

SPECIAL FITNESS ISSUE: THE FOOT

Ward off blisters and warts ...

Skin and nails may be resilient but they're also vulnerable to fungus, friction and damage.

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Danger lurks: Public showers are hot spots for fungi that can cause athlete's foot. (Carlos Chavez / LAT)

SKIN and nails of the feet just don't get any respect. When researchers talk foot science, they lavish attention on bones, muscles, tendons and ligaments.

And when athletes trade stories in the locker room, they'll recount the finer points of a plantar fasciitis episode — but are far less likely to breathe a word about a wicked case of warts or toenail-crumbing fungus.

Embarrassment: That's forgivable. Taking the humble foot wrapping for granted: That would be nothing short of foolish.

Layers of resilient skin offer the first line of defense against infection-causing microscopic nasties, and thick nail armor protects toes' most vulnerable parts from bashing and bruising.

Well-exercised feet endure more abuse than the typical couch-potato foot, meaning that trauma, fungi and viruses are more likely to present problems. Ignore them and you run the risk of their getting painfully out of control and keeping you on the sidelines.

Luckily, prevention and treatment for most athletic skin ailments is simple. And scientists are steadily finding new solutions, using tools such as sock-testing robotic feet and duct-tape home remedies.

Here's a closer look at the top five surface problems of feet.

Blisters

Cause: "Pure physics," says Dr. Brian B. Adams, director of the sports dermatology clinic at University of Cincinnati and author of a textbook on the subject. Meaning: they're all about friction.

A new shoe that slips and rubs a bit on your heel may feel fine at the store, but after 1,700 steps — a runner's typical mile — it can peel away outer skin from the layers beneath. When that happens, fluid rushes into the gap from surrounding tissue, and there's your blister — painful, and a nice breeding ground for bacteria

too.

Treatment: Don't rip off the skin flap. ("There's no Band-Aid as good as your own skin," Adams says.) Soak in warm Epsom salts. Big blisters can also be sanitized, lanced with a sterilized needle and drained, which speeds reabsorption of loose skin and helps keep infection at bay.

Prevention: Also a matter of physics. Get shoes that fit well, says Dr. Carolyn McAloon, a podiatrist in private practice in Castro Valley, Calif. For super-sweaty feet, try rolling antiperspirant along your soles. And for known hotspots, dab friction-reducing petroleum jelly or a personal lubricant such as Astroglide, McAloon adds.

Change socks often, because sweat actually increases frictional drag on the skin. But watch what you're buying.

Recently, biological engineering students at the University of Missouri-Columbia tested 10 brands of athletic socks in the lab using a specially built device: a plastic foot to hold socks against a simulated shoe, a motor to create a slow-motion stepping action, and a humidity chamber to provide a realistic sweaty-foot environment.

All-cotton socks were the worst, the students found, because friction increased as soon as they cranked up the moisture. Price tag wasn't a factor, however: Although an improvement over cotton, expensive nylon blends were no better than bargain brands.

Athlete's foot

Cause: Mold-like fungi eat protein in the upper layer of your skin, then leave their digested remains — a dense, moist, smelly mess — to sit around on your foot, interlaced with still-healthy cells.

You can pick up the fungus from clothing, locker rooms, pool decks and showers. But only in warm, moist conditions will it really thrive — and odds are good you're cheerfully providing that. "A hot, sweaty foot in an athletic shoe is a perfect environment," says Dr. Kelly Cordoro, a dermatology professor at University of Virginia.

Athletes are also more at risk than less active folks, she says, because tiny, unnoticeable cuts and abrasions acquired during sports activity are convenient "ports of entry" for the fungus to burrow into, then spread.

Burning and itchiness aren't always the biggest problems, though. "Think of the skin as the wall and the fungus as a vine," Adams says. Fungi creep between layers of skin and destroy them from within, giving harmful bacteria — such as

Pseudomonas or *Staphylococci* — a chance to invade. Healthy immune systems usually can fight them off, but diabetics and other immunocompromised folks are at risk for more serious infections.

Danger lurks: Public showers are hot spots for fungi that can cause athlete's foot. (Carlos Chavez / LAT)

Treatment: Over-the-counter antifungal creams and powders, or a short course of prescription oral medicine, usually wipe out infections easily. Easier-to-use innovations are also under development: A new topical formulation of terbinafine (the antifungal in Lamisil) will form a thin film over the foot and slowly release medication. In a recent European trial, a single application cured athlete's foot in 63% of patients, compared with 17% in the placebo. For particularly thick athlete's foot, doctors sometimes try creams with urea — a major component of urine — to soften skin and let topical treatments penetrate better. But wives' tales notwithstanding, one's own urine is unlikely to do the trick, Adams says. For one thing, most creams are 40% urea concentration, compared with less than 20% for urine.

Prevention: Never go barefoot at the gym, McAloon says. Keep feet dry and cool with antifungal sprays and powders. And be careful when you're dressing: If you pull on tight underwear over bare feet, you might drag the fungus straight up to your groin — another warm, moist environment — where it can develop into jock itch.

Toenail fungus

Cause: The longer you have fungi sitting around on your feet, the more likely they will wander around and start feeding on your toenails too. "Once fungus infects the nail, it's a completely different playing field," Adams says. Whereas athlete's foot sits on the skin's top layers, toenail infections go deep through the nail, where topical treatments can't easily reach.

Hungry fungi metabolize protein in the nail plates, tinting them yellow or brown and littering foul-smelling debris beneath the tip. Over time, nail layers start to split and grow thick and crumbly.

Athletes are extra susceptible, McAloon says, because toenails bruised and banged about from sports can make it easier for the fungus to settle in.

Treatment: Oral antifungals taken daily for three months are effective against toenail infections, but the long treatment — compared with that for athlete's foot, which is often cured in two to four weeks — also brings the risk of liver complications such as hepatitis, Cordoro says. New, deep-reaching topical treatments are being tested: Small molecules in one lacquer, right now known only as AN2690, slip more easily through tough nail layers and deliver fungicide

to the skin beneath. Clinical trials are ongoing; preliminary results found that about half of nails treated daily for six months ended up growing fungus-free.

Prevention: Treat athlete's foot early to keep the fungus from spreading to nails. Make your toes dry, inhospitable places for fungus to live. And consider nagging your housemates about hygiene: A recent study of 57 households by researchers at University Hospitals of Cleveland found that foot fungi were passed along person-to-person about half the time — and even more often if a member's infected toenails had already started to discolor.

Runner's toe

Cause: Not every ugly toenail is teeming with fungus. Equally common is "tennis toe" or "runner's toe," where physical trauma, not infection, is to blame.

The toenail's purpose is to protect plush, vulnerable toe tips from damage. But repeated banging against the front of the shoe — especially in stop-and-go sports like tennis and soccer — can burst small blood vessels under nails, says Dr. Lisa Schoene, a sports medicine podiatrist in Chicago. When that happens, blood blisters bubble up and lend toenails a pearly black tinge — often until the painful pressure splits off nails from the skin entirely. (They usually grow back, but with repeated injury, toenails can sometimes grow in thick and deformed.)

Treatment: To ease the pressure and let blood escape — which might save the toenail — doctors sometimes burn a small hole in the top of the nail with a hot, sterilized needle, a process called trephination.

But it's tricky to get deep enough into the nail without going too far and searing skin. So researchers have developed a new "micro-cutting" power tool called the PathFormer. As sharp tips drill downward, sensors monitor changes in the water composition of nail layers. As soon as the tool detects moist skin ahead, the blades retract, sparing the tender nail bed.

In a pilot study of 14 people published in June in the journal *Dermatologic Surgery*, patients reported minimal pain and pressure — with no bleeding or skin punctures.

Prevention: The best prevention for runner's toe is keeping the nails trimmed neat and short, Schoene says, and wearing good shoes with a proper fit.

Plantar warts

Cause: Human papilloma viruses (different strains than those causing cervical cancer) infect and hijack skin cells, forcing them to grow extra protective flesh to encircle the viruses' DNA. Black spots dot the wart's surface when fast-growing blood vessels get clogged up.

Though harmless, plantar warts still hurt because as these tough nodules develop on the bottom of weight-bearing soles or heels, they start growing up back inside your body instead of growing outward as they do on other parts of your skin. "It's like having a pebble in your shoe that feels like a boulder," Adams says.

Treatment: Remove the extra wart flesh, which will encourage your body's immune system to dispatch the virus on its own. Doctors often use corrosive solutions such as salicylic acid and then cut away the wart with a scalpel or freeze it off with liquid nitrogen.

Do-it-yourselfers have other options: a therapy of duct tape, pumice stone and patience. In 2002, researchers at the Cincinnati Children's Hospital Medical Center published results of a study of 51 kids with warts. Doctors first covered the wart in duct tape for six days, then removed the tape, soaked the area in water and pared it down with an emery board or pumice stone. The next morning, new duct tape was applied and the whole process repeated.

After two months, 85% of the warts in the duct-tape group had disappeared, compared with 60% in another group receiving liquid-nitrogen treatment.

But we may not have the last word on duct tape yet: In a study published in November, researchers tried the approach and found it to be no better at curing warts than a placebo. The researchers noted, however, that they used a different, less-sticky type of duct tape than the traditional, silver kind.

Prevention: Viruses are passed along from skin-to-skin and floor-to-barefoot contact, just as with fungus, so keep your flip-flops on — and just say no to footsies with warty feet.