

Blisters: Their Prevention & Care

by Paul Nicolazzo

Blisters are the bane of outdoor men and women everywhere. We are all familiar with them. The initial “hot spot” whose warning we often ignore and the subsequent burning pain, as fluid seeps between skin layers, that grabs our attention. Blisters seem to occur at random times, during any season, and with most activities...including skiing. Some people seem prone to them and others immune. Most occur on the victim’s feet. Significant blisters can derail a trip. Myths abound for prevention and treatment alike. In order to separate myth from truth, you must first understand the forces that create them.

Mechanism of Injury: Shear Forces

Shear forces are exerted horizontally between skin layers, between the skin and outer sock, between socks, and footwear as the victim walks, runs, skis, etc. When the force is strong enough to breakdown the resistance between two layers, sliding occurs. Sliding between the skin’s layers is responsible for “hot spots” and blisters. Sliding between the skin and socks, between multiple pair of socks, or between the outer sock and the footwear rarely causes blisters.

Micro damage within the skin can occur in a surprisingly short period of time when high shear forces are high; longer if the forces are smaller. If the sliding stops early enough, the damage will heal as a callus. If the sliding continues, damage increases, and a “hot spot” forms. Left untreated, most hot spots become blisters as the skin eventually delaminates and fluid leaks between the layers forming a “wet” blister. Surface abrasions may occur if sand or dirt is introduced between the skin and sock.

Prevention

Conceptually, prevention is threefold: 1) reduce general movement within the footwear system; 2) keep feet clean and dry; and, 3) reduce the peak shear forces between layers in the footwear system by deliberately creating a “weak” shear layer between the skin and sock, between multiple socks, or between the sock and footwear.

Reduce general movement:

- Choose well fitted footwear appropriate to the activity. Remember to size your boots with the socks you will be wearing; you may need a larger size boot.
- Make sure leather is well broken in.
- Gel footbeds or liners in both ski and climbing boots go a long way in achieving a perfect fit.

Keep feet clean and dry:

- Keep your feet, socks, and boots clean; wash them on a regular basis.
- Wear gaiters to help eliminate dirt, gravel, and snow from contaminating your system.
- Keep your feet dry. Wet skin increases the surface adhesion while reducing the shear resistance between skin layers. Plastic shells and vapor barrier socks often exacerbate the problem by trapping moisture next to the skin. Use synthetic socks next to your skin to wick excess moisture away from the surface and, if possible, air dry your feet on a regular basis. If you have consistently moist skin (and blisters), you need to change your socks more frequently, air your feet out so that they remain dryer, or use less insulated footwear. For some people, a spray-on antiperspirant aids in reducing sweat.

Deliberately create a weak shear layer within your footwear system:

- To create a weak shear layer between the skin and outer sock *where there is a history of blister formation*, paint the affected areas with tincture of Benzoin and cover with cloth tape. Duct or pipe tape (stronger, by far, than duct tape and available only at pipe supply stores) is okay if the adhesive doesn’t irritate your skin. You will only know after you try it. I prefer cloth tape. **CAUTION:** Benzoin may cause skin irritation.

- To create a *nonspecific* weak shear layer between multiple layers of socks, wear a pair of “slippery” liner socks and a heavier pair of shock-absorbing socks.
- To create a weak shear layer between multiple layers of socks or between the outer sock and footwear *where there is a history of blister formation*, use a ENGO™ patch. ENGO™ uses ENGO™ technology: a self-sticking PTFE¹ coated material originally designed for the prosthetics industry that reduces the shear forces between the victim’s skin and sock, between multiple socks, or between the outer sock and footwear. Apply a patch directly to your footwear under the affected area; make sure the footwear is clean or the patch will peel off after a few hours or days. Make sure the patch extends at least one centimeter beyond the edges of the affected area. Alternatively you can apply a patch to the inside of the outer shock-absorbing sock so that it rests against the outside of the liner sock *OR* apply it directly to the outside of a single sock. **DO NOT** apply ENGO™ directly to your skin; the adhesive is not designed for and will not adhere to skin. Properly applied, either patch should last for two to three weeks before requiring replacement. When attaching a to your footwear, you may use Super Glue™ to keep the edges from peeling over time. ENGO™ is available from our web store in four by six inch sheets or precut patches. Please go to www.wildmedcenter.com if you would like to purchase some.

Trouble shooting:

- Are you giving your skin enough time to toughen under a new activity before pushing hard? If not, take it easier or add shear protection.
- Is there a pattern to where the blisters appear (back of heels, instep, etc.)? If so, this is a potentially weak area and needs more time to toughen. Or you may need to start adding specific shear protection.
- Are the blisters related to a specific activity? If so, you may not be using the correct footwear or allowing enough time for your skin to toughen. Consider using specific shear protection.

Prevention Summary

- Wear well-fitted and appropriate footwear.
- Keep feet clean, cool, & dry.
- Use a blister (liner) sock & a heavier pair for shock- absorption and cushioning. Keep them clean.
- Wear gaiters to keep dirt, gravel, and snow out of socks and boots.
- Treat “hot spots” before they become a blister. Clean, dry, and cover affected area with cloth, duct, or pipe tape and/or add a ENGO™ patch to footwear or socks. Painting skin with Tincture of Benzoin prior to taping often increases adhesion. *REMEMBER THAT Benzoin may cause skin irritation in some people.*

Treatment

Blister treatment is a subject that is often controversial among outdoor people. Each seem to have their own “patented” method that works for them (and their friends). At the root of ALL of these differing methods is collagen. Collagen is the building block for skin and moisture is required for collagen production. If the lid of the blister is left in place the damaged area is kept moist and collagen production and healing follow. If the lid is removed, the damaged area must be kept moist or collagen will not form well and the area will heal slowly, probably with scarring. The problem, and the controversy, is that if a blister is left unbroken pressure builds between the skin layers causing pain and further delamination. If the blister is simply punctured with a needle and drained, in most cases it will refill within a few hours and you are back where you started. If you cut a hole big enough to allow continuous drainage, you risk tearing the lid off and damaging skin outside the blistered area. And all of this is exacerbated by continued use. At the risk of adding to the controversy (versus eliminating it), I’ve included my treatment recommendations below.

- *If you are already back at home:* consider leaving the blister alone. Wear comfortable footwear

that doesn't irritate the area; it should reabsorb and heal completely in 7-14 days.

- *To complete a day hike/ski:* drain the blister by nicking it with a clean knife blade or scalpel; leave skin cover intact. Pad with "donuts" of mole skin or mole foam to relieve pressure (and pain). Add a ENGO™ patch to footwear or socks. Alternatively, pass a sterile² needle and thread through the blister; leave a small section of thread on each side of the blister to act as a wick. Pad and protect as above.

- *To continue a multiple day hike/ski:* Remove skin over blister. Wash with soap and clean water. Remove all foreign debris by gentle scrubbing and/or by careful picking with a tweezers. Avoid vigorous scrubbing. Pat or air dry. To keep the exposed skin moist and promote collagen production: cover the exposed area with Second Skin™ or a petroleum based ointment and gauze. In addition to keeping the exposed blister moist, Second Skin™ adds padding that often reduces pain. Secure in place with porous cloth tape. Add a ENGO™ patch to footwear or socks. Consider using Tincture of Benzoin prior to taping. *AGAIN, REMEMBER THAT Benzoin may cause skin irritation in some people.*

1 PTFE is the generic chemical name for Teflon™

2 To sterilize the needle and thread boil for ten minutes (adding an extra minute for each 1000 feet in elevation) or soak in a 10% Povidone Iodine solution.