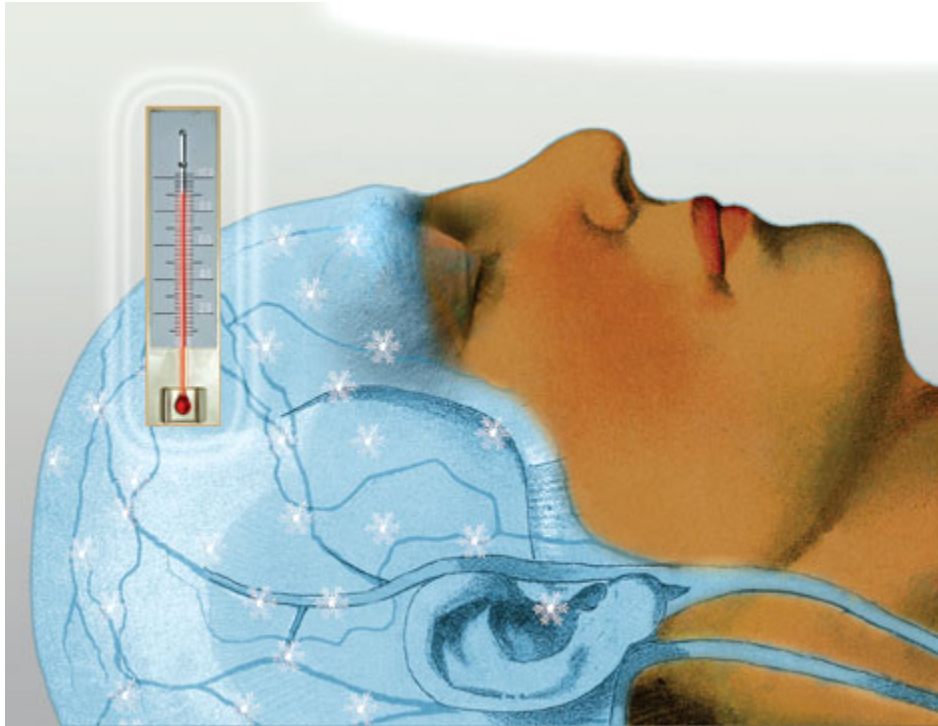


COLD CASE

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Texas Monthly April 1, 2009



BRAIN FREEZE: Lowering a patient's body temperature may slow the potentially fatal brain swelling caused by severe head trauma.

Illustration by Lou Beach

Did induced hypothermia save the life—and art—of tejano legend Emilio Navaira?

One year ago, at about five a.m. on Easter Sunday, a 26,000-pound bus crashed at high speed into a wedge-shaped traffic barrier near the intersection of Loop 610 and Highway 59, in the Houston suburb of Bellaire. On impact, the driver was hurled headfirst through the exploding windshield toward the crushed barrier and concrete pavement. Remarkably, he sustained no open head wounds or skull fractures—he suffered what trauma experts call a closed-head injury—but he arrived at Memorial Hermann-Texas Medical Center in a coma. A Hispanic man who appeared to be in his mid-forties, he had no identifying paperwork, so the hospital staff gave him a generic name: Julio 1288. Doctors and nurses moved quickly to stanch his bleeding and thread a breathing tube into his trachea. They were too intent on stabilizing him to wonder who he was.

The attending doctor on call that morning was Alex Valadka, a soft-spoken neurosurgeon and the director of neurotrauma services at Memorial Hermann. He studied a CAT scan of Julio 1288's brain and found a large blood clot lying on its surface. The clot was creating intracranial pressure that diminished the flow of blood—and therefore oxygen and glucose—to the brain. This could

swiftly initiate a cascade of microscopic disasters, ending in permanent disintegration of brain tissue. The man could plummet into an irreversible vegetative coma, suffer devastating brain damage, or die.

Valadka noted Julio 1288's approximate age, comatose condition, lack of other serious injuries, and, crucially, the short amount of elapsed time between the crash and the man's arrival at the hospital. He then chose to do what only a tiny fraction of neurosurgeons would have done: He initiated an experimental treatment known as hypothermia therapy. (Valadka could do this without explicit permission from the patient because of a federal ethics guideline called waiver of consent, which considers the potential medical benefit and scientific merit of a given treatment.) The therapy involves dramatically lowering a patient's body temperature for a sustained period of time. Major damage from severe head trauma is caused by a rapid, abnormal buildup of fluid between cells. By cooling cells and slowing their activity, hypothermia may greatly reduce the extent of damage.

Through an IV, Julio 1288 was given morphine and antibiotics. His blood was infused with a saline solution that steadily brought his temperature down from the norm of 98.6 degrees toward the desired 91.5. The trauma team simultaneously administered a potent sedative, which suppressed the patient's shivering reflex by inducing temporary paralysis. (Radically lowering a patient's temperature is a delicate process that requires near immobility.)

Valadka knew that the procedure could have involved dangerous complications, including heart arrhythmia and spontaneous hemorrhaging. But he was guided by a 43-page protocol based on two rigorous and extensive clinical studies. The second study was ongoing, and Valadka himself was directing it. Ninety-five percent of patients screened for the study had been rejected; Julio 1288 was the rare perfect candidate.

When the patient had been sufficiently cooled, Valadka began to operate. Surgical technique does not change with hypothermia treatment, and the ensuing operation was extremely tricky. First Valadka removed a large piece of skull, carefully opened the leathery membrane underneath, and removed the clot. When he was confident that the bleeding had stopped, he used tiny screws and a titanium plate to reattach the skull fragment. It would be days before he knew whether his hypothermic and surgical interventions had spared his patient catastrophic brain injury—or whether Julio 1288 would survive.

After the surgery, Valadka went out to meet the man's brother, who had been a passenger on the bus and escaped with only bruises and a sprained ankle. "That's when we began finding out about Emilio," Valadka said later.

A lithe and handsome man who wore a well-groomed dark mustache and trademark cowboy hat, Emilio Navaira had been a star of tejano music for more than two decades. Born in 1962, the San Antonio native and father of five taught himself to sing while listening to Willie Nelson, George Strait, "Little Joe" DeLeon Hernandez, and Pedro Infante, a Mexican screen idol and mariachi and ranchera singing star.

Navaira launched his career in 1985 as the lead singer of David Lee Garza y Los Musicales. In 1987 the band scored its first hit single, a fast-paced trendsetter called “Sensaciones.” Its first record, *Cuántas Veces*, beat out Selena’s *Alpha* for album of the year at the Tejano Music Awards. On his own, Navaira styled himself “Emilio,” dropping his last name. His 1995 crossover hit, “Life Is Good,” reached number thirteen on *Billboard*’s country and western chart and earned him endorsement contracts with Wrangler and Coca-Cola. In 2003 his CD *Acuérdate* won a Grammy for best tejano album. With seventeen records to his credit, he has been hailed as “the king of tejano music” and “the Garth Brooks of Texas.”

Backed by acoustic and electric guitars, a twelve-string bajo sexto, a keyboard, drums, and an accordion, Navaira sang with impressive range. He enunciated every syllable, trilling his *r*’s while resisting operatics. He excelled at ballads, and his music had a lighthearted side. Navaira’s rotund brother, Raul, or Raulito, was a harmonist and partner. They had an onstage dance routine in which they scooted on their boot heels and swung their arms and hips as if they were twirling hula hoops. One time Raulito danced right out from under his wide-brimmed straw hat; when he reached down to retrieve it, his brother gave him a cheerful kick in the butt.

On the night of the wreck, Navaira and his band, Grupo Rio, had played a gig at a south Houston club called Hallabaloo’s. An after-hours party ensued, and when it was done, Emilio announced that he would drive the tour bus back to San Antonio. He owned the bus but was not licensed to drive it, and he had been drinking. Just after the crash, Raulito called out to Emilio and thought he heard a reply, but the response had come from another musician. Six members of the band were taken to Ben Taub General Hospital for treatment. As word of the crash spread that Sunday, Emilio’s friends and fans congregated outside Memorial Hermann, and about seven hundred people maintained a candlelight vigil in the parking lot of San Antonio’s Alamodome.

Few if any of these fans knew much about the experimental surgical procedure that had saved their hero’s life. Hardly a single person outside the medical profession had heard of hypothermia therapy before September 2007, when Kevin Everett, a young Port Arthur native and tight end for the Buffalo Bills, severely injured his spinal cord while making a tackle. He immediately lost voluntary movement below the neck. A team doctor and orthopedic surgeon initiated hypothermic cooling in the ambulance. Astonishingly, two days later Everett was able to wiggle his toes and raise his legs. Three months later he was walking.

Everett’s case was closely followed by the media, and hope arose that hypothermia could be medicine’s newest magic wand. But experts in the field cautioned that Everett’s recovery might have begun before the doctors initiated the cooling, and no clinical study had ever documented hypothermia’s effectiveness in treating spinal cord injuries. Yet hypothermia is known to help protect brain function in victims of cardiac arrest, in patients who are undergoing cardiopulmonary bypass surgery, and in infants who have suffered traumatic births. Memorial Hermann has become a world leader in experiments to extend the treatment to other neuropathologies.

One day last fall, I decided to visit Memorial Hermann. After spending time with Valadka, I met Dr. James Grotta, the co-director of the Mischer Neuroscience Institute, at the University of Texas Health Science Center at Houston. Grotta took me to see a patient that his team had been

treating for a stroke. During surgery, the man had gone into cardiac arrest; Grotta was using hypothermia to minimize resultant brain trauma. The patient was wrapped from mid-thigh to collarbone in what resembled a flak jacket, except that the material was translucent plastic. Called Arctic Sun, the device precisely controls body temperature by continuously circulating cold water through the jacket, eliminating the need for intravenous coolants.

The neurologist mused on hypothermia's broader future as we left the patient. "Do you know how a bear hibernates?" he asked. "Its body adjusts its own temperature to match the temperature of its environment. A biochemist here named Chieng Chi Lee is conducting some very interesting animal research. He's isolated a protein that enables him to take a rat to a state of extreme frigidity. Except for slight evidence of breathing, the rat looks like it's dead. But then the man raises the temperature by manipulating this protein, and the rat stirs and gets right up, looks for something to eat. Obviously, it's going to be a while before we see that tested on humans."

After his first surgery, Navaira remained stable in his chilled state. But protocol dictates that patients should not be suspended in a hypothermic coma for more than two days. At about 6 a.m. on Tuesday, doctors began to raise his temperature back to normal very slowly, just one quarter of a degree per hour. During this process, Navaira developed a late-blooming contusion on his left temporal lobe, and later that day Valadka felt compelled to operate again. He was reluctant to remove the lobe surgically because it governs speech—and singing. So he took out the screws and plate securing the skull flap, set the fragment aside for sterile safekeeping, and vented the pressure that was roiling the brain tissues. At a press conference afterward, he said, "There is a chance he may not make it. You have to acknowledge that."

But Navaira continued to hold his own, and by early Wednesday morning the singer's experience with induced hypothermia was over. That evening, he opened his eyes, murmured a few words, and began to move his legs. It seemed like a miracle.

Did the artificially chilled state save Navaira's life and preserve his brain function? Valadka was reluctant to draw firm conclusions before seeing the data from all the patients in the study. He had used hypothermia therapy in the interest of doing all he could for an individual patient. And, he told me, "You have to define the outcome you seek. If the standard is mortality, all right. Death has been avoided and life prolonged. But what quality of life defines a favorable outcome? Emilio has done very well, but it's worrisome that his injury was in the part of the brain that governs speech." As gently as possible, the doctor was saying that this gifted man might not be able to sing again.

When I spoke with Valadka and Grotta, I thought of the intellectual debate that followed the remarkable recovery of Kevin Everett. Dr. Wise Young, a leading surgeon and neuroscientist at Rutgers University, in New Jersey, wrote in a medical blog that moderate hypothermia does not cool the body enough to help *any* patients with neurological injuries. "To achieve truly protective effects," he wrote, "it is necessary to cool the body to 15° C [59 degrees Fahrenheit]. This kind of hypothermia presents its own problems. If the body is kept at 15° C for more than a couple of hours, the cells lose their ionic gradients and become inexcitable . . . It is often hard to restart the heart."

But the therapy is not just wishful thinking. In the United States and Europe, there have been several studies of hypothermia and brain injury, none more respected and cautious than one reported in the *New England Journal of Medicine* in 2001. The article's lead author was Dr. Guy Clifton, a noted neurosurgeon who then practiced at Memorial Hermann. Clifton and his co-authors concluded that hypothermia was not beneficial for victims of severe brain trauma when the target temperature was reached eight or more hours after an injury.

"So why do another study?" I asked Clifton in a phone interview.

"The same data suggested that hypothermia *did* help when the target temperature was reached four hours after the injury," he replied.

Many doctors are forging ahead with the treatment in the firm belief that hypothermia is beneficial, and this past December, health officials in New York City announced that its EMS crews would no longer deliver patients to hospitals that were not equipped to administer hypothermia therapy.

In the spotlight of media scrutiny and medical inquiry, Navaira's recovery has not been untroubled. Nine days after the crash, he required a third procedure, this time to repair a dangerous rupture of a blood vessel in one of his lungs. A month after the wreck, he took his first steps and started speech therapy and physical and occupational rehab. Meanwhile, law enforcement officials in Houston were considering whether to charge him with felony DWI and intoxication assault. Two band members and a passenger have since sued him.

While Navaira was still at Memorial Hermann, one of his teenage sons, Emilio, spoke optimistically about his progress. "Oh, yeah," he told reporters in San Antonio. "He's walking around and talking and singing." In July Navaira was transferred to another rehab program, at the Transitional Learning Center, in Galveston. His brother Raulito told a reporter that he was trying to talk and sing but that he got confused when the words didn't come out right. In September, with Hurricane Ike churning toward Galveston, doctors at the Transitional Learning Center discharged Navaira to the care of his wife, Maru, and urged evacuation to San Antonio. On September 24, nearly six months to the day after the bus wreck, Maru was driving him home from outpatient therapy when they were hit by a truck. Both were hospitalized with minor injuries.

November brought heartening news: Navaira had won a Latin Grammy for his 2007 album, *De Nuevo*. But he and Raulito, who accepted the award, had scant time to celebrate. In early December, Navaira woke up to find the left side of his head badly swollen, and recurring weakness on that side of his body had returned. The skull flap that Valadka had twice removed and then restored had become infected. Navaira had successful corrective surgery, but Raulito described the complication as a major setback. Navaira had been running for exercise, but after the surgery he got noticeably weaker, and his confusion worsened. "It's like starting all over," Raulito told reporters.

Yet Navaira has survived, and he has a fighting chance to regain his talent, his voice, and the music that has nurtured his career. It seems likely that hypothermia treatment bought Valadka the

time he needed to help Navaira turn the first critical corners after the accident. In Houston, Valadka reflected on his patient's challenge: "I always keep in mind a professor I had in medical school. He kept telling us, 'Neurological time is not measured in minutes or hours. It's measured in months and years.'" 🚩