

Unprotected People #59

Tetanus

Blindsided by Tetanus: Are you psychotic, overdosing, or did you just forget your booster shot?

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Blindsided by Tetanus: are you psychotic, overdosing, or did you just forget your booster shot?

By Claire Panosian Dunavan, MD, professor of medicine and infectious diseases, University of California at Los Angeles School of Medicine

Eduardo rubbed his jaw and tried to open his mouth, wondering about the tight muscles in his face and neck that had plagued him all day. Then he noticed the flashing lights of a police cruiser in his rearview mirror. As an illegal [immigrant] in a battered pickup without cash, driver's license, or friends, Eduardo felt that this was becoming his worst nightmare.

Charged with weaving across lanes and driving an unregistered vehicle, Eduardo spent the next two days in a holding cell. As the hours passed, his cell mates noticed that he grew stiff, grinned oddly, and ignored his food. Then, one of the guards saw him violently jerk his neck and torso. The guard thought, "This guy's faking seizures to get out of jail." But Eduardo's spasms persisted, and other prisoners began backing away from him. The staff decided to pack him off to the county hospital's psychiatric unit.

During my years as the sole infectious diseases specialist at that small county hospital in southern California, I wasn't called to the psychiatric emergency room often. But when I was, the cases were never boring, [and this case was no exception].

Eduardo posed a challenge. As I and the resident both knew—but the police did not—psychosis and [drug] overdose were not the only conditions that could produce a rigid neck and torso, a mute smile, and jerking movements. An infection of the central nervous system was another possibility, and we'd recently seen a few cases of mosquito-borne encephalitis in the area. "Como esta?" I asked as I approached the young man lying on a gurney in a curtained cubicle. The greeting was a courtesy. Eduardo was in no shape to talk. Invisible pulleys had stretched his mouth into a tight smirk. But his eyes were wide open, alert, and terrified—no sign of confusion or coma.

"Great—you got here fast!" The resident's voice rang out as he flung back the curtain.

The sharp sound and sudden motion startled Eduardo. His head jerked back, his shoulders and trunk arched up, and he gasped in pain. But he remained conscious throughout the 15-second attack. That's not consistent with spasms induced by brain disorders. This was no ordinary seizure. Suddenly the diagnosis dawned on me. Twelve years earlier, as a medical volunteer in Haiti, I had watched a rigid yet fully conscious pregnant woman arch her body in just the same way.

She'd had tetanus.

"Get the ICU team here as soon as possible," I said to the resident. I spoke softly to avoid startling Eduardo into another spasm. "The next time this happens, he could stop breathing," I told the resident. "You make sure he gets an airway. Meanwhile, I'll order up some antitoxin."

In the specialty of infectious diseases, few physical displays are as dramatic as the spasms provoked by

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tetanus. Its cause is a protein toxin so potent that many victims require months to recover from its effects, if they survive at all.

But the toxin is not the ultimate perpetrator of tetanus. That honor is reserved for the bacillus *Clostridium tetani*, which produces the toxin. Excreted in the feces of animals and widely distributed in soil, mature *C. tetani* resemble tennis rackets, bulging at one end with a hardy spore. It doesn't always take an old nail puncturing a foot to get these into a human host. All the bacteria need is a minor breach of the skin—a laceration, a burn, or even an insect bite. And if they land in tissue that receives little oxygen, they will thrive—multiplying and manufacturing their deadly product.

Once secreted, the toxin molecule sneaks into the rootlike hairs of nerve fibers, climbs toward the spinal cord, and binds itself to inhibitory neurons, thus disrupting their function. That takes the brakes off the peripheral nerve cells, and they start firing faster. The result is muscle rigidity that typically begins in the head and neck, then moves to the chest and abdomen, and eventually reaches the extremities.

Lockjaw, or trismus, is an early sign of tetanus. It means the toxin has affected nerves in the masseters, or chewing muscles. Another early symptom is risus sardonicus, a term from Roman times for the tetanus victim's telltale smile, raised eyelids, and wrinkled forehead. The most vivid hallmark of all is the wrenching spasms, which result when two opposing muscle groups are simultaneously activated. The spasms can be triggered by anything from a sudden noise, movement, or draft of air to such internal stimuli as a full bladder or a cough.

Fortunately, most people in industrialized countries needn't worry that everyday scratches and scrapes will yield an internal harvest of tetanus toxin. Because they've received a series of tetanus vaccines in childhood as well as the occasional tetanus booster, their bodies have plenty of protective antibodies. Reported tetanus cases in the United States often number no more than 100 a year.

But people in the developing world are less likely to receive tetanus vaccines and they suffer the consequences. Tetanus kills an estimated 300,000 each year; almost all deaths occur in developing countries. Newborns are particularly vulnerable. During the first few weeks of life, their only defense against pathogens comes from antibodies imported from their mothers Infants born to nonimmunized mothers are tetanus cases waiting to happen. One dirty knife or soiled bandage on the umbilical stump is all it takes. Today neonatal tetanus accounts for over half of the more than 500,000 cases worldwide.

In my quick exam of Eduardo, I hadn't seen a scratch. I suspected tetanus, but there's no definitive diagnostic test for the disease because the toxin hides away in the central nervous system. To confirm my suspicion, I needed to exclude the possibility that another condition was mimicking tetanus symptoms.

Tests of Eduardo's electrolytes were normal, which ruled out a low calcium level as the cause of his spastic muscles. And Eduardo's spinal fluid showed no signs of infection; that ruled out encephalitis or meningitis. And just in case he was suffering from dystonia—a movement disorder triggered by certain prescription drugs—he got a dose of diphenhydramine (Benadryl), the usual antidote. That maneuver proved fruitless as well. The only remaining tests were blood and urine assays for strychnine, and those results might not be back for days. Tetanus was the leading contender.

"We'll start the antitoxin as soon as pharmacy brings it up," said the ICU chief, taking me aside. "In the meantime, he's intubated, with diazepam [Valium] by IV. Now what about antibiotics?"

Although Eduardo had no visible signs of infection, at least somewhere in his tissues there must be *C. tetani* pumping out toxin. Penicillin was in order. The drug would wipe out the toxin-producing bacteria. And we hoped the antitoxin—antibodies culled from horses or humans immunized against tetanus—

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would intercept the poisons in his blood and prevent his symptoms from getting worse.

Unfortunately, its effects were far from Lazarus-like. Eduardo remained in the ICU for a full month, while the toxin was slowly leached from his spinal cord and brain. I was hoping for a full recovery, but sometimes tetanus so damages nerves that muscles are left permanently weakened. Even muscle relaxants, low lights, and tiptoeing doctors and nurses couldn't prevent Eduardo's spasms, so we paralyzed his muscles and put him on a ventilator. Thankfully, he made it through.

Several weeks after his discharge from the hospital, I saw Eduardo at a follow-up visit. He was still thin and leaning on a cane. When I greeted him in the hall, he seemed to remember me.

"Tetanus vaccine?" he responded laconically to my first eager question. "I don't remember any vaccines in the village where I grew up."

I made a mental note to ask our nurse to vaccinate him. Ironically, so little toxin is released during an infection that even a full-blown case of tetanus builds no immunity against future attacks.

"What about an injury?" I persisted. "Usually a wound precedes tetanus."

"Ah, the soccer game," he mused. "A few weekends before I started getting stiff, something sharp went right through the sole of my shoe. Glass, I think." [This information let me put the last piece of the puzzle in place: Eduardo's untreated puncture wound explained the cause of his tetanus episode. Case closed.]