Learning to Care for Those in Harm's Way

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Release No. 20-01-31
February 1, 2019
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Scientists develop safer, less costly polio vaccine

Bethesda, Md. – As the world nears poliovirus eradication, the vaccines themselves have become the greatest threat. In response to a global demand for an effective, safer-to-handle and less costly polio vaccine, scientists at the Uniformed Services University (USU) have developed a new one that could help secure a polio-free world.

In developing countries, the live Sabin oral polio vaccine (OPV) has generally been used because it has been more cost effective than the injectable, inactivated polio vaccine (IPV). Now, both OPV and IPV are becoming tricky because children vaccinated with OPV can shed paralysis-causing mutant polioviruses, and because the manufacture of IPV uses deadly, "wild" viruses that are a biosecurity threat. Therefore, in a call to action, the World Health Organization (WHO) has urged the scientific research community to develop safer polio vaccines, ideally based on the use of inactivated "killed" Sabin viruses since they are much safer to handle than the "wild" viruses used in IPV production. The researchers believe this could lead to the production of a safer, less costly injectable polio vaccine.

In response to the WHO request, researchers from USU and BMI, Inc., led by Dr. Michael J. Daly, professor of Pathology at USU, and Dr. Gregory J. Tobin, president of BMI, Inc., applied a synthetic Deinococcus manganese-antioxidant, developed by Daly and his USU team, to the Sabin virus. Then they exposed the Sabin virus to large doses of gamma radiation. The Mn-antioxidant, in turn, preserved the virus protein "shell," making the killed Sabin virus vaccine highly protective against polioviruses when injected into animals.

Their promising results, "A Novel Gamma Radiation-Inactivated Sabin-Based Polio Vaccine," were published in PLOS ONE on Jan. 30.

"We have also successfully applied this radiation vaccine approach against alpha viruses, like chikungunya virus and Venezuelan equine encephalitis virus, as well as deadly bacteria like the 'super bug' MRSA, for which there are still no licensed vaccines, " Daly said.

"Equally important to WHO goals is the cost associated with vaccine production," Tobin emphasized. "The gamma radiation-killed Sabin vaccine is prepared in just hours, whereas killing polioviruses with formaldehyde takes weeks and doesn't work well on Sabin viruses."

This project was supported by a Defense Threat Reduction Agency (DTRA) grant and National Institutes of Health (NIH) grant to Dr. Tobin. The team included Drs. Chumakov and Kouiavskaia at the Food and Drug Administration (FDA), and Dr. Meeks at DTRA. For more information on Deinococcus research see, *http://www.usuhs.mil/pat/deinococcus/index_20.htm*.

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