



Multi-Strain Synbiotic Modulation of the Gut-Brain Axis Improves Metabolic and Cognitive Function in HFD/STZ Mice

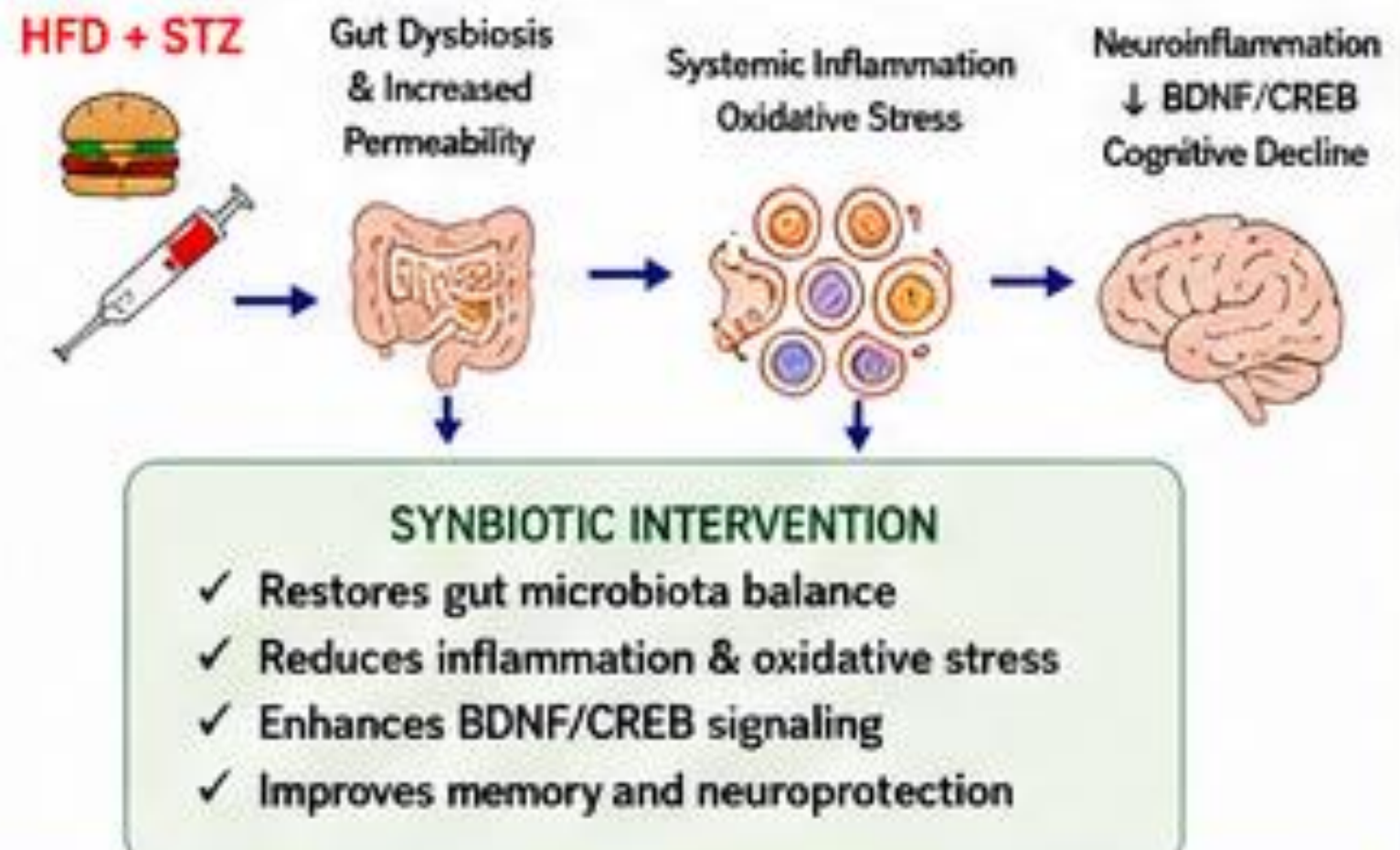
Abiola Oluwatosin Obisesan¹, Juanita Oluchi Agwu², Chiamaka Vivian Onwughalu², JULIET NNENDA OLAYINKA³, Adedamola Fafure⁴

¹Pharmaceutical Microbiology and Biotechnology, Afe Babalola University, Ado Ekiti, Nigeria
²Pharmacology and Therapeutics, Afe Babalola University, Ado Ekiti, Nigeria
³Pharmacology and Toxicology, University of Benin, Benin City, Nigeria ⁴Human Anatomy, Afe Babalola University, Ado Ekiti, Nigeria

BACKGROUND

- Obesity and type 2 diabetes promote chronic inflammation, oxidative stress and gut dysbiosis, impairing neurotrophic signaling (BDNF/CREB) in the hippocampus and prefrontal cortex.
- These disruptions contribute to synaptic dysfunction and cognitive decline, increasing Alzheimer's disease (AD) risk.
- Synbiotic (probiotics + prebiotic inulin) intervention may restore gut-brain axis homeostasis, reduce neuroinflammation and oxidative stress, and enhance neuroprotection.

GUT-BRAIN AXIS IN METABOLIC DYSFUNCTION



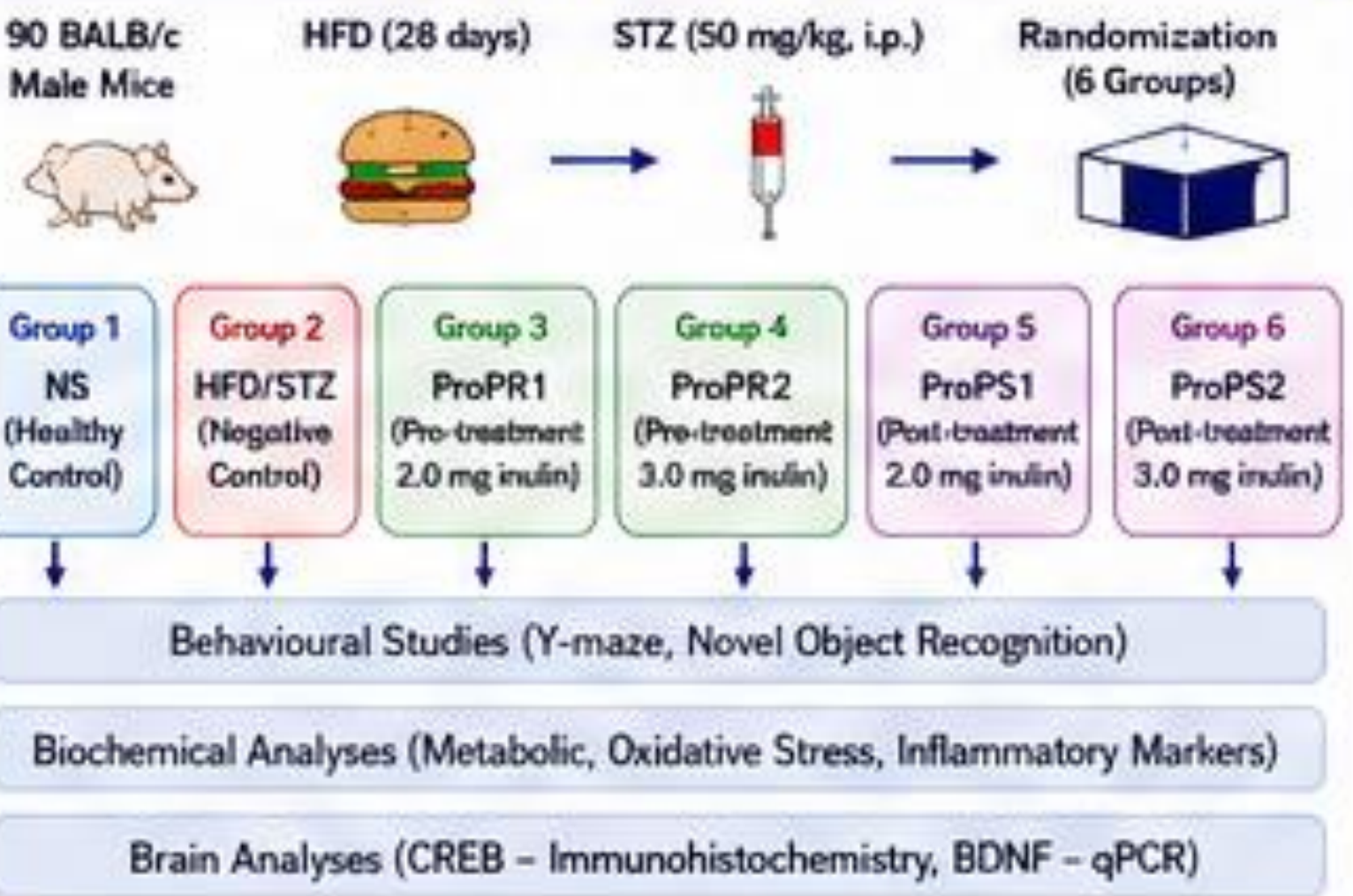
OBJECTIVE

To evaluate the effect of multi-strain synbiotic (probiotics + inulin) on metabolic dysfunction, neuroinflammation, and cognitive deficits in a high-fat diet (HFD)/streptozotocin (STZ) induced mouse model.

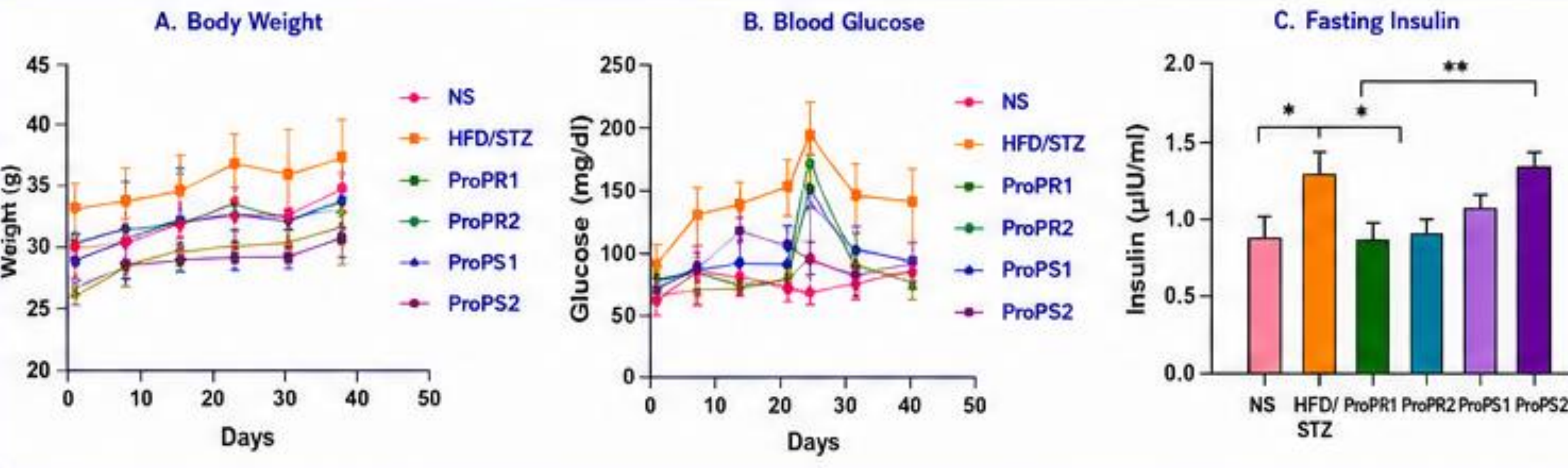
ABBREVIATIONS / KEYS

- NS: Normal saline
- HFD: High-fat diet
- STZ: Streptozotocin
- BHS: Behavioural studies
- ProPR1: Pre-treatment (2.0 mg inulin)
- ProPR2: Pre-treatment (3.0 mg inulin)
- ProPS1: Post-treatment (2.0 mg inulin)
- ProPS2: Post-treatment (3.0 mg inulin)

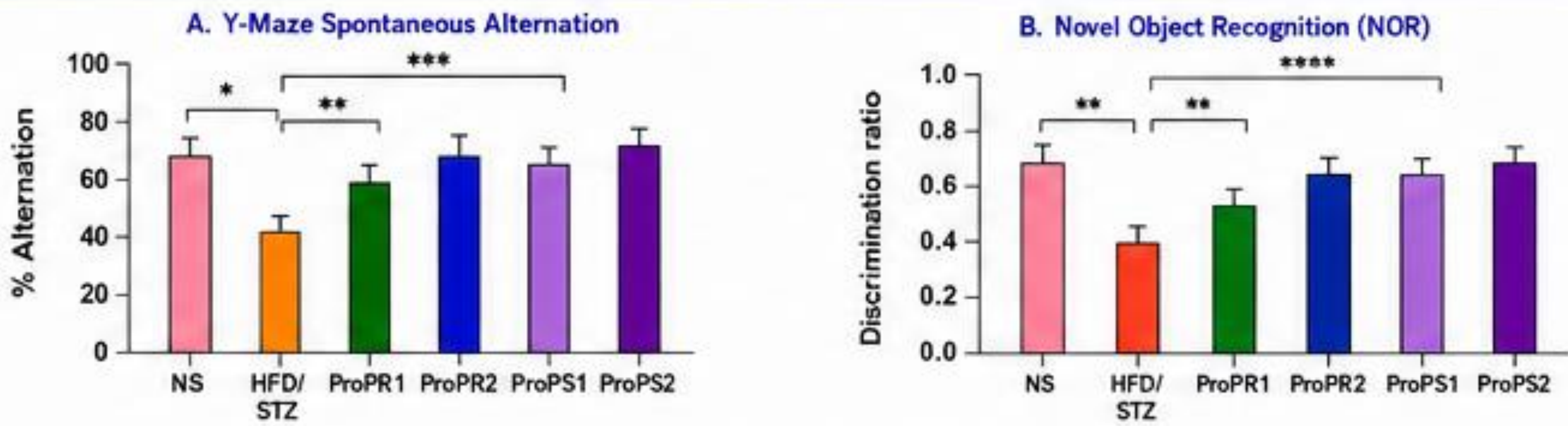
EXPERIMENTAL DESIGN



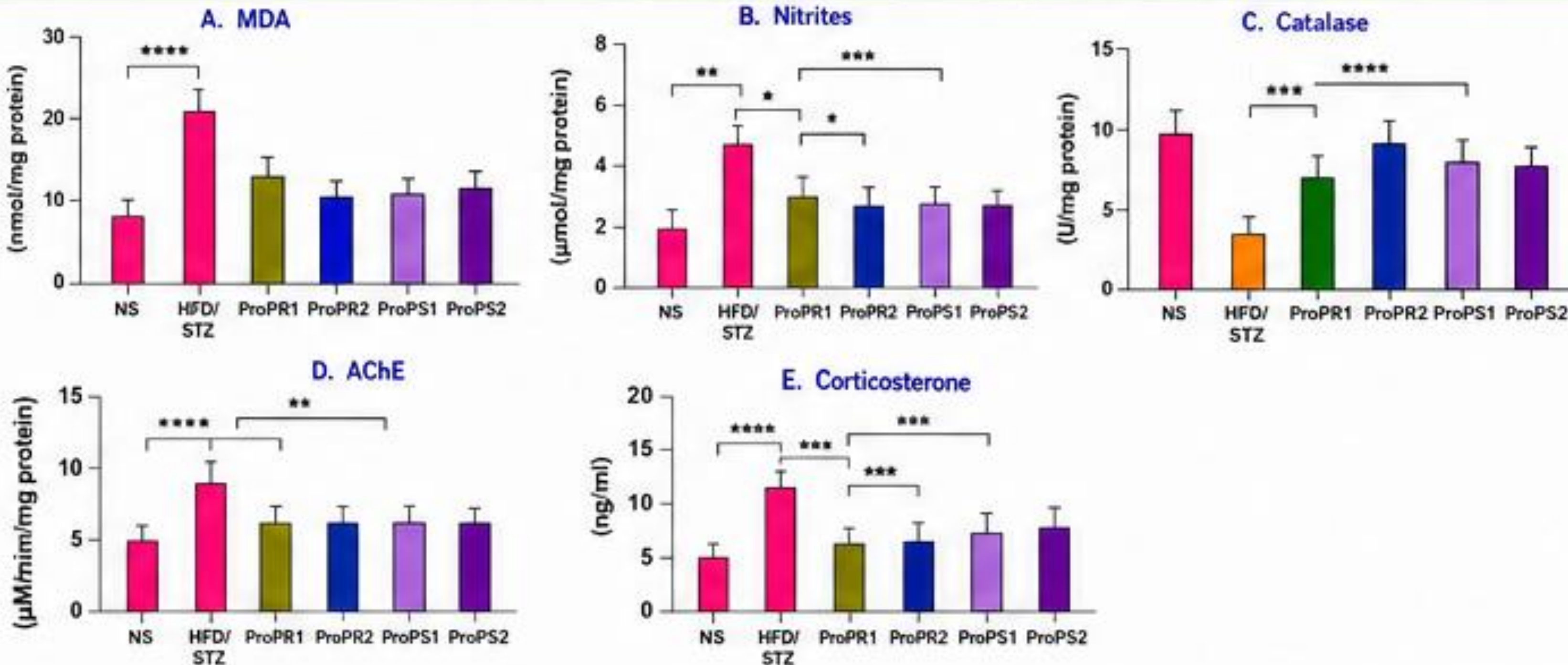
I. METABOLIC OUTCOMES



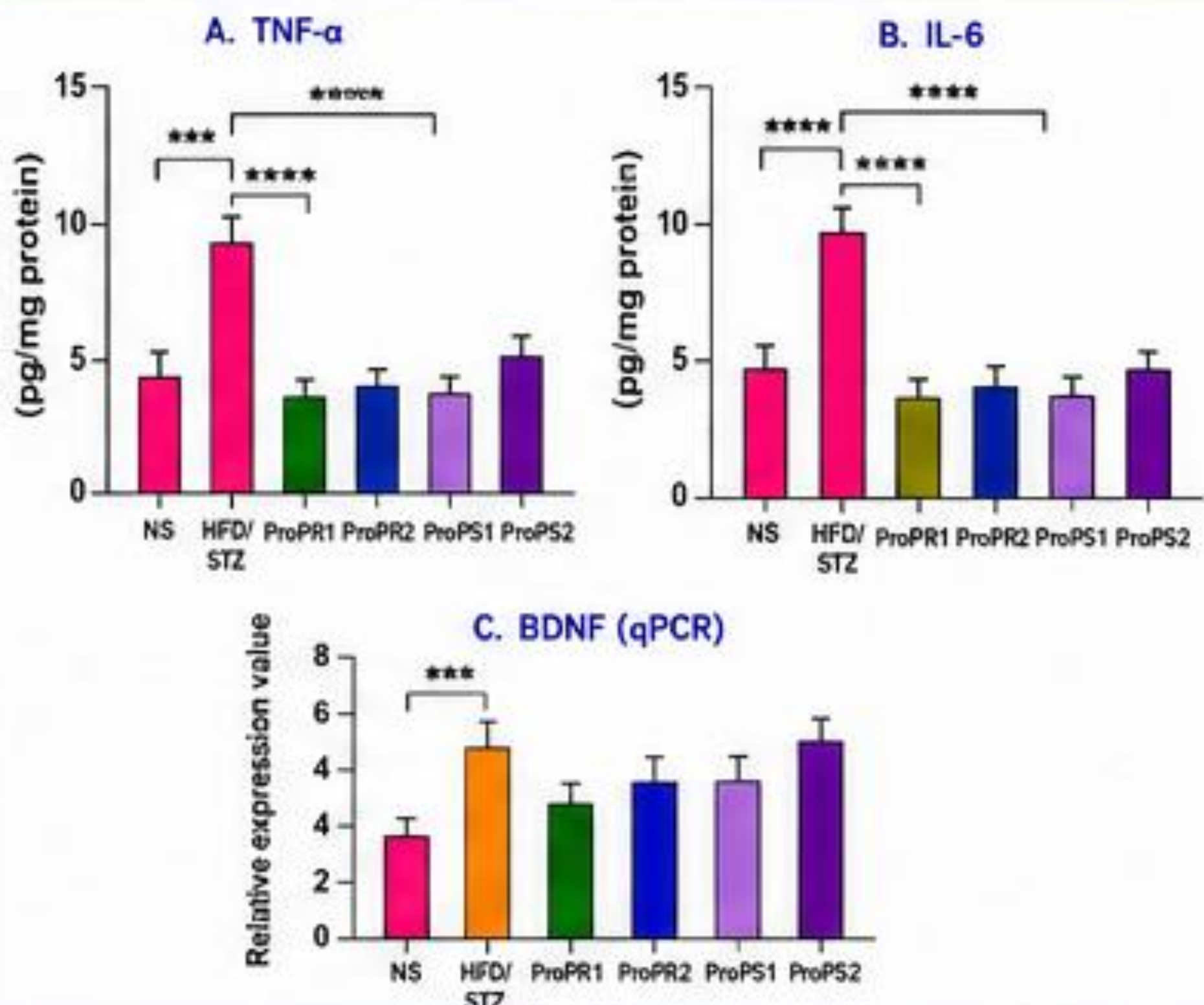
II. COGNITIVE PERFORMANCE



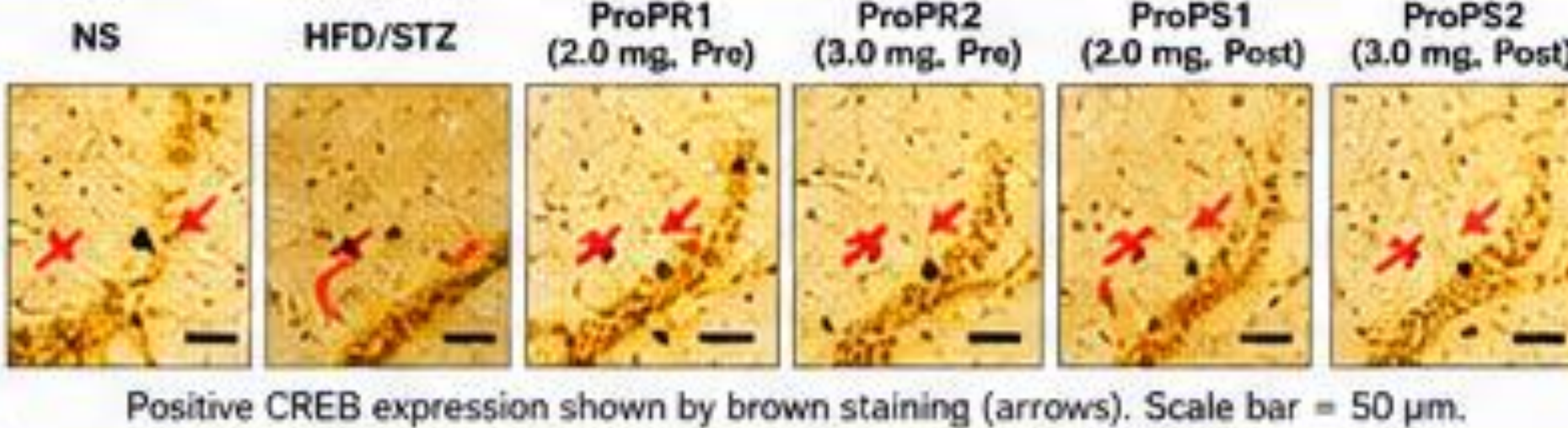
III. OXIDATIVE STRESS & NEUROCHEMICAL MARKERS



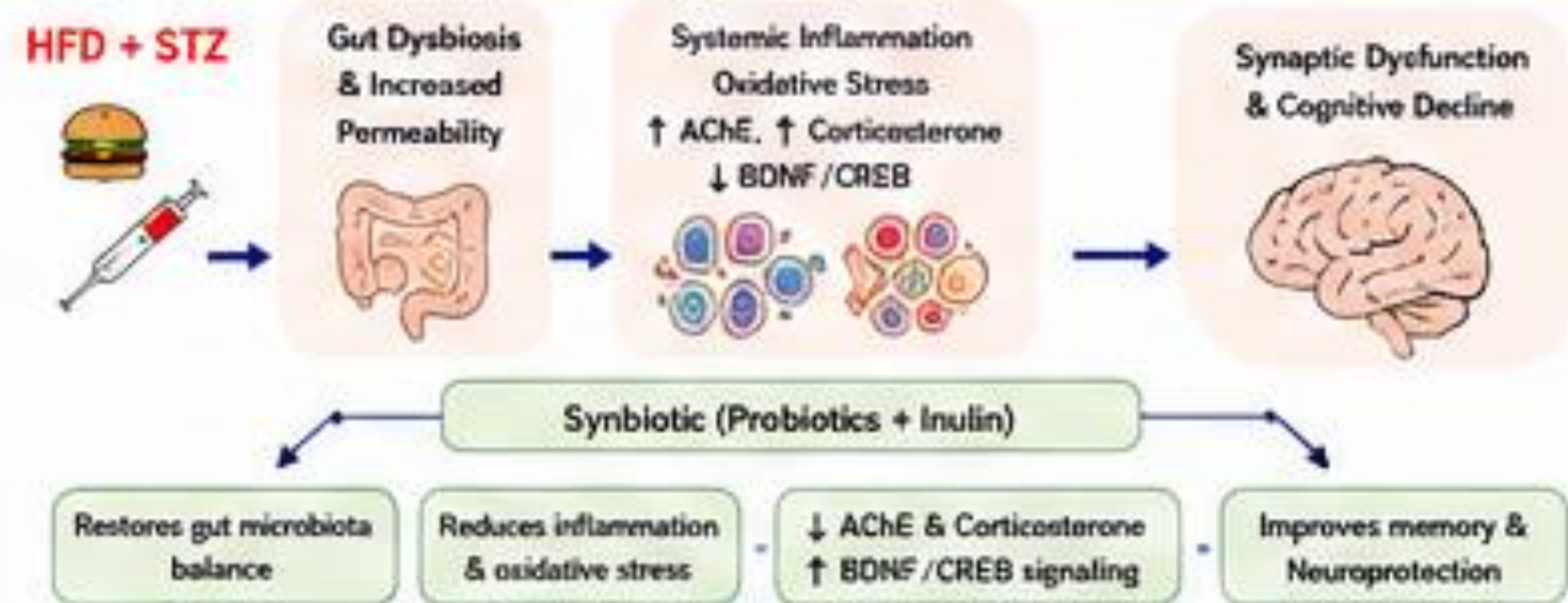
IV. INFLAMMATORY MARKERS



V. CREB IMMUNOHISTOCHEMISTRY (HIPPOCAMPUS)



VI. PROPOSED MECHANISM OF ACTION



CONCLUSION

- Multi-strain synbiotic intervention improved metabolic parameters and cognitive performance in HFD/STZ mice.
- It reduced oxidative stress, neuroinflammation, and normalized cholinergic function.
- Synbiotic treatment restored CREB and BDNF expression in the hippocampus.
- These findings support synbiotic therapy as a promising strategy for preventing or mitigating metabolic-associated cognitive impairment and Alzheimer's disease.

FUNDING & ACKNOWLEDGEMENT

This work was supported by Afe Babalola University, Ado Ekiti, Nigeria. We thank all members of the Pharmacology and Molecular Biology Research Unit.



SCAN ME
For full data
and updates

Data are Mean ± SEM (n=5). *p<0.05, **p<0.01, ***p<0.001, ****p<0.0001 vs HFD/STZ