

XM294 and M291

— new detection and decontamination devices

By Dr. Peggy-Lynn Prescott

The US Army Chemical Corps is fielding two new items of equipment: The XM294 chemical agent detector kit that includes a T-2 toxin detection capability and the M291 skin decon kit (SDK) for individual decontamination.

To fight and win under NBC conditions requires an application of the three fundamentals of NBC defense at all levels of command. Those three fundamentals are avoidance, protection, and decontamination. We now have new equipment to provide better NBC defense capabilities: the new T-2 toxin detector for detection and identification and the new M291 SDK for basic soldier skills decontamination.

NBC weapons are among the most hazardous on the battlefield. The doctrine of many potential enemies calls for their wartime employment of NBC weapons. In order to deter an enemy from exercising this option, US forces must be continuously prepared to fight and win under NBC conditions. The newly fielded equipment will aid this goal by providing our force with an improved capability to identify and avoid hazards and decrease hazard levels.

Let's take a closer look at these two new pieces of equipment by addressing their properties, capabilities, and use. Since the first and most important tenet of NBC defense is avoidance, and detection is one of its most important elements, we'll start by introducing you to the T-2 toxin detector that has been added to the

M256A1 kit. The nomenclature, with the addition of the T-2 toxin kit, is the Detector Kit, Chemical Agent: T2 Toxin, XM294.

XM294 Chemical Agent Detector Kit

The current M256A1 chemical agent detector kit detects and identifies dangerous concentrations of toxic chemical agents in vapor and liquid form. This detector kit, adopted in December 1985, increased the sensitivity for nerve agent vapors by a factor of 10 for nerve agent GB and a factor of 5 for nerve agent VX. The kit consists of 12 vapor sampler/detectors, one booklet (25 sheets) of M8 detector paper, and instruction cards within a small (7 by 5 by 3 inches) plastic carrying case. The kit case and its contents are expendable.

Nerve (V and G), blood (hydrogen cyanide [AC] and cyanogen chloride [CK]), and blister (mustard [H], Lewisite [L], and phosgene oxime [CK]) agent vapors are all detected and classified by exposure of a single agent vapor sampler/detector, which provides a colorimetric response indicating the specific agent that is present. The agent

vapor sampler/detectors are individually packaged in vacuum-sealed plastic/foil-laminated envelopes; they consist of two vacuum-formed polyethylene sheets containing three test spots, premeasured chemical reagents in frangible glass ampoules, a chemical heater pad, and a reagent crayon and marking pad to test for Lewisite. Liquid nerve and



Soldier takes surface sample with the T-2 toxin kit from the XM294 chemical agent detector kit.



Soldier decontaminates hands using the M291 Skin Decon Kit.

blister agent contamination on exposed surfaces is detected and identified with the M8 chemical agent detector paper.

The XM294 chemical agent detector kit will add a detection capability for T-2 toxin contamination on surfaces by means of a rapid immunochemical test and a surface sampling device. The detection capability of the kit for blood, blister, and nerve agents is unaffected by this addition, as the agent vapor sampler/detectors and the T-2 toxin detector tickets are individually packaged within the kit.

Most reported deaths associated with T-2 poisoning have been in the Soviet Union; the latest reported outbreaks in 1959. However, other countries have been affected as late as 1960.

Open Soviet scientific literature suggests that the Soviets **have** intensively studied this toxin and are able to reproduce it in laboratories through biosynthesis.

Most reported attacks in Laos and Afghanistan occurred between 1976 and the early 1980's. T-2 toxin was disseminated primarily with captured US 2.75-inch rockets with a specially adapted warhead that fit loosely on

the base. [See page 30, bottom, for more on T-2 toxin. — Editor]

During this same time frame (1976 to the early 1980's), the Soviet Union was importing grain (wheat in particular) from the United States and other countries. This was due, reportedly, to widespread crop failures.

The new T-2 kits will be housed within the current M256A1 case: eight T-2 toxin detectors and eight surface samplers per case. The NSN is due to be issued within 2nd Quarter FY 91.

The surface sampling device is a disposable, self-contained device consisting of a felt swab and a frangible glass ampoule. The ampoule contains a ten percent methanol/water solution, within a plastic holder that functions as a drop-wise dispenser.

The detector for the immunochemical test is a single-use, disposable ticket consisting of two test spots affixed to a polypropylene plastic support. The sample spot and smaller readout spot fold over a vacuum strip which protects the spot. The hole or well on the top side of the polypropylene support (that covers the sample spot) is where the sample is applied.

The soldier, wearing protective mask and gloves, uses the surface sampler to wipe approximately 400 square centimeters (approximately 1 square foot) of a surface suspected of being contaminated. He then places this sample on the detector sample test spot. After applying the required drops from the detector portion, the soldier waits 5 minutes for a possible color change. A danger condition is indicated by appearance of any green color on the small test spot. Operating instructions for the new kit are shown on pages 7 and 8 of the instruction cards that comes with the XM294 Kit.

There is also a new training kit forthcoming, the simulator, detection tickets, chemical agent; T2 toxin, training (TRAINS), XM294. This is the training simulator for the XM294 chemical agent detector kit. The new trainer includes two training simulators for the T-2 toxin test. Each training simulator is pre-engineered to provide either a positive or a negative indication of the presence of T-2 toxin. For training realism, the XM294 TRAINS will make use of the same surface sampling device as the XM294 chemical agent detector kit.

The contents of the XM294 TRAINS are: a carrying box, with handle; 36 training samplers in a protective bag; 12 training T-2 toxin detectors in a protective bag; and 12 surface samplers in a clear protective bag.

You must adhere to the following safety precautions when using the T-2 toxin detector in the XM294 TRAINS kit. The samplers and T-2 toxin detectors are for *training only*. *Do not use them for actual chemical agents or T-2 toxin testing.* **You must wear your protective mask and gloves when using the kit. If the sampler is damaged or becomes wet, do not use.**

The XM294 is suitable for carry and use by soldiers engaged in combat, combat support, and combat service support activities. It is operated by unit personnel who have

received training in its use. The kit provides information on residual vapor and liquid chemical agent contamination. This information will identify hazards and improve the combat effectiveness of troops engaged in chemical conflicts by assisting field commanders in decisions regarding reductions in protective posture, the need for decontamination procedures, and the selection of proper therapeutic measures.

M291 Skin Decon Kit

A soldier operating in a contaminated environment must be able to decontaminate both skin and individual equipment (gloves, mask, hood, boots, helmet, weapon, and LCE). The M258A1 personal decontaminating kit, fielded in 1981, currently provides a skin decon capability. The soldier's ability to decon his individual equipment was still limited, so in 1987, the M280 decon kit, individual equipment (DKIE) was fielded. However, the DKIE had various problems, the most significant being interference with the chemical agent monitor (CAM). In November 1989, we adopted the M291 skin decon kit (SDK) which is now being fielded in FY 91. The kit is to be used for both skin and individual equipment decontamination.

Decon aids in minimizing chemical weapons' effects by restoring individual and/or unit combat potential under NBC conditions. The M291 skin decon kit removes/absorbs chemical agents found on the skin. NBC defense directs and supports our ability to take countermeasures to avoid or reduce the hazard. Reduction takes place in the form of decontamination to prevent transfer or spread of the hazard. When chemical and toxic agents get on bare skin, you have an emergency. Some of these agents kill if they remain on the skin for longer than a minute. The best technique for removing these agents is to use the M258A1 or M291 skin decon kit. Since the M291 is the

newest member of decon equipment line, we will address the characteristics and purpose of the kit.

The M291 SDK consists of a wallet-like carrying pouch containing six individual decon packets. Each packet contains an applicator filled with decon powder. The same kit can be used for both actual combat and for training purposes. Each soldier will carry two M291 SDKs. The NSN for the M291 SDK is 4230-01-276-1905, which identifies a box containing 20 kits.

The purpose of the M291 SDK is to allow you to completely decontaminate your skin through physical removal and absorption of toxic liquid chemical agent, with no long-term effects. Two kits provide soldiers with the capability to do one personal wipedown and



SSG Charles L. Halliday demonstrates correct stance (top) for decontaminating the face. In order to more clearly show the procedure, we have removed SSG Halliday's mask (bottom) and drawn lines on the face to indicate correct zig-zag motion to use.

one individual equipment decon.

The kit can be stored over a wide range of temperatures: -60 degrees F

(-51 degrees C) to 160 degrees F (71 degrees C). Each packet weighs only 1.6 ounces and can be operated in

temperatures ranging from -50 degrees F (-46 degrees C) to 120 degrees F (49 degrees C). The M291 SDK is expendable and the carrying pouch is to be discarded after all packets are used.

Keep the following safety precautions in mind while performing individual decon procedures using the M291 SDK. The kit is for external use only. It may be slightly irritating to skin or eyes. You should keep the powder out of eyes, cuts, and wounds. However, following the individual decon process, it does not matter how long the black decon powder stays on your skin. You can remove the powder with soap and water when operational conditions permit.

The instructional packages for the T-2 toxin detector and the M291 SDK are currently being approved for implementation in our courses at the

Chemical School. Further, information on these two new items of equipment will be distributed in our Tactical Trainer's Notes during the 2nd Quarter FY 91. If you need further information, give us a call: AUTOVON 865-4070/3748 or commercial (205) 848-4070/3748.

The XM294 chemical agent detector kit and the M291 skin decon kit improve our forces' NBC defense capabilities. Improved detection capabilities will provide a more accurate feedback on battlefield hazards. Lightweight individual decontamination kits are easily stored and are effective in the decontamination of chemical agents. These enhancements in our NBC defense materiel capabilities will have a positive impact on our soldiers' preparedness for operations under NBC conditions.

In summary, with the worldwide proliferation of chemical weapons, improvements in our detection and decontamination capability will enhance our ability to warn, protect, conserve, and preserve the fighting potential of the force.

The photos on pages 28 and 29 were taken by Dr. Prescott. — Editor

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History of a Powerful Killer

US forces have good reason to need a detection device for T-2 toxin. T-2 or trichothecene is a fungal poison and has been prevalent throughout history as a powerful killer. Purified T-2 toxin may occur as colorless crystals or as a clear to yellowish oil. Dissemination of trichothecenes is likely to be in powder or smoke aerosol form or as large, liquid drops as a ground contaminant. (They have sometimes been called "yellow rain.") These toxins enter the body by absorption through the skin and eyes, inhalation (aerosols), or ingestion in contaminated food or water.

Throughout the Dark Ages, fungal poisons plagued man causing widespread death. "They called the different symptoms holy fire, occult fire, Saint Anthony's fire or Saint Vitus dance."

However, these fungal poisons had a variety of symptoms. The first recorded symptoms that resemble T-2 occurred in 1891 in eastern Siberia. It is presumed that several outbreaks of this "staggering disease" occurred, possibly every year since that time, but due to the disruption of Russian society and World War I, it was unnoticed until the 1930s. Five districts were hit with this "disease" in the 1930's. Once World War II began, again Soviet agricul-

ture was disrupted. "It hit hardest, because of certain favorable environmental conditions, in the Orenburg district—an area the size of Czechoslovakia—where 10% of the population of roughly 300,000 died hideously."

Reported symptoms of Soviet citizens during World War II were similar to those apparent victims in Laos, Yemen, and Afghanistan.

"Soviet scientists began studying the disease intensively in the late 1930's—almost thirty years before fungal poisons attracted attention in America, England, or Japan."

Much research has been conducted to isolate the fungal poison. It has been determined that the fusarium fungus is primarily responsible for the outbreaks of poisoning. This fungus produces T-2 or trichothecene. The trichothecenes are a family of about 40 rapidly acting fungal toxins (mycotoxins). They are primarily isolated from molds of the genus *Fusarium* found on infected grain. Harvesting and extracting infected grain can produce large amounts of these toxins. But, there is no antidote or antitoxin available to combat T-2.

Reference: : *Yellow Rain*, Sterling Seagrave; M. Evans and Company, Inc.; New York, 1981.