FORUM

Products To Protect Consumers and the Military From Insects

Agriculture is about producing food, fiber, fuel, wood, and other essential products in a sustainable way. It is absolutely necessary for human life, and it makes us partners with natural processes that are the basis of growing plants and animals. That partnership means that agriculture is exposed to negative influences from nature, including threats from thousands of kinds of insects.

The U.S. Department of Agriculture has been extremely active for more than 100 years in finding ways to relieve the pressure from insects, motivated by the huge losses that occur when nothing is done about the problem. As a result, USDA has developed tremendous expertise in dealing with insect species.

The nation has called on this expertise repeatedly for help in managing nonagricultural pests. In the early 1900s, Leland O. Howard of USDA started the first guide to the mosquitoes of the United States, culminating in the classic work that reviews all mosquitoes of North and Central America. The guide was published between 1912 and 1917.

In 1941, the U.S. military asked USDA to support the war effort by developing products to protect personnel from insect-transmitted diseases, especially plague, malaria, scrub typhus, epidemic typhus, and dengue. The research led to repellents and insecticides that, for the first time, protected forces in the field, contributing significantly to the victory in both Pacific and European lands. Other accomplishments include the invention of the aerosol can, repellents for clothing and skin, insecticides for louse and mosquito control, and methods to eradicate malaria from the United States and other countries.

The U.S. Department of Defense continued to ask for help from USDA on insect-related problems, and the research provided solutions for termites, cockroaches, mosquitoes, and stored-product pests. This relationship took on new urgency after the turn of the millennium, as U.S. military personnel were being exposed to disease-carrying insects in Afghanistan and Iraq.

U.S. Navy Captain Gary Breeden, executive director of the Armed Forces Pest Management Board, and Ronald Rosenberg, a USDA-Agricultural Research Service national program leader for Veterinary, Medical, and Urban Entomology and a retired U.S. Army colonel, teamed up in 2004 to form a program they called "Deployed War-Fighter Protection" (DWFP). This program provides $3 million per year directly to ARS for the purpose of developing new ways to protect deployed military personnel from diseases transmitted by insects. DWFP also provides almost $2 million per year to universities, industry, and government to fund competitive proposals. (For more details on DWFP, see story on page 4.)

Discovering new insecticides for use against public-health pests like mosquitoes and sand flies has been the goal of a number of programs. DWFP has been particularly successful at discovering completely new kinds of insecticides and adapting existing ones to new conditions. The laboratories have used several strategies, including screening many chemicals for toxicity to mosquitoes, modifying known insecticides, examining substances derived from plants, and targeting specific physiological processes.

DWFP has the help of the Interregional Research Project No. 4 (IR-4) program, which is a USDA-financed operation that facilitates registration of minor-use pesticides. For 3 years, IR-4 has assisted with registration of public-health pesticides, thanks to funding from DWFP.

Personal protection from insects is particularly important to the military because war-fighters often find themselves in places where there is no possibility of areawide control. DWFP has supported USDA's work on developing new repellent active ingredients derived from plants, spatial repellents based on chemicals in our own skin, and new clothing treatments that provide protection from bites through the cloth and on adjacent exposed skin. Basic research on how mosquitoes locate hosts has raised the possibility of much more effective repellent active ingredients that would be game-changers for personal protection.

Scientific evaluation of insecticide application performed by ARS in cooperation with the U.S. Navy and industry partners has resulted in much better estimates of the right equipment for the right place. Sponsored by DWFP, an ARS laboratory has produced a smartphone application that makes selection of equipment much easier for the operator in the field. (See story on page 15.)

The ability of the U.S. military to deploy personnel anywhere in the world and to keep them healthy has been an important tactical advantage in every conflict. Protecting deployed war-fighters from insect-transmitted diseases is an important part of the preventive-medicine mission, avoiding the kinds of disasters from malaria, typhus, and plague that were formerly accepted as an inevitable part of warfare. An added benefit is that advances derived from this research may be useful for public and veterinary health as well.

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