NML SCIENCE STORY

WEEK OF FEBRUARY 24, 2020

ONE VACCINE TARGETS MULTIPLE VIRUSES

Innovative discovery research leading to the development of therapeutics and vaccines is important for public health. This work to develop medical countermeasures increases our understanding of the methods to protect against infectious and deadly zoonotic pathogens.

Vesicular stomatitis virus-based vaccines provide cross-protection against Andes and Sin Nombre viruses. Warner BM*, Stein DR*, Jangra RK, Slough MM, Sroga P, Sloan A*, Frost KL*, Booth S*, Chandran K, Safronetz, D*. Viruses 2019 Jul 13;11(7):E645. doi: https://doi.org/10.3390/v11070645

What was known about this area prior to your work, and why was the research done?

Hantavirus cardiopulmonary syndrome (HCPS) is a severe respiratory disease caused by certain hantaviruses including Andes virus (ANDV) and Sin Nombre virus (SNV). There are currently no approved vaccines or therapeutics for the prevention or treatment of HCPS, and its fatality rate can be up to 35%. The vesicular stomatis virus (VSV) has successfully been used as a vaccine platform, meaning it can be genetically manipulated to express the surface proteins of one or more different viruses. This model has a proven track record and is the foundation of vaccines providing immunity to deadly viruses, such as Ebola. Although vaccines have been developed to produce antibodies against one or more hantaviruses, few have been tested to confirm they actually protect against exposure to the viruses. It is also thought immunization against one hantavirus species may provide protection against others. This study examines two VSV-based vaccines, against either ANDV or SNV, to determine if they would confer protection against one or both of these viruses.

What are your most significant findings from this work?

Two VSV vaccines, expressing either ANDV or SNV surface proteins (VSV-ANDV, VSV-SNV), were developed for this study. This work was the first to report on the efficacy of a VSV-SNV vaccine, targeting the less common SNV. A single vaccination with either vaccine produced an immune response resulting in the production of antibodies. Either vaccine provided protection against both pathogens when an immunized rodent was exposed to either virus. Vaccines and therapeutics are usually developed and manufactured with a "one bug, one drug" approach. The cross-protection in this study shows immune protection against related organisms is possible.

What are the implications or impact of the research?

There are currently no approved vaccines to prevent infections of ANDV or SNV hantaviruses. Some vaccine candidates have progressed through early clinical trials, but only focused on one target species. Due to the low incidence of infection with hantaviruses such as SNV, development of a vaccine for use in humans is perceived as neither practical nor cost-effective. The development of a single vaccine candidate against a pathogen with a higher incidence, such as ANDV, that can also provide protection against multiple hantaviruses would be ideal as a means to prevent infection with other common species. The VSV vaccines expressing the surface protein of a single hantavirus, either SNV or ANDV, can induce antibodies specific for both viruses and provide protection against infection with both viruses. The data suggests that an approach using a single vaccine for prevention of infection with multiple viruses could have some merit. This could lead to future vaccine development against other hantaviruses.

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