

THE PROPERTIES OF X-STATIC® IN SOLE DEFENSE® FOOTWEAR

The antimicrobial performance of X-Static has been validated by prestigious institutions throughout the world. In addition to independent laboratory and field tests, X-Static was the focus of numerous medical abstracts published over the past several years. A synopsis of these studies has been included in this document—all show that X-Static provides unparalleled antibacterial performance. Several studies prove that when someone wears an X-Static product, the fiber is so effective that sweat actually becomes antimicrobial. When you compare X-Static to other antimicrobial products, there are several distinct performance advantages:

- **Speed:** X-Static eliminates 99.9% of bacteria in less than one hour of exposure. (Most antimicrobial products test over 48 hours and still do not reach this level of effectiveness.)
- **Catalysts:** The hotter and wetter the environment, the more effective X-Static becomes. This is perfect, because bacteria are more prevalent in these environments.
- **Safe and Natural:** X-Static is made with pure silver, a naturally occurring element. There are no chemicals and there is no fear of toxicity for the consumer. Silver is one of the safest and most benign substances to mammals. (The use of chemical antimicrobial products has been clouded by fears of harmful side effects.)
- **Permanent:** X-Static is not a surface treatment. Silver is irreversibly bound to a polymer so it becomes a physical part of the fiber. X-Static is permanent and performance does not diminish over time. In fact, X-Static has been tested for more than 250 washes with virtually no reduction in antibacterial performance.

ANTI-ODOR PERFORMANCE

Antimicrobial is not always synonymous with anti-odor. X-Static offers both antimicrobial and anti-odor performance.

Bacteria are only one cause of body odor. Ammonia and denatured proteins are also significant contributors to odor in apparel and hosiery products. Incredibly, both ammonia and denatured proteins bind most readily to silver. Because silver is on the outside of the fiber, X-Static allows for immediate binding with ammonia and denatured proteins — resulting in instant odor reduction.

HEAT TRANSFER

The biophysics of clothing has become an area of significant interest in recent years. It represents the marriage of physiology, physics, textile science and clothing design. The specific area of thermal performance has been the primary focus of this burgeoning area of study. Given the proper materials and constructions, it is now possible to use the existing energy of the body and the environment to actively regulate temperature through heat transfer. Because of the inherent properties of silver, X-Static is perfectly suited to this task.

Body heat is transferred by four basic mechanisms:

1. **Radiation:** the primary heat transfer mechanism in cold weather, contributing to approximately 90% of body heat loss. (In warm weather, heat loss due to radiation will be very low or none.) In order to increase body temperature in cold weather, it is critical to actively use the radiative energy generated by the body. The most efficient means of using this energy is to reflect it back to its source and/or to store it.
2. **Conduction:** the primary heat transfer mechanism in warm weather (because radiation contributes to little or no heat transfer). In order to transfer heat and reduce body temperature, it is necessary to actively move, or conduct, heat from the skin to the outside environment.
3. **Evaporation:** the change of a liquid into a gas. When the body can't dissipate enough heat through conduction or convection, it will use evaporation, the result of which is sweat. Evaporation is active in warm and cold weather, depending on activity levels. In order to remain comfortable, the moisture generated by the body must be transported efficiently away from the skin.
4. **Convection:** the movement of heat between a solid and a liquid or gas. Convection is noticeable in cold and warm weather. For example, wind will cool your skin, making you more comfortable in hot weather and less comfortable in cold weather. Convective heat transfer can be discouraged or encouraged by using or not using insulation and wind barriers.

THERAPEUTIC

X-Static is used in several FDA approved medical devices for its therapeutic qualities. Examples include TENS units (electrical stimulation devices for pain relief) and diabetic foot care products. The mechanisms of action in these therapeutic devices are electrical and thermal conductivity. Using the foot as an example, many people claim to experience acupuncture-like effects when wearing X-Static footwear. Another common observation is the elimination or significant reduction of edema (swelling). People also claim that their feet do not feel as tired as they do without X-Static footwear. Today, X-Static is widely touted in Asia for its therapeutic effects in numerous products.

Why is there such a profound effect?

ELECTRICITY: The body consists of thousands and thousands of nerves that reach the surface of the skin. In fact, the bottom of the foot alone has more than 7,000 nerve endings. The body uses these nerves to transmit electrical signals, including the feeling of pain and discomfort. Because silver is the most conductive element, X-Static products will pick up the electrical charges on the surface of the skin and dissipate them (much like external triboelectric charges). The result is less discomfort.

MAGNETISM: Whenever electricity passes through a medium, a magnetic field is created. Therefore, when the electrical currents from the body are distributed throughout the X-Static fiber, a magnetic field is created around the body. Beyond the traditional belief in the benefits of magnetic therapy, many prestigious healthcare institutions have recently published studies defending the claim that magnetic products will increase blood flow and reduce swelling. It makes sense, then, that people wear X-Static footwear on long airplane trips so that their feet will not swell.