

## Xenobiotic Bisphenol A (C<sub>15</sub>H<sub>16</sub>O<sub>2</sub>) from (Micro)plastic Pollution: Oxidative Stress and Genotoxic Effects in *Aristichthys nobilis*

Rabia Akram 1, Rehana Iqbal 2, Riaz Hussain 3

Independent Researcher, 1 Rahim Yar Khan 64200, Punjab, Pakistan PhD in Zoology, Bahauddin Zakariya University. Email: rabiaakram37@gmail.com phon No/ 03041366808

Associate Professor, 2 Department of Zoology, Bahauddin Zakariya University Multan 60800, Punjab, Pakistan 2. Email: rehanaiqbal82@gmail.com  
Professor, 3 Department of Pathology, Faculty of Veterinary and Animal Sciences, The Islamia University of Bahawalpur. Bahawalpur 63100, Punjab, Pakistan Email: dr.riaz.hussain@iub.edu.pk Phone: +92 321 7533473

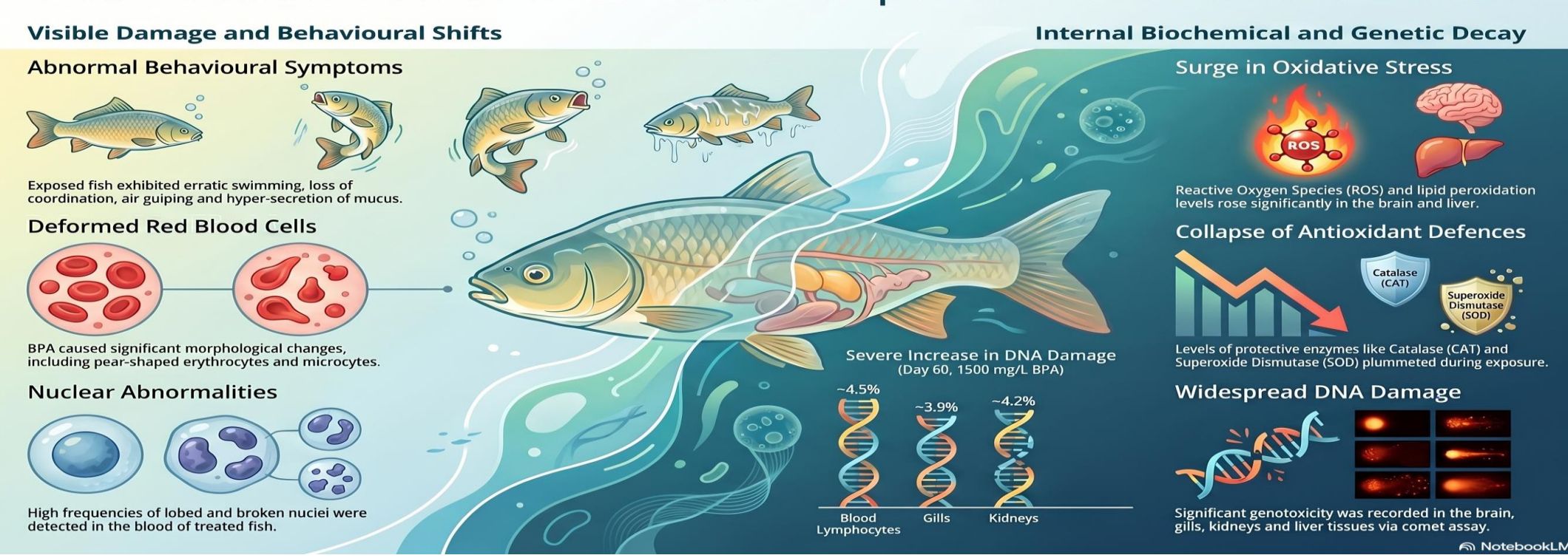
### INTRODUCTION & AIM

Microplastic pollution has emerged as a major environmental concern due to its widespread distribution in aquatic ecosystems and its role as a carrier of hazardous xenobiotics. Bisphenol A (BPA; C<sub>15</sub>H<sub>16</sub>O<sub>2</sub>), a commonly used component of polycarbonate plastics and epoxy resins, is frequently released into water bodies through plastic degradation and industrial discharge. As an endocrine-disrupting chemical, BPA poses significant risks to aquatic organisms and may ultimately threaten human health through bioaccumulation and trophic transfer.

Aquatic species are particularly vulnerable to BPA exposure because of its persistence and continuous release into freshwater environments. BPA has been reported to induce oxidative stress by enhancing reactive oxygen species (ROS) production, disrupting antioxidant defense mechanisms, and causing cellular and genetic damage. Therefore, the present study evaluates the oxidative stress responses, antioxidant enzyme alterations, and genotoxic effects of BPA in bighead carp (*Aristichthys nobilis*), providing insights into the ecological risks associated with microplastic-derived contaminants.

To investigate the toxic effects of Bisphenol A (BPA), a microplastic-associated xenobiotic, on oxidative stress biomarkers, antioxidant defense mechanisms, and DNA integrity in bighead carp (*Aristichthys nobilis*), and to assess its potential ecological risks in freshwater ecosystems.

### The Hidden Toll of BPA: Toxic Impacts on Freshwater Fish

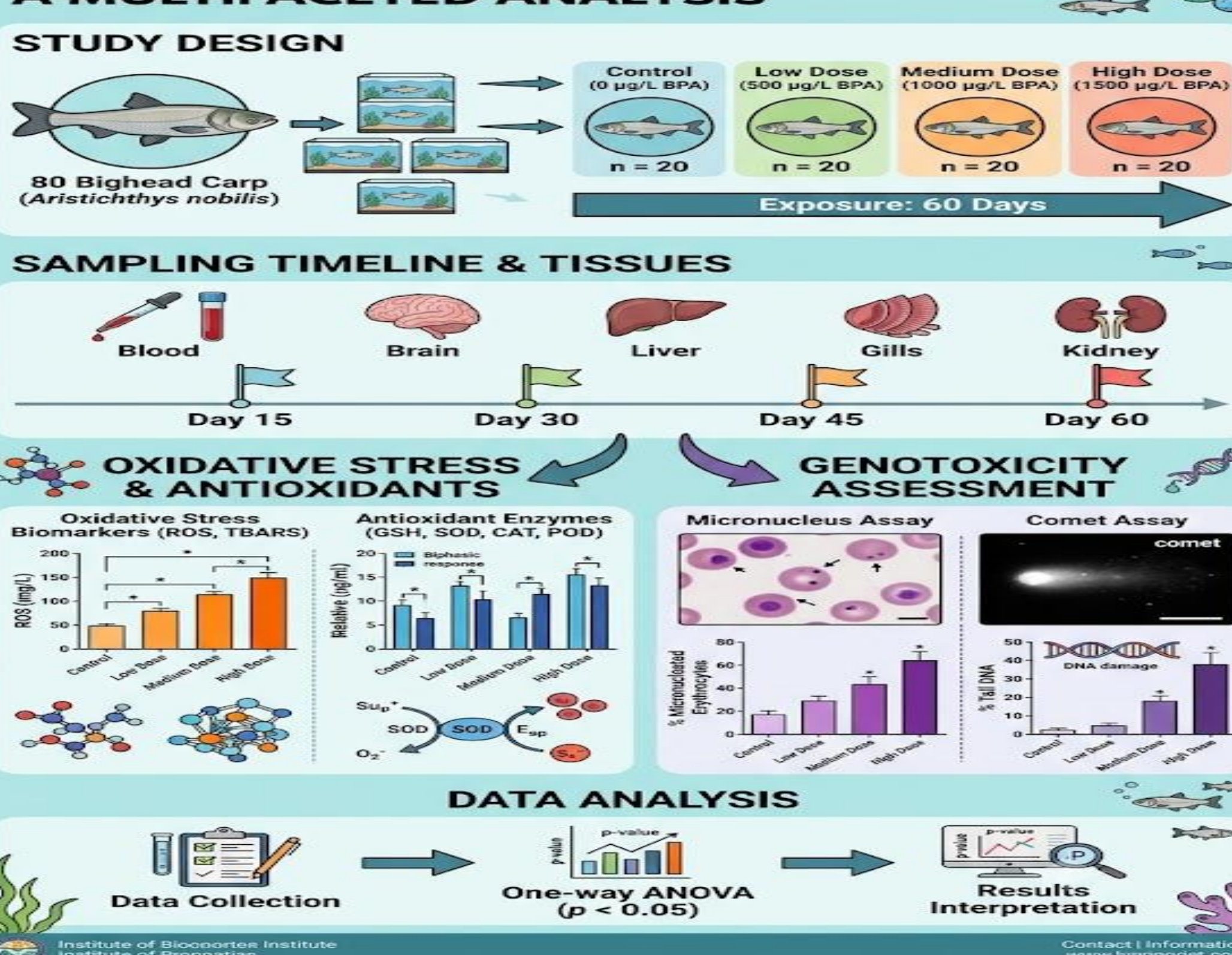


### METHOD

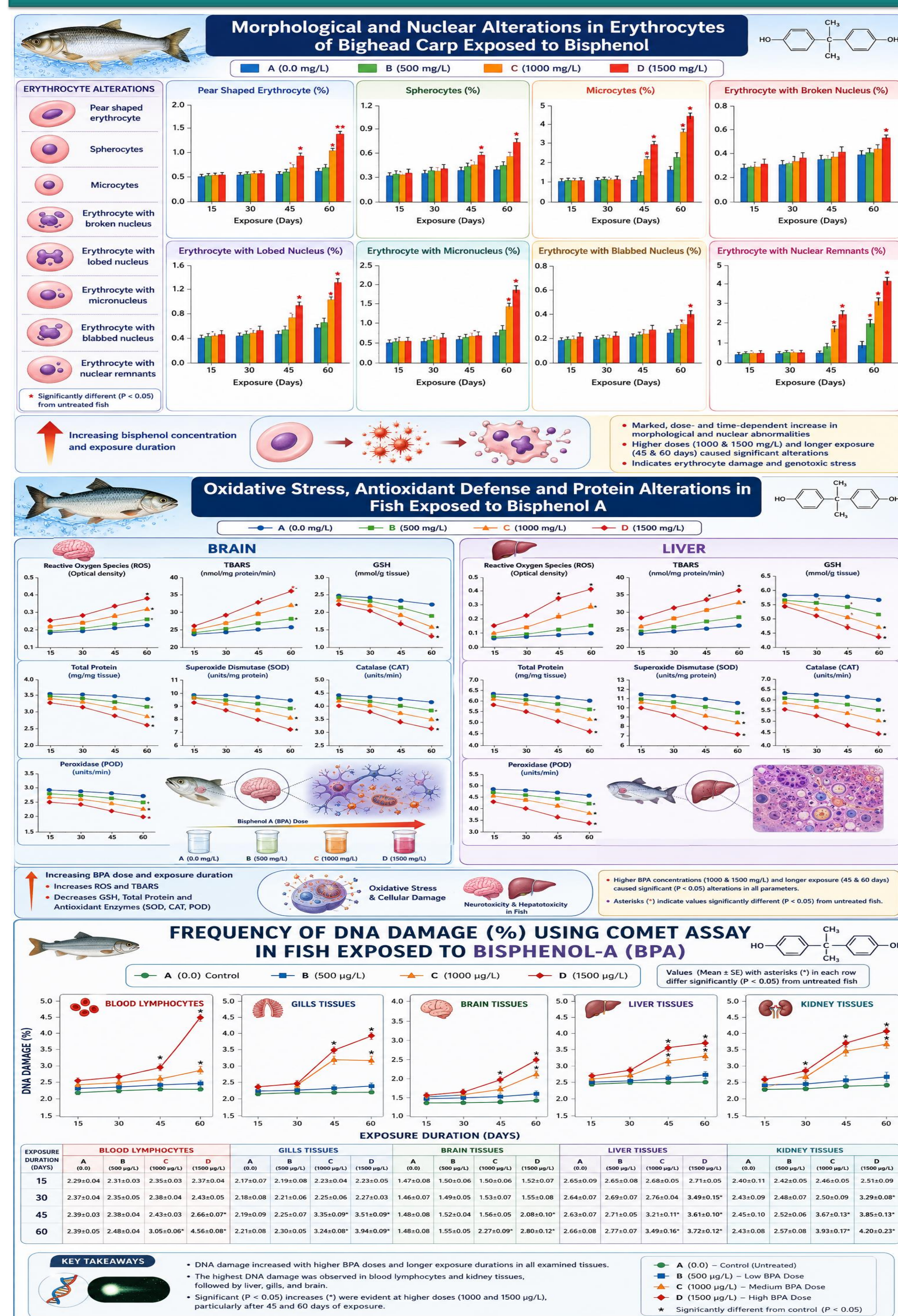
80 Bighead Carp (n=20/group) were exposed to 0, 500, 1000, and 1500 µg/L BPA for 60 days, with blood and tissue (brain, liver, gills, kidney) sampled every 15 days.

• Analysis: Oxidative stress (ROS, TBARS), antioxidant enzymes (GSH, SOD, CAT, POD), and genotoxicity (micronucleus and comet assays) were evaluated using one-way ANOVA (p < 0.05).

### BIOLOGICAL EFFECTS OF BISPHENOL A (BPA) ON BIGHEAD CARP (*Aristichthys nobilis*): A MULTIFACETED ANALYSIS



### RESULTS & DISCUSSION



BPA exposure increased oxidative stress and DNA damage while reducing antioxidant enzyme activities in *A. nobilis*. It also caused morphological abnormalities in erythrocytes of fish blood. Toxic effects were dose- and time-dependent, indicating that microplastic-associated BPA poses a serious threat to freshwater fish health and ecosystem stability.

### CONCLUSION

BPA derived from microplastic pollution induces oxidative stress, suppresses antioxidant defense, and causes significant DNA damage in multiple tissues of *Aristichthys nobilis*.

### FUTURE WORK / REFERENCES

Future studies should investigate the combined effects of BPA and other microplastic-associated contaminants under real environmental conditions. Long-term research is needed to assess chronic oxidative stress, genotoxicity, and reproductive impacts in fish. Further studies should also explore biomagnification across trophic levels and potential risks to human health.

Hussain, R., Ali, F., Javed, M.T., Jabeen, G., Ghaffar, A., Khan, I., Liaqat, S., Hussain, T., Abbas, R.Z., Riaz, A., Gul, S.T., Ghori, M.T., 2019b. Clinico-hematological, serum biochemical, genotoxic and histopathological effects of trichlorin in adult cockerles. *Toxin Rev.* 1556e9551. <https://doi.org/10.1080/15569543.2019.1673422>.  
Ali, D., Falodah, F.A., Almutairi, B., Alkahtani, S., Alarif, S., 2020. Assessment of DNA damage and oxidative stress in juvenile *Channa punctatus* (Bloch) after exposure to multi-walled carbon nanotubes. *Environ. Toxicol.* 35, 359e367. <https://doi.org/10.1002/tox.22871>.