Insect repellent you'll love to wear™

Technology Education Guide

insect shield®
repellent technology

What is Insect Shield?

Insect Shield is a revolutionary new defense in the battle against bugs. Insect Shield technology converts clothing and gear into long-lasting, effective and convenient insect protection.

Insect Shield uses a

man-made version of a natural repellent found in certain types of chrysanthemum flowers, like an African Daisy.

Which insects does Insect Shield repel?

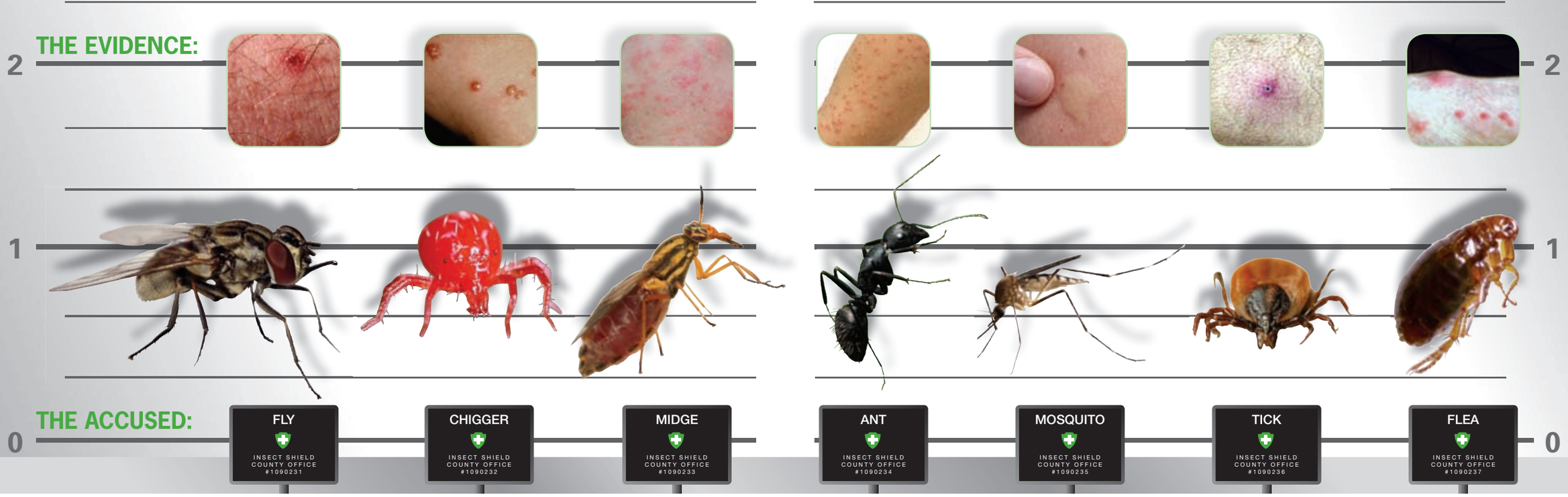
Insect Shield protects against a variety of bugs including those that can carry dangerous diseases such as malaria, West Nile virus, Lyme disease and dengue fever.

Insect Shield® Repellent Apparel is proven and registered to repel mosquitoes, ticks, ants, flies, chiggers, and midges (no-see-ums).

EPA Registration No. 74843-2

Insect Shield® Repellent Gear is proven and registered to repel mosquitoes, ticks, flies, and fleas.

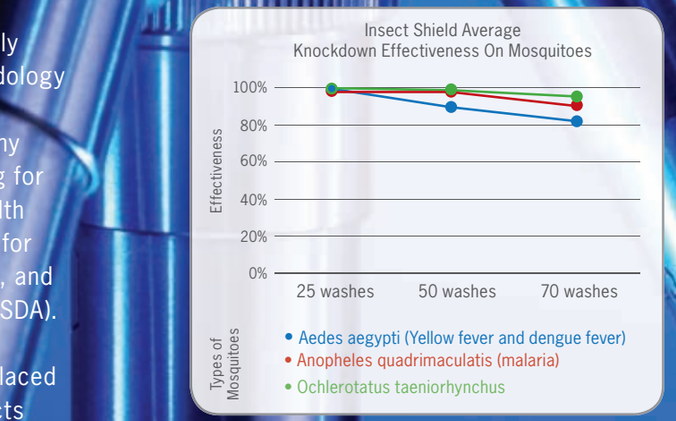
EPA Registration No. 82108-1-74843

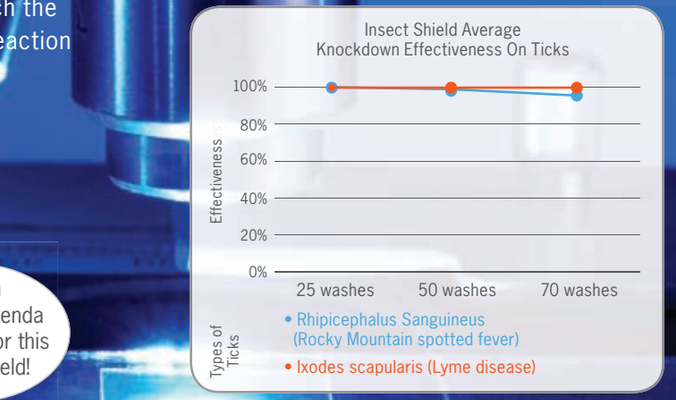


How well does Insect Shield work?

Knockdown Testing Overview
Knockdown, or "KD," testing is a widely accepted scientific laboratory methodology for determining the efficacy of insect repellent-treated textile products. Many recognized agencies utilize KD testing for this purpose, including the World Health Organization (WHO), the U.S. Centers for Disease Control and Prevention (CDC), and the U.S. Department of Agriculture (USDA).

A repellent-treated textile sample is placed in an enclosed space containing insects for a specified time period, after which the sample is removed and the insects' reaction is documented.





What do Knockdown results mean in the outdoors?

Research shows that permethrin-treated clothing that tested at 66% knockdown in the laboratory achieved 97% bite reduction in the field.
US Army/USDA Research Study

US Army/USDA Research Study Results

Published in the American Journal of Tropical Medicine & Hygiene

Title: *The Effectiveness of Permethrin... For Protection Against Aedes Taeniorhynchus*. (Schreck, Haile & Kline)

This field study is considered to be one of the most comprehensive conducted on permethrin-treated textiles.

How is Insect Shield keeping it green?

The Insect Shield process is designed to prevent loss of active ingredient outside the system.

Insect Shield is so tightly bonded

to fabric fibers that the apparel retains effective repellency through 70 launderings. The protection provided by Insect Shield gear lasts through six months of constant exposure to weathering (sun/rain). Compare this to insect-control methods that require fogging or spraying, and traditional topical repellents that last just a matter of hours and readily wash off in water.

What are the benefits of Insect Shield over other forms of protection?

Insect Shield has the benefit of being near your skin, instead of on it. Also, the repellency is long lasting, so no re-application is needed. This can help alleviate worries about overuse and misuse of repellents. Insect Shield doesn't leave behind empty containers either.

Is Insect Shield tested and proven?

The U.S. EPA issues a consumer labeling rating for each product it registers, and Insect Shield has been rated category IV—which is the most favorable rating.

Insect Shield Advantages:

- Requires no re-application
- Has no potential for over-use
- Cannot be swallowed
- Is not harmful to eyes
- Can be used by women who are pregnant or nursing
- Can be used by infants and children of any age

EPA Toxicity Categories for Consumer Labeling	
Category I	DANGER
Category II	WARNING
Category III	CAUTION
Category IV	NONE REQUIRED

The overall category is determined by the most severe route of exposure (i.e., oral, dermal, ocular, inhalation)

Product Name	Overall Toxicity Category
Bleach	I
Liquid Disinfectant Bowl Cleaner	I
Disinfectant Antibacterial Kitchen Cleaner	II
Mildew Remover	II
Insect Repellent, 23% DEET	II
Insect Repellent, 15% DEET	II
Insect-Repellent Clothing and Gear Spray, 0.5% permethrin	III
Disinfectant Daily Shower Cleaner	III
Military-Style Insect-Repellent Clothing Treatment, 0.5% permethrin	III
Insect Repellent for Kids, 7% DEET	III
Tick Repellent Spray, 0.5% permethrin	III
Insect Shield® Repellent Apparel	**IV**

Note: Similar sounding products with different EPA registration numbers may not be comparable in toxicity to those shown above.

How long will Insect Shield last?

Insect Shield is built right

into your clothes and lasts through 70 washings—the expected life of a garment. This is also well beyond the life of most performance fabric finishes. So wear Insect Shield clothing and use Insect Shield gear and enjoy convenient, long-lasting protection from bugs.

How does Insect Shield support global health?

Every year, millions of people around the world are affected by insect-borne diseases. The impact of these preventable diseases on families, communities and the economies of developing countries is tremendous. Insect Shield technology has the potential to be an important tool in the battle against insect-borne diseases and improve the health of people worldwide. Our technology can be used for apparel and many other items that people use daily, to aid in protection against insects.

Photo: World Concern

Insect Shield welcomes

opportunities to assist agencies and international relief organizations that work to protect at-risk populations from insect-borne diseases.

Contact us for more information about:

- Insect Shield uniform programs for relief and health workers
- Insect Shield vector-control tools such as kangas, blankets and covers

Who recommends Insect Shield?

"Cases of Lyme disease continue to increase each year and have more than doubled in the last 10 years...permethrin-treated clothing, such as Insect Shield, is one of the most convenient and effective methods of protection for the entire family."

— Kenneth R. Dardick, MD FACP
University of Connecticut School of Medicine, American Society of Tropical Medicine and Hygiene, International Society of Travel Medicine

"I've worn Insect Shield in some of the worst areas imaginable...Insect Shield allows me to work in areas that used to be impossible to tolerate."

— Gary Taylor, **Former Assistant Director** of Mosquito Control, State of Louisiana

"Insect Shield is effective, comfortable and convenient, and represents a remarkable breakthrough in tick protection and disease prevention."

— Thomas N. Mather, **Director**
University of Rhode Island, Tick Encounter Resource Center
www.tickencounter.org

"I spend 8 months of the year traveling and teaching ecology to undergraduate students. This past year, I chose Insect Shield for my insect protection shirt. In my travels, insects are not merely a nuisance, but can be life-threatening. The shirt went everywhere. It looked stylish and performed beyond my expectations – both in cities and extreme rural areas (living with Masai in Tanzania, researching organic cotton farms in central India, hiking in New Zealand, exploring Zapotec mountain communities in Mexico). It soon became indispensable and much envied. I'm signed up for another similar year and Insect Shield shall be part of my VERY limited packing list."

— J. Lee Jones, PhD
Boston, MA

The following international agencies recommend insect repellent apparel:

The U.S Dept. of Health & Human Services Centers For Disease Control and Prevention (CDC)
www.cdc.gov/travel

World Health Organization (WHO)
www.who.int

The American Academy of Family Physicians
www.familydoctor.org

The Public Health Agency of Canada
www.phac-aspc.gc.ca

All of these agencies urge anyone concerned about insect-borne disease to use permethrin-treated clothing (like Insect Shield) as a protective measure.

Within the last 10 years

the number of victims of Lyme disease has more than doubled, and according to a recent *New York Times* article, cases of West Nile virus are already four times what they were one year ago. Clearly, protection is needed and Insect Shield technology has many advantages.

Insect Shield apparel & gear questions and answers

Q: What is Insect Shield?

A: Insect Shield® Repellent Apparel and Insect Shield® Repellent Gear are revolutionary products designed to provide long-lasting, effective and convenient personal insect protection. The durable protection provided by Insect Shield apparel and gear is the result of years of research and testing. In July 2003, the U.S. Environmental Protection Agency granted registration of Insect Shield Insect Repellent Apparel—the first-ever, EPA-registered insect-repellent clothing.

In 2007, Insect Shield, LLC, introduced the Insect Shield® brand to launch its remarkable new, enhanced repellent apparel technology. The EPA granted Insect Shield extended durability claims for its apparel registration, through 70 washings. Seventy washings is nearly three times the longevity of the original EPA apparel registration at 25 washings. Insect Shield apparel and gear products combine the patent-pending Insect Shield process with a proprietary formulation of the insect repellent permethrin—resulting in effective, odorless insect protection that lasts the expected lifetime of a garment. We think of it as passive, personal protection.

Q: Is Insect Shield EPA-registered?

A: Following many years of extensive product testing, Insect Shield for apparel and gear has been successfully registered by the United States Environmental Protection Agency (EPA). It's the only repellent apparel registered by the EPA for protection through 70 launderings.

Q: What does EPA registration mean?

A: The EPA registration process is designed to evaluate a proposed product to ensure it will not have adverse effects on people or the environment. Insect Shield products have been rigorously evaluated on multiple levels—the chemistry, the application process and the final consumer product. The end result? Insect Shield received the first-ever EPA registrations for insect-repellent clothing and gear.

Q: How does Insect Shield compare according to the EPA?

A: The U.S. Environmental Protection Agency (EPA) issues a consumer labeling category rating for each product registered. Insect Shield has been rated a category IV by the EPA, which is the most favorable rating issued. (see chart on page 10)

Q: Are warning labels required on Insect Shield products?

A: No. During the registration process, the EPA issues a consumer labeling rating for each product. Insect Shield has been rated a category IV product by the EPA—which is the most favorable rating issued. No warning labels are required on category IV products.

Q: Can Insect Shield® Repellent Apparel and Gear be used by children, infants and pregnant women?

A: Yes. Use of Insect Shield products by children of all ages, and pregnant women, is consistent with the EPA registrations of both Insect Shield apparel and gear.

Q: Which insects does Insect Shield repel?

A: Insect Shield® Repellent Apparel has been proven and registered to repel mosquitoes, ticks, ants, flies, chiggers, and midges (no-see-ums). Insect Shield® Repellent Gear has been proven and registered to repel mosquitoes, ticks, fleas, and flies. The EPA requires extensive effectiveness data to prove a product's ability to repel insects. Many species and varieties of these insects have been tested, including many that can carry dangerous diseases.

Q: How much protection is provided by Insect Shield® Repellent Apparel?

A: A small item of Insect Shield clothing provides less repellency than a larger one. You may need to adjust the amount of Insect Shield apparel you wear, depending on the number of biting insects that are present. For example, you might prefer to wear pants instead of shorts in certain situations; long sleeves instead of short; or add a hat and socks. Topical repellent can be used for exposed skin, and is especially recommended for heavily-infested locations.

Q: Does the product have an odor?

A: No. Insect Shield protection is invisible, odorless and colorless, and does not change the feel of the garment.

Q: How long will Insect Shield protection last?

A: The repellency of Insect Shield apparel is EPA-registered to last through 70 launderings—the expected lifetime of a garment. This is also well beyond the life of most performance fabric finishes commonly used in the technical-apparel industry. Insect Shield gear repellency remains effective through 6 months of exposure to weathering, or through 25 launderings for washable items. Insect Shield products also have a long shelf life. Insect Shield-treated garments stored for ten years have shown no loss of repellent effectiveness.

Sampling of Applied Performance Treatments for Apparel

Durability (Number of Washes)	10	20	30	40	50	60	70
Water/Stain Resistance	●	●					
Moisture Wicking	●	●	●				
UV Block	●	●	●				
Odor Resistance	●	●					
Insect Shield	●	●	●	●	●	●	●

Q: What are the benefits of Insect Shield vs. other forms of insect protection?

A: Insect Shield® Repellent Apparel puts insect repellency near your skin, instead of on it, and the protection is odorless and invisible. Also, the repellency is long lasting, so no re-application is needed, which is convenient and can help alleviate concerns about overuse and misuse of repellent.

Comparison of Insect Shield to Topical Repellents

Forms of Repellent	Odor	Re-application Required	Potential for Overuse	Dermal Absorption	Harmful If Swallowed	Keep Out of Reach of Children	Harmful to Eyes
DEET	●	●	●	●	●	●	●
Citronella	●	●		●	●	●	●
Picaridin	●	●	●	●	●	●	●
Lemon Eucalyptus	●	●	●	●	●	●	●
Insect Shield		N/A			N/A		

Q: How well does Insect Shield work?

A: Knockdown, or "KD," testing is a widely accepted scientific laboratory methodology for determining the efficacy of insect repellent-treated textile products. Many recognized agencies utilize KD testing for this purpose, including the World Health Organization (WHO), the U.S. Centers for Disease Control and Prevention (CDC), and the U.S. Department of Agriculture (USDA). One of the advantages of KD testing is that no human subjects are exposed to insects. A repellent-treated textile sample is placed in an enclosed space containing insects for a specified time period, after which the sample is removed and the insects' reaction is documented.

Average knockdown effectiveness of Insect Shield

Types of Mosquitoes	25 washes	50 washes	70 washes
Aedes aegypt	100.0%	90.2%	80.8%
Anopheles quadrimaculatis	99.3%	99.0%	92.2%
Ochlerotatus taeniorhynch	100.0%	99.5%	96.7%

Types of Ticks	25 washes	50 washes	70 washes
Rhipicephalus Sanguineus	100.0%	97.6%	95.8%
Ixodes scapularis	100.0%	100.0%	100.0%

Other Testing Methods

Two other methods used for measuring the efficacy of insect-repellent products are field testing and arm-in-cage testing.

Field Testing

Field testing can be used to measure the effectiveness of insect-repellent products; however, data is difficult to obtain. Some comprehensive field studies have been conducted such as the US Army/USDA Research Study referenced on page 7 of this guide.

Arm-in-Cage Testing

Use of a small, enclosed area does not replicate the behavior of mosquitoes in the outdoors. Additionally, in testing repellent-treated textile products, the cumulative benefit of the repellency may not be achieved, because only a small portion of a treated garment may be exposed, which does not measure the overall repellent effectiveness of that garment.

Q: Is Insect Shield responsible insect protection?

A: The patent-pending Insect Shield process is designed to prevent loss of active ingredient outside the system, and once applied, Insect Shield repellency is so tightly bound to fabric fibers that garments retain effective repellency through 70 launderings. Compare this to insect-control methods that require fogging or spraying, and traditional topical repellents that last just a matter of hours and readily wash off in water.

Q: Why does the Insect Shield label say "dispose of in trash after use?"

A: This indicates that Insect Shield products can be simply deposited in the trash and require no special disposal process. In the case of Insect Shield-treated apparel, the "after use" can last for years in the used clothing market since many people donate their clothing. Eventually, the repellency becomes exhausted through wearing and laundering.

Q: How do you care for Insect Shield products?

A: For items that can be washed, normal home laundering is recommended. Insect Shield® Repellent Apparel can be bleached, starched, pressed, etc., without effect on the repellent quality; however, it should not be dry-cleaned.

Q: Do Insect Shield products require special storage?

A: No. And the repellency has a long shelf life. Insect Shield-treated garments stored for ten years have shown no loss of repellent effectiveness.

Q: How can Insect Shield impact world health?

A: As reported by the U.S. Centers for Disease Control and Prevention (CDC) website, 41% percent of the world's population live in areas where malaria is transmitted. Each year, 350–500 million cases of malaria occur worldwide, and over one million people die—mostly young children in Africa. Additionally, *Newsweek International* raised awareness about the effect of global warming on insect-borne diseases, indicating that temperature increases can extend a mosquito species' range and result in a longer biting season. Insect Shield technology has the potential to greatly impact worldwide health by offering durable and effective solutions to people whose lives are threatened by insect-borne diseases.

Q: Who recommends permethrin-treated apparel?

The following international agencies recommend permethrin-treated apparel:

- The U.S. Centers for Disease Control and Prevention (CDC), www.cdc.gov/travel
- The World Health Organization (WHO), www.who.int
- The American Academy of Family Physicians, www.familydoctor.org
- The Public Health Agency of Canada, www.phac-aspc.gc.ca

Insect Shield represents a promising new approach to the longstanding problem of protection against both insects and the diseases they can carry. All of the above agencies actively encourage at-risk individuals to use permethrin-treated clothing as a protective measure against insect-borne diseases.

Q: How did permethrin originate, and how is it used?

A: Permethrin is a man-made version of a natural insect repellent found in certain chrysanthemum plants. It has been successfully used in the United States as an EPA-registered product since 1977, with an excellent safety record. Permethrin is used in lice shampoos for children, flea dips for dogs, and various other products, some of which are regulated by the FDA.

The Insect Shield process uses a proprietary formulation of permethrin in a patent-pending system, and the resulting repellency is so tightly bound to the fabric fibers of each garment that it lasts through 70 launderings.

The patent-pending process designed by our researchers specifically for creating Insect Shield products and the proprietary formulation that is used are quite different from permethrin-based technologies employed in other industries.

Q: How are permethrin-treated products being utilized to save lives?

A: As reported by the U.S. Centers for Disease Control and Prevention (CDC) website, 41% of the world's population live in areas where malaria is transmitted. Each year, 350–500 million cases of malaria occur worldwide, and over one million people die—mostly young children in Africa. Millions of permethrin-treated bed nets are being distributed globally via malaria control programs. Insect Shield-treated uniforms are now being utilized by numerous international relief organizations to help protect them in areas prone to insect-borne diseases. Research is also being done on the impact of future alternative Insect Shield products.

Q: Why can't the products be dry-cleaned?

A: Dry cleaning removes some of the active ingredient—which reduces the insect repellent quality of the apparel.

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To see all the brands utilizing Insect Shield technology, go to insectshield.com

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