Army

US Army Medical Research and Development Command in Support of Desert Shield/Storm

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The US Army Medical Research and Development Command played a large role in medical support and medical readiness in Southwest Asia. The Command addressed infectious disease and environmental threats, and chemical and biological defense. It also developed field medical equipment to better serve the soldier. Teams were also deployed from the Command to provide specialized assistance, including immunization teams and neuropsychiatric teams.

The combat soldier is the focal point and the beneficiary of Army medical research and medical materiel development. The US Army Medical Research and Development Command, its nine laboratories and institutes, and its two contracting and acquisition management activities contributed in numerous vital ways to successful medical support and medical readiness in Operations Desert Shield and Desert Storm. While not as dramatic or telegenic as smart bombs, Patriot missiles or combined air and armor assaults, the Command's efforts were equally important.

History shows that infectious disease invariably takes a greater toll on armies than enemy weapons. A Middle East military history lesson helps to illustrate the problems addressed by the Command.

Middle East Military History

In one World War I campaign, an allied force with 50% of its members infected with malaria was able to defeat an opposing German-Turkish force, perhaps because 85% of the Germans and Turks had malaria. Rommel's World War II Africa Corps lost three men to disease for every one lost to combat injury. Rommel left Africa twice during the war to recover from hepatitis. A division from New Zealand joining the battle of El Alamein lost 14% of its soldiers to hepatitis A in its first 30 days of fighting.

American forces assigned to the Middle East in World War II represented only 0.6% of the total US Army average strength, but they contributed 3.6% to total Army cases of dysentery and diarrhea. US forces reported 2,968 cases of sandfly fever in 1943, or 56 cases per 1,000 men. Twenty-nine cases of malaria per thousand men were reported for the same year.

A deployment of 12,000 US soldiers and Marines to Lebanon in 1958 resulted in 50% of the force experiencing diarrhea, with 5% (600) admitted to hospitals. In 1961, a British brigade sent to Kuwait to discourage an attack from Iraq suffered such extensive heat injuries that 5% of the force required medical evacuation.

Disease and nonbattle injuries always take a high toll on deploying armies. Historical experience in the Middle East reinforces this fact of war. The USAMRDC organized to address these and other threats in several ways.

Infectious Disease and Environmental Threats

Researchers at the Walter Reed Army Institute of Research (WRAIR) were called upon very early in Operation Desert Shield to provide information about the infectious disease threats in the region. They responded with a detailed pamphlet describing 19 types of infectious diseases found in Southwest Asia. They supported the Office of The Surgeon General in determining the appropriate vaccinations to give deploying soldiers to protect them from indigenous infectious disease threats. They also made recommendations for special procurement of therapeutic drugs to treat various diseases. The WRAIR pamphlet was subsequently issued as a pocket size booklet.

Climatic and other hazards were addressed by the US Army Research Institute of Environmental Medicine (USARIEM). "A Pocket Guide to Environmental Medicine for Operations in Southwest Asia," published in a 5- by 7-inch format to fit in BDU pockets, addresses medical problems caused by heat, cold, dust, sand, wind, stress, snakes, scorpions and other hazards. It offers concise advice on first aid and buddy aid and a summary of key points and reminders for surviving and functioning effectively in the desert.

Some extremely valuable advice was provided, including recommended water intake of up to four gallons per soldier per day and the "weak link" rule, which says that the first heat casualty indicates the unit is near its limit and more casualties will follow unless there's an immediate break for rest and rehydration. Defense Department guidelines for water consumption and work-rest schedules during

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acclimatization in the desert are based on research by USARIEM.

Prepared at the request of the Deputy Chief of Staff, Personnel, HQDA, the guide was shipped directly to Army units deployed in Southwest Asia. Copies were also provided to the US Marine Corps for distribution to deployed Marine units and to the British embassy for distribution to British Army units.

Chemical and Biological Defense

The USAMRDC is responsible for medical protection of service members from the threats of chemical and biological attack, as well as naturally-occurring infectious disease and other nonbattle injuries. The Defense Department and the mass media acknowledged the threat of both chemical and biological weapons from the very beginning of Operation Desert Shield.

In the chemical arena, each soldier deployed to the region was issued four types of medical protection against chemical warfare agents. All four are products of the Medical Chemical Defense Research Program, with significant basic research conducted at the US Army Medical Research Institute of Chemical Defense (USAMRICD) at Aberdeen Proving Ground, and with product development and fielding supported by the US Army Medical Materiel Development Activity (USAMMDA) at Fort Detrick.

Pyridostigmine, a drug used safely and effectively for years to treat nerve disorders such as myasthenia gravis, was identified in the mid-1980s as an effective pretreatment for nerve agent exposure. When taken in advance, the pretreatment enhances the effectiveness of the antidote drugs in the event of exposure.

The Mark I nerve agent antidote kit consists of two autoinjectors, one containing atropine, a drug that interrupts the activity of chemical nerve agents, and a second that contains pralidoxime chloride, a drug that restores normal nerve function. The USAMRICD and USAMMDA played key roles in the early 1980s in the selection of drugs, the packaging of the kit, development of doctrine for its use and technological improvements to it, which are in development.

A third drug, diazepam, more commonly known by its trade name Valium, has been identified as an effective antidote for convulsions resulting from nerve agent poisoning. Although it was already available in medical channels, diazepam has now been issued in autoinjectors to individual soldiers, with training on how and when to use it and strict accountability to prevent inappropriate use.

A fourth chemical defense product is the skin decontamination kit. Army scientists took the skin decon kit that was in the field and came up with a better, user-friendly item that is easier to carry and quicker and easier to use. Its composition, a non-toxic mixture of ion exchange and charcoal based resins, is another important improvement.

Vaccines act as pretreatments, stimulating the body's defenses against possible future exposure to infectious diseases. The average length of time for development of a safe, effective and approved vaccine is 15 years. The US Army Medical Research Institute of Infectious Diseases (USAMRIID) has developed and established the safety and effectiveness of several vaccines for biological defense, and the USAMRDC has managed compliance with all civilian regulatory agencies involved.

The Command also maintains contacts in the pharmaceutical industry, so that accelerated production, which is no easy task, is nonetheless possible in a contingency situation. The USAMRDC, as the lead agency for the accelerated production of vaccines for biological defense in Operation Desert Shield and Desert Storm, resolved several challenging contractual issues as part of the effort. Production, delivery and administration of these vaccines proceeded on schedule.

Post-exposure treatment with therapeutic drugs is another line of defense. The Command contracted for the purchase of antibiotics and other drugs to protect soldiers from both naturally occurring and potential biological warfare threat agents. Ribavirin, an antiviral, was tested in clinical trials in Korea and the Peoples Republic of China by investigators at USAMRIID. It was purchased in both liquid and tablet forms to prevent and treat a life-threatening viral hemorrhagic fever illness that occurs naturally in Southwest Asia.

Another drug, Centoxin, a human monoclonal antibody, protects against severe bacterial infections and shock. Investigators at WRAIR participated in an extensive clinical trial in multiple medical centers which showed this treatment can be life-saving. This drug was distributed to medical facilities in the theater of operations for the treatment of bacterial infections following combat wounds or burns. Fortunately, the extremely low incidence of combat wounds in Operation Desert Storm resulted in little requirement for the use of Centoxin, but future combat zones may indicate considerably more use.

An essential element of casualty management and disease control is accurate and speedy diagnosis. The USAMRIID has developed highly specific, easy-to-perform laboratory tests for several infectious diseases found in the Middle East. These tests were used in Army and Navy laboratories in Saudi Arabia, Egypt and Europe to define the disease risks and provide valuable information to allow clinicians to use the most appropriate medical treatments. Six laboratory teams received training and diagnostic supplies and equipment at USAMRIID before deploying to provide medical laboratory support.

Many regulatory issues surfaced in the effort to field vaccines and drugs for biological and chemical defense. The USAMRDC's Human Use Review and Regulatory Affairs Office maintained constant communication with the US Food and Drug Administration during Operation Desert Shield to insure compliance with all drug regulatory standards.

The US Army Medical Research Acquisition Activity (USAMRAA) absorbed a surge of purchasing and contracting workload in direct support of Operation Desert Shield/Storm. The vast majority of the purchasing and contracting actions for medical materiel shipped to the overseas theater, amounting to approximately 65% of a normal annual workload, were above and beyond the normal mission of the unit. Items purchased included antibiotics and vaccines for biologic defense, skin decontamination kits, chemical agent antidotes, hospital equipment, medical supplies, laser protective aviation spectacles and ballistic laser protective spectacles for soldiers.

Field Medical Equipment

Three pieces of field medical equipment developed at the US Army Biomedical Research and Development Laboratory (USABRDL) were used in Southwest Asia.

The far-forward surgical table with accessories is designed for use by the special forces and forward surgical teams. The table uses a standard field litter as the operating platform, and is packaged with accessories including surgical lighting, IV poles, armboard and instrument tray. It can be assembled by one person in five minutes, without tools, and weighs 85lb.

A portable surgical scrub sink was also used. This too was designed to be lightweight and portable. A collapsible, anodized aluminum frame supports a waterproof fabric basin, and a foot pedal operated switch and valve assembly controls water flow from pressurized and nonpressurized sources and temperature through an electric heater. The sink is half the weight volume of the existing field surgical scrub sink.

In a high-tech age, we sometimes overlook the simple things. The USABRDL has also developed a new field litter. Instead of wooden poles and canvas fabric, the new one is made entirely of polypropylene, and is easier to decontaminate than the wood and canvas model. A similar item, a wheeled litter carrier, for transporting patients and heavy pieces of equipment, was also used in Southwest Asia. It is lightweight, rugged, stable and foldable to reduce storage volume.

Dental researchers at the US Army Institute of Dental Research (USAIDR) developed a miniature x-ray system which was used in Operation Desert Storm. With a total weight of 25lb, the suitcase-sized system can be used for dental x-rays or to view limb fractures. It is battery-powered, and can be recharged from alternating current or from vehicle batteries. A filmless imaging subsystem produces a Polaroid-type self-developing picture.

In Saudi Arabia, ticks and sandflies are capable of spreading disease. An improved, extended duration version of the Army's standard bug repellant, Deet, developed by the USAMRDC, was used by soldiers in the desert. The new repellant smells better, feels more comfortable on the skin and works for 12 hours per application. Insect repellant can also be processed into the battle dress uniform fabric with a kit issued to individual soldiers. The basic laboratory research for the arthropod repellant was conducted at another of the Command's laboratories, the Letterman Army Institute of Research (LAIR), and the product development process was coordinated by USAMMDA.

A similar involvement by these two units, as well as many other Army organizations, occurred in the development and fielding of the ballistic-laser protective spectacles, which protect soldier's eyes from low intensity laser beams used as target designators and range finders. The USAMRDC contributed laser bioeffects research and optical correction inserts. These spectacles were valuable in the desert for their protection of the eyes from wind-blown sand and dust.

Deployable Teams

Another major contribution to Operation Desert Storm was the teams who went or were ready to go to the theater of operations to provide specialized assistance. Expertise possessed by the command was readily available to the CENTCOM Surgeon. Teams for environmental medicine, aviation medicine, dental casualty assessment, and various infectious disease research teams were ready for rapid deployment.

Special immunization teams accompanied shipments of biological defense vaccines to the theater of operations. They were responsible for insuring proper handling of the vaccines in the medical logistics system and for advising and assisting medical personnel who helped administer the vaccines to up to 10,000 soldiers per day.

Teams were dispatched to Southwest Asia to assess morale and other aspects of the psychological well-being of deployed soldiers in September and December. The Division of Neuropsychiatry, WRAIR, has long studied the psychological and psychiatric effects of deployment, the anticipation of combat, the combat experience and the return to peacetime duty or civilian life. These teams visited deployed units to survey soldiers individually and in small groups to identify causes of stress and possible ways to minimize stress.

They reported that morale was, in general, high in September and higher in December. Combat unit members were perceived to care for, trust and respect each other. Combat service support units were observed to be very proud of their enormous output of labor. Access to telephones and mail from home were seen as the biggest morale boosters. However, problems of family separation caused by the deployment had the most negative impact. The "maturation" of the theater led to improved unit living areas, increased amenities such as showers, and the sense of the unit area as "home."

A work/sleep cycle evaluation team accompanied combat aviation units into Iraq to measure sleep quantity and quality and to advise commanders on avoiding performance decrements due to sleep loss.

(cont'd on page 12)

US Army Medical Research and Development Command in Support of Desert Shield/Storm

(cont'd from page 15)

The short-term result of these efforts is to make recommendations to the leadership to minimize stress-related performance deterioration. In the longer term, the researchers analyze available data about the deployment, publish these insights and integrate new knowledge into Army doctrine.

Casualty Data Assessment Teams interviewed almost two-thirds of all wounded-in-action soldiers after their evacuation to military hospitals in Germany. For many of these patients, the bedside interview with the team member was the first opportunity to talk at length about the events surrounding the injury. Casualty data assessment leads to analysis of the entire casualty picture of the conflict. Many soldiers wounded in combat vehicles provided the vehicle identification number. Potentially, other agencies could locate and evaluate the damaged vehicles, and associate the type of wound with the damage sustained by the vehicle. This information might lead to improved safety features in combat vehicles.

Three burn care teams deployed to Saudi Arabia from the US Army Institute of Surgical Research (the "Army Burn Unit"). One team deployed to King Khalid Military City where it treated coalition forces, civilians and enemy prisoners of war. A second team set up in Riyadh to treat US headquarters forces. The third team deployed later to Dharan, just in time to treat victims of the barracks scud attack.

The USAMRICD teaches the Medical Management of Chemical Casualties Course, which trains active duty and reserve doctors, nurses and corpsmen in techniques for dealing with chemical casualties. The instructors were on the road beginning in August, training active and reserve units preparing to deploy. A team was in Saudi Arabia for most of the operation, working with medical units on the ground and at sea. An important accomplishment was the building of soldier confidence in the ability to manage a chemical attack. The education removed some of the mystery surrounding the chemical threat and emphasized survivability through proper use of protective equipment, doctrine and medical countermeasures.

After returning soldiers were heartily thanked for a job well done, one of the most important jobs of the research and development community began — the application of lessons learned. The Army Medical Department will take new steps forward in its ability to protect and sustain the force. That progress will be fully supported by "Research for the Soldier." ●