



# Permethrin Factory – Treated Army Combat Uniforms

## Frequently Asked Questions and Answers

FACT SHEET 18-078-0317

### **What are the known health risks associated with wearing permethrin-treated garments/uniforms to me and my family?**

There are no known adverse health risks associated with wearing the permethrin factory-treated Army Combat Uniform (ACU Permethrin). Although there are potential health risks associated with permethrin that is NOT impregnated into clothing, these are uncommon and usually only occur when a permethrin product is used in a way not directed on the label. The factory treatment process used to impregnate permethrin on ACU's employs special binders that ensure that permethrin will stick to the uniform fabric quite tightly; therefore, contact with family members such as holding your child or infant, provides minimal opportunity for them to absorb permethrin from the treated uniform. As recently as 2009, the US Environmental Protection Agency (EPA) completed a human health risk assessment review for permethrin impregnated clothing. The risks to people wearing treated clothing, as well as people coming into contact with people wearing the clothing are below the EPA level of concern.

### **What if I am pregnant or nursing? Will wearing an ACU Permethrin harm my baby?**

Based on EPA's review of scientific studies, there is no evidence of reproductive or developmental effects to the mother and child following exposure to permethrin treated clothing. However, pregnant and nursing Soldiers, and Soldiers trying to get pregnant, are authorized to wear untreated uniforms prior to the wear of an untreated maternity uniform. Soldiers must see their Health Care Provider to obtain a medical profile exempting the wear of a factory or individually treated permethrin uniform.

### **Is the ACU Permethrin safe to wear around infants and children?**

Yes. Research confirms the safety of permethrin, even for use on children's clothing. Permethrin has been used in the United States as an EPA-approved product since 1979, after successfully completing a registration process that evaluated whether this chemical would have adverse effects on people or the environment. Permethrin is the only pesticide that is EPA-registered to treat clothing or garments. It has accumulated an excellent safety record applied as a repellent to clothing since the early 1990's. As regulated by the US Food and Drug Administration (FDA), permethrin is considered safe enough for use in lice shampoos and scabies skin preparations for children. In 2009, the EPA published human health risk assessments for permethrin, including an assessment of the special sensitivities of infants and children. This risk assessment investigated toddlers and youth wearing clothing treated with permethrin at the levels of fabric impregnation concentration of 0.52% weight of permethrin/weight of fabric (0.52% w/w) which is identical to the rate used for permethrin factory treatment of the ACU Permethrin. In all cases, EPA's evaluation found that permethrin-treated clothing meets the standard for safety as required by U.S. law.

### **Should people with hypersensitive skin or allergies be concerned with side effects resulting from exposure to Permethrin?**

The weight of evidence in the medical literature indicates that exposure to permethrin from wearing permethrin-impregnated uniforms at the recommended concentrations is unlikely to cause skin sensitization, skin irritation, or other skin effects in humans. An advantage of permethrin-impregnated uniforms is that the binder system used by the factory retains more permethrin in the fabric, resulting in Soldiers being exposed to a much lower level of permethrin touching the skin compared to field-treated uniforms. Although there may be itching, numbness, tingling, redness, or a rash associated with direct application to the skin or scalp from lotions, creams, solutions, and shampoos containing permethrin, these reactions are not expected to occur with the ACU Permethrin. A few hypersensitive persons may show signs of skin irritation which could be attributed to the permethrin or laundry detergent used to wash the uniform. Soldiers should consult with a health care professional if they have reactions that may be associated with wearing the ACU Permethrin.

### **What research supports the safety of permethrin in my ACU Permethrin?**

The safety testing of permethrin has been conducted almost continuously since the 1970s. The US Army Environmental Hygiene Agency (USAEHA), under a memorandum of understanding with the US Department of Agriculture (USDA), initiated safety testing of permethrin in 1975, not long after its initial introduction. In 2009, the EPA completed a human health and environmental risk assessment for permethrin and issued its risk management decision and tolerance reassessment. The EPA's review reassessed the potential adverse health effects resulting from wearing permethrin-treated uniforms. Based upon the best science and studies performed to date, the EPA determined that wearing or coming into contact with permethrin-treated uniforms are unlikely to cause adverse health effects.

## **Will permethrin leave the treated uniform and enter your skin? How harmful is that?**

Many substances that contact the skin's surface are absorbed to some extent, whether they are fabric finishes, cosmetics, sunscreens, or insect repellents. A number of studies that examine the dermal absorption potential of permethrin have been reviewed by the EPA. In general, these studies showed the absorption potential of permethrin is low (i.e. <5%). The factory process used to impregnate the uniform with permethrin binds the repellent so tightly to the fabric that only a miniscule amount of the repellent leaves the garment and is deposited on the skin. Any permethrin that is absorbed through the skin is rapidly changed to metabolites in the skin and liver and then rapidly excreted by the kidneys during urination. The presence of a measurable amount of these metabolites in blood or urine does not necessarily indicate the potential for adverse health effects. Although exposure to large amounts of permethrin has been associated with temporary symptoms of itching, burning, or numbness, these symptoms have not been reported from consumers wearing permethrin-treated clothing.

## **Does skin exposure to permethrin cause cancer?**

Permethrin underwent more than 15 years of testing and literally hundreds of toxicity studies before the EPA approved it for use as a fabric treatment. The EPA asked a group of independent experts to review the data and assess the cancer-causing potential of permethrin; this panel concluded that: "...based on all the data together ...the possibility of [cancer caused by permethrin] in man was extremely remote." The National Academy of Sciences also reviewed the data and stated: "...the subcommittee concludes that permethrin-impregnation of [Battle Dress Uniforms] is not a serious carcinogenic risk to field or non-field military personnel or to garment workers."

## **What are some of the threats Soldiers face by NOT wearing treated uniforms?**

Many vector-borne risks exist for service members who do not wear treated uniforms, both here in the US and overseas. While service members may not always be in a high risk environment for vector-borne illness or death, having our military members protected prior to entering these environments is critical to mission effectiveness and readiness, and is the right thing to do to safeguard the health of Soldiers from these risks. The risk of some mosquito- or tick-borne disease is present in nearly every US state. In contrast, the health risks associated with wearing your ACU Permethrin range from minimal to nonexistent. In 2012, a total of 5,674 cases of West Nile virus disease in people, including 286 deaths, were reported to CDC from 48 states (excluding Alaska and Hawaii). Tick-transmitted diseases are a threat as well, with nearly 30,000 cases confirmed in the US in 2009, with most of the cases reported from states in the Northeast and upper Midwest. This represents a steady increase from the approximately 12,000 cases reported in 1995. In addition to Lyme disease, Soldiers in the US can be exposed to other tick-borne bacterial diseases— human anaplasmosis, ehrlichiosis, rickettsiosis, babesiosis, and the viral disease Powassan encephalitis. Vaccines are not available against most of these diseases. The implementation of Personal Protective Measures (PPMs), such as the wearing of permethrin-treated clothing and use of insect repellent is the only defense.

## **What about common household pets? Will it hurt a cat to sleep on top of the ACU Permethrin, for instance? What if a puppy chews on it?**

While some permethrin products can be potentially hazardous to some pets, especially when not applied in accordance with the label, permethrin-treated clothing has not shown to cause any danger to household pets due to the factory process that binds the permethrin with the fabric. This process that binds the permethrin to the fabric only releases enough to repel/kill arthropods but does not release enough to cause danger to pets.

## **What are the advantages of permethrin factory-treated uniforms over individually treated uniforms?**

The ACU Permethrin eliminates the need for Soldiers to ever think about treating their uniforms. Factory treatment guarantees that a safe and effective amount of permethrin is precisely applied to your uniform. This improvement over field application techniques translates into better protection for every Soldier from arthropod bites and the diseases they may cause. Factory treatment also eliminates a potential risk of increased exposure by eliminating the need for Soldiers to apply liquid permethrin products. Because factory treatment binds permethrin so tightly to the fabric of the uniform, the Soldier who wears the ACU Permethrin will have protection from arthropod bites for the lifetime of the uniform.

## **Why is the Army issuing permethrin factory-treated ACU's?**

The Army is providing the best possible products available to enhance Force Health Protection and Readiness. The introduction of the ACU Permethrin will provide Soldier protection from insect- and tick-borne diseases, while in garrison and training environments throughout the world in non-combat situations. By providing the ACU Permethrin to all Soldiers, the guesswork as to who has and who does not have a permethrin-treated uniform is removed. Soldiers must be prepared to perform their duties at anytime and anywhere in response to field training, garrison environments such as working in the motor pool, and Disaster and National Response incidents in high risk vector-borne disease areas. The ACU Permethrin will ensure that Soldiers are protected from vector-borne diseases at all times. Most importantly, the decision to issue the ACU Permethrin to all Soldiers was made only after the factory treatment of uniforms was assessed for safety and repellency in the laboratory.

## **What proof exists that supports the effectiveness of permethrin-treated uniforms in preventing arthropod-borne disease?**

A 2008 civilian Lyme disease study in Connecticut concluded that use of protective (permethrin-impregnated) clothing is effective in preventing Lyme disease. In another civilian study reported in 2011, the effectiveness of permethrin-treated summer clothing in reducing tick bites and tick-borne pathogen transmission was clearly demonstrated. An additional civilian study conducted in 2010 showed that permethrin factory-treated clothing was very effective in preventing tick bites among North Carolina outdoor workers under field conditions.

A 1990 Army evaluation reported 97 percent fewer ticks on permethrin-impregnated uniforms than were found on untreated uniforms.

Prior to the 2002-2003 academic year, a few Cadets at the United States Military Academy would contract Lyme disease annually during field training exercises, even though they had been given the Individual Dynamic Absorption (IDA) kits to treat their uniforms with permethrin. Beginning in 2002, the Cadets were issued factory-treated uniforms, and in 2003 the number of cases of Lyme disease in Cadets dropped to zero.

## **How do I take care of my ACU Permethrin?**

Following factory treatment, the permethrin is so tightly bound to fabric fibers that the ACU Permethrin will provide effective protection from arthropod bites through 50 launderings, the estimated field life of the uniform. The ACU Permethrin can be put in the dryer or pressed without affecting the repellency. This uniform should not be dry-cleaned, however. Even a single dry cleaning will remove most, but not all of the permethrin, and significantly reduce the bite protection. Dry cleaning will also fade the ACU Permethrin and weaken the fiber strength, causing it to become unserviceable sooner. The labeling affixed to all garments, military and civilian, that are permethrin factory-treated, has the EPA instruction to launder separately.

## **What is permethrin, and how does it work?**

Permethrin is a man-made insecticide, developed in the 1970's, and is structurally similar to a naturally-occurring chemical called pyrethrum. Pyrethrum was initially derived from the crushed dried flowers of the daisy *Chrysanthemum*, and has been used to repel or kill insects for almost two centuries. Permethrin works as a contact insecticide, damaging the nervous system of insects and other arthropods which come in contact with it, leading to either their death or knockdown. Permethrin is effective against many species of crawling and flying insects, including mosquitoes, ticks, ants, chiggers, and flies. Ticks crawling across the ACU Permethrin will drop off before they are able to attach and feed. Mosquitoes and flies that land on the ACU Permethrin will quickly fall from the fabric and often die from the exposure to the permethrin treatment.

## **Will the ACU Permethrin have an odor?**

Permethrin is odorless and therefore the new uniforms won't have any smell. The factory treatment process results in a permethrin treatment that is invisible, odorless, and colorless. It will not change the feel of the uniform. The odors associated with field application techniques (the Individual Dynamic Absorption kit, aerosol can or 2 gallon sprayer methods), was the result of the solvent system used to treat the uniforms. The factory treatment process removes all solvents and odors associated with them prior to the uniforms being issued.

## **Can I retreat my ACU Permethrin with permethrin?**

The EPA strictly prohibits the retreatment of factory treated uniforms. The Army objective is to provide 90% bite protection out to at least 50 launderings; an objective easily met through factory treatment of the ACU Permethrin which demonstrates 99-100% bite protection out to 50 launderings (the expected lifetime of the uniform). Beyond this point, the uniform still provides bite protection, but not as much.

## **Will the ACU Permethrin eliminate the need for Soldiers to wear DEET and use other personal protection measures (PPM)?**

No. The key to preventing diseases transmitted by mosquitoes and ticks (such as West Nile virus and Lyme disease) is the simultaneous use of all elements of the DoD Insect Repellent System. Wearing permethrin-treated uniforms is a key component of this system. The DoD Insect Repellent System is a proven strategy used to prevent diseases transmitted by mosquitoes, flies, ticks, and other biting arthropods. It is implemented through the combined use of skin and clothing insect repellents and properly worn uniforms. In the field, Soldiers wearing the ACU Permethrin should continue to properly protect themselves against arthropod bites and diseases by wearing the uniform with sleeves rolled down, closing all openings in clothing that might let arthropods in, tucking pants into boots and undershirt into pants, and keeping the uniform loose. This is important because some insects, such as mosquitoes, can bite through fabric that is pulled tight against the skin. Apply a thin coat of DEET lotion to all areas of exposed skin. Wash and inspect your body for insects and their bites daily, or as often as the situation permits. Use the buddy system to check your clothing for ticks. Wash your uniform routinely to remove any pests and their eggs. Remember: only use approved PPM products within the Army's inventory.

## **What other groups of people use permethrin-treated clothing?**

The Army has used permethrin for over 20 years to treat Soldiers' uniforms, compiling an excellent safety record with Soldiers. The EPA, the National Academy of Sciences, the US Army Surgeon General, and the Commandant of the US Marine Corps have all approved permethrin treatment of clothing. Since March of 2007, the US Marine Corps has sold and issued only factory-treated Marine Corps Combat Utility Uniforms (MCCUU's). Permethrin is the only pesticide registered by the EPA to treat clothing for protection against biting insects, ticks and other arthropods. The Centers for Disease Control and Prevention (CDC), World Health Organization, American College of Family Physicians, and other national and international health organizations all advocate the use of permethrin-treated clothing as a method of preventing arthropod-borne disease. Permethrin is also widely available at sporting goods and outdoor retailers for treating civilian clothing and gear. Since 2003, well-known companies have marketed permethrin factory-treated outdoor gear and clothing. The ACU Permethrin is factory treated by some of the same companies that produce treated clothing for the civilian market.

## **Whom can I contact if I have any questions or concerns?**

Contact your local Preventive Medicine Service/Army Public Health Command Regional Support Staff. E-mail inquiries concerning the DoD Insect Repellent System and Personal Protective Measures to the DoD Pesticide Hotline at [usarmy.apg.medcom-phc.mbx.pesticide-hotline@mail.mil](mailto:usarmy.apg.medcom-phc.mbx.pesticide-hotline@mail.mil) or via commercial telephone 410-436-3773 / DSN 584-3773. Additional information is available from the DoD Armed Forces Pest Management Board (AFPMB) Website at [www.afpmg.org](http://www.afpmg.org). If the AFPMB website does not suffice to answer specific questions, contact the AFPMB, Contingency Liaison Officer by calling DSN 295-8312/7476 or commercial 301-295-8312; or by writing to AFPMB, ATTN: Contingency Liaison Officer, US Army Garrison-Forest Glen, Armed Forces Pest Management Board, 2460 Linden Lane, Bldg 172, Silver Spring, MD 20910.