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Vaccine and drug research aimed at ticks and mosquitoes to prevent disease transmission

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Most successful vaccines and drugs rely on protecting humans or animals by blocking certain bacteria from growing in their systems. But, a new theory actually hopes to take stopping infectious diseases such as West Nile virus and Malaria to the next level by disabling insects from transmitting these viruses. Research to be presented at the 57th American Society of Tropical Medicine and Hygiene (ASTMH) annual meeting in New Orleans, explains how vaccines and drugs may not only be able to stop disease transmission, but also prematurely kill the vectors carrying these diseases; such vectors include ticks, sand flies and mosquitoes – the insects responsible for most deaths world wide.

"In order to successfully slow the transmission rate of these potentially fatal diseases, we need to reduce the lifespan of the vector, or block them from becoming infected in the first place," explains Brian Foy, Ph.D., at Colorado State University. "One of our goals is to curtail the spread of mosquito-borne diseases through strategic use of compounds, known as endectocides, to target hosts. This new strategy will make blood meals from humans lethal to mosquitoes so they die before they can transmit a disease." Endectocides are currently mass administered to human populations to control the worm parasites that cause river blindness and are widely used in animals for worm control.

Professor Foy says that thanks to new technologies using genomics, scientists can now sift through vector genomes to more quickly and accurately find protein targets, which can then aid in the development of more specified drugs and vaccines.

A vaccine developed using functional genomics is already in early stages for cattle, whose production is greatly affected by tick-borne diseases. Katherine Kocan, Ph.D., at Oklahoma State University, concentrates her research on tick vaccines and anaplasmosis, a tick-transmitted disease of cattle that infects the red blood cells, causing mild to severe anemia and often death. "Even if the cow doesn't die," explains Professor Kocan, "the bacteria serve as a continued source of infection for cows and ticks. We are working on a vaccine to target tick-protective genes, so when ticks feed on immunized cattle, the vaccine antibodies interfere directly with the biology of the tick and its feeding pattern which results in reduced tick populations." The vaccine model being developed for cattle, which we call a dual target vaccine approach because both ticks and tick-borne pathogens are targeted, will likely be applicable to other ticks and the bacteria that they transmit.

According to Professor Foy, this theory of vaccine and drug development would offer many advantages over currently-used mosquito and tick-borne disease control measures: it would be more targeted than environmental spraying of insecticides; proper application would kill older frequently-biting insects and interrupt disease transmission; resistance would be slower to develop; and there may be little cross-resistance from agricultural applications.

Source: American Society of Tropical Medicine and Hygiene