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CYTOTOXIC, GENOTOXIC, AND MUTAGENIC EFFECTS OF THE MIXTURE OF DYES USED IN THE FORMULATION OF BLACK HAIR DYE

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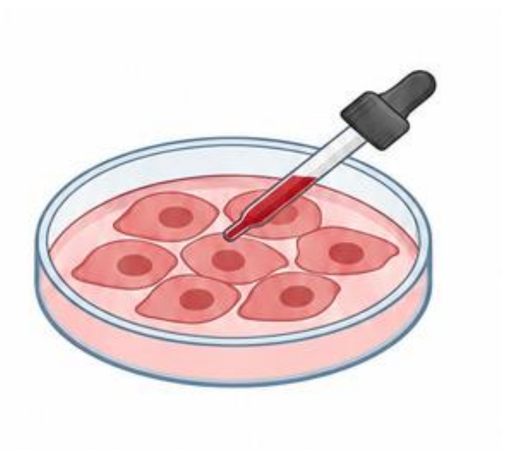
INTRODUCTION & AIM

Hair dyes may pose risks to human health due to their complex chemical composition and reactivity, potentially affecting both users and professionals, with some evidence linking permanent dyes to an increased risk of bladder cancer. Black hair dye is a semi-permanent formulation containing multiple dyes, including azo compounds and anthraquinones. Some studies have indicated that the use of permanent hair dyes may be a risk factor for bladder cancer

This study aimed to evaluate the cytotoxic, genotoxic mutagenic potential of a mixture of hair dyes used in the formulation of black color (BHD), as well as its potential to alter the activities of apoptosis genes. using assays performed with two different test systems (human hepatoma cells maintained in cultures - HepG2, and bacteria).

METHOD

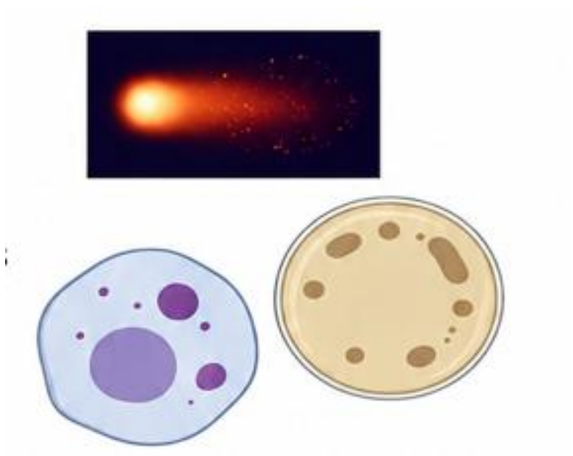


Cell Model

Human hepatoma cells (HepG2) were selected as the test organism due to their expression of phase I and II metabolizing enzymes, making them a well-established tool for evaluating mutagens and pro-mutagens

Toxicity Testing

Cytotoxicity was assessed using the MTT assay, DNA damage through the comet assay, chromosomal damage with the micronucleus test, and apoptosis-related gene expression in HepG2 cells. Mutagenicity was assessed using the Ames test with *Salmonella typhimurium*.



Commercial concentration Ratios

The tested concentrations were defined based on the commercial usage ratio indicated by the manufacturer (Arianor Cherry Red 0.002%, Arianor Sienna Brown 0.04% and Arianor Ebony 0.32%).

RESULTS & DISCUSSION

Confirmed Cytotoxicity

The BHD mixture showed toxic effects on HepG2 cells even at concentrations currently allowed for human use.

Results indicated genotoxic effects induced by all tested concentrations in the comet assay (Figure 1). According to the MN assay results, all tested concentrations of the BHD induced significant chromosomal damage compared to NC, indicating a high genotoxic potential for HepG2 cells (Figure 2)

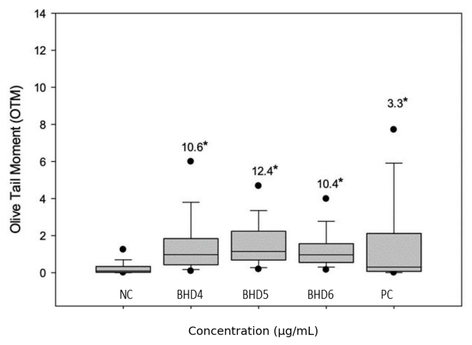


Figure 1. Genotoxic effects comet assay

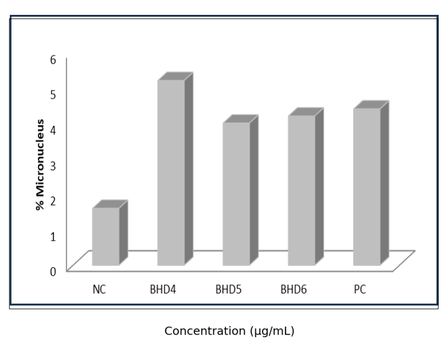
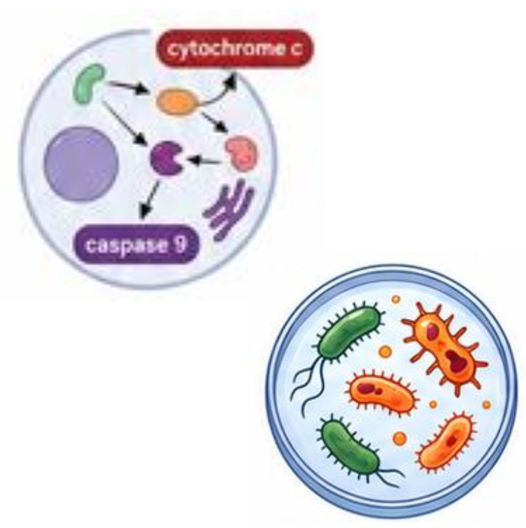


Figure 2: Micronucleus assay (MN)

Mutagenicity and Alteration Apoptosis Gene Expression

Mutagenicity was confirmed in Salmonella typhimurium TA100 assays without S9, and altered expression was observed in two apoptosis-related genes (cytochrome c and caspase 9).



CONCLUSION

The findings support strategies to protect exposed populations from DNA-damaging chemicals and highlight their potential role in degenerative diseases, including cancer. Further investigation is needed on the adverse effects of hair dyes in humans and the environment.

FUTURE WORK / REFERENCES

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