PALADINS: PROTECTIVE APPROACHES LEVERAGING AD-APTIVE AND IN-NATE SYSTEMS

Development Of Mrna Vaccine Platform Against Emerging Infectious Disease

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The world has continued to be threatened by infectious disease. Following COVID-19 pandemic, monkeypox, endemic to some African countries, is newly threatening the world in 2022. Since its first outbreak in the UK, monkeypox has now spread to more than 50 countries. As vaccine is an effective barrier to prevent the spread of infectious diseases, it is important to develop it quickly in line with the sudden outbreaks. RNA vaccine, the next generation vaccine, has been proven to be a suitable vaccine type for infectious disease during the COVID-19 pandemic. RNA vaccines can immediately respond to emerging infectious diseases as a platform because it only needs to change the nucleotide sequences of target antigens. Two RNA vaccines were quickly developed and approved in 2020 for emergency use, which were effective to prevent against SARS-CoV-2. In this study, we aimed to develop an RNA platform for vaccine to prepare against the next infectious disease. The mRNA construct was designed focusing on maximizing RNA stability and translation efficiency. In order to find and test vaccine candidates for our RNA platform, truncated L1R of vaccinia virus (tL1R) was found and used as antigen, which induced excellent immunity in smallpox DNA vaccine. tL1R expression encoded in mRNA vaccine was confirmed in mammalian cells. Furthermore, vaccination with tL1R mRNA stimulated strong humoral immunity in mice. Mice, immunized with tL1R mRNA, were survived 100% upon challenging with vaccinia virus, while all control mice died. Considering that tL1R sequence is highly homologous to M1R of monkeypox virus, tL1R mRNA is thought to be effective enough against monkeypox. Through this study, we established mRNA vaccine as platform technology, focusing on respond rapid and effective response to new infectious diseases. These results demonstrate that our vaccine platform is suitable for responding to emergent biological threats.