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### Blisters: The Enemy of The Feet

#### To the Editor:

We enjoyed the well-written recent Wilderness Medical Society practice guidelines for wound management,<sup>1</sup> but have concerns that the recommended preventions and treatment of friction blisters do not represent current best practice. Quinn et al<sup>1</sup> aptly describe friction foot blisters as ubiquitous. In addition to their referenced high incidence in civilian and military populations,<sup>1</sup> they have been reported as the cause of nearly 75% of medical visits during an ultramarathon<sup>2</sup> and recent rates in multi-stage ultramarathon participants have been reported as high as 76% to 100%.<sup>3,4</sup> Of those athletes who suffer from blisters, many complain of multiple blisters, most commonly located on the toes.<sup>3,4</sup> As anecdotally and in the literature blisters have been found to be the most likely factor to adversely affect ultramarathon performance,<sup>5</sup> we thought the subject matter warranted further discussion.

Blisters are formed by friction and shear stress on the epithelium that results in delamination of the stratum granulosum and spinosum. A cleft forms, that then fills with fluid, protected by a “roof” composed of the stratum corneum and granulosum. We agree with the authors of the wound management guidelines that there is scant evidence supporting blister preventive measures. However, they overlooked Blist-O-Ban (Seaberg Company Inc, Newport, OR), which has proven efficacy,<sup>6</sup> and also neglected to mention that 57% of the participants who used antiperspirant for blister prevention reported unpleasant skin irritation (vs 6% in the placebo group).<sup>7</sup> Although not available at the time of the practice guidelines’ publication, a recent study found that application of paper tape for blister prevention resulted in high user satisfaction (84% would use again), although no statistical significance was found and application appeared to increase the odds of blister occurrence in those with Injinji socks.<sup>4</sup>

Our major concern with the discussion about blisters is the treatment portion. There is no literature or expert opinion that denotes a size requirement for blister drainage. The reference quoted does not specify either “5 mm” as a threshold for trephination nor application of a quoted “donut-shaped pad (ie, moleskin).” The prospective trial found that multiple blister drainages in the first 24 hours led to the quickest healing vs no drainage (75% vs 16%),<sup>8</sup> but did not specify a size requirement or treatment regimen. Also, we disagree with the suggestion to cover the blister with petrolatum or antibacterial ointment, as Nacht et al<sup>9</sup> found that ointment applications resulted in a 30% to 40% increase of the coefficient of friction over baseline in the subsequent 4 to 6 hours. In the absence of quality evidence to support their recommendations, we regret that the authors did not instead turn to expert opinion on blister care such as that found in Dr Auerbach’s *Wilderness Medicine*.<sup>10</sup>

The pain from a blister is caused by pressure on an incompressible fluid between skin layers. If a blister does not hurt or is not in danger of spontaneous rupture, it should be left intact. The best protection for a blister is its own roof, so efforts should be taken to maintain this natural skin protection. If the blister is punctured with a needle and drained, it will often refill within a few hours. If a large hole is made that allows continuous fluid drainage, there is the risk of losing integrity of the blister and having the blister’s roof tear off, leaving a large painful area. The common recommendation is to use a safety pin to create an optimum sized hole. Clean the blister skin and safety pin with an alcohol pad. Puncture the blister with the prepared pin at a distal point allowing natural foot pressure to continually

squeeze out fluid. If more drainage is required, use several small holes rather than one large hole, limiting the risk of derroofing the blister. Blot out the expressed fluid and cover the now-flattened blister with paper tape that is cut to overlap the edge of the blister. This step protects the roof of the blister when the overlying tape is removed. Cover the paper tape with a benzoin-type adhesive, and as a final layer, apply shaped adhesive tape over the drained blister. Blisters that recur under intact tape can be drained with a prepared safety pin through the tape. If the blister is open, trim off the dead skin and consider applying a layer of the hydrocolloid Spenco 2nd Skin pads (Spenco Medical Corp, Waco, TX) over the exposed base, then finish as above.

We appreciate that space constraints in the wound management guidelines likely limited the extent of detail that could be applied to the subject of blisters. And as the Wilderness Medicine Society guidelines are a frequently referenced resource for individuals, outdoor programs, and industry standards, we hope these points on treatment and prevention of the “enemy of the feet” are constructive and well received.

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### Shark Attacks and Shark Diving

To the Editor:

It is with great astonishment and concern that I read the letter to the editor by Barreiros et al<sup>1</sup> in which the authors report an attack by a blue shark on a spear fisherman in the Azores. Whereas the first part of the article accurately details the circumstances of the accident, Barreiros et al, in the second part, devise a far-fetched and illegitimate connection with shark diving, in particular with shark feeding.

Shark-induced human injuries are among those interactions between humans and wildlife that arguably receive the most media and public attention. The general arguments of shark feeding critics are that 1) luring or feeding sharks over a period of time has the potential to condition them and that this conditioning could lead to sharks associating the presence of humans with food; and by insinuation, 2) make them aggressive toward humans. This in turn could lead to 3) an increase in accidents (eg, bites) at shark feeding sites when no food is provided. Concern also exists that 4) regular shark feeding at ecotourism sites may increase the risk of shark attacks on ocean users in surrounding areas.

The first argument is beyond scientific controversy. There is ample empiric evidence that elasmobranchs can be conditioned and are capable of learning to associate, for example, specific locations with food rewards.<sup>2</sup>