



A Translational Exosome-based Intranasal Therapeutic Strategy for Early Biomarker Modulation in Alzheimer's Disease

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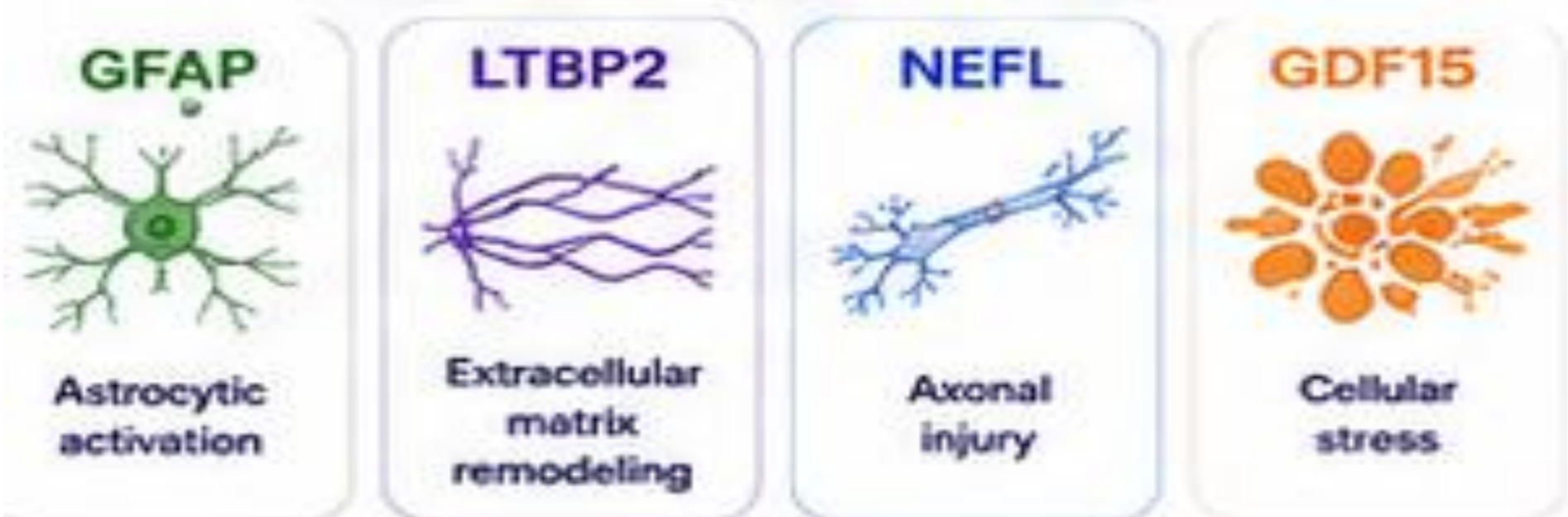
KEY TAKEAWAY

Exosome-mediated intranasal delivery significantly enhanced brain targeting and normalised key early Alzheimer's disease biomarkers (GFAP, LTBP2, NEFL and GDF15), supporting a non-invasive translational strategy for disease modification.

INTRODUCTION

- Alzheimer's disease (AD) is the leading cause of dementia worldwide.
- Early pathological alterations occur years before irreversible neuronal degeneration.
- Novel biomarkers-GFAP, LTBP2, NEFL and GDF15-reflect early astrocytic activation, ECM remodelling, axonal injury and cellular stress.
- Conventional therapies face poor penetration across the blood-brain barrier (BBB).
- Intranasal exosomes can bypass the BBB via the olfactory pathway and enhance brain delivery.

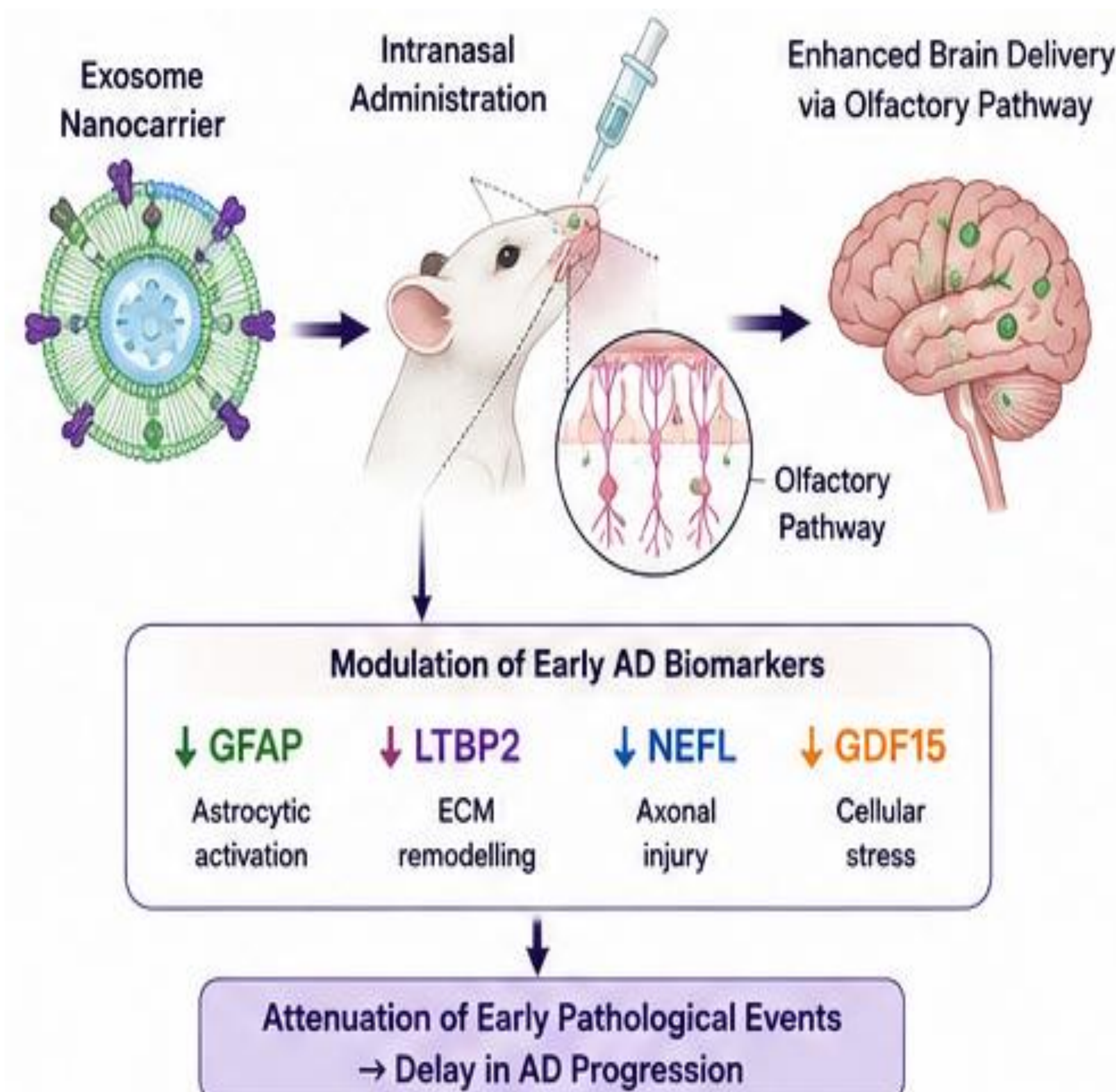
BIOMARKERS OF INTEREST



OBJECTIVE

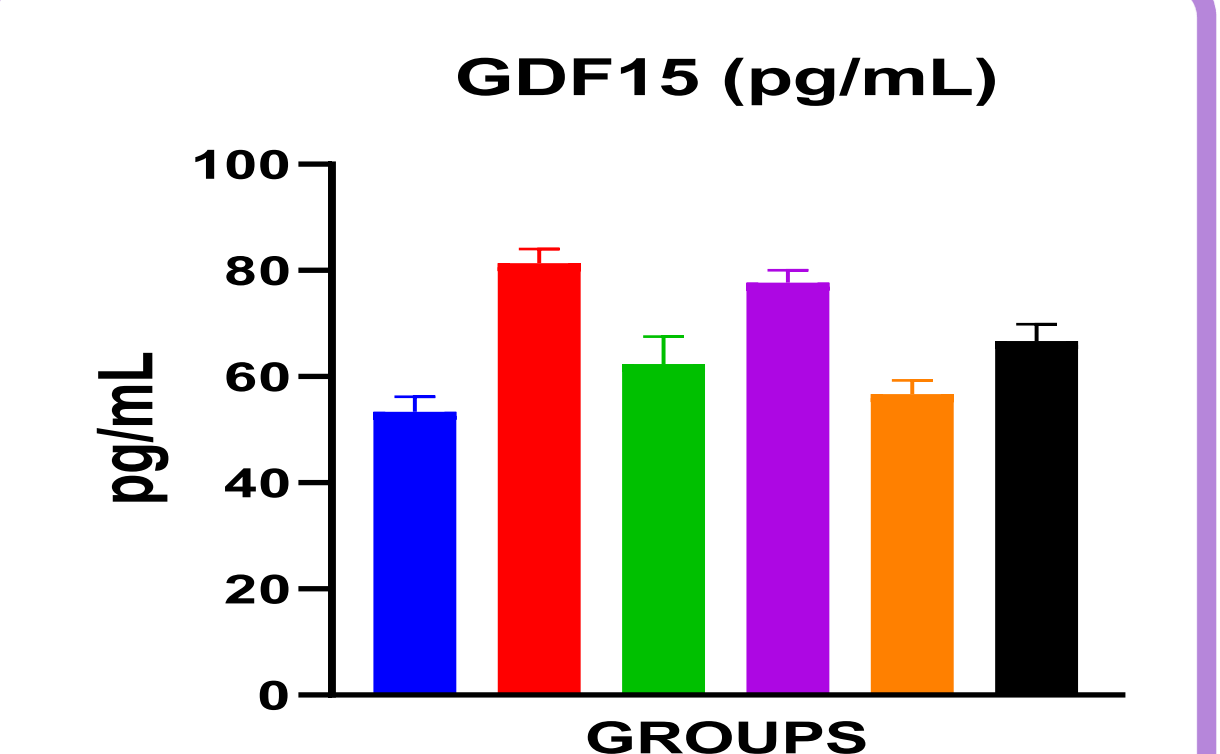
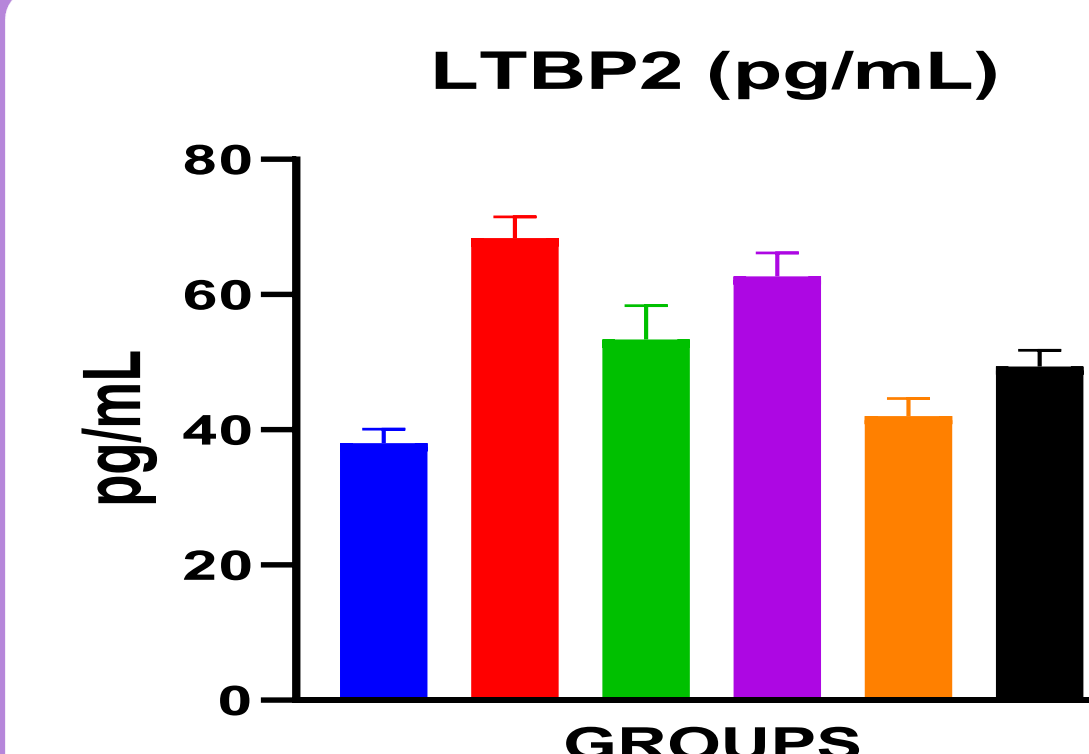
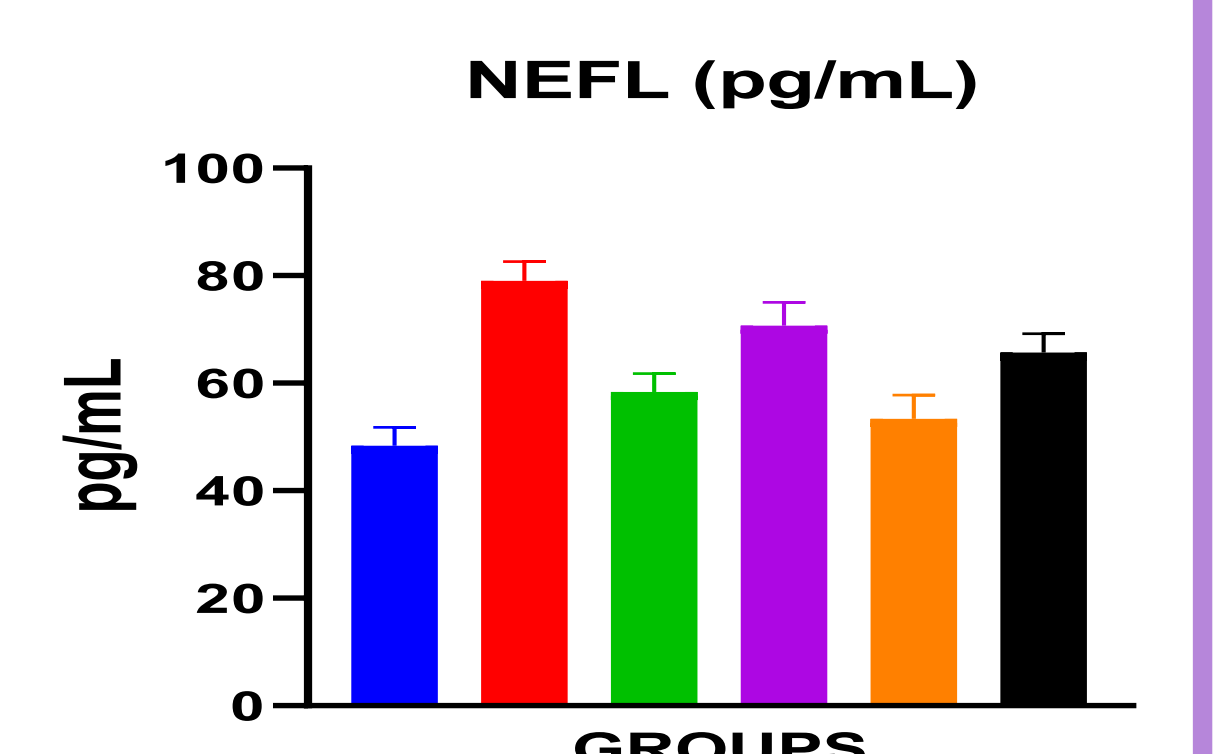
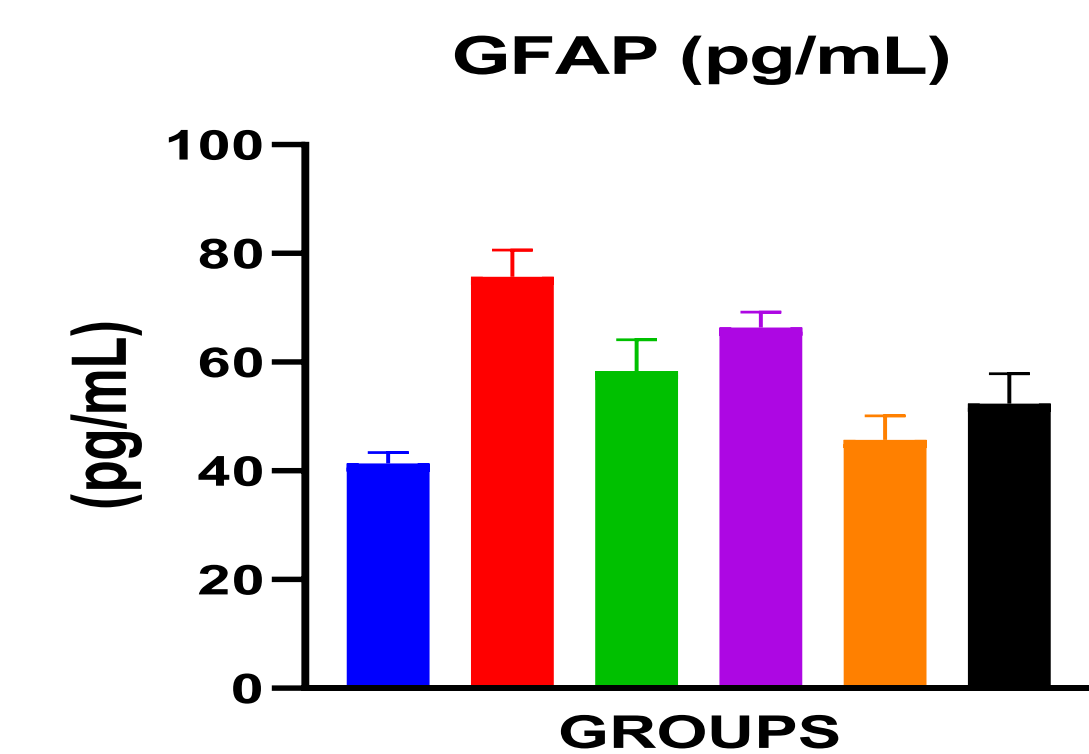
To evaluate the pharmacodynamic efficacy of an exosome-based intranasal therapeutic strategy for modulation of early Alzheimer's disease biomarkers and improved brain targeting.

GRAPHICAL ABSTRACT



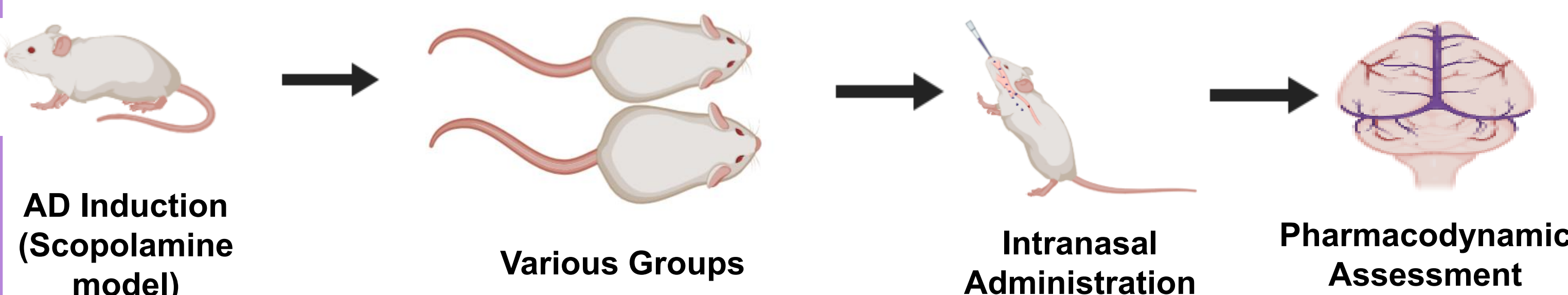
RESULTS: BIOMARKER MODULATION (ELISA)

Legend: Negative Control (Blue), Positive Control (Red), Exosome-loaded Therapeutic(s) (Green), Therapeutic(s) Suspension (Purple), Combination Therapy (Exosome-loaded) (Orange), Combination Therapy (Suspension) (Black).



- Exosome-based intranasal delivery significantly reduced GFAP and NEFL levels, indicating reduced astrocytic activation and axonal damage.
- Modulation of LTBP2 suggests regulation of extracellular matrix remodelling and decreased GDF15 levels reflect reduced cellular stress.
- Combination therapy (exosome-loaded) showed the greatest normalization of biomarkers.
- Exosome-based delivery outperformed suspension across all biomarkers.

METHODS



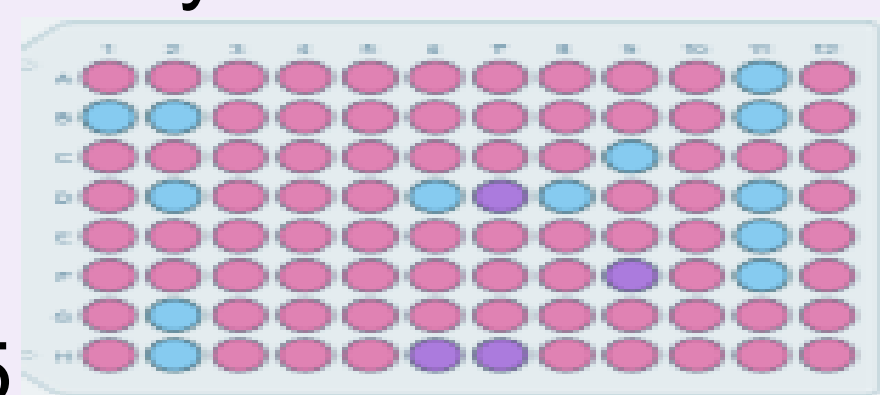
Treatment Groups

- Negative Control
- Positive Control (I.P)
- Exosome-loaded Therapeutic(s)
- Therapeutic(s) Suspension
- Combination Therapy (Exosome-loaded)
- Combination Therapy (Suspension)

Biomarker Evaluation

Analysed by ELISA for :

- GFAP
- NEFL
- LTBP2
- GDF15



Comparative Analysis

- Effect of formulation type and combination therapy on biomarker modulation

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CONCLUSION

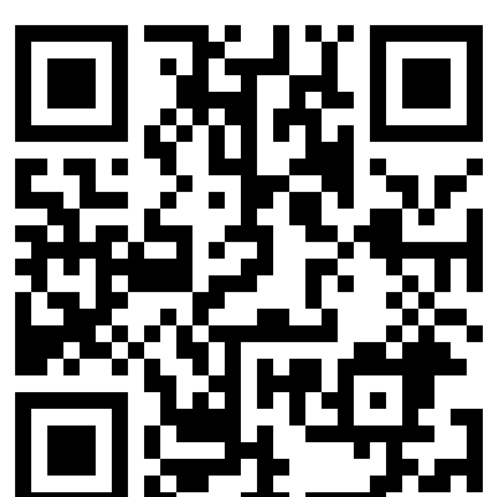
- A biomarker-driven exosome-based intranasal delivery system demonstrated enhanced therapeutic efficacy.
- Significant modulation of early AD biomarkers (GFAP, LTBP2, NEFL, GDF15).
- Enhanced brain targeting may enable intervention before irreversible neurodegeneration.
- This strategy holds strong translational potential for early, disease-modifying therapeutic interventions in Alzheimer's disease.

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