

What neurological evidence has been reported on the long-term effects of human exposure to mixtures of environmental neurotoxicants?

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INTRODUCTION & AIM

- **Environmental pollutants** threaten **global public health**, rising incidence of **morbidity** and **mortality**.
- Three critical yet poorly characterized outcomes of chemical pollution are **neurodevelopmental toxicity**, **reproductive toxicity**, and **immunotoxicity** [1].
- Toxicological and epidemiological data reveal increasing **prevalence** of neurological disorders such as **Alzheimer's** and **Parkinson's disease**, **amyotrophic lateral sclerosis**, and **Huntington's illness** [2].
- Neurological dysfunction induced by environmental pollutants may alter neuronal **excitability**, **synaptic transmission**, and **neuromuscular communication** (Figure 1) [3,4].

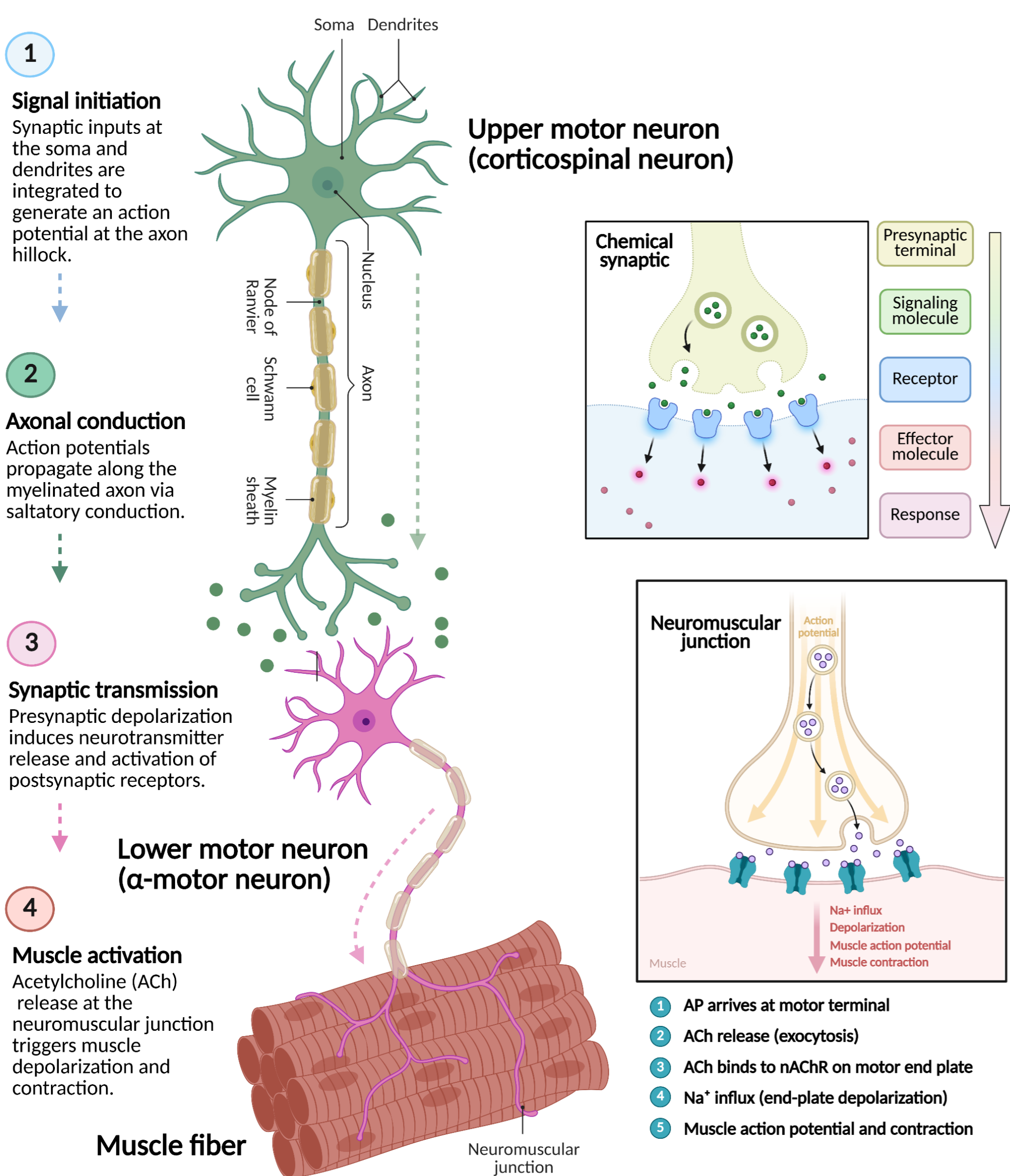


Figure 1. Schematic representation of neuronal signaling and neuromuscular transmission. Created in <https://BioRender.com>

METHODOLOGY

A PRISMA compliant review was conducted using the PubMed, ScienceDirect, and Scopus databases. Keywords used included:

“environmental contaminants,”
“pollutants exposure,”
“neurological diseases,” and
“neurotoxicants”.

Only scientific opinions from the EFSA and peer-reviewed articles from 2020 and 2025 were included. The aim of this study is to assess current evidence correlating environmental neurotoxicants with cognitive dysfunction.

RESULTS & DISCUSSION

- Data reveal epidemiological evidence linking long-term exposure to environmental pollutants with nervous system dysfunction [2].
- Prenatal exposure to outdoor air pollutants is linked to lower cognitive development scores and an increased risk of adverse neurodevelopmental and behavioral outcomes, such as autism spectrum disorder (ASD) and attention deficit hyperactivity disorder (ADHD) [5,6].
- According to EFSA opinions, substances such as endocrine disruptors (e.g., dioxins and polychlorinated biphenyls) interfere with neurodevelopmental processes, especially if exposure occurs at critical stages of development (e.g., pregnancy, infancy, and puberty) [7].
- Long-term exposure to air pollution, pesticides, and metals in adults may contribute to cognitive dysfunction [4].

CONCLUSION

The underlying etiology of the neurodegenerative process in patients is likely influenced by the interplay between predisposing genetic variants and environmental insults [8].

While the associations are strong, a causal relationship has not been fully proven due to methodological variability and confounding factors. A better understanding of the neurological impact of environmental pollutants is crucial for developing effective prevention and intervention strategies.

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