

## How air pollution affects the digestive system

May 24 2024



The diseases caused by PM<sub>2.5</sub> pollution in different systems are shown. CAD, cardiovascular disease; NASH, non-alcoholic steatohepatitis; HCC, hepatocellular carcinoma. Credit: Kezhong Zhang

Fine air particles, less than 2.5 micrometers in diameter  $(PM_{2.5})$ , are a major air pollutant linked to various health problems. These particles can travel deep into the lungs and even enter the bloodstream when inhaled.



Recent research suggests a major health concern:  $PM_{2.5}$  exposure can also damage the digestive system, including the liver, pancreas, and intestines.

The work is <u>published</u> in the journal *eGastroenterology*.

This recent research has been focused on how  $PM_{2.5}$  exposure triggers stress responses within the digestive system's cells. These stress responses involve specialized subcellular structures within cells called organelles, such as the <u>endoplasmic reticulum</u> (ER), mitochondria, and lysosomes. When  $PM_{2.5}$  disrupts these organelles, it creates a <u>chain</u> <u>reaction</u> within the cells that can lead to inflammation and other <u>harmful</u> <u>effects</u>.

The liver, a major organ for detoxification and metabolism, is particularly susceptible to  $PM_{2.5}$  damage. Studies have shown that  $PM_{2.5}$ exposure can lead to a cascade of problems within the liver, including inflammation, stress responses, and damage to the organelles, and disrupted energy metabolism. These effects can contribute to the development of non-alcoholic fatty liver disease (NASH) and type 2 diabetes.

 $PM_{2.5}$  exposure does not stop at the liver. It can also harm the pancreas and intestines. Studies have linked  $PM_{2.5}$  to an increased risk of pancreatic impairment in people with diabetes, as well as damage to intestinal cells and an increase in their permeability. This increased permeability can lead to a variety of digestive issues.

While the recent research efforts provide valuable insights, key questions remain. Scientists are still working to understand how cells sense  $PM_{2.5}$  and how the <u>stress response</u> differs in various digestive organs. Additionally, they are investigating how  $PM_{2.5}$  exposure affects communication between different digestive organs, potentially impacting



overall digestive function.

Finally, researchers are exploring whether dietary or pharmaceutical interventions can mitigate  $PM_{2.5}$  damage. Interestingly, some studies suggest that certain nutrients, like <u>monounsaturated fatty acids</u> and vitamins, may offer some protection against the harmful effects of  $PM_{2.5}$ .

Air pollution is a complex issue with no easy solutions. While research continues mitigating  $PM_{2.5}$  exposure, the current understanding of its impact on the <u>digestive system</u> highlights the far-reaching consequences of air pollution on human health. It underscores the need for continued efforts to reduce <u>air pollution</u> levels and develop strategies to protect ourselves from its detrimental effects.

**More information:** Kezhong Zhang, Environmental PM2.5-triggered stress responses in digestive diseases, *eGastroenterology* (2024). <u>DOI:</u> <u>10.1136/egastro-2024-100063</u>

Provided by First Hospital of Jilin University

Citation: How air pollution affects the digestive system (2024, May 24) retrieved 17 June 2024 from <u>https://medicalxpress.com/news/2024-05-air-pollution-affects-digestive.html</u>

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