

Antimutagenic Effect of Protein Hydrolysate from *Arthrospira platensis* in Cyclophosphamide-Induced Mutagenicity in Rats



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Abstract

Nowadays, spirulina or *Arthrospira platensis* is gaining attention due to its antioxidant properties. However, there are no clear reports on the antimutagenic efficacy of protein hydrolysate from *A. platensis* (PS). Thus, the aim of this study was to evaluate the antimutagenic effects of PS in cyclophosphamide-induced mutagenicity in rats. Male rats were randomly divided into four groups. Group 1 and 2 served as the normal and negative controls and received distilled water orally. Groups 3 and 4 were treated with PS at doses of 3 and 6 mg/kg for 14 days. Mutagenicity was induced by intraperitoneal injection of cyclophosphamide (CP) on days 7 and 14 of the treatment period. Micronucleus formation in bone marrow and the level of malondialdehyde, an index of lipid peroxidation in male albino rats, were examined. The results showed that treatment with PS at both doses tended to reduce the number of micronuclei in polychromatic erythrocytes (MnPCE/PCE) in CP-induced rats, but the differences were not statistically significant ($p > 0.05$) compared to the negative control group. However, PS at 6 mg/kg significantly ($p < 0.05$) increased the PCE:NCE ratio compared to the negative control group. Furthermore, a significantly lower ($p < 0.05$) serum MDA level was observed in all PS-treated groups compared to the negative control group. In conclusion, protein hydrolysate from *A. platensis* at 3 and 6 mg/kg exhibits antimutagenic properties.

Introduction

Natural extracts are increasingly being studied for their potential applications in pharmaceuticals and dietary supplements, particularly those with antioxidant properties such as vitamin C and vitamin E. However, most available supplements are synthetic, driving interest in natural antioxidant sources. One such compound is protein hydrolysate, a product derived from enzymatic protein hydrolysis that breaks proteins into smaller peptides, enhancing absorption efficiency in the body. Protein hydrolysates exhibit significant biological properties, including blood pressure regulation, blood sugar reduction, cardiovascular disease prevention, and immune system enhancement. Spirulina or *Arthrospira platensis* is recognized as a high-quality protein source, containing 60–70% protein by dry weight, and offers numerous health benefits. However, no studies have reported on the antimutagenic effects of protein hydrolysate from *A. platensis* (PS). Thus, this study aimed to evaluate the antimutagenic effects of PS against cyclophosphamide-induced mutagenicity in rats by assessing micronucleus formation in erythroblast cells and analyzing malondialdehyde (MDA) levels in the liver and serum of experimental rats treated with the hydrolysate.

Results

Micronucleus formation

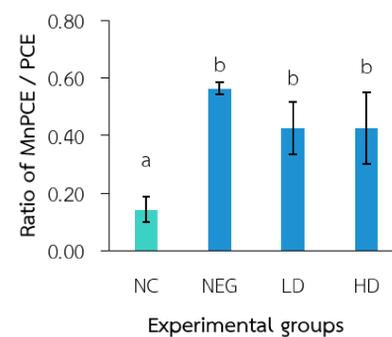


Figure 1. The ratio of micronucleus formation (MnPCE) in polychromatic erythrocyte (PCE) of experimental rats. a and b indicate statistically significant differences at $p < 0.05$, Duncan's test.

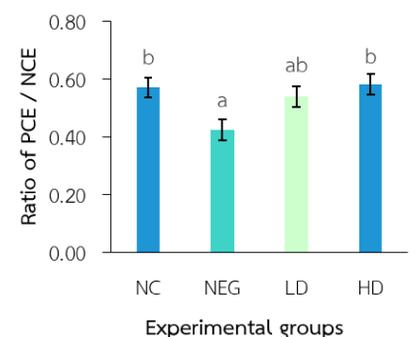
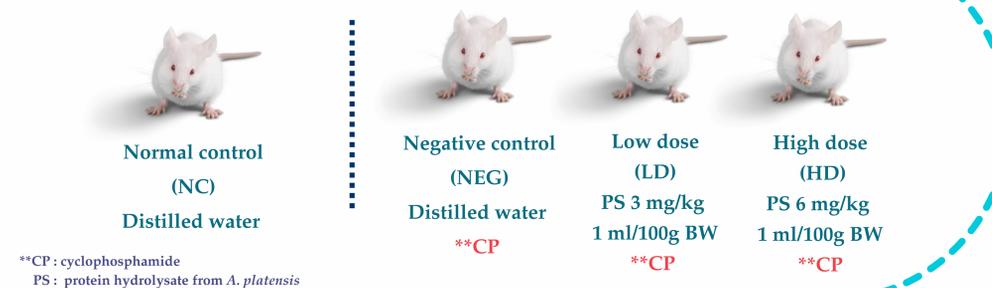


Figure 2. The ratio of PCE to NCE in experimental group of rats. a and b indicate statistically significant differences at $p < 0.05$, Duncan's test.

Materials & Methods

Experimental grouping and treatment

Male Wistar rats



Malondialdehyde levels

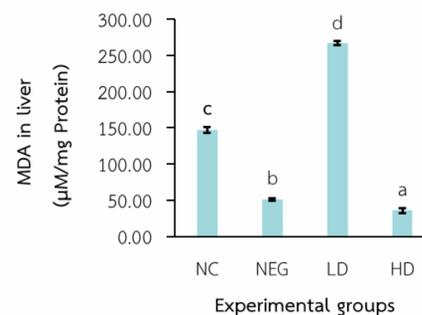
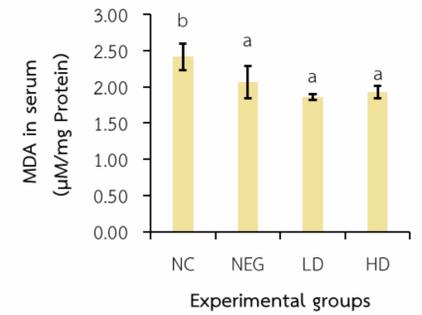
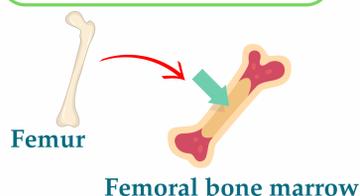


Figure 3. MDA levels in the liver and serum of the experimental rats. a, b, c and d indicate statistically significant differences at $p < 0.05$, Duncan's test.

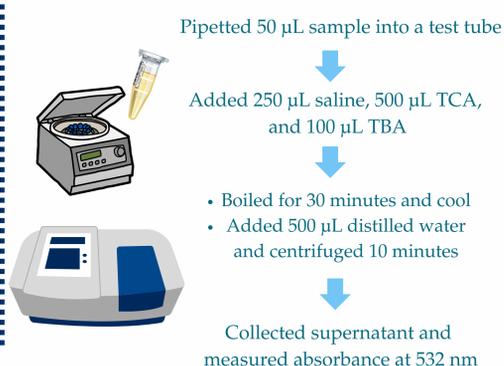
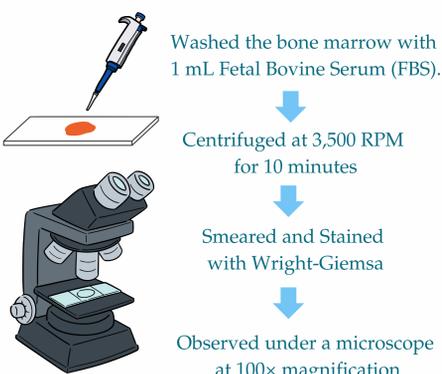
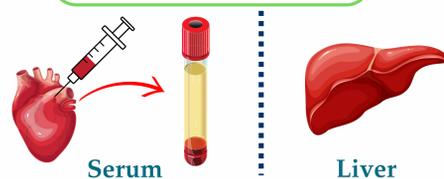


Sample Collection

Micronucleus formation



Malondialdehyde levels



Conclusion

In conclusion, the protein hydrolysate from *A. platensis* shows potential in reducing micronucleus formation in polychromatic erythrocytes (PCE) and alleviating the effects of cyclophosphamide, resulting in a statistically significant increase in PCE count. Additionally, it appears to reduce MDA levels in the serum of cyclophosphamide-induced mutagenicity in rats.

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