Blisters
Causes, Prevention, Treatment

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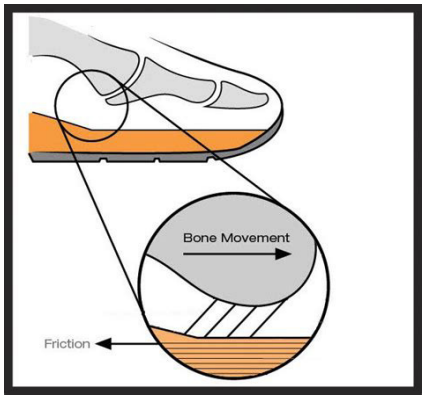
The information below is based on the presentation by Kyle Allred PA-C, at the National Conference on Wilderness Medicine Spring "2021" Information gathered, summarized and presented by: Keith Farrar

Blisters are caused by "Shear Stress."

Shear Stress is a strain in the structure of something when its layers are laterally shifted in relation to each other. In the case of blisters, the skin and bones are moving "out of sync."

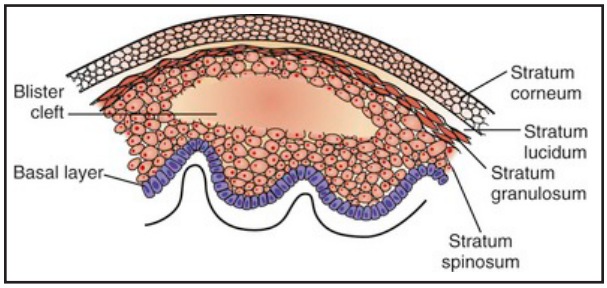
Contributers to "shear stress" include:
•Heat •Moisture •Rubbing •Friction



Above: The bones in our feet move, however the skin may be sticking to the sock or shoe, creating "shear stress."

Skin "stretching" is a more accurate way to think about blisters rather than "rubbing."

There are 26 bones in each foot, so there is a lot of movement between the soft tissue and the bones in our feet. The tissue of our feet need to be flexible but have tremendous strength to take on our body weight. Without excellent structural connection, our feet would fall apart!



The Stratum Spinosum layer of the Epidermis is most prone to blisters. Separation in that layer causes a blister cleft (separation), which fills with fluid. The layers above form the "blister roof."

Side Notes:
•For each mile walked, each foot steps 800+ times....The skin stretches 800+ times per mile!
•The more weight you carry (in your pack or on your body), the more risk for blisters due to an increase in pressure on the feet. The feet can be conditioned so ramp up distance and weight gradually.
•Moisture on the foot can lead to increased friction, which can cause blisters.

The Correct Fit - for your Boot / Shoe

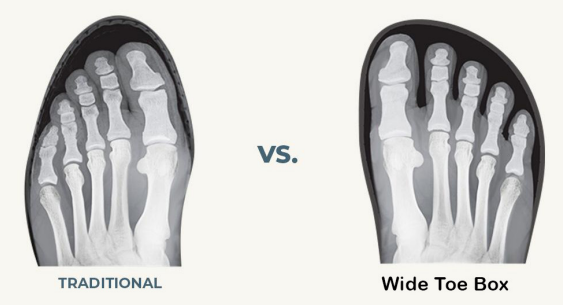
Look for a “happy medium” in shoe fit. You want to decrease movement, which can occur with a shoe that is too loose, without adding pressure, which can occur with a shoe that is too tight.

•Too tight, increases forces from the shoe to the foot, increasing the chance of blisters.
•Too loose, increases movement of the foot inside the shoe, increasing shear and causing blisters.

Goal: Decreased movement of the foot, without adding pressure, especially in blister prone areas.

Toe Box - Too tight of a toe box pushes toes together. Toes should be able to wiggle and breathe.

Also recommended is one full inch from the end of your longest toe to the end of your insole.



Other fitting tips:
•Because feet swell as the day goes on, try on hiking shoes/boots later in the day.
•Try on using the same socks you will be hiking with.
•Feet lengthen with age, so get your feet measured often.
•Try on for a decent amount of time, at least 20 minutes.

Orthotics:

Almost all shoes, even the most expensive hiking boots, come with poor insoles.

Orthotics help evenly distribute pressure. Unless you have specific foot issues, most people will benefit from “over the counter” type orthotics such as Superfeet, Powerstep or other well made orthotics. If you have specific foot injuries or issues, custom orthotics made by a podiatrist will be your best choice.

Additionally, a breakdown of your arch can cause blisters to form between the arch and heel, orthotics can alleviate this problem.

Two Sock Method:

For some people, the two sock method works well. Using a liner sock between the foot and the main sock can help reduce shear because the socks rub against each other as opposed to your foot rubbing directly against the main sock. If the two sock method works for you, try “Wright Socks” brand as they have the second layer built into the sock.

Moisture

Dry feet have less friction (shear). Moist, sweaty feet will cause friction to increase.

•Take frequent breaks to "air out" your feet and change your socks.
•"Moisture Wicking" socks do not get rid of moisture, however they can help because they more evenly distributing the moisture on your feet.
•Do not use skin lubricants with moisture wicking socks.
•Remove shoes and socks for river crossings (if not dangerous to do so).

Additional Tips:
•Keep your feet as clean as possible.
•Keep your socks clean and free of debris.
•Occasionally wash your socks inside out.
•Gaiters can help keep debris out of your shoes, which can cause abrasiveness.

•**Injinji** brand toe socks (pictured on the right) are extremely popular with runners as they help reduce toe blisters

More Blister Prevention:

Bad & Good

•Foot Antiperspirant - Studies have shown significant side effects such as a high likelihood of itching and rashes.
•Powders - Can reduce moisture but are known to "cake" into clumps, increasing abrasiveness and sheer. Powders also clog "moisture wicking" socks.
•Lubricants are not recommended because they dry out creating more friction. They can also attract dirt. Also, foot slide from a lubricated foot can cause injury.

•2-Toms blister shield is the only moisture related blister product shown to be effective.
•Shortening stride length can help reduce blisters.

Use a "targeted" approach to prevention:

Target the high friction areas prone to blisters and leave traction on the rest of the foot as is.
•Engo Patches - Applied to the dry shoe in blister prone areas to reduce friction, they have a teflon type slippery surface to reduce friction.
•Paper tape, Leuko tape or Hypafix (all discussed later) to cover blister prone areas of your foot.

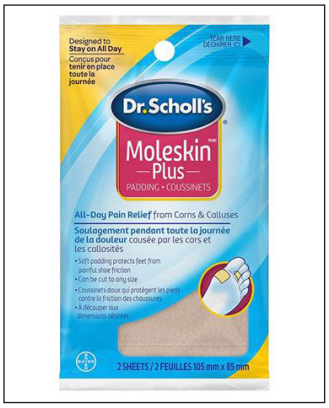
Treatment of Blisters

Hot Spots: Immediately cover any "hot spots" as they appear using products such as paper tape, Leuko Tape or Hypafix (preferable due to the thinness of the tape). Round the corners of the tape to reduce pressure on the edges. **<u>Do not use duct tape</u>** as it is very thick and tends to "bunch up" causing more friction and shear (see photo below).

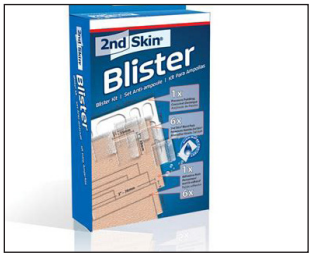
Intact Blister: Do not de-roof an intact blister. Use a sterilized safety pin to drain the fluid.

Use Moleskin (cut like a donut), to surround the blister (not on it), to create cushioning around the blister.

Orthopedic felt is an alternative to Moleskin



Ulcerated Blister (torn roof): Trim the skin to smooth out the area. Place a small amount of antibiotic ointment directly on the exposed skin.
Cover the blister with products such as 2nd skin or Blist-O-Ban. Both provide a very good cushion to protect the exposed area. For toes, use toe sleeves to cover the blister. Toe sleeves can also be used for hot spots on toes as well as to cover intact blisters on toes, as it is sometimes difficult to tape toes.



Your Blister Kit should include:
•Small Scissors •Safety Pin(s) •Moleskin •Engo Patches •Hypafix •Alcohol Pads
•Antibiotic Ointment •Blist-O-Ban •Benzoin Tincture (adhesive enhancer) •Toe Sleeves