Air pollutions correlation with Alzheimer's risk

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Abstract

Alzheimer's is one of the most prominent neurological disorders that affects our society today. There is not much known regarding how to treat or prevent this disorder. Recent findings indicate that there is a linkage between Alzheimer's risk and air pollution. This review discusses the harmful components in air pollution and how they contribute to the risk of Alzheimer's. Specifically, Particulate matter and Ozone will be discussed in great detail. These components were also found to increase Alzheimer risk when found in high concentrations as well as when an individual is chronically exposed. These finding clearly show that there is a relationship between Alzheimer risk and air pollution. This being the case actions may need to be implemented to decrease air pollution concentration.

Introduction

Alzheimer's is one of the most prominent neurological diseases in today's society with around 500,000 new cases being diagnosed every year in the United States alone. One reason why this disease is so prominent is due to how little we know about what causes it or how we can treat it. Recent studies show there may be a relationship between Alzheimer's and air pollution.

Air pollution is composed of a variety of components such as particulate matter (PM), gases such as carbon monoxide (CO), sulfur oxides, as well as nitrogen oxide. Ozone (O3) has also been found to be prominent in air pollution. Of these components particulate matter as well as ozone were found to be most prominent in causing health concerns regarding neurological disorders.

This review will expose the relationship between air pollution and an increased risk of Alzheimer's disease due to the harmful components that reside in air pollution as well as the detrimental effects that arise from chronic exposure.

For more information

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Ozone Exposure

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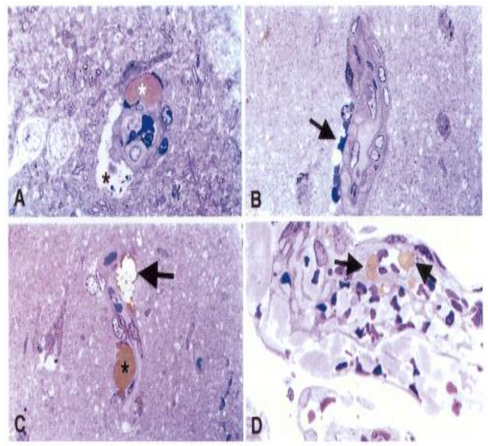

FIGURE1.—SWMMC dogs . Frontal cortex,1-lm-thick epoxy resin-embedded, toluidine blue-stained sections. 5A)2-year-old. Small cortical blood vessel shows2 lipid deposits(white*)in the blood vessel. 5B)6-year-old. Several red blood cells are seen outside the vessel wall(arrow). The nucleus above the arrow shows clumping of the chromatin. Neurons contain lipofuscin pigment..5C)12-year-old. Blood vessel is compressed by large lipid deposit(*). In focal areas the lipid has been partially removed(arrow). 5D)3-years-old. Frontal leptomeninges. Lipid deposits are present in leptomeningeal blood vessels(arrows)420.

- In an animal model, mongrel dogs were exposed to high concentrations of O3 and PM (Garciduenas et al 2002).
- These dogs showcased symptoms that are present in Alzheimer's pathology including alterations in the blood brain barrier (Garciduenas et al 2002).
- study conducted in Taiwan found that in a population those who lived in areas exposed to a higher concentration of air pollution were found to have a higher risk of Alzheimer's disease (Jung et al 2015).
- In this population-based cohort study it was found that an increase in concentrations of O3 lead to a higher risk of newly diagnosed Alzheimer's disease (Jung et al 2015).

PM Exposure

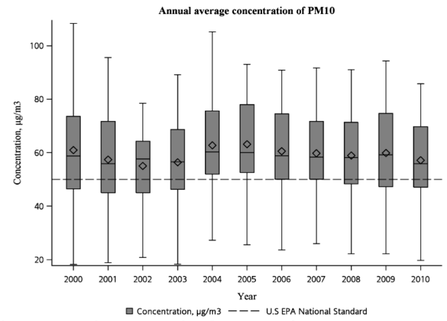

Figure2-The trend of annual average concentration of PM10 in Taiwan during 2000-2010.

- In the same cohort study, It was found that elevated long term exposure to PM10 was significantly associated with disease (Jung et al 2015).
- an increased risk of Alzheimer's These finding correlate with previous studies that found that air pollutants trigger inflammations responses in the brain(Yu et al 2010).
- PM 2.5 particles which are found in air pollution has been usually linked with respiratory and cardiovascular diseases however they have now been shown to cause CNS diseases including Alzheimer's (Shou et al 2019).
- This occurs due to PM2.5 having the ability to destroy the blood brain barrier, doing so allows inflammation to easily cross the blood brain barrier and eventually reaching and damaging the CNS (Shou et al 2019).

Increased risk

- High levels of air pollution, especially in areas where pollution is above the US EPA standard level have been found to increase the risk of Alzheimer's in an individual (Jung et al 2015).
- A study conducted in Mexico City indicated that children exposed to a greater level of air pollution were found to have an increased risk of Alzheimer's disease (Garciduenas et al 2008).

Synthesis

Throughout all of the studies mentioned in the review PM has been shown to have a correlation with Alzheimer's risk. PM has been shown to consistently trigger brain inflammations which is consistent with the Alzheimer's pathology.

Throughout this review it has been repeatedly shown that Ozone has been found to damage the CNS. This damage in the CNS has been found consistently in patients with Alzheimer's . These finding have indicated that there is likely a linkage between Ozone and Alzheimer's risk.

Further investigation may need to be implemented on the concentrations of air pollution and its components to further determine what the safest concentration an individual can be exposed to before there is an Alzheimer's risk.

Overall this review has showcased consequences of air pollution and its components. Air pollution has been found to damage to CNS while also causing cognitive impairment both of which are found in the Alzheimer's pathology. This being the case the evidence indicates that there is a relationship with air pollution and Alzheimer's risk.

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