

Here's Why Humans Are Uniquely Sensitive to Wildfire

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Transcript

Dr. Dawn Bowdish: When the air quality is poor due to wildfires, we're told to go indoors or to wear a mask if we must be outside. Do you ever wonder why it's okay to take your dog out for a walk during wildfire season, or why the zookeeper doesn't have to take all the other animals indoors when the air quality is bad? As it turns out, this is because humans are uniquely susceptible to particulate air pollution.

Wildfire smoke includes two dangerous components: the volatile chemicals, which include the things that you can smell, and small particles, which you can't.

Both these components cause a lot of inflammation when we breathe them in and can trigger asthma attacks, exacerbations of COPD, and increases the risk of heart attacks. We don't have immune defenses to stop the volatile chemicals, but we do have a few layers of protection from the small particles. Some of these particles get trapped in the mucus that lines our nose or mouth and our lungs, and these are generally eaten up by immune cells called macrophages.

Unfortunately, an evolutionary quirk that occurred tens of thousands of years ago means that our macrophages are less good at eating those particles than other animals. You see, the size of the particle that causes us the most grief is about the same size as the bacteria and one particular bacteria called *Mycobacterium tuberculosis*, which is the bacteria that causes tuberculosis or TB, and has shaped our evolution.

Most bacteria do everything they can to stay away from macrophages, which eat and destroy them, but *Mycobacterium tuberculosis* can't survive unless it's inside a macrophage. In order to protect us from *Mycobacterium tuberculosis*, our macrophages developed mutations that made eating this bacteria just a little bit slower and gave them more time to turn on their antimicrobial defenses.

This mutation was so useful and important that it became widespread in modern humans. Primates don't have it, and even our close cousins, the Neanderthals or Denisovans, didn't have it. Unfortunately, this mutation means that our macrophages are not very good at ingesting small-sized pieces of dust. And if they can't do their job, we get a lot of dangerous lung inflammation.

This evolutionary quirk explains why humans are uniquely sensitive to particulate pollution, and why it's important to wear a mask when you're in an unventilated area, making a lot of dust, like during construction. During wildfires, when there's a lot of these particulates around, there are more hospitalizations for heart attacks and lung conditions.

There are also long-term health effects, whether it be from wildfires, factories or living in busy urban areas. that can increase many conditions that have inflammation at the root, like

dementia. This particulate air pollution can have a negative impact on pregnancies and to the health of babies born to women who are exposed to a lot of pollution.

There are many, many good reasons to worry about climate change and the increase in wildfires, but this quirk in our evolution means that protecting our short-term and long-term health is one of them.

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