

# AGRICULTURAL ENVIRONMENTAL EXPOSURES SHAPE THE ORAL MICROBIOME AND COGNITIVE FUNCTION: INSIGHTS FROM A MULTI-OMICS FRAMEWORK

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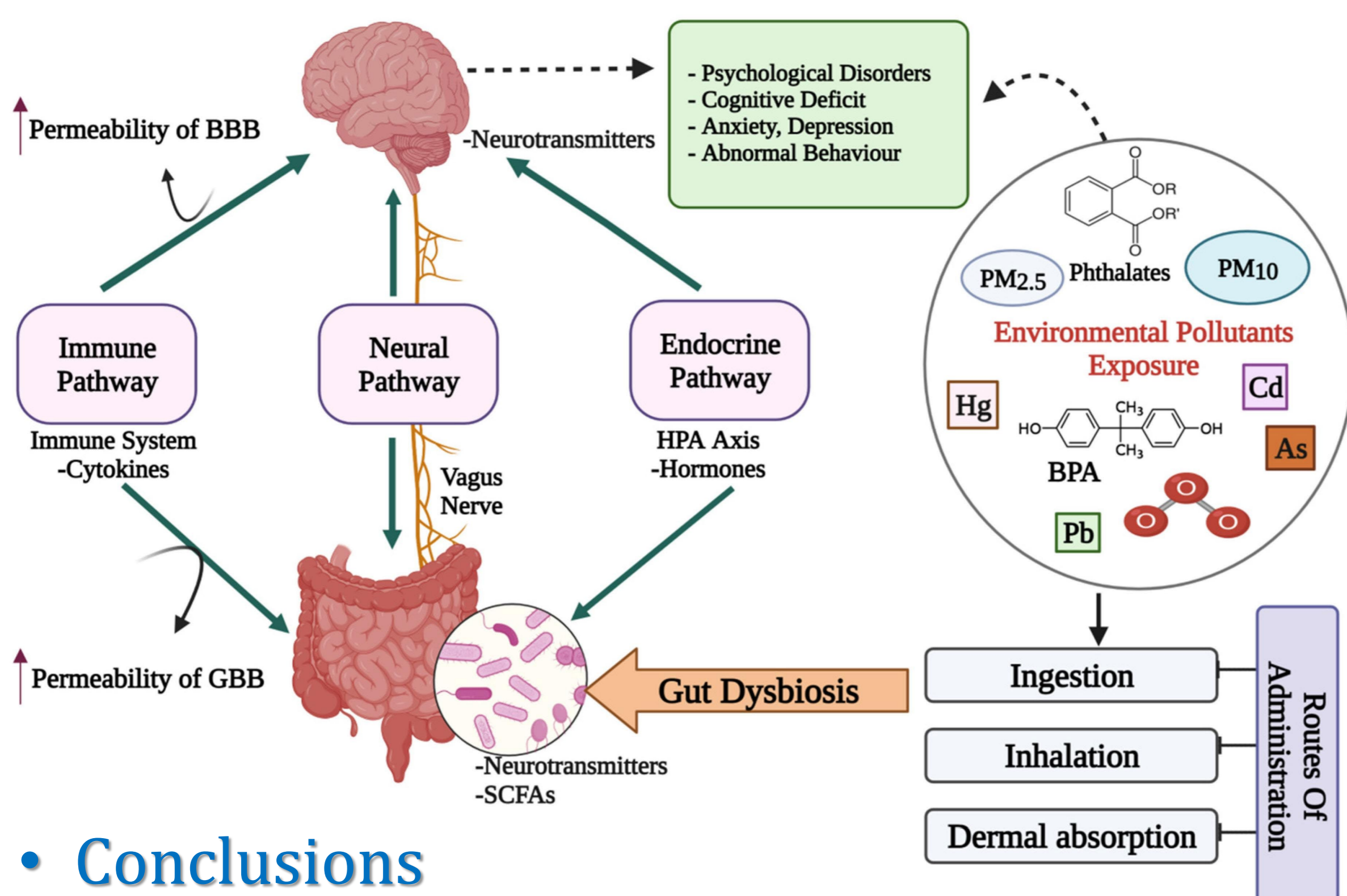
**Abstract:** Agricultural pollutants may alter the oral microbiome, contributing to systemic inflammation and neurocognitive dysfunction. This review highlights multi-omics evidence linking oral dysbiosis, neuroinflammation, and blood–brain barrier impairment, suggesting that environmentally induced microbial changes may mediate interactions between agricultural exposure and brain health.

## • Introduction

- Agricultural pollutants may disrupt the oral microbiome.
- Oral dysbiosis is associated with systemic inflammation.
- Microbiome alterations may influence brain function and cognition.
- Multi-omics approaches help investigate exposure–microbiome interactions.
- Understanding these mechanisms may support prevention strategies.

## • Agricultural exposure and oral dysbiosis

- Environmental factors: pesticides, heavy metals, fertilizers, airborne pollutants.
- Biological effects: altered microbial diversity, oxidative stress, inflammatory cytokines, biofilm disruption.

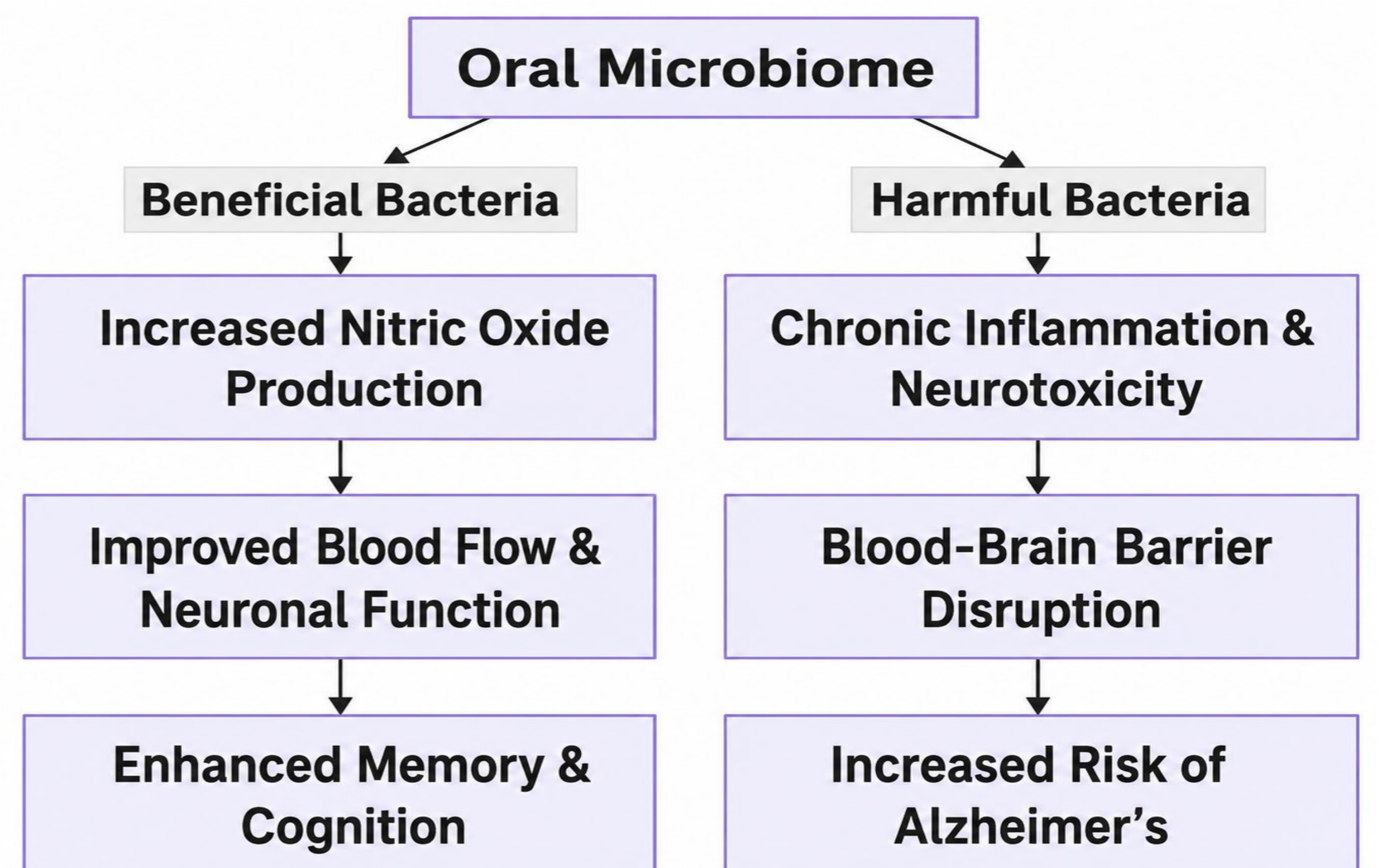


## • Conclusions

- Agricultural pollutants alter oral microbiota;
- Oral dysbiosis contributes to neuroinflammatory processes;

## • Microbiome–brain axis and cognitive effects

- Oral dysbiosis, through inflammatory mediators and microbial metabolites, may promote neuroinflammation.
- Altered microbiota can affect blood–brain barrier integrity and neuronal signaling.
- Chronic inflammation has been associated with cognitive decline and impaired brain function.



## • Multi-omics perspective

- Metagenomics: identify microbial composition;
- Metabolomics: detect inflammatory metabolites;
- Transcriptomics: analyze host-response pathways.

## • Conclusions

- Oral microbiome signatures could serve as early biomarkers;
- Interdisciplinary research is essential for translational applications.