

# ENVIRONMENTAL HEALTH PROJECT

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## Featured Research Review:

You, R., Ho, Y.,- Chang, R. -C. (2022). A review of the harmful effects of particulate matter on the central nervous system

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### Terms to know:

[Alzheimer's disease \(AD\)](#) – the most common form of dementia, AD impacts an individual's thoughts, memories, and language.

[Epidemiological study](#) – a type of scientific study that aims to track the frequency of disease presence, understand the disease, identify potential causes and risk factors, and then determine areas for preventative medicine.

[Experimental study](#) – a type of scientific study that randomly selects individuals to participate in the intervention in order to understand the potential impact.

Neurodegenerative diseases – also known as degenerative nerve diseases, these are conditions that affect the body's activities such as balance, movement, or breathing.

[Neuroinflammation](#) – the process in which the immune response is triggered in the body as a result of some challenge to the inflammatory system such as injury, infection, exposure to toxins, etc.

[Parkinson's disease \(PD\)](#) – is a type of [movement disorder](#) that occurs when nerve cells in the brain don't produce enough dopamine, which leads to trembling, stiffness, slowness, and poor balance/coordination.

[Oxidative stress](#) – a condition of the body which occurs when antioxidant levels are low, measured through the plasma in your blood.

Particulate matter (PM), or particle pollution, is composed of tiny solid and liquid particles found in the air. The particles enter the air from a variety of sources, such as burning fossil fuels, vehicle emissions, animals, fires, and dirt. Shale gas development (SGD) emits toxic substances through the air at every stage, from drilling to extraction to transportation. PM is especially concerning when it comes to SGD air emissions.

PM is classified based on the size of the particles, measured in microns or micrometers, with PM2.5 and PM10 being two sizes of concern. The smaller the size the longer it stays in the air, the further it can travel, and the more detrimental it can be to health.

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Previous research has found particulate matter can have numerous negative effects on the human body. Studies have indicated exposure to PM can increase the likelihood of developing lung and heart diseases as well as impacting the immune and central nervous systems. Exposure to PM can also aggravate asthma symptoms, cause irregular heartbeat and heart attacks, and lead to premature death in those with heart and lung diseases.

In this study, researchers conducted a literature review in which they explored the effects of PM on the central nervous system by reviewing recent relevant epidemiological and experimental studies.

The authors found:

- Consistently, across a variety of studies, there was a strong correlation between chronic exposure to PM, especially PM<sub>2.5</sub>, and the onset of dementia and Alzheimer's.
- Oxidative stress was seen to be one of the causes of neuron damage from exposure to PM.
- Neuroinflammation was seen as a potential way further damage could occur to the neurons.
- Short-term exposure to PM triggers the body's stress response in the brain; long-term exposure can lead to diseases such as Alzheimer's.

**To learn more about this study, explore these links:**

Block, M. L., & Calderón-Garcidueñas, L. (2009). Air pollution: mechanisms of neuroinflammation and CNS disease. *Trends in Neurosciences*, 32(9), 506–516. <https://doi.org/10.1016/j.tins.2009.05.009>

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Environmental Health Project. (2021, January 21). *What is PM and Why Should You Be Concerned?*

[https://www.environmentalhealthproject.org/files/ugd/a9ce25\\_ab5fa37038d94686ad6459027e203035.pdf?index=true](https://www.environmentalhealthproject.org/files/ugd/a9ce25_ab5fa37038d94686ad6459027e203035.pdf?index=true)

Pope, C. A., Burnett, R. T., Krewski, D., Jerrett, M., Shi, Y., Calle, E. E., & Thun, M. J. (2009). Cardiovascular Mortality and Exposure to Airborne Fine Particulate Matter and Cigarette Smoke. *Circulation*, 120(11), 941–948. <https://doi.org/10.1161/circulationaha.109.857888>

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You, R., Ho, Y. S., & Chang, R. C. C. (2022). The pathogenic effects of particulate matter on neurodegeneration: a review. *Journal of Biomedical Science*, 29(1). <https://doi.org/10.1186/s12929-022-00799-x>

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