

Lead Poisoning

The Army Thought He Was Faking His Health Issues. Turns Out He Had Chronic Lead Poisoning.

At age 30, Stephen Hopkins was back in the Army for a second time. After serving as an enlisted soldier from 1991 to 1995, he returned as an officer in 2000. He was a man who routinely maxed fitness tests and endured physical hardship while deployed to rural locales in Afghanistan. Selected for Special Forces training, Hopkins tackled the demanding courses with gusto, later returning to combat for a total of seven deployments. He had a job he loved and excelled at, and his star was ascending.



Stephen Hopkins, an Army veteran who received a diagnosis of chronic lead poisoning, outside his gym in Fort Washington, Md., on March 5.

But in 2005, Hopkins began experiencing wild swings in blood pressure. And he had other symptoms: crippling nausea, constant dizziness, a skyrocketing heart rate. He was given a diagnosis of common high blood pressure, and for a while he felt better by keeping himself on a high dose of a medication for that condition. He was on deployment in Afghanistan when the nausea returned, with migraine symptoms, abnormal thirst and muddled thinking. Medical tests were inconclusive, leading military doctors and commanders to suspect depression, post-traumatic stress disorder or, worse, “malingerer” — the medical term for soldiers who feign sickness to shirk duty.

“‘Malingering’? I was offended,” said Hopkins, who retired in 2017 as a major and now lives in Fort Washington, Md. “I was seeking medical care so I could figure out how to stay in the Army, not get out.” He was sent back to the United States in the summer of 2012 and was getting ready to attend a training course when he collapsed one day in a parking lot. His parents drove him to Walter Reed National Military Medical Center in Maryland, where he was seen by Capt. Kevin Dorrance, then the facility’s chief of internal medicine. Dorrance investigated a wide range of possible factors, including endocrine conditions, PTSD and various types of toxic exposures. A series of tests increasingly pointed toward lead, but chronic lead poisoning — from repeated exposures months or years in the past, rather than from a recent, short-term exposure — cannot be definitively identified by blood tests.

Dorrance sent Hopkins to Mount Sinai Medical Center in New York for an X-ray fluorescence (XRF) test, a procedure to measure the level of lead in his bones. They were riddled with it: His tibia registered more than two and a half times the level expected in an average American his age, then 42. With that test, Hopkins became the first of 38 service members from 2012 to today tested at Mount Sinai for chronic lead poisoning. Of those, a dozen have measured bone lead levels higher than what is considered normal, including four with almost twice the expected amount. Dozens of other service members have gone to the Cleveland Clinic's Center for Functional Medicine in Ohio to be treated for lead and other types of metal poisoning. While the number of affected soldiers is small, the diagnosis can be life-changing to these troops, who for years have wrestled with unexplained symptoms that mimic traumatic brain injury or PTSD, including impaired concentration, anger, anxiety and impulsivity, as well as physical manifestations like tremors, high blood pressure, low sperm count and peripheral neuropathy.

Lead exposure is a known hazard of military service: The United States armed forces have fired billions of rounds of ammunition containing the toxic material since entering Afghanistan in October 2001. Troops are exposed to the metal while shooting indoors and outside; gathering shell casings; smoking, chewing tobacco or eating on ranges; cleaning their weapons; and living and fighting in polluted environments. But lead monitoring and testing programs at the Defense Department have focused primarily on service members who work on firing ranges and on the civilian staff at ranges, who are regulated by Occupational Safety and Health Administration guidelines. Defense Department policy requires service members who may be exposed to high levels of airborne lead for 30 or more days a year to get a blood test for lead, with follow-up tests at least annually.

After he diagnosed Hopkins and another service member with chronic lead poisoning, Dorrance contacted the office of the surgeon at Special Operations Command, the Environmental Health unit at Fort Bragg and officials at Navy and Marine Corps Public Health Command to request that more troops be tested and the problem be researched. But six years after the issue was first raised, little progress has been made. The Department of Defense, which until last year annually tested blood lead levels in just 1,200 out of almost three million troops and civilian employees, has found very few cases of lead poisoning, leading Army officials to believe that there isn't a widespread problem.

Dorrance, who retired from the Navy in 2017 and started a company to help veterans and others with addiction recovery, said the condition is a tough sell to military physicians and the broader medical community, as they rarely see lead poisoning from long-term exposure in adults. Chronic lead poisoning is difficult to diagnose, and the medical community and government agencies that study environmental exposures have long asserted that the lead that accumulates in the bones (specifically in dense, hard areas known as cortical bone) is locked in place and doesn't circulate back into the bloodstream and cause symptoms, except in cases of a handful of specific medical conditions.



Dr. Kevin Dorrance in Potomac, Md., on March 5.

Dorrance and Dr. Mark Hyman, director of the Center for Functional Medicine at the Cleveland Clinic, argue that this theory is wrong — and that they have the patients to prove it. Pointing to a growing body of research that suggests that lead in the bones may be more toxic than once thought, they say physicians should be considering lead poisoning as a possible cause for many unexplained symptoms in service members, especially uncontrolled hypertension, fatigue and brain fog. “These soldiers are breaking down, and they go to doctor after doctor after doctor, and every single one of them misses what is going on,” Hyman said. “These soldiers aren’t getting the proper care. It’s a huge blind spot.”

Master Sgt. Geoff Dardia, now 42, began working as a Special Forces training instructor in 2009, teaching high-intensity courses to fellow Green Berets. In a single six-week course, each student would fire upward of 150,000 rounds — and Dardia taught 16 such courses in just over three years. “I lived in shoot houses,” he recalls. By 2009, he was living with an array of debilitating symptoms: fatigue, migraines, muscle loss, double vision, trouble with his balance, high blood pressure and low heart rate. When out on deployment to Afghanistan and elsewhere, he would actually feel better. When he returned home, to Fort Bragg, in North Carolina, things got really bad. “There’d be big blanks where I couldn’t remember large chunks of what I’d done, like driving home,” Dardia said. “At the same time, my mind was racing. I didn’t want to tell anyone, because I was afraid of losing my job.” But eventually, Dardia heard about Hopkins and his symptoms and went to Walter Reed to meet with Dorrance. Dardia was soon on his way to Mount Sinai for an XRF test. The results showed that his bone lead levels were 30 percent higher than normal.

Dardia eventually went to the Cleveland Clinic, where he was prescribed a treatment called chelation, which involves taking a medication, orally or intravenously, that binds with the lead circulating in the body so that it can be excreted. Over the course of about a year, Dardia experienced a tremendous improvement. He was lucky both medically and administratively: Because he had found doctors who recognized lead poisoning and how to treat it, Dardia’s chelation was covered by Tricare, the military’s health program for active-duty service members and retirees. In 2013, knowing that there must be other service members suffering from lead poisoning without ever getting a proper diagnosis, Dardia teamed up with an existing nonprofit, the Task Force Dagger Foundation, to teach about the condition and to raise money to help other people in the Special Operations community cover the costs associated with diagnosis and treatment. He continues to serve in the Army and recently returned from his seventh deployment to a conflict zone. “I think there are a lot of people out there who have symptoms and just think it’s stress,” Dardia said. “No one even thinks about lead or other toxic metals.”

Like Dardia, Hopkins also underwent chelation — the only service member at the time to receive the treatment for chronic lead exposure within the Department of Defense, where his therapy was overseen by Dorrance. Even now he continues to take antioxidants and vitamin supplements and takes great care to minimize his risk of any additional exposure to lead.

Between 2005 and 2016, the Centers for Disease Control and Prevention’s Adult Blood Lead Epidemiology and Surveillance program reported 210 cases of elevated lead levels across the Defense Department. These cases were measured by blood lead level tests, but according to Stephanie Stevens, a spokeswoman for the National Institute for Occupational Safety and Health, the number is a “huge underestimate,” because federal military labs aren’t required to report their data to state public health offices that collect the information. Stevens added that many states themselves don’t report their data to the C.D.C.: In 2016, the most recent year the information was collected, just 21 states participated.

In 2012, about the time Hopkins underwent XRF testing at Mount Sinai, United States Army Special Operations Command was dealing with a lead exposure problem at Range 37, a firing range heavily used for elite training courses at the United States Army John F. Kennedy Special Warfare Center and School at Fort Bragg. In a two-year investigation, the command had found unsafe levels of lead in the air at shoot

houses and indoor ranges that were “directly responsible for elevated blood lead levels that have been found in weapons instructors and soldiers conducting high intensity weapons training,” according to a command document. The command cleaned up or closed some of its ranges and dropped the level of unacceptable exposure to 20 micrograms of lead per deciliter of blood. The Special Warfare Center now offers some types of training with “green” ammunition (rounds made of more environmentally friendly materials, like a copper slug with a steel penetrator, that contain lead only in the primer) and monitors blood lead levels of its instructors and students more frequently.



A machine, nicknamed “Charlie,” that is used for measuring lead levels in a person’s bones at Mount Sinai Hospital in New York.

The command also warned Army leadership that many soldiers *arriving* at Fort Bragg for training had elevated blood lead levels — an indication that the problem was not limited to particular ranges or training courses. This was a “larger, Army-wide problem,” the Army Special Operations Command Surgeon’s Office noted in a 2012 summary.

The same year, the Defense Department asked the National Research Council to study the levels of occupational exposure to lead on military firing ranges. But the council’s review was hampered by data being withheld by the Pentagon and the services, which provided only scanty and incomplete information, even on basic facts like the number of military firing ranges in operation, air quality data and blood test results. With that limitation, the National Research Council wasn’t able to comment specifically on the risks facing people who work at military shooting ranges, but in its report, released at the end of 2012, it concluded that the prevailing American workplace regulations allowed for higher levels of lead in the blood than are actually safe. OSHA limits, which the Defense Department had long used as a guideline, allow employees to work indefinitely at a job that keeps their lead level at 40 micrograms per deciliter of blood; the report endorses a limit of 20 micrograms. In 2017, five years after the National Research Council report, the Defense Department tightened their regulations, setting 20 micrograms as the threshold for removing military and civilian staff from jobs involving high exposure to lead.

Under the new regulation — and facing a growing controversy over lead contamination in Army housing — the Army performed 1,728 blood lead level tests on active-duty soldiers in the first two quarters of 2018, according to service officials. Of those, 335 service members had levels higher than 5 micrograms per deciliter of blood (the C.D.C.’s definition of an elevated lead level): Two exceeded 40 micrograms, another

three exceeded 20 micrograms and the remaining 330 were between 5 and 19 micrograms. “Given the current Army end strength of 475,367, this equates to a prevalence of less than 1 in 1,000, which indicates that elevated blood lead levels is not a widespread problem,” John J. Resta, the director of the Army Public Health Center, wrote in an email.

Even if the Army expanded its efforts to measure blood lead levels, those tests can only catch a recent or ongoing exposure. When lead enters the body — from inhaling airborne lead particles that are emitted from a weapon while it is firing, ingesting it when eating or smoking in a contaminated environment or from any other source — it initially lingers in the blood, where it can be detected by a blood test, but it doesn’t stay there. Some is filtered out and eliminated, and some is absorbed into the bones. Once an adult is removed from the source of contamination, most of the lead will be gone from the blood after a period of one to four months, depending on the severity of the exposure. At that point, a blood test can come back clean. But the lead that has been absorbed into cortical bone stays there for decades. And the concentration of lead in the bones increases with each subsequent exposure.

According to the Agency for Toxic Substances and Disease Registry, the federal agency concerned with public health risks associated with exposure to hazardous substances, the lead that has been stored away in bones, even in dense cortical bone, may be released back into the bloodstream, especially in times of calcium stress, as with a broken bone, pregnancy, lactation, osteoporosis or kidney disease. But Hopkins, Dardia and other soldiers experienced symptoms without having any of these conditions. Their symptoms were consistent with civilian workers who experience chronic lead exposure through jobs like smelting, foundry operations, soldering, scrap-metal salvage and bridge repair — populations that, according to the National Organization for Rare Disorders, are known to be at higher risk but are nevertheless prone to overlooking long-term lead exposure as the root cause of symptoms like depression, fatigue, irritability, memory loss, neuropathy, impotence and serious cardiovascular conditions.

That soldiers are exposed to lead while on the job isn’t news for the Army. A 1996 study by the Army Center for Health Promotion and Preventive Medicine noted that soldiers on bases were at risk for exposure to “unhealthy levels of lead” from firing ranges, battery repair, lead paint and building demolition. The center recommended fully implementing “existing Army policies, programs and procedures for lead-exposure reduction” and including lead “as a priority pollutant in . . . pollution prevention programs.” Yet Hopkins and others say they never received explicit warnings of potential lead exposure or guidance on proper range hygiene. “The Army did nothing to warn anyone or deal with the issue,” Hopkins said. “It’s baffling to me.” Dardia saw improvements arrive in 2012 at the ranges for Special Forces troops, but only after the Army Special Operations Command realized the extent of the problem at its facilities.



A Special Forces soldier firing a machine gun on a qualification course in South Korea in January 2018

Service members aren't the only people within the military community affected by lead exposure. In August 2018, Reuters reported that more than 1,000 military children living in Army housing tested positive for high levels of lead between 2011 and 2016. Senators have asked the Army to investigate. The Army published a policy memorandum on childhood lead exposure and hazard management in October, clarifying the policy and procedures for the service's role in preventing lead exposure in children. Spurred by the Reuters report, the service directed its Public Health Center to develop "a Lead Hazard Management Control Plan to monitor compliance" with the policy.

The Army continues to assert that elevated blood lead levels are not a common problem among its soldiers. In correspondence with The New York Times, Army Public Health Center officials took issue with the term "lead poisoning," asking instead that the phrase "elevated blood lead levels" be used. Beyond the measures taken by Army Special Operations Command, the rest of the Army has done little, according to Dardia, speaking in his capacity as a Task Force Dagger volunteer, not as an active-duty Green Beret. "Big Army just is not acknowledging this the way they should be," Dardia said.

Dorrance, Hopkins and others have pressed members of Congress to require the Defense Department to increase testing and treatment for lead poisoning — both acute and chronic exposure. They want mandatory bone baseline screening and ongoing testing for troops whose specialties or deployments entail likely lead exposure, XRF equipment and technicians to carry out that testing program, more research into the toxicity of lead and the effectiveness of chelation therapy and a dedicated center for studying military environmental exposures.

Meanwhile, Dardia is working to increase awareness that lead poisoning is treatable. Chelation is an F.D.A.-approved outpatient treatment for acute lead exposure, as determined by blood test. While it's not normally used to treat bone lead, it was successful for Hopkins, who took an oral chelating agent, and for Dardia, whose treatment included both oral and intravenous chelation. Hopkins's levels dropped from 20 micrograms of lead per gram of bone mineral to 6 micrograms.

"Lead is generally not bio-available if it's in the bones," explained Andrew Todd, a research professor and the director of the X-ray Fluorescence Laboratory at Mount Sinai — meaning that it shouldn't be circulating in the bloodstream and soft tissue. "But slowly, chelation worked down Hopkins's bone supplies of lead. When I saw his reduced level, I didn't believe it. I had to repeat the test."

In addition to trying to influence policy, Hopkins and Dorrance want to educate the military medical community about the signs and symptoms of chronic lead exposure. "The reason it's being sidelined in the medical community is that it's really not understood. Doctors have this discomfort with not knowing, and that's a problem," Dorrance said.

They also say that service members need more education on the dangers of lead exposure. "I spent 20 years in the active duty service," Hopkins said. "No one talked to me about lead exposure on a range, not once."

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