

Transcript Details

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ReachMD

www.reachmd.com
info@reachmd.com
(866) 423-7849

Exertional Heat Stroke (EHS): Neurological Characteristics & Pathophysiology

Narrator:

Welcome to REACHMD. This special edition of *The Pulse of Emergency Medicine* is sponsored by Eagle Pharmaceuticals. The following activity is intended for physicians. Here's your host, Dr. Andrew Wilner.

Dr. Wilner:

Exertional heatstroke, or EHS, is a sudden and unpredictable condition that raises core body temperatures above 104 degrees Fahrenheit. Left untreated, EHS leads to significant neurological dysfunction and high mortality rates. On this program, we'll take a closer look at the neurological underpinnings and pathophysiology of this disease, identifying those at highest risk to help make a faster diagnosis.

This is ReachMD and I'm Dr. Andrew Wilner. Joining me is Dr. Julian Bailes, Director of the Department of Neurosurgery and Co-Director of the NorthShore University Health System Neurological Institute in Chicago. Dr. Bailes, welcome to the program.

Dr. Bailes:

Thank you, Dr. Wilner. Good to be with you.

Dr. Wilner:

To start, help us characterize exertional heatstroke, or EHS, from a diagnostic standpoint.

Dr. Bailes:

Exertional heatstroke differs from standard or classic heatstroke. Classic heatstroke typically occurred after heat waves and particularly vulnerable population, like the very young or the elderly, and those with pre-existing conditions. Exertional heatstroke is caused by physical activity, such as exercising or working outside, in hot and humid environments. And so, oftentimes, we can tell from the history itself, the history of exposure, and also by the symptoms of the patient.

Dr. Wilner:

Is the diagnosis straightforward, or does it ever get mistaken for other etiologies?

Dr. Bailes:

Well, it's ordinarily, in most circumstances, it's able to be discerned. But it can, sometimes, masquerade as other conditions, such as concussion or stroke or exertional hyponatremia, cardiac arrest, or even heat exhaustion. But, exertional heatstroke, the problem is it can proceed and develop rapidly, and so, then, the neurological conditions often emerge: fainting, dizziness, vomiting, or unusual behavior are often the very first things which are seen.

Dr. Wilner:

In terms of the epidemiology, do we have a good estimation of the incidence and prevalence of EHS?

Dr. Bailes:

Well, we probably don't. It's believed that it is becoming more common. It's believed that because of the rising temperatures worldwide, and because of perhaps a greater recognition, that exertional heatstroke is more common than it was in the past.

Dr. Wilner:

Which patient populations are at the highest risk for this disease?

Dr. Bailes:

Well, exertional heatstroke is most common, again, in exercising in hot and humid environments, and those are most commonly athletes, often athletes in high school that are undergoing football practice in the summer months, particularly August, or those undergoing training. Those working out who are not acclimated, or who may be out of shape, or obese. Not only athletes; however, though, construction workers, outdoor workers, firefighters, and military, who are exposed to a hot, humid environment, and with exertion, are the usual ones who are at risk for exertional heatstroke.

Dr. Wilner:

Yes, in my mind, I picture Marines in training and others who are having to push themselves, like professional athletes, whereas someone else, if they began to feel that way, might say, "Oh, I think I'm going to go lie down." But these are people maybe who don't really have that option.

Dr. Bailes:

Well, that's correct, and many of these, whether they're athletes or construction workers or firefighters, they are either expected, it's expected of them, or they expect of themselves to push through some of these initial sensations they get. And if the body can't cool itself efficiently and sufficiently, that's where you can exceed your body's ability to handle the heat, and that's where the problems can begin.

Dr. Wilner:

Dr. Bailes, let's walk through the pathophysiology of this disease process to get a better sense for what's going on at the cellular level.

Dr. Bailes:

Well, the exact temperature at which the collapse of the body's ability to handle may vary, but by definition, as was said earlier, if the temperature is greater than 104 degrees Fahrenheit or 40 degrees Centigrade, in most people, the body can no longer efficiently cool to prevent the metabolic effects to begin to occur. And that begins at the cellular level where proteins can get denatured. Phospholipids and lipoproteins can become destabilized. And then, it ultimately affects at the cellular level the intracellular regulation of calcium.

Dr. Wilner:

Well, now that we know a little bit more about this disease process and the at-risk patients, what are the short- and long-term complications for those who aren't quickly identified and treated?

Dr. Bailes:

Well certainly, exertional heatstroke can progress. It can progress to neurological problems and neurological compromise including even alteration in sensorium, alteration in level of consciousness, coma, and death. In addition to the brain, the two other organs which are commonly affected by exertional heatstroke are the kidneys and the liver.

Dr. Wilner:

Are the neurological effects of EHS quickly reversible with aggressive cooling?

Dr. Bailes:

Well, they are if cooling is instituted in time, and if the tipping point, metabolically, hasn't been reached. And that's really what we have to work on is identifying those at risk and then getting them out of that environment, getting them cooled, and in many cases getting them to medical attention.

Dr. Wilner:

From your specialty's vantage point, what neurological assessments or measures do you prefer for helping make this diagnosis quickly and accurately?

Dr. Bailes:

Well, the number one thing is the history, the exposure to temperature and humidity, perhaps in those who have either, like you mentioned earlier, pushed themselves beyond their limits, or in those who are not acclimated, or out of shape, or obese, or have co-existing medical conditions. And, for us, it's really a high index of suspicion; knowing someone who's been in that environment, been in that exposure, and then to begin to realize and put that together that that not only may it be initially nausea and vomiting, but also beginning to have neurological changes such as alterations in sensorium, confusion, emotional instability, irritability, nausea, vomiting; cramps can occur. But if it progresses unabated, it will lead to collapse and coma.

Dr. Wilner:

Before we wrap up, are there any additional thoughts on EHS that you'd like to impart to our listening audience?

Dr. Bailes:

The main thing is the awareness, particularly as we enter the summer months, and an awareness of those who are at risk, and that

exertional heatstroke is different than classic heatstroke, which occurs in heat waves. Exertional heatstroke can occur to anyone. It can occur to someone who's relatively young and someone who's athletic, or maybe serving in the military, or is a firefighter. So, it's not the old or the young that have medical pre-existing conditions. It's seemingly healthy, but those are ones who, in the right setup, a perfect storm to have this occur if the temperature rises too high and cannot be gotten down.

Dr. Wilner:

Well, with that, I want to thank my guest for joining me to discuss the characterization and pathophysiology of exertional heatstroke. Dr. Bailes, it was great having you on the program.

Dr. Bailes:

Thank you. Enjoyed being here with you, Dr. Wilner.

Narrator:

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