FS No. 026-1123

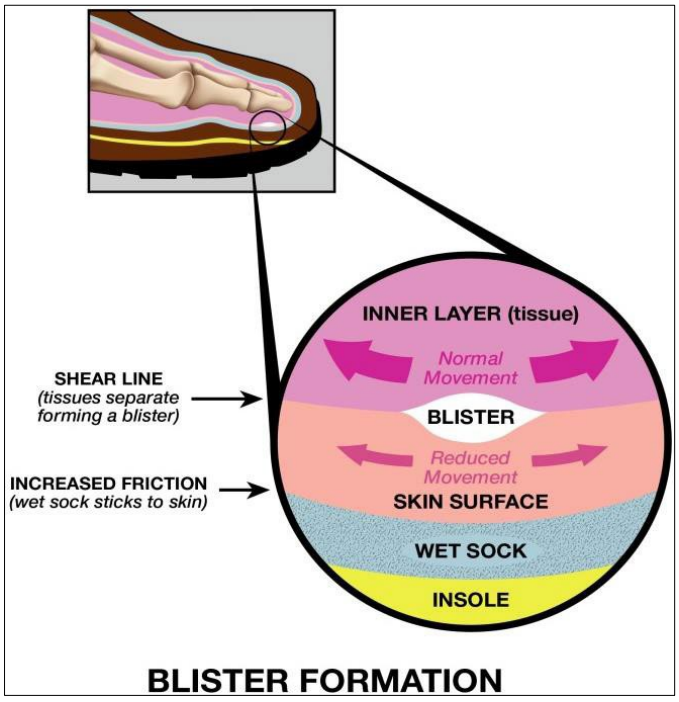
Injury Prevention: Blister Prevention

What are blisters?

Blisters are fluid-filled sacks of the skin caused by burns (e.g., heat, electrical, and chemical), cold injuries, insect bites, acute trauma (pressure), or repeated rubbing (friction) of the skin. Friction blisters are the most common type of blister and one of the most common injuries in the military. They typically form on toes, feet, and ankles but can also occur on the hands or other places where there is repeated rubbing, such as on the torso from the straps of a heavy backpack.

How are blisters caused?

Friction blisters result from repetitive divergent forces being applied to the skin (i.e., boot repeatedly rubbing an unprotected area of the foot), resulting in shear forces within the skin layer; these shear forces cause cell death between the outermost layer and underlying skin.[1] Cell death within this layer of the skin fills with serum-like fluid due to the hydrostatic pressure of the gap.[2]



Source: DCPH-A illustration

Why are blisters a concern for the U.S. Military?

Friction blisters impact a large number of U.S. Service members, with 33% reporting foot blisters during deployment[3] and 57% reporting foot blisters during basic military training.[4] Blisters often only cause minor discomfort; however, they can become severe enough to temporarily restrict a person's physical capacity during training and job duties. Basic military training recruits with blisters were 44–50% more likely to experience musculoskeletal injuries compared to recruits with no blisters, potentially due to gait alterations.[4] Additionally, blisters are an open wound, resulting in increased susceptibility to infection and serious medical complications.[5] As one of the most common injuries among Active-Duty military, blisters present a notable detriment to military readiness.

Source: DoD photo

What increases risk of blister injuries?

Activities such as marching and running are the most common causes of blisters in the military. Individual risk factors also appear to increase the likelihood and severity of a blister. The more risk factors you have, the higher your chance of developing a blister. Potential risk factors include:[6]

- Wearing non-moisture wicking socks (e.g., cotton)
- High skin moisture (e.g., wet feet)
- Improper shoe fit (e.g., boots too tight)
- Having no foot arch or flat feet

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How can blister injuries be prevented?

Various best practices for preventing blisters exist from both medical professionals and participants experience. Due to the complex nature of blisters (e.g., type, location, cause, and intensity), a combination of recommendations may be necessary to prevent blister formation. Soldiers may need to adopt a trial-and-error approach to find what solution or solutions work best for their specific anatomy, environment, and shoe choice.

Prevention Tactic	Description
SOCKS: Use synthetic moisture-wicking blends (no cotton)	• Moisture-wicking socks, made from acrylic, nylon, or polyester, that ventilate and wick moisture away from the feet can help prevent blisters.[4] • Frequent sock changes and double-layered socks may help prevent blister formation.[6]
ADAPTATION: Start slowly and build up to activity and equipment	• To help the skin become more resistant to blistering, the duration and intensity of blister-causing activities should be increased slowly over time. Also, use the same shoes, gloves, or load weight/shape as you increase activity.
SHOES: Ensure proper fit and maintenance	• Minimize direct contact between your foot and shoe to reduce the risk of blisters (i.e., shoe-sock-foot interfaces). Make sure toes do not touch the end of the shoe while walking and consider a wide-toe box with room for toes to wiggle. • Since feet may swell half a size throughout the day or after activity, strive to purchase shoes when feet are most swollen. • Additional best practice guidelines include ensuring proper shoe care to minimize rubbing. For example, do not leave shoes/boots on or near heaters, as this can cause them to shrink and seams to protrude. • Closed-cell neoprene insoles were found to reduce the incidence of blisters,[7] likely due to the insoles' absorption of shear force as opposed to the foot/skin.
TAPING AND SKIN COVERINGS: Specific products to stick with you for hours	• Taping products should be thin, adhere well, apply easily, and reduce friction points. Skin coverings, like 3M Micropore paper tape®, have been shown to reduce blister occurrence.[8] • Tapes like Dr. Scholl's Moleskin® and Zinc Oxide (or Kinesiology®) tape have been purported to reduce blister formation and severity. • Blister plasters, like Blist-O-Ban®, are efficacious in preventing blister formation,[9] but require greater preparation compared to taping methods.
ANTIPERSPIRANTS, CREAMS, AND POWDERS: Reduce friction with various coating products	• Antiperspirants that contain 20% aluminum chloride hexahydrate, most commonly used in over-the-counter products, significantly reduces blister formation.[10] Although this product has moderate reports of skin irritation,[10] a trial period using shorter events is warranted. • Powders, like 2Toms Blister Shield®, have been noted to reduce near-surface skin hydration,[11] potentially reducing the risk of blister formation. • Lubricating substances require routine reapplication to fully protect against blister formation. Within 1 hour, protective benefits return to normal with a subsequent increase of 35% over normal during the next 4–6 hours.[12] • Anti-chafe products, like Body Glide® or Squirrel's Nut Butter®, potentially provide a longer-lasting benefit to reduce the risk of blister formation. While many anecdotal reports suggest these products, no scientific literature has validated their efficacy or effectiveness.

Note: The mention of any non-federal entity and/or its products is for informational purposes only, and is not to be construed or interpreted, in any manner, as federal endorsement of that non-federal entity or its products.

Key Information Sources

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