

# All the havoc a marathon wreaks on the human body

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According to marathon-running mythology, Pheidippides, the ancient Greek athlete often named as history's first endurance runner, dropped dead at the end of his run.

Historians say this false dramatic detail [springs more from poetry](#) than traceable records, but the lie has likely endured because purposefully running 26.2 miles seems like a direct challenge to human limitations.

The myth might be false—but it is plausible.

Running an estimated 55,000 steps over the course of a few hours hours brings about risks that *can* prove fatal. Luckily for most participants, however, the marathon merely wreaks utter havoc on your system in surprising and decidedly unflattering ways. Here's what we know about how participation in this athletic rite beats up the body.

## **Your urine turns tea-colored, your nipples bleed, and your toenails fall off**

On marathon day, all the risks that come with everyday running [injuries](#)—including shin splints, Patellofemoral pain syndrome (runner's knee), hamstring damage, and plantar fasciitis (heel pain)—are still present. But the long run triggers even more systemic reactions.

For instance, over-stressing muscles causes them to release a protein called myoglobin to your body's mitochondria, which produces energy for your cells. Myoglobin is eventually filtered out of the bloodstream and sent to the bladder, where it can make a permanent exit. The result is a darkish brown stream of urine that alarms marathoners the first time they see it, as

it looks remarkably like blood. But despite appearing gnarly, myoglobin-tainted pee is safe enough as long as your body doesn't excrete too much of it. (As with any of the symptoms discussed in this story, check with your doctor about potentially hazardous post-race concerns.)

And then you have the actual blood. The places where you're most likely to actually bleed in a marathon are on your nipples (from the chaffing of a sports bra or t-shirt) and on your feet, where the friction from your shoes can cause fluid-filled blisters or their more colorful cousins, blood blisters, which occur when [blood vessels are ruptured](#).

Post-marathon, runners might also find one of their toenails blackened and bruised by the impact of their toes hitting the end of the shoe each time their foot hits the ground and slides forward. Exacerbated by ill-fitting shoes, runner's toe occurs even when you're wearing the right size, as your feet can swell a half size over the course of a marathon.

Freaking out about your dead-looking appendage? It may appear that a new toenail is waiting beneath the old one, like a diva's understudy just off stage, but it's a little more complicated than that: "We actually have matrix cells in the nail bed—that's where the new toenail comes from, and it literally pushes off the old one" explained Marybeth Crane, a Texas podiatrist and foot surgeon [to NBC News](#). So if it hasn't fallen off yet, just leave the bruised nail alone, and it will divorce itself from your foot when it is ready.

## **Your temperature spikes and your immune system is compromised**

During a marathon, your body can become as hot as a low-grade fever, up to 102°F (39°C), and sometimes even higher. In response, "blood flow increases significantly to [a runner's] skin to cool it down, stealing it from skeletal muscles," [says](#) Gregory Lewis, director of the Cardiopulmonary Exercise Testing Laboratory at Massachusetts General Hospital. At the end

of the race, your core temperature falls drastically again as your sweat begins to cool on your skin. Because of this, after crossing the finish line, runners often cocoon themselves in mylar blankets to reduce their chances of developing hypothermia. This kind of stress ultimately weakens the body's immune system, leaving marathoners open to a cold or fever—a kind of trophy virus—following the big day.

As Harvard physician Arthur Siegel [told Men's Health](#), “Your body doesn't know whether you've run a marathon...or been hit by a truck.” The magazine explains:

This is why, as you go deeper into the race, your body reacts to injury by mounting an emergency-repair response. Your adrenal glands and brain produce the stress hormones cortisol and vasopressin; your damaged muscles churn out proteins called cytokines, which trigger your liver to start producing C-reactive protein. The result is what Dr. Siegel calls “an inflammatory storm” throughout your body.

The triage system that sends blood to the hardest working and most essential muscles during a marathon also means your digestive system is left to operate with less of it. That shortage—a condition called ischemia—is thought to weaken the mucus system lining the intestine. Researchers in Brazil [have hypothesized](#) that this disturbance largely explains why runners experience nausea, vomiting, stomach cramps, and diarrhea; rattling all those blood-starved abdominal organs for hours probably also ups the chances of loose stools.

## **You stress out your heart and injure your kidneys**

Medical researchers have investigated the ways that extreme endurance races tax the heart and kidneys. In a [recently published study](#) from Yale University, scientists found signs of acute kidney damage in two thirds of their small sample group. They tracked 22 people who ran the 2015 Hartford marathon and found that the markers of kidney injury peaked the

day after the race. Two days later, however, the runners' biomarker test results were closer to normal. Still, anyone already at risk of kidney failure needs to consider the added risk of overwhelming the body's trash collectors with chemicals released into the bloodstream during strenuous exercise.

Researchers have also found that runners have higher levels of troponin, the enzyme that is normally used to diagnose damage during a heart attack or another cardiac episode, in their bloodstream during and after a marathon. This is because its levels rise when the heart is being overworked and can't get enough oxygen. As [reported by Time magazine](#), most people's troponin levels return to normal levels a few months after the race, and there are no long-term consequences.

What's more, scientists have found the risk of having a heart attack during the race is actually quite low. Those most in danger of sudden cardiac arrest are those who have an undiagnosed heart condition, which could be exacerbated by the pressure of the long run. Although runners can die from a condition called hypertrophic cardiomyopathy—so finds a study published in the [New England Journal of Medicine](#)—it's still uncommon.

## **You end the race shorter**

When Meb Keflezighi, the American Olympian who plans to retire after this year's New York City marathon, was [asked in an interview with AP](#) why he was giving up marathons, he said, "It takes a lot of you."

That is literally true of body fluids, which you can lose five to 10 pounds of during a race. Some of that outflow is [fluid from between vertebrae in your spine](#), meaning you'll end the race a tiny bit shorter than when you started. It's therefore important that runners stay hydrated during the race—but even then, drinking too much water can create a serious risk of hyponatremia or dangerously low sodium levels caused by overhydration.

In many ways, it's a lose/lose situation for your body. So, if marathon causes so much pain—and even a professional like Keflezighi sometimes has to stop and vomit then “[literally fall across the finish line](#)”—you might wonder why millions of people globally run one every year.

It may partially be because your brain forgets the pain, as [Shape magazine reported](#) following the publication of [an intriguing but small study](#) conducted in Poland in 2014. We often forget the pain that comes with positive experiences [like childbirth or running marathons](#): The pain of being tortured is different from the pain that comes from proving to yourself that you can finish a 26.2 mile run.

Your muscles and organs might be crying out internally, but your runners' euphoria is right there on your face, forever frozen in all those photos sweaty you've uploaded to your social feeds.