
Insect Salivary Proteins Prevent Blood Clotting

Every summer, both people and livestock face pesky mosquitoes, gnats, and other biting flies.

The resultant itching and discomfort come from the immune system reacting to proteins in the insects' salivary glands. These proteins help victims' blood to flow so the insects can feed easier. They may also aid the transmission of insect-borne pathogens that can cause diseases.

Scientists at the ARS Arthropod-borne Animal Diseases Research Laboratory in Laramie, Wyoming, have identified several such proteins in a small biting midge called *Culicoides variipennis*.

This pest is the principal carrier of the viruses that cause bluetongue in North American cattle. When an infected midge feeds, it can simultaneously release the viruses into the animal's bloodstream. Bluetongue costs \$100 million in lost trade annually, because countries without the disease won't accept some U.S. livestock exports.

ARS entomologists Walter J. Tabachnick and Adalberto Perez de Leon have found that the midges secrete several proteins during feeding.

"Some of the proteins cause blood vessel dilation, another acts as an anticlotting agent, and one inhibits blood platelets from aggregating and helping in clotting," Tabachnick says.

Still other salivary proteins inhibit pathogen-fighting cells like macrophages and lymphocytes, weakening an animal's ability to fight off the viruses. "The insect creates a very conducive environment in the host," says Tabachnick.

The next step, he says, is to develop vaccines against these insect proteins, to reduce the spread of bluetongue viruses.

Surprisingly, though, there may also be some beneficial uses for the proteins. "We see great potential that these proteins might serve as pharmaceuticals for humans and livestock—such as anticlotting factors, vasodilators to widen blood vessels, or immunosuppressives to depress natural immune responses," says Tabachnick.

The researchers are also studying the role of insect salivary gland proteins from biting flies in spreading another important livestock disease, vesicular stomatitis. Preliminary results indicate that, like the midges, other biting flies release substances into an animal's blood that reduce its ability to fight off the disease-causing virus.—By **Dennis Senft**, formerly with ARS.

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