What the science tells us about the ApoE Genotype

The ApoE gene provides instructions for making a protein called Apolipoprotein E. This protein combines with fats (lipids) in the body to form molecules called lipoproteins. Lipoproteins are responsible for packaging cholesterol and other fats and carrying them through the bloodstream. Maintaining normal levels of cholesterol is essential for the prevention of disorders that affect the heart and blood vessels (cardiovascular diseases), including heart attack and stroke.

There are at least three slightly different versions (alleles) of the *APOE* gene. The major alleles are called e2, e3, and e4. The most common allele is e3, which is found in more than half of the general population. (SOURCE)

ApoE is the only apolipoprotein that has been associated to the deleterious consequences of mercury exposure. No other apolipoprotein gene has been associated to the susceptibility to mercury intoxication. (SOURCE)

It was shown that both organic and inorganic mercury cause those biochemical changes in tubuli structures which can be found in brains of patients with Alzheimer's disease (AD).
In healthy human brain tissue cultures, only mercury, even in lower concentrations, but not aluminum, lead, zinc or iron were able to inhibit binding to guanosine-tri-phosphate (GTP), which is necessary for tubulin synthesis and thus for neuron function.

The ApoEe4 allele is associated with an increased risk of developing either AD and Parkinson's (PD). An earlier onset of PD and an earlier onset of psychosis in PD have also been associated with an elevated expression of the ApoEe4 allele.

The ApoEe4 also appears to increase susceptibility to the neurotoxic effects of lead and mercury. These associations may be explained by the fact that ApoEe4 allele has reduced detoxifying capabilities compared to the other two subtypes (ApoEe2, ApoEe3).
Unlike these two subtypes, the ApoEe4 allele does not contain any sulfhydryl- groups, which may have the ability to bind to and detoxify metals such as lead and mercury. (SOURCE)
Parkinson's disease (PD) is the most common muscular functioning disorder, and it is the second most common neurodegenerative disorder after Alzheimer's disease (AD). The prevalence of PD

has increased in industrialized nations and will continue to increase alongside the longevity of the population. A large number of metals such as mercury, copper, and others can be released from metal body implants such as dental restorations, phagocyted by blood macrophages, and transported into the brain.

Additionally, mercury as vapor needs no transportations through macrophages, because it can easily penetrate through the blood-brain barrier (BBB). Mercury exhibits synergistic effects when combined with other metals such as lead, aluminum, manganese, cadmium, and zinc, exacerbating mercury toxicity even at low and nontoxic doses. (SOURCE)

Children have a higher susceptibility to adverse neurological mercury effects, compared to adults with similar exposures. Moreover, there exists a marked variability of personal response to detrimental mercury action, in particular among population groups with significant mercury exposure. The possibility that the presence of *ApoE ε4* allele may enhance the risk of behavioral deficit among preschool children, previously characterized by elevated Hg concentrations in the cord blood, was investigated. The findings confirmed the influence of *ApoE* on the child's neurodevelopment by means of three allelic variants ε2, ε3 and ε4 (rs7412 and rs429358), acting as important protective (ε2) or risk (ε4) factors. (SOURCE) Additional Research & Resources

SOURCE REFERENCES

https://ghr.nlm.nih.gov/gene/APOE
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