that are more easily amenable to the warfighter's needs. By developing a sustainable diagnostic program and transitioning these capabilities to our in-country collaborators, we have the best chance at rapidly responding to emerging infectious diseases, protecting our warfighters, and ultimately avoiding another widespread outbreak.