

# BLISTERS TREATMENT & PREVENTION: *A Fresh Approach*

WRITTEN BY REBECCA RUSHTON  
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**There is a deeply entrenched belief that friction blisters are burns caused by the shoe rubbing on the foot. It's an understandable assumption – but it's wrong. In fact, research shows we've known this for at least 40 years. As a result of this misunderstanding, rather than effective prevention, runners have often relied on blister treatment.**

**T**he answers to blister causation have been buried in academic research in the fields of diabetic foot disease, prosthetics literature and studies commissioned by the American and British military. But now these answers have been uncovered and pieced together in a way that is easy to understand and apply.

The research is clear – to understand what really causes blisters, you have to understand what friction is and how it works.

## What is friction?

Friction is the force that resists movement – it keeps surfaces stuck together.

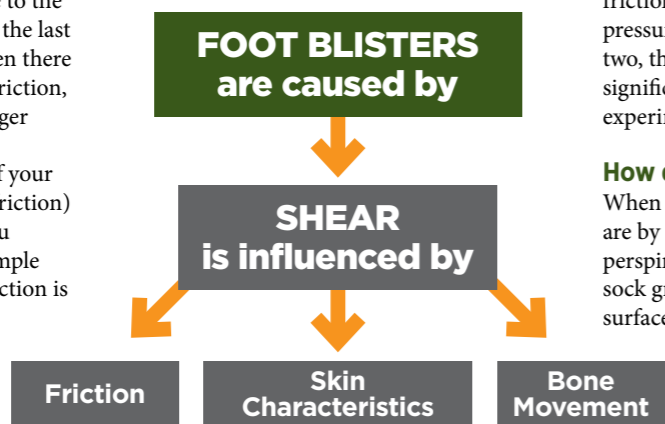
As an example, place the tip of your right index finger on the back of your left hand. Now wobble it back and forth but keep it stuck to the same bit of skin. Notice how your skin stretches? This is shear, and it's what causes blisters.

Shear might look like rubbing, but it's not. Notice how your fingertip has not moved relative to the skin of the back of your hand? But your hand skin has moved relative to the underlying bone. This is shear, and it's the last little bit of shear that is damaging, when there is maximum stretch. It all starts with friction, which is what keeps the tip of your finger stuck to the back of your hand.

Now put a drop of oil on the back of your hand (i.e. minimise the coefficient of friction) and repeat. Regardless of how hard you press, there is almost no shear. This simple experiment shows why minimising friction is the key to blister prevention.

## How can runners prevent blisters?

Blister prevention mostly revolves around friction, but also takes into account



## What's an interface?

It's where two surfaces meet. When we're wearing shoes and socks, we have two interfaces: the *skin-sock* interface; and the *shoe-sock* interface. Each interface has a friction level (a coefficient of friction).

bone movement and skin characteristics.

**Skin Characteristics:** The skin of our foot is susceptible to blister formation, particularly the plantar (sole) surface. That's because it's thicker and less mobile than other skin. Gradually adapting the skin to the rigours of the activity and terrain can be helpful; but in reality, this alone won't be enough for many runners. Furthermore, calluses are not protective of blisters – they are more likely to cause deeper blisters and blood blisters.

**Bone Movement:** As we run, the bones move around within the foot. In the presence of high friction, the more the bones move, the more excessive the shear. There are circumstances where this movement can be reduced to some degree by altering our biomechanics and form. Alternatively, you can change aspects of your activity (intensity/duration/terrain), though obviously this is often undesirable.

**Friction:** Our biggest opportunity for blister prevention involves minimising friction. Friction is the combination of both pressure and the *coefficient of friction*. Of the two, the coefficient of friction is the more significant factor (as you saw in the above experiment).

## How does reducing friction work?

When friction levels are high (which they are by default, but they increase further with perspiration), the skin grips the sock and the sock grips the shoe, which results in these surfaces remaining stuck together for longer. Meanwhile, as the bones move back and forth, internal tissue layers are made to stretch and distort (shear). If the structural connections that bind these layers are stretched too far, they

will tear. One to two hours later, fluid fills the injury site to create a blister.

By reducing friction at one of the interfaces, you are encouraging movement at that interface and an earlier glide between the two surfaces. By doing so, you allow the skin to move sooner so it is more in sync with the underlying bone (Richie, 2010).

Blister prevention strategies that reduce the coefficient of friction include:

**1) Skin-sock interface: Lubricants, powders, antiperspirants, tapes**

Movement occurs between the sock and skin. As long as friction remains low enough for long enough, there will be no skin damage.

**2) Shoe-sock interface: Footwear patches**

The sock protects the skin as movement occurs between the shoe and sock.

**3) Sock-sock interface: Double sock systems, toe-socks**

When friction is lowest between two sock layers, movement occurs at this interface.

## Blister treatment

Blister treatment is tricky. It rarely provides 100 per cent pain relief and requires ongoing intervention. What's more, if you've never had a blister, it doesn't mean you'll never have blister troubles. For one thing, blisters are a common consequence of changing your running in some way. The slight variations in terrain, gear, running form, weather conditions, duration and intensity that you're bound to experience mean blisters are always a possibility.

Below is a brief overview of how to deal with different types of blisters. To prevent the blister getting worse and speed healing, you'll need to reduce friction at all stages: that means minimising the coefficient of friction (using one of the methods mentioned above) and pressure (with a donut pad, orthotic or cushioning).

Treating blisters also requires preventing infection and further damage. This involves:

- Using antiseptic to kill any bacteria present
- Applying sterile dressing (individually packaged) to keep bacteria out
- Maintaining the blister roof – this is the best dressing for a blister, so if possible, leave it in place
- Using a sterile lancing implement such as a scalpel blade or needle (if lancing is appropriate)
- Cleaning the hands and feet – waterless antibacterial hand gel is convenient

## Hot-spot

According to Knapik et al (1995), a hot-spot is the feeling of heat accompanied by reddened skin. While you won't see the reddened skin while you're running, this feeling of heat is your cue. The hot-spot stage doesn't last long. If you wait until there's a stinging sensation, you're probably too late – a blister will form in 1-2 hours. So act immediately and you'll remain blister-free.

*“Successful foot blister treatment is all about controlling infection and minimising pain, neither of which is easy and both of which require you to have equipment on hand.”*

## Intact blister

We know the majority of blisters rupture if you put your shoes back on or just ignore it and hope for the best. So the least you can do is dress your blister so if it does rupture, it does so in a clean environment.

If your blister is large or particularly painful, or if you know it will burst, you could consider taking matters into your own hands. Lancing the blister so that the fluid will dispel as you continue running can be the better option, but you must have the right equipment with you.

*Tip: Dress your blister with a non-adherent dressing. Rather than taping straight over it, you need the blister itself to be in contact with an absorbent pad. If not, as you remove the dressing, the blister roof may peel off with your dressing – not good!*

## Torn blister

It's a good thing if the roof is still there. Even though it has torn, leave it in place. It will aid in healing and minimise pain. Because the blister roof is compromised, though, infection is a concern, so antiseptic and dressing is required.

## Deroofed blister

This is where the roof has sheared off and you're left with a red, raw sore. Following antiseptic, a “second skin” patch is a good dressing choice. The hydrocolloid material provides an environment that aids healing. As the wound weeps, it prevents the dressing from sticking to the blister bed and disrupting valuable healed tissue. It will get goeey, but rest assured this is a good healing environment. The frequency with which it should be changed depends on the degree of weeping.

## Blood blister

It pays to have a healthy respect for blood blisters, as they pose a heightened risk of infection. Blood blisters are an indication there has been deeper skin injury because of a higher concentration of pressure. Excess pressure ruptures capillaries, and this bleeding tracks into the blister.

If you want to be super-cautious about preventing a blood blister from becoming infected, you should leave it intact, stop running, take away pressure where possible, dress it in case it ruptures during the course of necessary walking, and give it time to resolve (somewhere between a few days to a week). This is the course of action John

Vonhof (American ultrarunner, race medic and author of *Fixing Your Feet*) takes at the ultras he provides medical support for.

If you insist on lancing a blood blister and carrying on, sterile equipment is a must, as is the ability to keep the site clean during the rest of the run. Over the next few days, you then need to monitor it for signs of infection, such as pus, a widening area of redness or red streaks extending up the leg (the latter suggests blood-borne infection and requires urgent medical attention).

## Conclusion

Successful foot blister treatment is all about controlling infection and minimising pain, neither of which is easy and both of which require you to have equipment on hand. That's not likely or possible in all situations, but you need to have a blister plan nonetheless – the most important component of which should be avoiding blisters with an effective preventative strategy. **FR**

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## ABOUT THE AUTHOR...



Rebecca Rushton is a Podiatrist with 20 years' experience who has her own practice in Esperance, Western Australia. Rebecca suffered with foot blisters for many years from walking, running and playing hockey, hence her special interest in this area. She manages the educational blister prevention website [www.blisterprevention.com.au](http://www.blisterprevention.com.au), a resource that increases athletes' and practitioners' understanding of blister causation and preventative options.