

The Effects of Glyphosate on Short-Term Memory in Iberian Swine

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Introduction

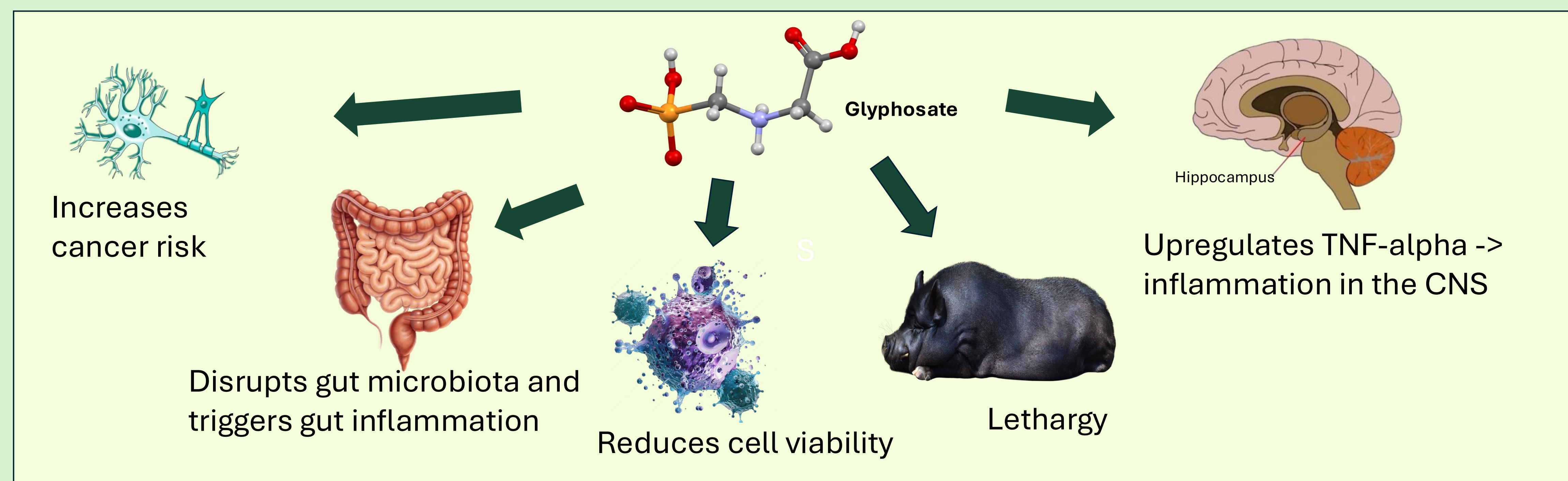
- **Glyphosate**, known as **Roundup**, is an herbicide routinely used in agricultural crops. It is commonly found in crops, water, and soil.
- **Metabolic Dysfunction-Associated Steatotic Liver Disease (MASLD)** is a condition in which fat builds up in the liver; 30% of people globally have MASLD.
- **Iberian pigs** have an innate mutation in the leptin receptor (LEPR) gene, which reduces satiety and encourages fat deposition.
- **The Novel Object Recognition (NOR)** test is used to evaluate short-term memory through the manipulation of a retention interval.
- **Hypothesis:** Pigs fed a high-sugar, high-fat diet with glyphosate supplementation will have a decreased level of novel object recognition.

Objectives

Assess short-term memory in pigs fed a high-fat, high-sugar diet supplemented with a low dose of glyphosate during 8-month long study



Impacts of Glyphosate Exposure



Materials and Methods

- **22 Iberian pigs** were fed specific diets twice a day, including:
 - Control (CON) n=6
 - High Fat + High Sugar (HFF) n=8
 - High Fat + High Sugar + Glyphosate (GLY) n=8
- **Glyphosate concentrations** were: 3.75 mg/kg body weight/day
- **Novel object recognition test was performed weekly** on Fridays
- Pig novel object recognition was quantified once a week using the BORIS software
- Behavioral Observation Research Interactive Software (BORIS) was used to review and quantify video data



Results

- The “recognition score” was calculated using the formula: time spent exploring novel/ (time exploring novel + time exploring kong)
- A p-value has not yet been determined, as data is still being processed.

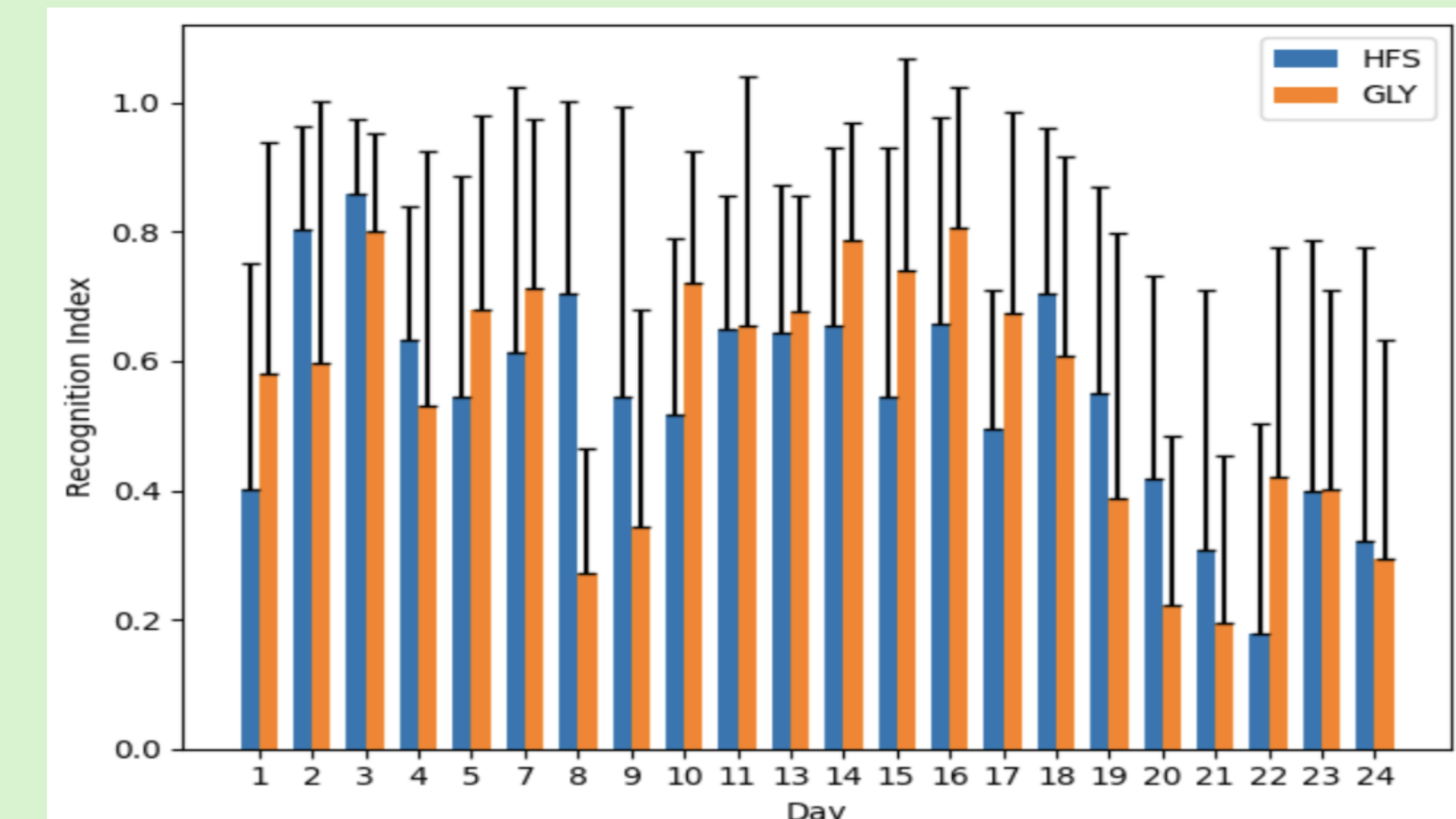


Figure 1. Novel object recognition (NOR) scores over time in HFS and GLY diet groups. Data presented as recognition index (RI; time exploring novel/total exploration time) with upper standard deviation bars.

Conclusion

Pigs fed a high-sugar, high-fat diet with glyphosate supplementation did not have a decreased level of novel object recognition indicated by **Figure 1**.

References

1. Zeltser, N.; Meyer, I.; Hernandez, G.V.; Trahan, M.J.; Fanter, R.K.; Abo-Ismael, M.; Glanz, H.; Strand, C.R.; Bur-rin, D.G.; La Frano, M.R.; et al. Neurodegeneration in juvenile Iberian pigs with diet-induced nonalcoholic fatty liver disease. *Am. J. Physiol. Endocrinol. Metab.* 2020, 319, E592-E606, doi:10.1152/ajpendo.00120.2020.
2. Costas-Ferreira, C., Durán, R., & Faro, L. R. 2022. Toxic Effects of Glyphosate on the Nervous System: A Systematic Review. *International Journal of Molecular Sciences*, 23(9):4605.

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