

# Military Entomology in Operation Enduring Freedom, 2010-2011

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Since 2001, the United States has been engaged in Operation Enduring Freedom (OEF) in Afghanistan. Although vector-borne disease in Afghanistan does not present as high a risk in comparison to other areas into which the US military deploys, such as sub-Saharan Africa, it does present sufficient risk to adversely impact military operations. This article discusses the growth and state of US military entomological support to the Afghan theater of operations (ATO).

## ENTOMOLOGICAL SUPPORT TO THE AFGHAN THEATER OF OPERATIONS

Providing entomological support to the Afghanistan theater of operations presents unique challenges to preventive medicine personnel, similar to those experienced in Iraq. Military and civilian infrastructure throughout the country remains poor, despite significant buildup and investment since 2001. Ground logistic routes are limited and security concerns often restrict movement not essential to direct support of combat operations and sustainment. Access to many US military camps in Afghanistan is primarily by air, and a number of locations are accessible only by air. Transporting equipment and pesticides further complicates the challenge of this operational reality. Consistent and comprehensive vector surveillance and disease reporting were improved over the years, however, coordination and oversight are required to identify pest and vector issues.

As a result of its diverse topography and climate, Afghanistan experiences significant variation in pest and vector issues. Each vector-related problem presents unique challenges that require careful coordination between base operations, preventive medicine (PM), and contracted vector control assets. Mosquito and sand fly populations are regional and seasonal. Other pest problems, such as bed bugs, fleas, wood infesting insects, flies, and rodents, are also relatively common in Afghanistan.

Over the past decade, entomological support to OEF has been fulfilled jointly, with the US Army and US Navy providing most of the support. Until 2010, there were generally one or 2 Army PM detachments operating in Afghanistan at any given time. In addition to the medical

entomologists with the PM detachments, there was also an Army or Navy entomologist assigned to the cooperative medical assistance (CMA) unit that dealt with various medical issues among the Afghan population. US forces were heavily focused in the eastern provinces of Afghanistan. One PM detachment generally operated split-based operations between Bagram Air Field and Forward Operating Base Salerno, while another PM detachment provided support to southern Afghanistan.<sup>1</sup> The map shown in the Figure displays the regions and areas of responsibility across Afghanistan.

As in-theater operations intensified in late 2009 and early 2010, entomological support across the ATO increased as well. In 2009, the Navy fielded a preventive medicine detachment, modeled after an Army PM detachment, to Kandahar Air Field, providing level III PM and entomological support (described in the Table) to the southern part of Afghanistan. In early 2010, the 12th Medical Detachment moved from Kandahar to western Afghanistan to provide support to that region. The Marine Expeditionary Brigade (MEB) in Helmand Province was replaced by a larger Marine Expeditionary Force (MEF) in 2010; with one Navy entomologist supporting the Regional Command Southwest (RC-SW). The US Air Force fielded a PM detachment based on the Army model that was assigned to conduct split-based operations between Kabul and northern Afghanistan. In June 2010, the 1st Area Medical Laboratory (AML) was deployed to Afghanistan and positioned at Kandahar to provide theater-wide level IV PM and laboratory support. Along with other scientific specialists, the 1st AML deployed to Afghanistan with a medical entomologist.

As a result of the rapidly changing requirements for preventive medicine and entomological support to US forces in Afghanistan, there were 7 US military entomologists in the Afghan theater by midsummer 2010. The total included one Air Force entomologist supporting the Kabul area and northern Afghanistan; 3 Army entomologists—one supporting eastern Afghanistan, one supporting western Afghanistan, one providing theater support as part of the 1st AML; and 3 Navy entomologists—one supporting the southern region, one

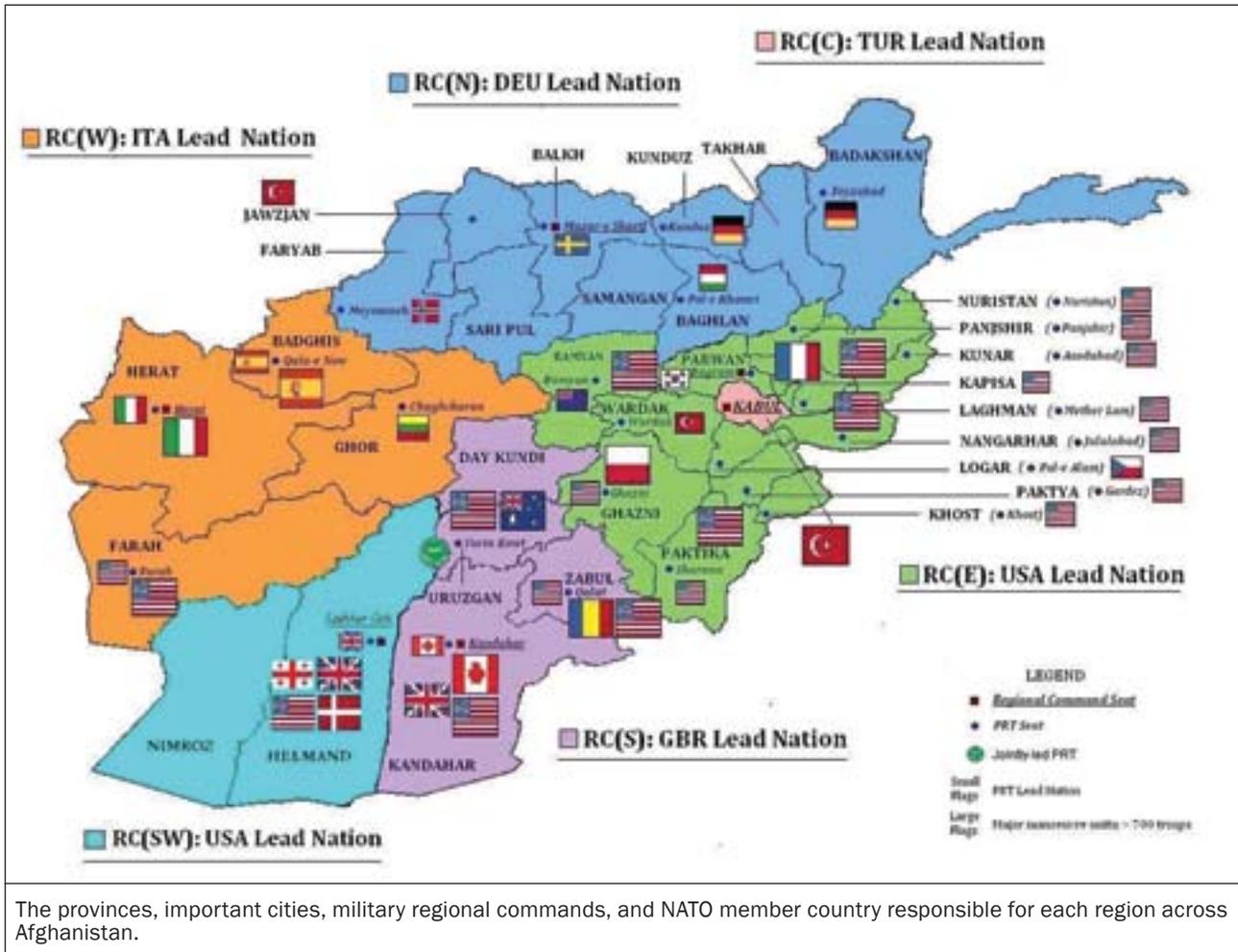
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supporting the southwestern region, and one working with the CMA to support counterinsurgency operations by providing entomological training to local nationals, Afghan medical personnel, and the Afghan National Army.

Prior to the autumn of 2010, the role of the theater entomologist had historically been filled as an additional duty by the CMA entomologist. This model was established because the CMA entomologist was located at Bagram Air Field along with primary headquarters elements; for several rotations the CMA entomologist was a senior entomologist; and there were very few entomologists in theater. With the changing requirements of PM and entomological support in OEF in 2010, the 62nd Medical Brigade revisited the automatic assignment of the theater entomologist duties to the CMA entomologist. Ultimately, the determination was made to select the theater medical entomologist based on a variety of factors including location in Afghanistan (with a location at one of the major airfields (Bagram or Kandahar) being preferred), rank, and previous deployment experience.

As a result, the theater entomologist duties moved from the CMA entomologist in Bagram to the 1st AML entomologist at Kandahar in late 2010. When the 1st AML redeployed from Afghanistan in June 2011, the theater entomologist duties moved to the entomologist assigned to the 155th Medical Detachment at Bagram Air Field.

### ENTOMOLOGICAL SUPPORT TO HELMAND PROVINCE

Entomological support to US forces in RC-SW differed from support in the rest of the regional commands since the preventive medicine support for this region did not mirror the Army preventive medicine detachment model used in the other regions. As previously described, command and control in RC-SW was transferred from a MEB to a MEF in 2010. Therefore, the preventive medicine support to the MEF was provided by the Navy and included one entomologist.

Southwestern Afghanistan, including Helmand Province, is largely a desert area with expected temperature extremes, lack of rain, and sparse vegetation. The

Helmand River, which cuts through the province, provides a significant amount of water for irrigation and other purposes throughout the region. The river valley is also a source of public health significance as the environment supports the presence of Anopheline mosquito vectors of malaria.

In 2010 and 2011, there were 2 large bases, Camps Dwyer and Leatherneck, and a number of smaller camps across the region. With much of the forces stationed at the 2 large camps, and thousands of military personnel spread among disparate forward operating bases and outposts, there was much ground to cover. The provision of preventive medicine services involved Marine and Navy operations within the constraints of a large geographic area, inadequate infrastructure, and large-scale security concerns.

Prior to 2010, the regional medical entomologist was stationed at Camp Dwyer. In 2010, after careful consideration of how to best support the region, the entomologist was moved to Camp Leatherneck, which was the logistics hub of Helmand Province, and the location of both the Defense Contract Management Activity (DCMA) and Logistics Civilian Augmentation Program activities for the region. In addition, the supervisory staff of contracted vector control was also located at Camp Leatherneck. The presence of these important groups in one location permitted the entomologist direct communication and increased influence regarding pest and vector control operations.

One significant operational consideration for Helmand Province is availability of transportation. As no formal or modern road system exists in the province, air assets are used extensively. Locating the entomologist at the air logistics hub provided the capability to travel to many areas of the Province in support of contract oversight, large-scale pest problems, or a breakout of vector-borne diseases. It was not feasible to travel around the province via convoy for regularly scheduled or reactive support. Positioning the entomologist at another forward operating base in Helmand Province would have delayed response to vector-borne diseases and pest problems.

Camp Leatherneck is also home to the largest Preventive Medicine Detachment in Helmand Province. A very important component of providing PM support to Marine forces is the provision of enlisted Navy Preventive Medicine Technicians (PMTs). Navy PMTs are broadly trained in preventive medicine, including monitoring disease and nonbattle injury, water quality/safety, food preparation and storage, and pesticide application. There are certainly limited resources, particularly available

The levels of preventive/environmental medicine support, compiled by the author from doctrinal publications. <sup>2</sup>	
Preventive Medicine Support	Definition
Level I	Support provided by a field sanitation team (FST) at the company level. The FST is responsible for establishing basic sanitation measures to prevent spread of diseases.
Level II	Preventive medicine (PM) personnel at the brigade combat team level. Responsibilities include, but are not limited to, dining facility inspections, waste disposal/treatment facilities, etc; vector surveillance and control; and base camp assessments. The level II PM personnel provide direct support to the field sanitation teams within their area of operations (AO).
Level III	Support provided by PM detachments. Units are typically responsible for areas that can include multiple level II preventive medicine units. PM detachments provide support to the level I and II preventive medicine assets in their AO. Their duties include, but are not limited to, base camp assessments, epidemiological investigations, occupational and environmental health site assessments, industrial hygiene surveys, and vector surveillance and control.
Level IV	Support provided by the Area Medical Laboratory. PM responsibilities of this unit include, but are not limited to, supporting levels I - II preventive medicine as needed; testing samples for toxic industrial chemicals and materials; performing industrial hygiene surveys; performing epidemiological investigations; and performing vector testing, including pathogen detection and insecticide resistance testing.
Level V	Support provided by the US Army Public Health Command and the Navy and Marine Corps Public Health Center. Responsibilities include, but are not limited to, supporting deployed level I - IV preventive medicine personnel; performing definitive testing of air, water, and soil samples; and performing vector pathogen testing.

environmental health officers and entomologists, therefore, PMTs are provided to the Marines at their various echelons of command. Although PMTs are certified to apply public health pesticides and do receive baseline training on pests and vectors, they are not subject matter experts on pesticides, pests, and disease vectors. The presence of an entomologist provided synergy to PMT efforts, as they could be better directed in the reduction of pests and disease vectors. Without question, stationing an entomologist in an area where he or she can train, guide, and use PMT resources was important, not only in Helmand Province, but throughout the ATO.

MAJOR ENTOMOLOGICAL ISSUES

The entomological issues that faced US forces in Afghanistan during 2010 were not unique, however, the rapidly increasing US footprint in the ATO increased the risk of vector-borne diseases and other entomological problems among US forces. Anticipating when and

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where an outbreak of vector-borne disease would occur was difficult, however, efforts to improve vector surveillance and disease reporting were made in 2010.

### Vector Surveillance

From the onset of operations in the Afghanistan theater until 2010, the fluid character of the operational environment and frequently shifting resource availability resulted in variations in the practice of vector surveillance across the ATO. In some areas, notably Regional Command North and Regional Command East, the level II PM personnel made efforts to conduct surveillance and submitted both sand flies and mosquitoes to the US Army Public Health Command (USAPHC) Region Europe for analysis. However, the majority of level II PM assets in theater did not conduct vector surveillance. Vector surveillance was typically performed by level III PM assets. However, in the absence of guidance as to the conduct of surveillance and what to do with insects that were collected, only about half of the level III PM units submitted specimens to USAPHC for analysis during the summer of 2010.

In an effort to ensure that vector surveillance was conducted properly and samples were submitted for laboratory analysis, a formal vector surveillance and testing program for US Forces Afghanistan (USFOR-A) was established in late spring 2011. Under this plan, the entomologists embedded with the level III PM units in each region were responsible for overseeing vector surveillance in their region and providing technical assistance as needed to level II preventive medicine units conducting vector surveillance. Sand flies, mosquitoes, and ectoparasites were submitted to the USAPHC for disease analysis, with results reported to the regional entomologists, the theater entomologist, and the clinical operations section of the medical task force for the ATO. While USAPHC (and its predecessor) had been conducting pathogen testing for vectors collected in the US Central Command (CENTCOM) area of operations for several years, formalization of the vector surveillance program in 2011 was necessary to ensure that units across theater were properly collecting and submitting vectors for testing.

### Vector-borne Diseases

Cutaneous leishmaniasis (CL) remains a significant cause of disease and injury among US service members deployed to Afghanistan. In 2010 and 2011, CL was diagnosed among US forces primarily located in Regional Command South and Regional Command North. Cutaneous leishmaniasis in Afghanistan may be zoonotic cutaneous leishmaniasis, caused by *Leishmania major*

(Friedlin), or anthroponotic cutaneous leishmaniasis (ACL), caused by *L. tropica* (Wright).

The majority of CL cases in 2010 and 2011 originated from Camp Mike Spann in northern Afghanistan. In this region, *L. major* is the primary cause of CL. NATO forces have experienced outbreaks in this area several times over the last decade.<sup>3</sup> In this epidemiological cycle, the primary vector is *Phlebotomus papatasi* (Scopoli), and the great gerbil, *Rhombomys opimus* (Lichtenstein), serves as the reservoir.<sup>4</sup> The preventive medicine team located at Camp Mike Spann in 2010 conducted sand fly surveillance and submitted samples to USAPHC-Europe for analysis. When the results were reported from USAPHC-Europe in early 2011, 3 of 74 pools of sand flies collected between July and September 2010 tested positive for *Leishmania* spp.

In early 2011, two cases of ACL were diagnosed in Soldiers bitten by sand flies in the Kandahar City area in the summer and fall of 2010. The Soldiers reported sleeping on the ground in open structures, not using N,N-diethyl-3-methyl-benzamide (deet) regularly, and not using bed nets. In both cases, the Soldiers had lesions for several months before seeking treatment.

Outbreaks of malaria have been reported periodically among US and coalition forces since 2001.<sup>5,6</sup> Malaria continued to be a problem for US forces in Afghanistan in 2010 and 2011. According to the Armed Forces Health Surveillance Center, 58 cases of malaria were reported in Afghanistan in 2010, and 91 cases in 2011.<sup>7,8</sup> From August through December 2010, approximately 37 cases of malaria were diagnosed in Regional Command-East, primarily from the Jalalabad area. During this period, the level II medical treatment facility located at Forward Operating Base Fenty collected blood samples from patients diagnosed with malaria at the camp. Seventeen samples were taken and both thick and thin blood smears were sent to the 1st AML for speciation. *Plasmodium vivax* (Grassi and Feletti) was the most common (14 of 17) malaria species, however, *P. falciparum* (Welch) was identified from 4 of the cases, including 2 *P. falciparum*/*P. vivax* mixed infections. Most military personnel from this region who were diagnosed reported improper use of chemoprophylaxis and/or not using appropriate personal protective measures.

In 2010 and 2011, the malaria chemoprophylaxis policy for Afghanistan was governed by USCENTCOM Individual Protection and Individual/Unit Deployment Policy,\* which required all military personnel to take

\* Internal, limited distribution military document not readily accessible by the general public.

prophylaxis year-round, with primaquine for postexposure prophylaxis. Since many areas of Afghanistan experience low winter temperatures, mosquitoes are not active year-round. Therefore, a concern was raised in late 2010 that the year-round prophylaxis policy was inappropriate. In order to assess the policy and examine the real risk of malaria across theater, the 62nd Medical Brigade established a malaria working group in late 2010. In the spring of 2011, the malaria working group recommended that CENTCOM examine changing the prophylaxis policy. In late 2011, the recommendation was accepted and the prophylaxis policy for Afghanistan was changed to require prophylaxis from March through November each year.

#### Vector Control

In 2010 and 2011, many forward operating bases and larger combat outposts in Afghanistan received vector control support from contractors. In the smaller locations without contracted vector control, the responsibility for vector control support was assumed by the entomologist assigned to the level III PM unit for the region, level II PM assets within the region, and the unit-level field sanitation teams, when present and equipped.

#### Locations with US Contracted Vector Control

Two companies held the contracts for pest control for US locations in the ATO in 2010, divided into 2 areas, (1) the northern and eastern regions, and (2) the southwestern and western regions. It is important to note that locations that were not under US military control had different pest control contracts which were not subject to the USFOR-A Integrated Pest Management Plan (IPMP).\*

Communication was one of the major challenges for successful pest control in those locations where vector control services were provided under a US contract. As indicated in the USFOR-A IPMP, military preventive medicine assets are responsible for public health vector surveillance, whereas pest control contractors are responsible for pest surveillance and large-scale vector control. Therefore, communication between those entities is critical in preventing vector-borne diseases among US forces. Communication between the pest control managers for the 2 contracting companies and the theater entomologist has historically been good. However, communication at the local level between PM assets and pest controllers can vary widely across the theater. In many instances, there was a positive 2-way flow of information between local PM and vector control assets. At the same time, communication was poor to nonexistent in some instances, leading to delayed vector control

activities and poor follow-up on the efficacy of vector surveillance efforts. In order to help mitigate this problem and ensure communication, part of the USFOR-A vector surveillance plan for 2011 included a clear directive for PM units to keep local pest control contractors informed of their surveillance results. While this requirement was previously outlined as part of the USFOR-A IPMP, mandating it as part of a fragmentary order helped ensure that the PM units were aware of this requirement.

Another major challenge for vector control contractors in the ATO was movement around the theater, especially when trying to carry pest control equipment and chemicals with them as they visited the geographically dispersed, smaller forward operating bases and combat outposts. To overcome this challenge, contractors wanted to establish pesticide storage facilities at key smaller locations to facilitate travel, increasing their ability to provide timely pest control services to those locations. Unfortunately, the language governing pesticide storage in the 2010 USFOR-A IPMP made it difficult to establish storage facilities at those locations. The 2010 USFOR-A IPMP referred to the *Armed Forces Pest Management Board Technical Guide No. 17*<sup>9</sup> (*TG 17*) for requirements for pesticide storage facilities. The guidance in that publication primarily addresses the storage conditions required in garrison-based operations, outside of combat zones. Unfortunately, the space and facility requirements of *TG 17* cannot always be met in contingency operations. The consensus of the theater and regional medical entomologists in the summer of 2010 was that the storage provisions outlined in *TG 17* were largely impractical for most locations in the ATO.

To address the issue of pesticide storage, the theater entomologist coordinated with other entomologists to review the pesticide storage provisions in the 2010 USFOR-A IPMP. The 2010 IPMP specifically stated:

Permanent or semipermanent pesticide storage facilities will comply with design and construction guidance as published in the Armed Forces Pest Management Board (AFPMB) *TG 17*.

In an effort to make the requirements more appropriate for the theater and more attainable for pest control contractors, the determination was made that the entire pesticide storage section of the USFOR-A IPMP should be rewritten. The revised, 2011 IPMP included clearly defined guidelines for pesticide storage facilities that are safe and allow contractors to store a basic load of supplies at smaller locations, increasing their ability to provide timely pest control services. The 2011 IPMP still

\*Internal, limited distribution military document not readily accessible by the general public.

refers to *TG 17* as a guide, but the language referring to this reference was changed considerably to state:

all interested parties should consult the...*TG 17*...for additional guidance or ideas to improve storage facilities based on local and theater conditions.

The 2011 IPMP provided a detailed list of storage condition criteria specific for both permanent (larger bases/installations) and semipermanent (small forward operating bases and combat outposts) storage facilities to facilitate timely and effective vector control services throughout the ATO.

### Locations with NATO Contract Vector Control

There are several locations throughout the ATO where US forces live on forward operating bases where contracted services, including pest control, are not provided under US contracts. At Kandahar Air Field, the largest location with a significant number of US forces, the pest control contract was managed by the NATO Maintenance and Supply Agency. The contractors are not required to comply with the USFOR-A IPMP, which outlines reporting requirements and allowable pesticides. While the contractors were not held to the USFOR-A IPMP, they had to meet reporting, pesticide use requirements, and quality control procedures outlined in their contract.

In 2010, the US population at Kandahar more than tripled. In response to this, the regional entomologist located at the Navy PM detachment worked with the contractor to foster a strong working relationship, helping to ensure that pest control met the spirit of the USFOR-A IPMP. An effort was made to ensure the insecticides in use were similar in active ingredient and concentration as those found on the AFPMB Standard Pesticides List and the DoD Contingency Pesticide List. This working relationship continued when the contractors were changed. The positive working relationship between the US Navy medical entomologist located at Kandahar in the summer of 2010 and the NATO pest control contractors was a good model for other locations in Afghanistan where similar situations existed.

### ENTOMOLOGICAL SUPPORT TO STABILITY OPERATIONS

Another area where entomologists played a critical role in the ATO was their work with organizations and units supporting counterinsurgency and stability operations. The entomologist assigned to the CMA unit had such responsibilities; however, that position was discontinued in mid-2011 due to theater-wide mission changes reducing MEDCAP and VETCAP operations.\* The CMA

entomologist provided training on basic vector surveillance and control techniques, following the “train-the-trainer” concept, to Afghan nationals and medical personnel. The CMA entomologist also worked with agribusiness development teams and provincial reconstruction teams on crop pest management and related issues. Further, the CMA entomologist, along with regional entomologists, worked with physicians and veterinarians in regional command stability operations, the World Health Organization, the Afghan Ministry of Public Health, the National Malaria and Leishmaniasis Control Program, and various nongovernment organizations working to understand and prevent vector-borne diseases among the Afghan population. These organizations represent a wealth of knowledge and have the continuity and expertise to track and predict vector and disease outbreaks that may impact US forces. Developing and cultivating relationships with nonmilitary governmental and nongovernmental organizations working to improve public health across Afghanistan was a significant role for both the CMA and AML entomologists in 2010-2011. Despite the loss of both of those positions in 2011, efforts by the entomologists currently in theater to continue to foster these relationships would be mutually beneficial for both the Afghan population and US forces. Improving those lines of communication would continue to help reduce disease risk in the local population, and contribute to a better understanding of the vector-borne disease threat to coalition forces in different parts of the country.

### SUMMARY

While the challenges and lessons learned from entomological support to the Afghanistan theater of operations in 2010 and 2011 were not novel, they provided a reminder that we often have to relearn the same lessons. The prevention of vector-borne diseases is one of the major responsibilities of deployed preventive medicine personnel at all levels. Given the wide variety of responsibilities placed on preventive medicine personnel, it can be easy to underestimate the importance of a well-designed, effective vector surveillance program. Deployed medical entomologists must champion the importance of appropriate surveillance in disease prevention to ensure that it is conducted in an effective manner. Further, entomologists must work closely with commanders to emphasize the use of personal protective measures to reduce the risk of vector-borne diseases.

Surveillance must be tied to responsive vector control efforts. In areas where surveillance is conducted by military personnel and vector control is conducted

\*MEDCAP indicates medical civic action program. VETCAP indicates veterinary civic action program.

by contractors, communication between these groups is critical in ensuring that effective vector control efforts can be initiated as soon after the identification of a problem as possible. It is also important that deployed entomologists establish relationships with the appropriate DCMA personnel so that the people responsible for contract enforcement have good subject matter experts to reach out to if and when they have questions about contract compliance.

While the vector-borne disease problems in Afghanistan are not as severe as in other areas to which the US military has been and will be deployed, there is still the threat of vector-borne diseases. It is important that deployed medical entomologists maintain their focus on prevention of those diseases while balancing other mission critical tasks.

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A medical entomology class at an Afghan girls school.