# ω-3 PUFA Nanoparticles Attenuate Oxidative Stress and Restore Mitochondrial Function via Antioxidant Payload Delivery

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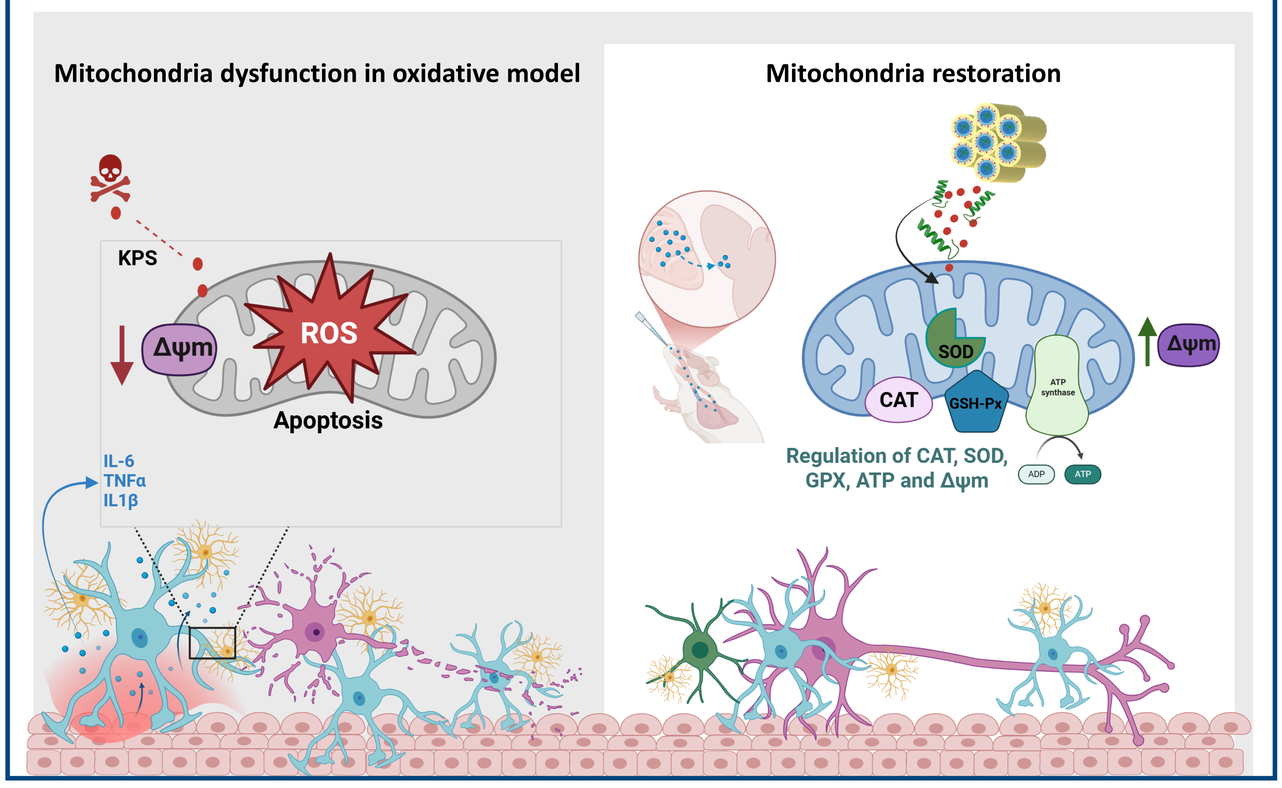
## Introduction

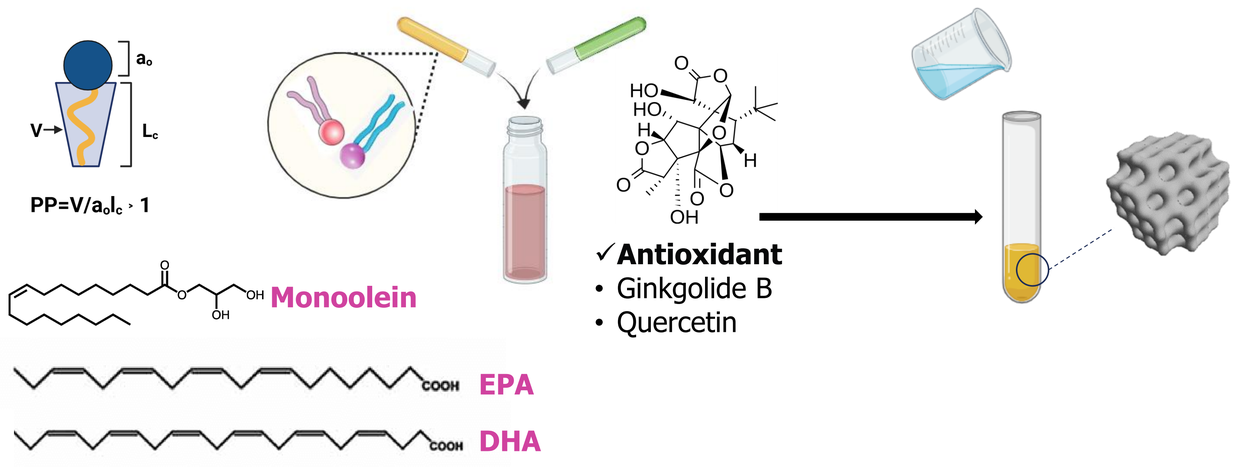
### Nanotherapy against oxidative stress and restoring mitochondrial function

To develop and characterize ω-3 PUFA-based lipid nanoparticles for noninvasive, targeted brain delivery of antioxidant drugs **(ginkgolide B and quercetin)**, and to evaluate their efficacy in overcoming endosomal barriers, reducing oxidative stress, and restoring mitochondrial function *in vitro* and *in vivo*.

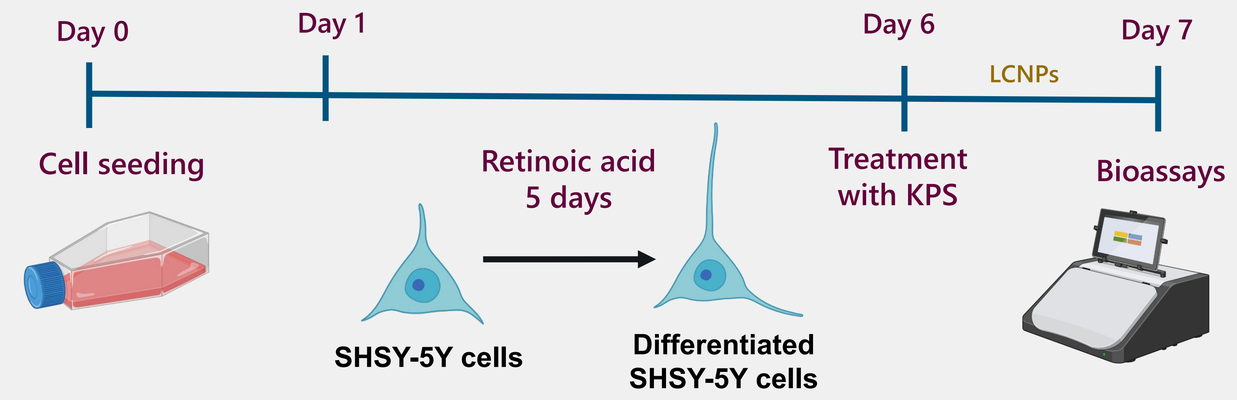



## Methods

### Development of PUFA-LCNPs

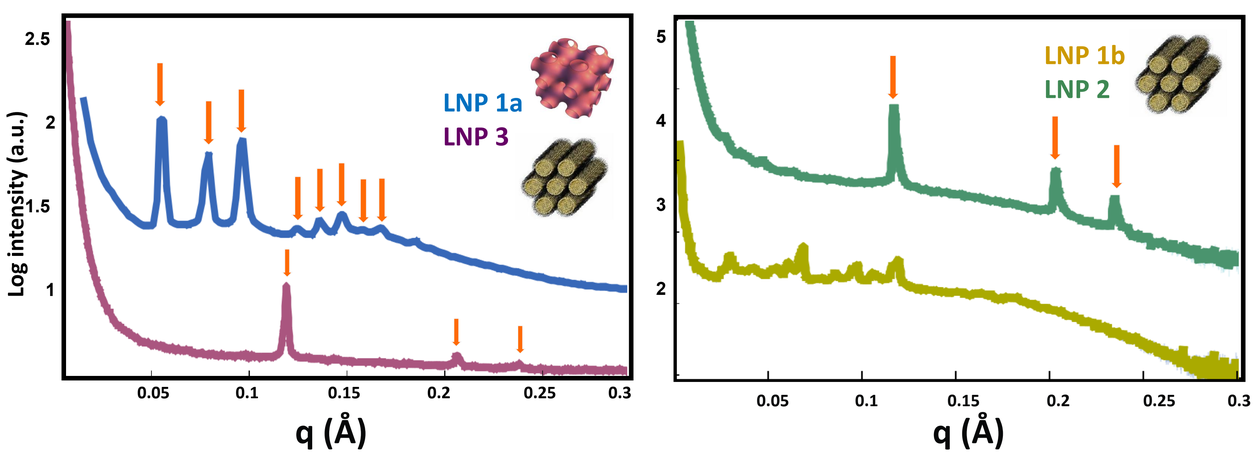



### Neuronal cells damage by oxidative stress

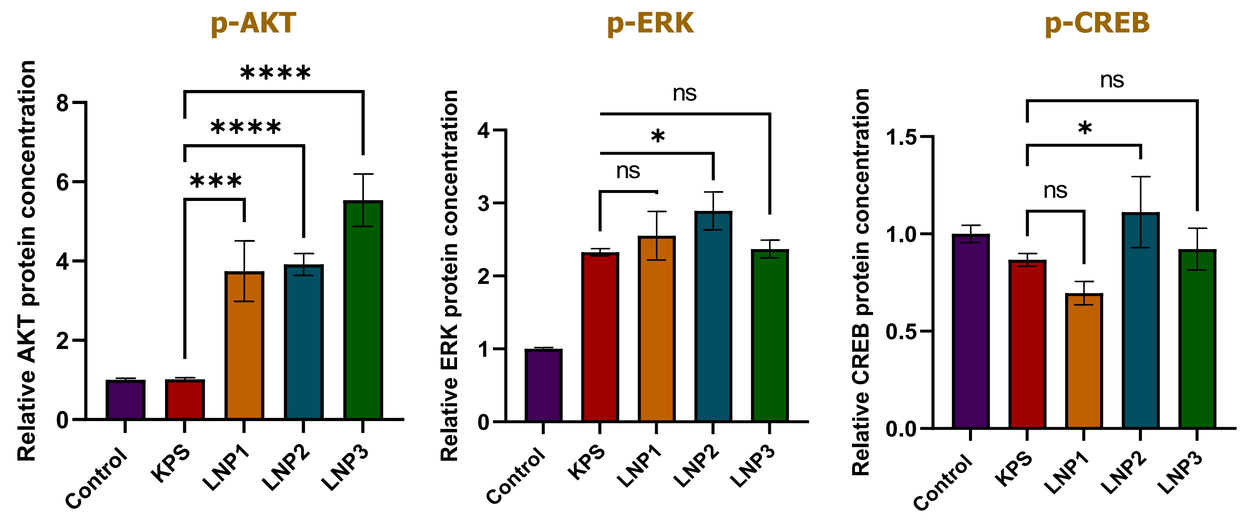



## Results and discussion

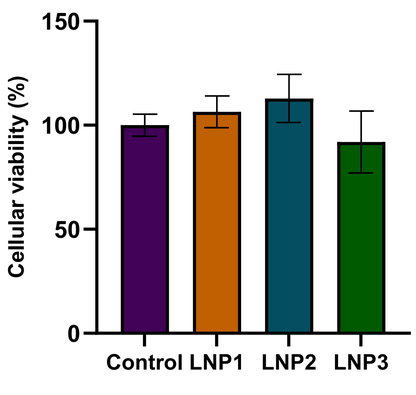
### Structural characterization of hexosome and cubosome type LCNPs



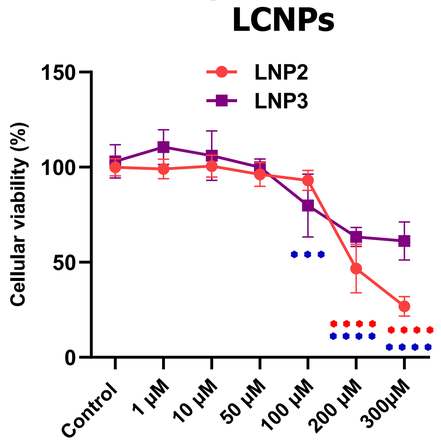

### Regulation of anti-apoptotic proteins



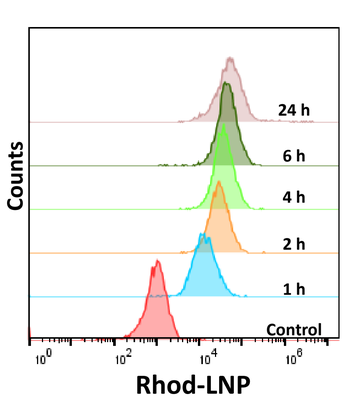

### Cell metabolic function



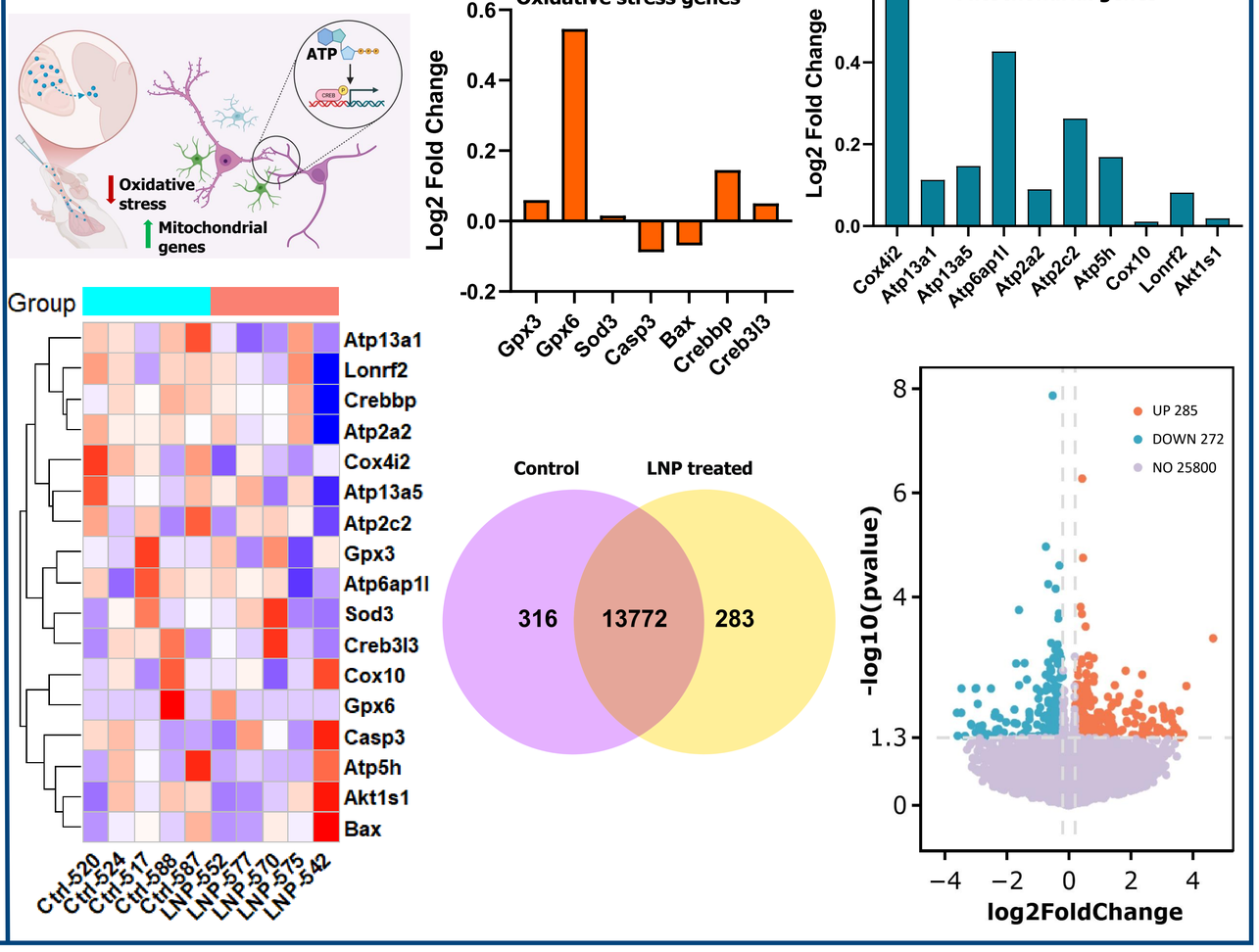

### Dose dependent effect of LCNPs



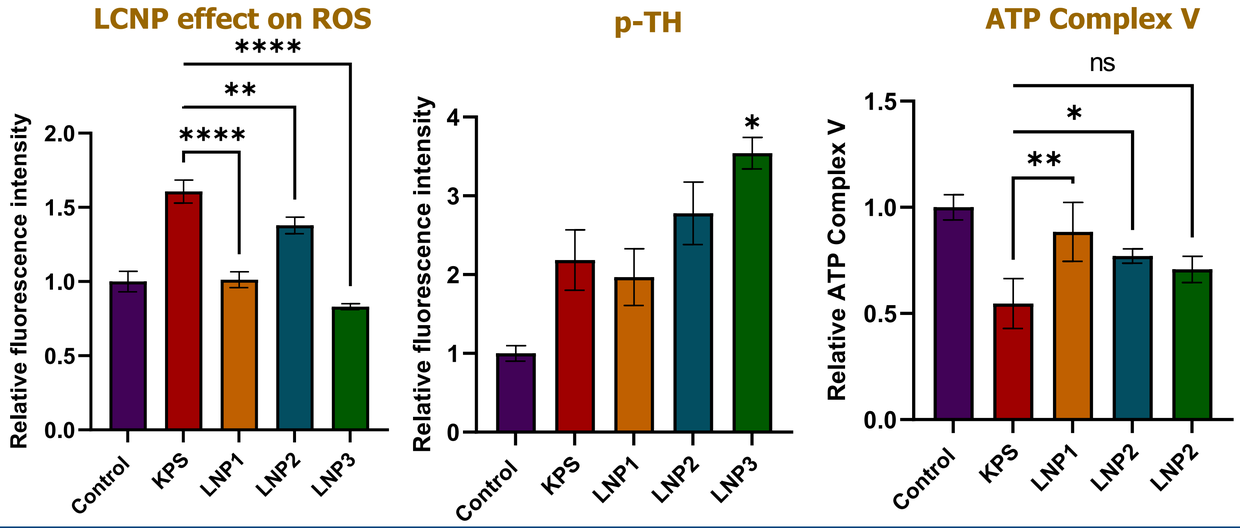

### Internalization




### PUFA-LCNPs induced neuroprotective gene expression *in vivo*




### Effect of PUFA-LCNPs on oxidative stress




## Conclusion

- ✓ PUFA-LCNPs enable efficient cellular uptake, enhancing intracellular delivery of antioxidant therapeutics.
- ✓ Intranasal delivery of multidrug-loaded PUFA-LNPs induces neuroprotective effects *in vivo*, including upregulation of mitochondrial and antioxidant genes and suppression of oxidative stress and apoptosis pathways.

## Reference

Akanchise T, Angelov B, Angelova A. Nanomedicine-mediated recovery of antioxidant glutathione peroxidase activity after oxidative-stress cellular damage: insights for neurological long COVID. J Med Virol. 2024;96:e29680. doi:10.1002/jmv.29680