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The Brain & Pollution: Effects on Adults and Elders
Part 2

The brain continues to mature up until the age of 25 on average, after which it loses much of its flexibility (Johnson et al., 2009). Furthermore, studies show that the brain continues to work at its peak until the age of 50. Afterward, a steady cognitive decline begins as a natural part of the aging process. In old age, the human brain is no longer able to absorb information as well, nor is it able to process it as rapidly as before. Nonetheless and thanks to scientific advancements, most healthy elders sustain their mental skills well into their 80s and 90s unless a pathology is involved.

The Prevalence of Neurological Disorders

The prevalence of neurological disorders has been increasing over the years and many factors are to blame, including air pollution (Gitler et al., 2017). The following article will discuss the contribution of pollution to these rising numbers.

As discussed in Part 1 of this article series, a lot of research has already demonstrated the effects of pollution on the developing brain of the child and the adolescent. To recap, there seems to be a clear set of evidence against pollution. Interestingly, a similar trend is observed in studies focusing on the adult brain.

Early & Middle Adulthood

In young adults, the still-maturing brain needs to continue to generate neurons through a process called ***neurogenesis***. Unfortunately, air pollution, and particulate matter (PM) to be specific, slow down these crucial neural activities. One study revealed that neurogenesis, synaptogenesis, and myelination are significantly impacted by environmental toxins (Boda et al., 2020). Although the mechanism through which

pollutants affect these processes is still a mystery, it seems that inflammation and microglial activation could be accomplices.

Microglial activation is a phenomenon that leads to and contributes to inflammation (Dheen et al., 2007). It is one of the defining characteristics of brain pathologies such as Alzheimer's and Parkinson's Diseases. Essentially, ***microglia*** are cells that can cause the death of neurons through the release of toxic compounds that further promote inflammation.

Old Adulthood & Cognitive Decline

A review by Haghani and colleagues (2020) found that air pollution increases the risk of neurodegenerative disorders such as Alzheimer's. Combined with a poor lifestyle and at-risk genetics, the consequences can be quite alarming.

One American study found that long-term exposure to fine particulate matter ($PM_{2.5\text{-}10}$) caused significantly worse cognitive impairment in older women (Weuve et al., 2012). Adding to the bank of evidence, a report published in 2020 divulged that individuals living in polluted areas of New York City had lower cognitive scores and exhibited rapid rates of cognitive decline over time compared to their counterparts living in lesser polluted areas (Kulick et al., 2020).

Pollution and Mental Illness

If the brain is afflicted by pollution, then theoretically, mental health could also be affected. To test this theory, a team of researchers at the University of Washington (2017) conducted a longitudinal study to observe the link between psychological distress and air pollution. The results were interesting, to say the least: Exposure to $PM_{2.5}$ (i.e., fine particulate matter) was significantly linked with mental distress.

Additionally, two different studies found a relationship between increasing concentrations of air pollutants and depressive disorders, especially in the elderly population (Lim et al., 2012; Vert et al., 2017). Further research discovered that nitrogen dioxide (NO_2, a compound typically released from the burning of fuels) may be the main pollutant to blame and that even short exposures, could be causing depression amongst adults (Fan et al., 2020).

Finishing Thoughts & Tips

The existing scientific literature indisputably validates the link between pollution and brain disorders. So, the looming question is: "What can we do to mitigate the effects of pollution on our brains?".

First and foremost, this is not only an individual problem, but it is also an important public health issue. That being stated, efforts need to be made at a higher level to reduce the concentrations of pollutants in the air. Nonetheless, at the individual level, you can intervene with the following three high-impact actions:

1. **Diminish your contribution to outdoor air pollution.** Reduce travel by car and opt for public transportations, bicycling, or walking whenever possible.
2. **Keep indoor air clean.** Make sure your house is properly sealed to prevent outdoor pollutants to enter the indoor environment. Install air filters that help clean indoor air.
3. **Avoid exercising in polluted areas.** For example, opt for jogging at a park as opposed to urban areas near ongoing traffic.
    - Keep an eye out for air quality. According to research, air pollution is worse on hot, sunny days, and around rush hour when there are many vehicles on the road.
    - If you are taking care of an elder, avoid exposing them to polluted areas when outside.

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