



# Sanitized<sup>®</sup> vector and pest protection for textiles

# Mosquitos

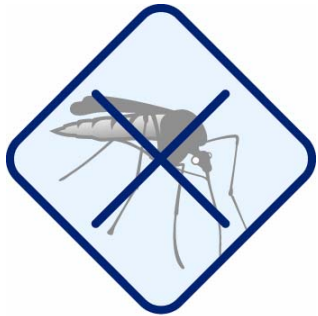
No thanks!



# Sanitized® AM 23-24

## Protects textiles from unwelcome guests

- › Reduces mosquito landings and bite
- › Protection from bedbugs
- › Tick protection
- › Carpet beetle protection



**NO VECTORS**



**NO BEDBUGS**





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# Why vector protection?

**"Most of the serious fever-related diseases in humans are triggered off by micro-organisms transmitted by insects."**

## **Encyclopedia Britannica**

Based on scientific estimates, at present one person out of six has been infected with insect-transmitted diseases. According to the information of US health control centres, from the 17th to the early 20th century, more cases of illness and death were caused by these than all other causes together.



## What are vectors?

Many people generally use the term insect not only for true six legged insects such as :

- › House flies
- › Beetles
- › Fleas or
- › Lice

But also for eight-legged insects such as:

- › Ticks and dust mites

Biologically, all these animals belong to the large group of arthropods.

Vectors = disease transmitting animals

# How do vectors transmit diseases?



**The transmission of a disease can take place in two ways:**

- › Vectors such as flies can carry on their legs a large number of microorganisms, which cause diseases (typhus, dysentery, cholera or trachoma, worldwide the most frequent cause of blindness) when exceeding a certain number.
- › The second possibility is that vectors spread bacteria, viruses or parasites by stinging or biting. In this way they transmit germs from an infected host into the body of the new host.

# Six-legged vectors and their transmittable diseases



Mosquitoes transmit malaria, dengue fever or yellow fever



Lice can transmit typhus



Fleas host encephalitis germs as well as agents of other diseases



Tsetse flies transmit sleeping sickness



Sand flies can transmit leishmaniasis





# Eight-legged vectors and their transmittable diseases



Ticks transmit lyme borreliosis



Bed bugs can be carrying plague and hepatitis B. Bedbugs are not regarded as a vector of transmissible diseases.

## Focusing on vectors

**Of all disease-transmitting insects, mosquitoes are the most dangerous.** Among mosquitoes the genus of Anopheles are the transmitter of malaria, which next to tuberculosis is the deadliest infectious disease in the world.

**In the temperate zones of Europe ticks transmit Lyme borreliosis.** Ticks can carry various pathogenic agents, which they are able to transmit with a single bite.





## Which mosquito species are of importance?

Worldwide there are over 3,500 species of mosquitoes. Many of them are "only" annoying.

Over 100 species, however, are possible vectors of diseases. The mosquitoes themselves are not causes of a disease. When they ingest the blood of an infected host they also take in disease-causing agents, which they can then pass on to a new host when they bite them.



Yellow-fever mosquito  
„Aedes aegypti“



Malaria-Mosquito  
„Anopheles gambiae“



Common mosquito of the  
nothern temperate zones of  
Europe and USA  
„Aedes vexans“



# What motivates the mosquito to bite?

## HUNGERY!

- › Mosquitoes live for only a few months. Only the females bite. They require extra protein for the maturing of their eggs and gaining energy. They bite until their hunger for blood is satisfied. Male mosquitoes require sugar as their nourishment, which they take from plants.
- › At warm temperatures (25-30°C) a female can seek a meal of blood every 2-4 days. It requires a "good" meal. If disturbed, the female bites its host and sucks blood again and again, until it has ingested the necessary volume.
- › After a good meal of blood, the female lays 50 to several hundred eggs, depending on its species.

# Where and when do mosquitoes bite?

- › The atmospheric humidity is vital to all mosquitoes and decisive for their biting activity.
- › The pattern of this activity depends on the species of the mosquito. It can bite around the clock – from early morning until late in the day and through the night.

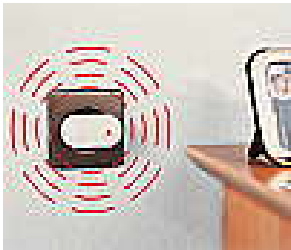


# How do mosquitoes choose their victims ?



- › Their sense of smell is even today not fully understood. It is not clear according to which **criteria** the female mosquito seeks its blood host. The gender or age of a person or whether he/she has eaten garlic seem not to be important.
- › The most important criteria is **body warmth**, exhaled CO<sub>2</sub> (carbon dioxide) in combination with a number of odor components such as perspiration or the urine of vertebrates.
- › Mosquitoes have a very fine **sense of smell**. Essentially, they have batteries of odor sensors on their antennae, the tips of the proboscis and on their legs.

# What types of anti-mosquito products are available?



Heavily-advertised "sonic devices" are useless, as they lie outside the hearing range of all mosquitoes.



Nets from local shops are in most cases not suitable for mosquitoes because they are too coarse-meshed. A further problem is lack of care of the net, because a female mosquito almost always finds the single hole it can slip through. Specialists therefore recommend bed nets which have been given a mosquito protection treatment.



There is also a considerable selection of mosquito repellent sprays available. The problem with these usually consists in often-inadequate prevention and the fact that the spraying protection becomes ineffective after a few hours!



## Mosquito protection on textiles as a supplement to spray?

The Sanitized® AM 23-24 offer a very good mosquito-repellent effect and can effectively implement the above-mentioned protective measures.

- › More convenient for (prevention-lazy) Western-hemisphere consumers!
- › As supplement to spray protection to increase safety in critical regions.
- › No irritations, also suitable for allergic persons. Active substance fixed on textile and not directly available on skin.
- › No repetition of treatment necessary.
- › Technical Supply Specifications TL 8305-0331 (BWB, for NATO army use)
- › Accepted by Oeko-Tex Standard 100, class I-IV
- › Dermatologically tested (DIN EN ISO 10993-5)





# What causes mosquito protection?

**The reason why some active ingredients work and others do not, has not yet been definitely established by science. However, the active ingredient Permethrin applied on textiles has proved to be effective.**

- › Permethrin belongs to the group of pyrethroids. These are synthetically produced compounds which are structurally derived from the natural pyrethrins but exhibit a higher stability than these.
- › Two types of pyrethroids are differentiated. Permethrin is a Type 1-pyrethroid, whose chemical name is 3-phenoxybenzyl-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropane carboxylate.
- › The mixture ratio of the cis- to the transisomers of the permethrin approved in Europe is 25:75. The molar weight is 391.3.
- › Like all pyrethroids, permethrin is strongly lipophilic and is not soluble in water but very soluble in organic solvents. The active substance can be in the form of a crystalline substance or as a brown liquid.



# What effect does mosquito protection have?

From a scientific view, the following statements are considered to represent the most probable effects:



“The odours of host organisms are the most important sensory stimulants permitting blood-sucking insects to localize and select their hosts. Synthetic repellents against *Aedes* mosquitoes work by confusing their sensory stimulation, not by blockage of their receptors for host odours or by general pharmacological effects on the sensory system of mosquitoes. As a consequence, the mosquito does not find the landing path to the protected host and thus seeks another one.”

Prof. Dr. Jürgen Boeckh, Institute of Zoology, University of Regensburg, Germany



“The molecules of the active ingredient block the pores of the moisture-sensing hairs of the mosquito's antennae, which prevents the flying female from detecting the host, even after being stimulated by the exhaled CO<sub>2</sub> (carbon dioxide). The female mosquito is thus not "repelled" but simply prevented from landing on the host to seek its meal of blood.”

Prof. Dr. Hans Briegel, Zoological Institute, University of Zurich, mosquito researcher for over 40 years, former head of the Mosquito Research Laboratory of the University of Zurich.



# Sanitized® AM 23-24

## Proof of effectiveness – Military application

**Technical Supply Specifications TL 8305-0331  
(BWB, for NATO army use):**

**(Excerpt from specification document, without claim to completeness;  
for further details see full Technical Supply Specifications document)**

The textile fabric which has been given the vector protection treatment and the textile garments made from it must be permanently effective against all blood-sucking arthropods (vectors). The protection effect must also be intact after 100 washings. Current approved bioactive ingredient: Permethrin, isomer cis:trans ratio 25:75

### **Requirements:**

- › Content of bioactive ingredient: 1300 +/- 300 mg Permethrin/m<sup>2</sup> textile fabric.
- › After 10 washings, decrease of active ingredient max. 30% related to initial value.
- › After 100 washings the test specimens must still exhibit a content of  $\geq$  200 mg/m<sup>2</sup>.
- › Washing method: DIN EN ISO 6330 – 2A (60°C, standard cycle).
- › Washing machine Type A

**Effect tested by SANITIZED AG by HPLC analysis.**

# Swiss Tropical Institute (STI)



**Foundation:** 1943

**Mission:** Contribute to the improvement of the health of peoples internationally and nationally through research, services and teaching / training.

**Services:** Swiss Centre for international Health  
Centre of Competence for tropical diseases  
National diagnostic and vaccination Centre

**Teaching and Research:** Medical Parasitology, infection biology, public health and epidemiology



**Swiss Tropical Institute**  
**Institut Tropical Suisse**  
**Schweizerisches Tropeninstitut**  

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**Médecine & Diagnostique**

# Tested at Swiss Tropical Institute (STI)



## Method

- › The mosquitoes were kept in a 30 x 30 x 30cm cage made from metal frame covered with mosquito-gauze. A glass bowl with a diameter of 12cm was filled with water of a temperature of  $40 + 1^{\circ}\text{C}$  and covered up with the test-tissue. The cage with the mosquitoes was placed over the glass bowl in a way that the gauze of the bottom made contact with the warm test-tissue, the warmth having the function of an attractant for the mosquitoes.
- › The number of mosquitoes settling on the warm test-tissue was counted after 1, 2 and 20 minutes and compared with the numbers found using an untreated tissue as a control.

## Mosquitoes

- › 200 Yellow fever mosquitoes, *Aedes aegypti*, males and females.



# Sanitized® AM 23-24

## Mosquito test procedure

1. Prepare mosquitoes



2. Prepare source of heat with textile protected



3. Position mosquitoes above source of heat with textile specimen



# Textile specimen treated with Sanitized® AM 23-24



Test with yellow-fever mosquitoes „Aedes aegypti“

protected



unprotected





# Textile specimen treated with Sanitized<sup>®</sup> AM 23-24



Test with malaria mosquitoes „Anopheles gambiae“

protected



unprotected





# Sanitized® AM 23-24



## Mosquito protection confirmed!



Swiss Tropical Institute  
Institut Tropical Suisse  
Schweizerisches Tropeninstitut  
Médicine & Diagnostique

Test fabric	Mosquitoes on woven fabric after:		
	1 min.	2 min.	20 min.
2 % Sanitized® AM 23-24	0	0	0
Control	ca. 25	ca. 30	ca. 20

### Final conclusion:

The comparison of the treated textile specimens with the untreated specimens confirms a very good mosquito repellence with Sanitized® AM 23-24.

# STI "Certificate"



Swiss Tropical Institute  
 Institut Tropical Suisse  
 Schweizerisches Tropeninstitut  
 Medizin & Diagnostik

Dr. Werner Rudin

Customer Organisation  
 Attn. Contact  
 Address, Street, No  
 ZIP code, city, country

Basel, Date

**REDUCTION OF INSECT LANDINGS ON TREATED TEXTILES**  
 According to STI-Norm MV-02

**Samples**

1. % Substrate, LISA-No. XY 10 red
2. % Substrate, LISA-No. XY 11 Red
3. Control sample, untreated

Sample Ref. No. XY 10 red
<b>Reduction in %</b>
Sample Ref. No. XY 11 red
<b>Reduction in %</b>
Control sample, untreated

> 70 % very good effect  
 50-69 % good effect

Treated textiles show, compared to untreated, a significant reduction in the number of landings and bites of vectors like mosquitoes, a s

Sample Ref. No. XY 10 red <b>Reduction in %</b>	<b>85%</b>	Very good effect
Sample Ref. No. XY 11 red <b>Reduction in %</b>	<b>90%</b>	Very good effect
Control sample, untreated	<b>0%</b>	Weak – no effect

> 70 % very good effect  
 50-69 % good effect

40-49 % sufficient effect  
 0-39 % weak - no effect

SWISS TROPICAL INSTITUTE

PD Dr. Werner Rudin

# BIOGENTS AG



## **Foundation:** 2002

BioGents is an official spin-off from the Institute of Zoology at the University of Regensburg in Bavaria, Germany. In 2002, BioGents was established as a Limited Company.

## **Mission:**

Focusing on blood-sucking disease vectors and household pests, we perform studies in the screening, development, improvement, and evaluation of host and oviposition attractants, pheromones, repellents, and treated fabrics. Objectivity and confidentiality is guaranteed.

## **Services:**

In addition, BioGents offers access to an international network of the experts, researchers, producers and marketing companies in fields of entomology and pest control.

# Testing at Biogents



Method:

The mosquitoes were kept in a 41x41x16 cm cage made from metal frame covered with glass.

Mosquitoes

Yellow fever mosquitoes, *Aedes aegypti*, 30 males and 30 females.

Cage tests of repellent-treated textiles:

Cage tests are the quick way determine the mosquito-repelling qualities of treated textiles. The tests follow the acknowledged protocol for cage tests of repellents. For such a test, volunteers cover a defined area of their forearms with the textiles and then present it to hungry mosquitoes in cage.

Basic for this test was the draft of a guideline of the US Environmental Protection Agency (EPA)



# Textile specimen treated with Sanitized<sup>®</sup> AM 23-24 mosquito protection

Test with malaria mosquitoes: „Anopheles gambiae“

protected



unprotected



# Sanitized<sup>®</sup> AM 23-24



Mosquito protection confirmed!

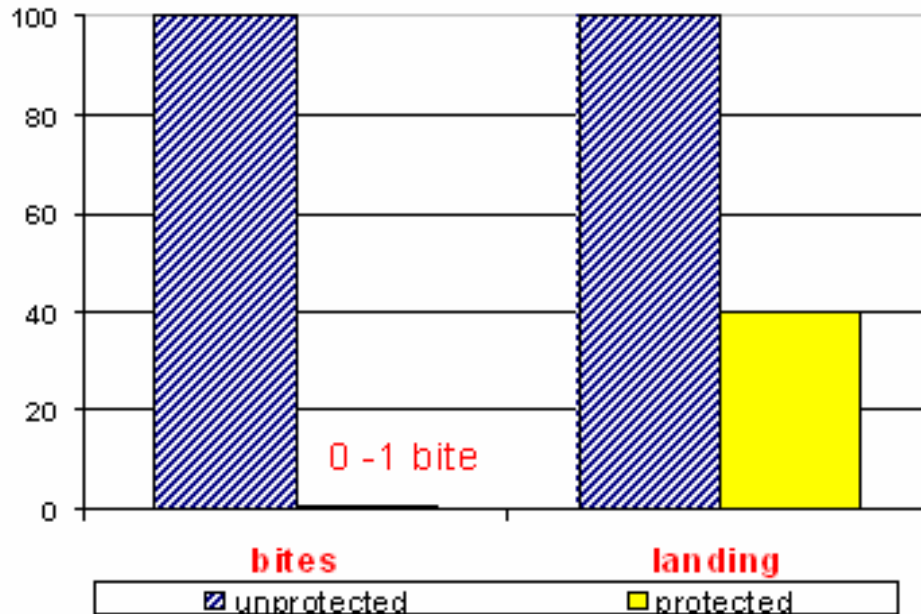
Test fabric	Mosquitoes bites after:
	2 min.
2 % Sanitized <sup>®</sup> AM 23-24	Landing/Bites Ø 48 / 0-1
Control untreated 10 Bites in ø 28 seconds.	

## Final conclusion

The comparison of the treated textile specimens with the untreated specimens confirms a very good mosquito repellence with Sanitized<sup>®</sup> AM 23-24. Despite noted landings an excellent protection against bites exists.



# Tested by Biogents



## Final conclusion

Textiles protected by Sanitized<sup>®</sup> AM 23-24 showed a high reduction of mosquito landings compared to unprotected textiles. In the conducted tests, non of the mosquitoes succeeded in biting.



## What are the main differences between these two testing methods?

Both institutes have confirmed that even if mosquitoes were landing an excellent protection against bites were still existing.



Swiss Tropical Institute  
Institut Tropical Suisse  
Schweizerisches Tropeninstitut  
Médecine & Diagnostique



### Method from STI

- › This method measures a situation after a specific time (2 or 5 min.). How many mosquitoes are settling on the sample.

### Method from Biogen

- › This method measures the number of landings and bites during a period of two minutes.





**What can we do for you?**