

Mary Ann Cooper

Keraunomedicine Expert

AFRICAN CENTRES FOR LIGHTNING AND ELECTROMAGNETICS NETWORK



Dr. Mary Ann Cooper is an emergency physician with a 30-year career in keraunomedicine—the medical study of lightning injuries and casualties. In 2001, Cooper received the American Meteorological Society’s Special Award “for outstanding work on the medical effects of lightning which has enhanced the treatment of lightning strike victims and revolutionized lightning safety worldwide.” And two years later, she was elected an AMS Fellow—to date the only physician to be so honored.

According to Cooper’s research, **it is estimated that lightning annually kills between 6,000 and 24,000 people across the globe, while injuring 10 times as many.** Cooper currently works as the founding director of the African Centres for Lightning and Electromagnetics Network (ACLENet), which is dedicated to reducing lightning-related deaths, injuries, and property damage across that continent.

How did you get into the field of keraunomedicine?

Before I went to medical school, I knew someone who was injured in a high-voltage industrial accident. The family knew I was going to medical school, so they started asking me questions but I didn’t know anything about it. During my last year of residency, one requirement was to give a lecture, so this was my opportunity to learn about electrical injuries. It was an unusual topic, so I gave the lecture several times. And at one, somebody raised their hand and asked, “Is lightning the same?”—and I didn’t know. I looked in the surgery textbooks: nothing. I looked in the intro medicine books, which are about “yay” thick, and

there were about two sentences in there about lighting. So, I started pulling cases and literature, but it didn’t tell me what I should do or recommend to emergency docs if a kid comes in who was hit by lightning.

Luckily, that summer in Cincinnati, Ohio, we had six or seven lightning strike [injuries] and I coded them: if they had seizures or their eardrums ruptured, if they had burns on their heads, arms, legs. At my next job, in Louisville, Kentucky, I talked someone into running the data, and we came up with five correlations, which hold up to this day—and that was published in 1989.

What are these some of these correlations?

You are more likely to have cardiac arrest or die if you have burns around the head. You are more likely to die if you have burns on the legs—but not arm-to-leg, arm-to-arm, or head-to-leg. The only reason you’re going to die is cardiac arrest at time of injury—period, end of story.

So this was a wide-open field when you entered.

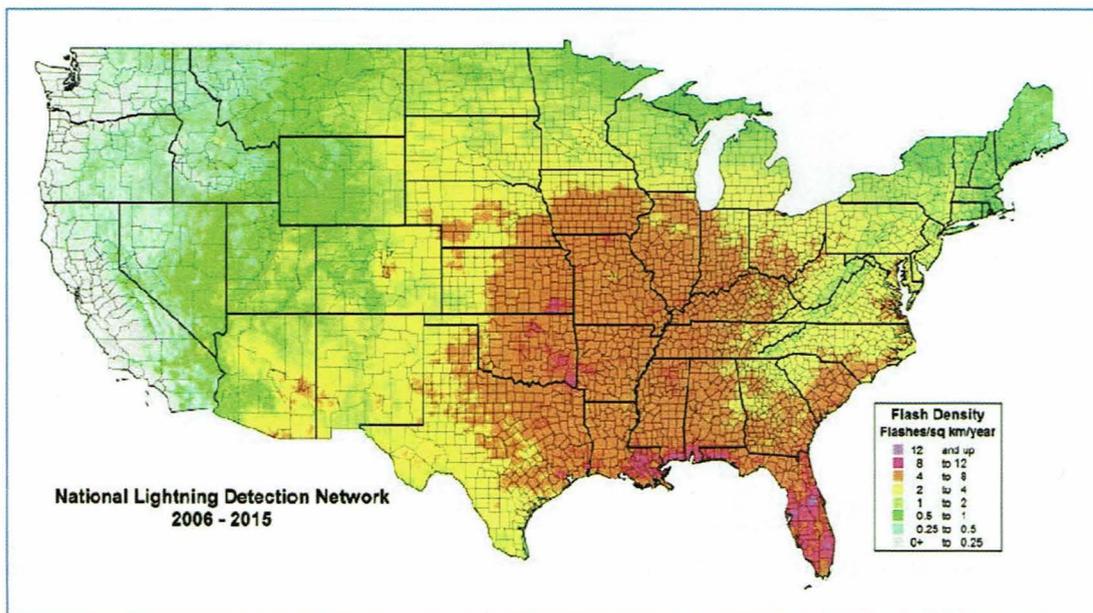
Absolutely. It’s not hard to be the international expert when there are only four, five, six of us in the world.

Now that the field is growing, in recent years what’s been the biggest breakthrough?

I don’t know if it’s about what we know, although our knowledge certainly has increased. We have got the lightning death rate in the United States to under 30 deaths per year. You talk about an orphan disease, or orphan trauma. Compared to 60 to 70 to 90 deaths annually 30 years ago, that’s pretty damn good!

How much did the field learn from Roy Sullivan (the park ranger who survived seven lightning strikes in his life)?

I never met him, and I never saw him when he was making the rounds of the talk shows. **But there are many, many other people who have been hit three or four times.** When you think that you’re more likely to be hit by lightning than win the lottery, several people have won several lotteries.



Cloud-to-ground flash density per square kilometer per year over the contiguous United States from the National Lightning Detection Network from 2006 through 2015.

I can't say anybody learned anything from him. One of the things we've learned from lightning survivors is that amnesia and loss of consciousness are frequent with lightning. The other thing is, lightning is so instantaneous, nobody really sees what happens.

Unreliable witnesses to the world's fastest car crashes.

Exactly.

Is there a common thread among victims of these lightning strikes?

At the time of the injury, you're talking about loss of consciousness, amnesia for the event, confusion, aches and pains, more often survival than not. They may have their chest pounded on whether or not they had cardiac arrest because it's impossible to feel a pulse in that situation. The American Heart Association told us 10 years ago to stop feeling for a pulse, because even for trained people like me, emergency docs, it's up for grabs.

Afterward, people will lay around the house for days—most people don't even go to the hospital. But after two, three, four days, people aren't getting back to where they think they should be. Then they try to go back to work—but if they're a mechanic, after overhauling a motor there are parts left over, and if they're a cook, they can't get a dinner put together. The injuries they have are brain injuries similar to a concussion. They'll be quite irritable, easily frustrated, easily distracted. They'll be a devil to their families and caregivers because of the anger; it takes a long time to work through that. Also, chronic pain—lightning is a

neurological injury. The nerves misfire, and the brain interprets those misfires as pain.

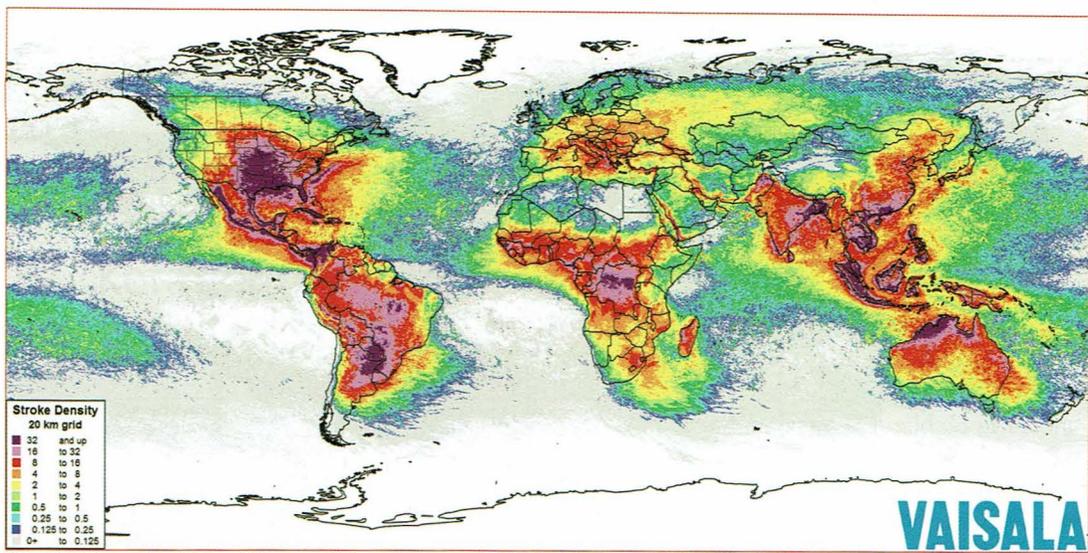
The parallel that comes to mind is traumatic brain injury from war.

Exactly. Same thing. There may be a couple little pieces where lightning is different from football concussions or war, but it's traumatic brain injury. These people can't even say what isn't working right in their brains; they just know it's not working right.

You're about to leave for Africa—what will you be doing there?

This is the fourth time I'll have been to Uganda. I was invited to speak at a climate change meeting, sponsored by the European Union, about how climate change affects health. Then I'll stay for another week and do staff training (for ACLENet), because at the schools we're protecting they don't know diddly about lightning. In Africa, they believe wearing red attracts lightning. They believe there's two kinds of lightning: natural and "witch" lightning, where you hire a witch to call down lightning on your enemies. There are leaders in many communities, when a thunderstorm is coming toward their village, who will stand up on a hill and tell the storm to go that way instead of to their village. We've got all this stuff to deal with.

Plus, the engineers in these communities don't know anything about lightning or lightning protection. Many of the schools we've gone to will have one multi-pronged rod on one building; the schools tend to be five, six, 20 separate buildings. But the person who installed this rod tells the



Stroke Density Map - 20 km grid Average: 2012-2016 GLD360 v2.0 data: 7,828,464,140 strokes

Lightning stroke density per square kilometer per year over the world from the Global Lightning Dataset GLD360 from 2012 through 2015.

community it will protect the entire compound. To be kind, I'll say they do this out of ignorance rather than being charlatans.

What must be done to protect these structures?

A lightning-protection system is not only a rod—it may need to be several rods. Then there's got to be down conductors, and then you need the earthing/grounding system. At the schools, we're getting families involved; they're digging the trenches—a meter wide, a meter from the building, and half a meter deep—for the earthing ring that attaches to the down conductor that attaches to the rod, for each building.

How much does it cost to lightning-protect a building?

Just the materials for a 250-square-meter building is about \$1,700–\$1,800. There is some economy of scale by the time you get up to about 2,000 square meters; it's only about \$4,000 or something. But that doesn't include the trip out there to measure the school, it doesn't include the design, the ordering and shipping of the materials, the customs and import fees, and it doesn't include installation.

So it's a commitment.

It's a lot more than you would think it would be.

Why are you starting your efforts with the schools?

Because there are no lightning-safe places in sub-Saharan Africa, outside of the major buildings in major cities, so there is no place a family can go to be safe. Most of the buildings are mud brick, with either a generations-old thatched roof that is tinder-dry ready to be set on fire or a cheap metal roof. The schools tend to be the most substantial buildings in the villages. It starts with education of teachers, officials, and parents about lightning safety. It's the best we can do at this point.

In a big-picture sense, lightning seems to be regarded as an inevitability.

Yep—you can't do anything about it, it's an act of God, it's never going to happen to me ... That's what we found in the United States—that you could talk to adults until you were blue in the face, but they never thought it was going to happen to them. Still, they went out and bought lottery tickets. But if you talked to them about their kids getting killed or injured, they'd pay attention to "When thunder roars, go indoors."

MIKE BRANOM is a freelance writer and former weather reporter based in Pasadena, California.