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Exploring the Impact of Bisphenol S on Lipid Storage, Behavior, and Neuronal Structure in Caenorhabditis Elegans

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Abstract: Bisphenol S (BPS) is a synthetic compound increasingly used as a substitute for bisphenol A (BPA) in consumer products. Despite its widespread use, growing evidence suggests that BPS may exhibit endocrine-disrupting properties similar to BPA. This study investigates the effects of BPS exposure on lipid storage, behavioral preference, and neuronal structure using Caenorhabditis elegans as a model organism. Worms were exposed to increasing concentrations of BPS and evaluated using preference assays, lipid staining, and neuronal imaging. Results demonstrate dose-dependent alterations in behavior, increased lipid accumulation, and measurable changes in neuronal morphology, suggesting that BPS is not biologically inert.

Keywords: Bisphenol S, endocrine disruptors, lipid metabolism, neurotoxicity, behavioral effects, dose-dependent toxicity, Caenorhabditis elegans, chemical substitutes.

INTRODUCTION

Bisphenol S (BPS) has been widely adopted as a replacement for bisphenol A (BPA), an endocrine-disrupting compound linked to obesity, diabetes, cardiovascular disease, and reproductive disorders. Due to regulatory restrictions on BPA, BPS has become prevalent in plastics and thermal paper. However, BPS shares a similar chemical structure with BPA, raising concerns regarding comparable biological effects.

Caenorhabditis elegans is a well-established model organism for toxicological research due to its genetic similarity to higher organisms, transparent body, short life cycle, and well-characterized nervous system.

OBJECTIVES

The objective of this study was to investigate the effects of BPS exposure on lipid storage, behavioral preference, and neuronal structure in Caenorhabditis elegans in order to assess potential health risks posed by BPS.

MATERIALS AND METHODS

L4 stage C. elegans were collected from nematode growth medium plates and exposed to increasing concentrations of BPS for 18 hours. Following exposure, worms were washed with M9 buffer, centrifuged, and allowed to recover before analysis.

Behavioral preference assays, lipid staining assays, and neuronal imaging were conducted to assess the effects of BPS.

RESULTS

Behavioral assays demonstrated that unexposed worms were attracted to BPS, while pre-exposed worms showed increasing avoidance. Lipid assays revealed increased accumulation of fully filled lipid droplets with increasing BPS exposure. Neuronal assays showed enlargement of neuron cell bodies and altered axonal morphology at higher concentrations.

DISCUSSION

The results suggest that BPS exposure leads to behavioral adaptation, metabolic disruption, and neurotoxicity in Caenorhabditis elegans. These findings raise concerns about the safety of BPA substitutes and support the need for comprehensive toxicological evaluation.

CONCLUSION

This study demonstrates that BPS exposure affects multiple biological systems in C. elegans, indicating potential risks associated with widespread human exposure to BPA substitutes.

FUTURE WORK

Future research should include increased sample sizes, genetic analysis, comparison with BPA exposure, and testing across additional model organisms.

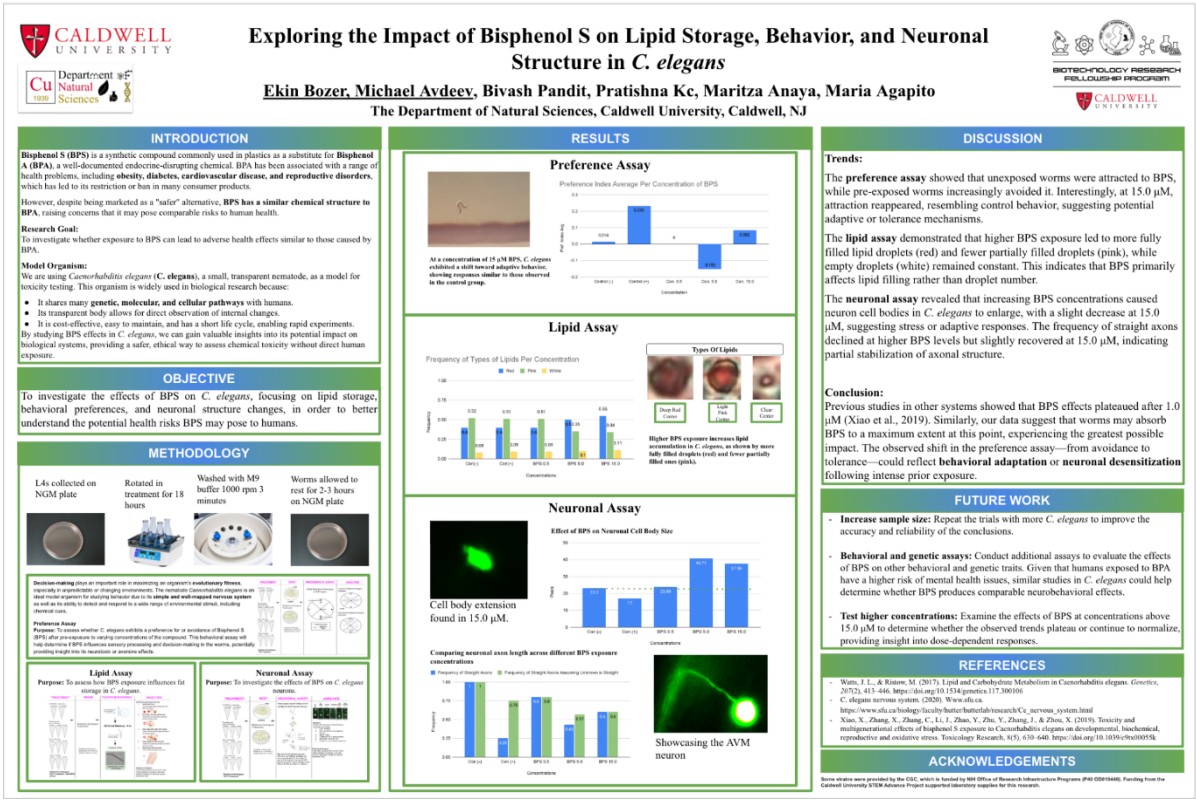

Figure 1-3: Behavioral Preference Assay, Lipid Assay, and Neuronal Assay Results from Poster.