GENERAL

When the Air Hurts the Brain: How Climate Change Is Affecting Neurological Health

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As wildfires rage, heatwaves intensify, and cities choke on air pollution, our lungs are not the only organs under siege. The brain ? delicate, intricate, and often overlooked in climate discourse ? is also a casualty of the climate crisis. Emerging research shows that climate change is not just an environmental or respiratory threat. It's a neurological one, too.

Climate Change and the Nervous System: An Overlooked Connection

Until recently, the intersection between neurology and climate change was scarcely addressed in mainstream public health discussions. But a growing body of evidence is now making it impossible to ignore. The brain is highly sensitive to external stressors ? and few are more pervasive and sustained than the effects of a warming, polluted planet.

In a comprehensive scoping review published in *Neurology* (Louis et al., 2023), researchers documented how extreme heat, air pollution, and vector-borne diseases linked to climate change are increasingly influencing neurological diseases and health outcomes. Their findings underscore a critical, if uncomfortable, truth: climate change is reprogramming not just ecosystems, but human biology ? including the central nervous system.

Heat, Stroke, and Neurodegeneration

High temperatures don't just make people uncomfortable ? they can make them sick. Heat exposure increases the risk of ischemic and hemorrhagic strokes, especially in older adults and individuals with preexisting cardiovascular conditions. As extreme weather events become more common, emergency rooms in heat-prone regions are seeing a rise in heat-induced neurological crises.

Additionally, chronic heat exposure has been linked to the progression of neurodegenerative conditions like Alzheimer's and Parkinson?s disease. A 2021 study in *Early Human Development* noted that persistent temperature elevation can alter protein stability in the brain and may accelerate the pathogenesis of certain neurological disorders (Zammit et al., 2021).

Air Pollution: A Silent Neurotoxin

Among the most insidious climate-related threats is particulate matter (PM2.5) ? fine air pollution particles that can cross the blood-brain barrier. Chronic exposure to PM2.5 and ozone has been associated with an increased risk of cognitive decline, dementia, multiple sclerosis relapses, and even neurodevelopmental disorders in children (Doan & Dhawan, 2024).

Researchers argue that air pollution acts as a silent neurotoxin, triggering neuroinflammation, oxidative stress, and vascular injury, which may compromise the brain over time. For children, this could mean developmental delays. For adults, it could mean earlier onset of dementia. For older adults, it could mean death.

Neuroinfectious Diseases on the Rise

Climate change is also altering the geographic distribution of mosquitoes and ticks, increasing the incidence of neuroinfectious diseases like West Nile virus, Lyme disease, and Japanese encephalitis. These infections don?t

just cause fevers ? they can lead to long-term brain inflammation, seizures, and paralysis.

As the authors of *Neurology in a Changing Climate* emphasized, many low-resource and tropical areas face rising risks without adequate neurological infrastructure to handle outbreaks (Louis et al., 2021).

The Inequity Problem

Like most climate-related health impacts, the burden isn?t distributed evenly. People in low-income, urban, or already-vulnerable populations face disproportionate risks. Access to neurologists, clean environments, cooling systems, and long-term care is deeply unequal ? turning a medical challenge into a social justice issue.

What Can Be Done?

The good news? Awareness is growing. Neurologists are beginning to integrate environmental risk factors into their patient assessments. Public health systems are being urged to develop heat-resilient infrastructure, monitor air quality, and educate communities about modifiable exposures.

But individual action matters too. Wearing masks during high-pollution days, using air purifiers, staying hydrated during heatwaves, and supporting clean energy policies are all ways to reduce personal and collective risk.

Final Thoughts

The mind-body connection doesn?t end at stress or sleep. It extends to the air we breathe, the climate we inhabit, and the environmental choices we make. Climate change is a neurologic issue ? not just because of its direct health effects, but because it alters how we think, move, remember, and live.

As the world heats up, so must our urgency to protect the brain ? humanity?s most vital organ ? from its rising toll.

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Competing interests

The authors declare that they have no competing interests.

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