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PROTECTING HUMAN AND ANIMAL HEALTH BY MITIGATING THE SPREAD OF VIRUSES

ARS research informs and provides solutions to improve the U.S. biodefense posture, a cross-cutting issue for both agriculture and public health. The risk of disease introduction—whether natural, intentional, or accidental—is increasing due to climate change and the increased movement of animals, plants, arthropods, and people around the globe. These diseases are a threat to food security and to human, animal, and environmental health. The following FY 2020 accomplishments highlight multidisciplinary efforts across ARS to prevent, mitigate, and respond to the spread of viruses.

COVID antiviral cotton facemasks. ARS researchers in New Orleans, Louisiana, in collaboration with a medical trauma wound dressing company, jointly developed a nonwoven cotton product demonstrated to exhibit antiviral activity. The product exhibited 99.999 percent antiviral activity after 1 hour of contact with SARS-CoV-2, the virus that causes COVID-19. Nonwoven cotton will be studied with collaborators to determine its ability to inhibit SARS-CoV-2. Following testing by a secondary company to obtain a Food and Drug Administration-approved International Organization for Standardization test for antiviral textiles, the company plans to develop a prototype for use in facemasks.

> **The facemasks exhibited 99.999 percent antiviral activity after 1 hour of contact with SARS-CoV-2, the virus that causes COVID-19.**

Integrated West Nile virus (WNV) early warning surveillance system developed. ARS scientists in Greece associated with the European Biological Control Laboratory designed an integrated WNV early warning surveillance system specifically targeting the L2 strains of WNV, a strain typically found in sub-Saharan Africa that was recently found in Europe and holds potential for invading North America. The surveillance system was successfully implemented and allowed for targeted and proactive vector control interventions, reducing this emerging threat.

Under-the-radar dengue virus infections in natural populations of *Aedes aegypti* mosquitoes. ARS researchers in Stoneville, Mississippi, have demonstrated the ability to monitor vector-borne diseases ahead of outbreaks using metagenomics and have helped identify dengue virus prior to any human infection. To date, the U.S. public health system's response to outbreaks has been largely reactive, but this research shows that by monitoring mosquito populations, it may be possible to identify emerging mosquito-borne diseases and enable proactive, targeted vector control before outbreaks occur.

Venereal transmission of vesicular stomatitis virus in biting midges. Biting midges transmit vesicular stomatitis virus (VSV) to cattle, horses, and swine. ARS scientists in Manhattan, Kansas, and Kansas State University collaborators investigated whether the virus can be maintained in insect populations in multi-year outbreaks. They found that, during mating, VSV-infected female midges could transmit virus to uninfected naïve males that had never been exposed to the virus and vice versa. This alternative route of transmission is the first evidence for venereal transmission of VSV in any known vector species.