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# After Heatstroke, When Is It Safe to Exercise?

By **GINA KOLATA**

It was 90 degrees in Buffalo when Douglas Casa stood on the starting line of a track, ready to run 25 laps in a race that was part of the Empire Games, a championship event for high school students.

The race began well for him — it was one of the best races of his life. Then, with half a lap to go, he collapsed. He got up, started to run again, and collapsed again, 50 meters from the finish line, in a [coma](#), unresponsive.

Even though he was immediately cooled with ice and cold wet towels, and taken by ambulance to a hospital where he was put in a tub of ice, he did not wake up until that evening.

That was in 1985, and it turned out to be a life-altering event for Dr. Casa, now the director of athletic training at the [University of Connecticut](#). He had a [heatstroke](#) on the track that day and, ever since, heatstrokes have been his obsession.

But heatstroke, a potentially deadly consequence of exercising strenuously in the heat, remains poorly understood — misunderstood, some say. Medical experts know it occurs when the body's temperature soars during exertion on a hot day, damaging tissues and organs. But they cannot agree on one of the most fundamental issues. After someone has a heatstroke, when is it safe to return to the sport?

“This is a very controversial area, even more so than [concussions](#),” said Dr. Francis G. O’Connor, president of the American Medical Society of Sports Medicine. He moderated a debate on the topic at a recent meeting of the American College of Sports Medicine.

Guidelines on returning to [exercise](#), from the [American College of Sports Medicine](#) and the [National Athletic Trainers’ Association](#), are not based on the best scientific evidence, Dr. O’Connor and others say. Instead, they are based on what the guideline committees think makes sense.

“There is a lot of reliance on dogma that has never been backed up or tested,” said Lisa Leon, a

research physiologist at the [United States Army](#) Research Institute of Environmental Medicine.

As a person exercises in the heat, blood gets diverted to the surface of the skin for cooling. The hotter the person gets, the more blood is diverted — as much as 25 percent of the body's blood can end up going to the skin instead of to exercising muscles and to organs like the intestines, kidneys and liver, said Michael Sawka, chief of the thermal and mountain medicine division at the [Army](#) environmental medicine institute.

One result can be heat exhaustion — the person may collapse, unable to continue exercising. Heatstroke is more serious than heat exhaustion, characterized by [delirium](#) or coma. The first thing that should be done is to immediately cool the person, with an ice bath or cold water, or cold towels — the best method is a matter of debate, Dr. O'Connor said.

But the real damage can be insidious, researchers say.

“The issue with heatstroke is that most people know that you are exposed to heat, you exercise, and you collapse,” Dr. Leon said. “They don't know about what happens in the days, weeks and months that follow.”

Researchers, including Dr. Leon, discovered that long term damage can occur because the gut, lacking enough blood, gets leaky. Toxic substances excreted by gut bacteria seep out. That results in inflammation that can cause serious damage to other organs, especially the liver and kidneys.

For decades, this cascade of events starting with a leaky gut was unappreciated because everyone focused on damage from high body temperatures, Dr. Leon said. “We were so blindfolded for so long,” she added.

And that leads to the question of when is it safe to return to exercise?

One school of thought says people who have had heatstroke should get a heat tolerance test — walking on a treadmill in a warm room to see if their body temperature stays in a safe range.

Another group of experts, including Dr. Sawka, say the heat tolerance test is based on an old, and incorrect, idea that heatstroke involves damage to the hypothalamus, a brain region that regulates body temperature. When a person has recovered from heatstroke, that theory says, the sign is that they no longer overheat during exercise.

But autopsy studies and some [MRI](#) scans of people who had heatstroke indicate the hypothalamus is not damaged. Injured brain regions include the cerebellum and the cerebral cortex, which is why people pass out, Dr. Sawka said. He worries about lasting damage to the liver and kidneys. One study of distance runners who had heatstrokes and repeated liver biopsies indicated their livers were still recovering four months later. And a study by the Army's Research Institute for

Environmental Medicine found that 30 years after soldiers had heatstroke they were at increased risk of death from liver failure and other organ damage.

“A picture is starting to emerge,” Dr. Sawka said. “Heatstroke causes organ damage, and that organ damage may persist for an unknown amount of time.”

“We need to be very careful” about allowing people to return to exercise after heatstroke, Dr. Sawka said.

But that does not help physicians and athletes, Dr. O’Connor said. Most doctors follow guidelines from professional organizations that say to wait at least a week after you have left the hospital. Then, if a medical assessment indicates that you seem to have recovered, you can gradually return to exercise.

Dr. Casa and others add a heat tolerance test on a treadmill. It is impossible to rule out organ damage with the current guidelines, he agrees, but he said most people who are cooled quickly seem to recover completely.

Twenty five years ago, when Dr. Casa had his heatstroke, he had no guidance on how to return to running.

“The first week after my heatstroke I was lethargic, totally out of it,” he said. “It took me two or three weeks to get my energy back.”

But he ran with the cross country team that fall, and did well.

And he has been running ever since.