Environmental Risk Factors in Alzheimer Disease

Venkatanaidu Karri, Julian Krauskopf, Jacco J Briedé, Jos CS Kleinjans
Department of Toxicogenomics, Maastricht University, 6200 MD Maastricht, The Netherlands

- Alzheimer’s disease (AD) cases estimated to rise to nearly 106 million by 2050.
- Environmental risk factors are majorly contributing to the >90% sporadic AD cases.
- For instance, Heavy metals, Pesticides, Industrial chemicals, and Air pollution are the top risk factors.
- AD pathological hallmarks: Amyloid plaques, Neurofibrillary tangles, Neuronal degeneration.

Top environmental Risk Factors for Sporadic Alzheimer’s disease (sAD)

1. Heavy metals
   - Human/Animal/In vitro Study
   - Toxicity Outcome
   - Aluminum: Human, Aggregation of Aβ42 forming the amyloid plaques.
   - Arsenic: Human, Hyper phosphorylation of protein tau.
   - Cadmium: Human, Increased aggregation of tau protein.
   - Lead: Human, Affects cognitive function.
   - Mercury: In vitro, Affect the tau protein function.
   - Copper: Human, Influence the Aβ 40, 42 homoeostasis.

2. Pesticides
   - Human/Animal/In vitro Study
   - Toxicity Outcome
   - Organochlorine pesticides (OCPs): Children, Cognitive dysfunction.
   - Organophosphate insecticides (OPIs): Children, Cognitive dysfunction.
   - Carbamates (carbofuran): Rat, Neurodegeneration in the hippocampus of brain.

3. Industrial Chemicals
   - Human/Animal/In vitro Study
   - Toxicity Outcome
   - Brominated flame retardants: Rat, Cognitive dysfunction.
   - Dieldrin: Rat, Dementia.
   - Parathion: Rat, Neurodevelopmental disorder.
   - Bisphenol A (BPA): Rat, Inhibit synapsis formation in hippocampus.
   - Phthalates: Human, Impaired neurodevelopment.

4. Air Pollutants
   - Human/Animal/In vitro Study
   - Toxicity Outcome
   - Particulate matter (PM): Mice, Amyloid β40 and 42 levels double in mouse brains.
   - Volatile Organic Compounds: Human, Memory impairment.

- Multiple classes of environmental chemicals have been hypothesized to play a role in the sporadic AD.
- In a realistic exposure, chemical mixtures/ cocktail of chemicals may increase the risk of sporadic AD compared to single chemical exposure.

References

Herinneringen (Memories)

Ministerie van Economische Zaken

Meer info: www.grensregio.eu

provincie limburg

Correspondence to:
Venkatanaidu Karri
v.karri@maastrichtuniversity.nl
www.toxicogenomics.nl

Department of Toxicogenomics
Maastricht University
P.O. Box 616
6200 MD Maastricht, The Netherlands

T +31 684843166
O: +3143 3881145