FOR MORE INFORMATION: https://ars.usda.gov/Mitigating Impacts of Vector-Borne Diseases

MITIGATING IMPACTS OF VECTOR-BORNE DISEASES

The ARS veterinary, medical, and urban entomology research program mitigates the health and economic impacts of arthropod vectors and the diseases that they transmit to livestock, humans, and other animals. ARS collaborates across the human, animal, and environmental health communities to achieve sustained health outcomes for both animals and people. Economic losses from arthropod damage exceed $100 billion annually. The following FY 2019 accomplishments illustrate ARS efforts to eliminate arthropod vectors and nullify their impacts.

New tick-borne disease diagnostic assay. ARS scientists in Kerrville, Texas, and collaborators at Texas A&M University in College Station developed the TickPath Layerplex to aid in the quick diagnosis of human and animal tick-borne diseases. This innovative assay detects several groups of tick-borne pathogens in a sample, identifies the type of tick-borne pathogen, and guides decisions for rapid and appropriate treatments.

Easily deployed spatial repellent provides protection from disease vectors. ARS scientists in Gainesville, Florida, and collaborators developed a way for the U.S. military to rapidly create shelters from biting and disease-vectoring insects. Transluthrin is a spatial repellent that emits vapors to deter insects. By applying transluthrin to strips of camouflage netting attachable to perimeters and structures, the research team successfully reduced the number of mosquitoes, sand flies, and other biting flies within the perimeter without having to wait for intervention by mosquito- and vector-control units.

Salivary proteins of biting midges associated with virus transmission in livestock. ARS scientists in Manhattan, Kansas, discovered that when virus-infected midges bite, they transmit the virus and 45 proteins in their saliva that are critical for successful acquisition of a bloodmeal. The salivary proteins also promote rapid infection and systemic dissemination of midge-transmitted viruses via the lymph system, and saliva-induced blood vessel dilation encourages virus replication and dissemination via the circulatory system. These discoveries will guide new methods to impede virus transmission in livestock.

Improved diagnostic kit in commercial development for all quarantined fire ant species. ARS scientists in Gainesville, Florida, with APHIS scientists in Biloxi, Mississippi, developed a simple-to-use and portable kit that can identify imported fire ants from all other ants in a single, 10-minute test. Unlike previous tests, this kit is capable of distinguishing black imported fire ants, a quarantined species. The speed of the test curtails extended delays at inspection stations by eliminating the need to send off samples for identification. Agida Inc. has acquired the license for this new technology for commercial development.

Surveillance of pesticide resistance in southern cattle fever tick. The southern cattle fever tick threatens the U.S. beef and dairy industries, and intensive pesticide use has driven pesticide-resistant tick populations. ARS scientists in Kerrville, Texas, developed a rapid molecular test to identify DNA variants in southern cattle fever ticks associated with resistance to a class of pesticides commonly used against ticks. This will inform rapid surveillance efforts and tick management strategies.

Development and validation of CRISPR-Cas9 for gene knockout in screwworms. The continual release of sterile screwworms is essential to the successful eradication of this economically important pest of livestock and wildlife in Central and South America. ARS scientists in Kerrville, Texas, and collaborators developed and validated methods for using genome editing to alter specific genes in screwworm. Their work holds promise for advancing sterile screwworm release as part of screwworm control efforts.