



Immunostimulant Activity of Protein Hydrolysate from *Arthrospira platensis* in Cyclophosphamide-Induced Immunosuppressive Rats

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Abstract

Protein hydrolysates are recognized as potent sources of bioactive peptide. They are widely used in nutritional supplements and sports nutrition due to their high solubility and rapid absorption in the body. Additionally, protein hydrolysates from various hydrolysis processes and sources have demonstrated immunostimulatory effects. Thus, this study aimed to evaluate the immunostimulatory effects of protein hydrolysate from *Spirulina* (*Arthrospira platensis*; PS) in cyclophosphamide (CP)-induced immunosuppressive rats. Male albino rats were randomly divided into four groups. The normal control and negative control groups were received distilled water orally, while the immunosuppressive groups were treated orally with PS at doses of 3 and 6 mg/kg for 14 consecutive days. CP was administered on days 7 and 14 to induce immunosuppression. After the end of the treatment period, lysozyme activity in serum was measured and phagocytic activity in peripheral blood was assessed. The results indicated that PS at all doses effectively stimulated immune function in CP-induced immunosuppressive rats by increasing the phagocytic number. A significant ($p < 0.05$) increase in the phagocytic index was observed only in the high-dose PS group compared to the negative control group. However, the low-dose PS group exhibited a greater enhancement in lysozyme activity than the high-dose group. These findings suggest that protein hydrolysate derived from *A. platensis* is a potential immunomodulator and could be developed as immune-boosting product.

Introduction

The immune system is an internal mechanism of the body that functions to protect and defend against various foreign substances that may cause diseases, particularly different types of pathogens. It also plays a role in detecting and generating response mechanisms to eliminate these foreign substances, allowing the body's systems to return to normal functioning. The immune system is divided into two main categories: innate immunity and acquired immunity. Currently, one of the most widely used immunosuppressive drugs is Cyclophosphamide, which is commonly used to treat various types of cancer, such as breast cancer, lymphoma, leukemia, and autoimmune diseases. Cyclophosphamide is a chemotherapy drug classified as an alkylating agent, which functions by forming chemical bonds in the DNA of cells, leading to DNA damage or preventing cell division, ultimately causing cancer cells to die. Additionally, it suppresses the immune system. The side effects of Cyclophosphamide depend on dosage, duration of use, and the patient's physical condition. Common side effects include nausea, vomiting, and hair loss, while severe side effects may lead to bone marrow suppression, causing a reduction in circulating white blood cells (leukopenia) and a decrease in platelet count, which increases the risk of infection and excessive bleeding. Therefore, protein hydrolysates have been utilized to modulate the immune system, help reduce side effects, and enhance immunity in patients receiving Cyclophosphamide treatment.

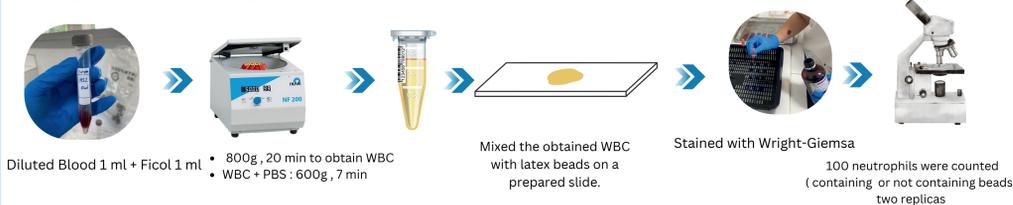
Objective

To study the immunostimulatory effects of protein hydrolysate derived from *A. platensis* in cyclophosphamide-immunosuppressed rats.

Materials & Methods

Group 1 Normal control		Distilled water
Group 2 Negative control		Distilled water + CP
Group 3 Low dose Spirulina		PS 3 mg/kg + CP
Group 4 High dose Spirulina		PS 6 mg/kg + CP

Phagocytosis activity



Lysozyme activity



Results

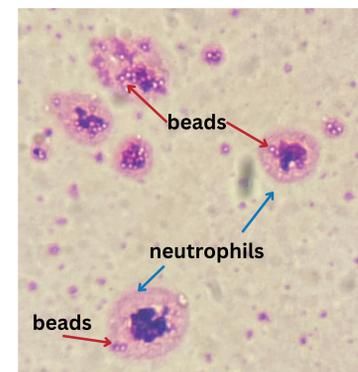


Figure 1 neutrophils with phagocytic activity

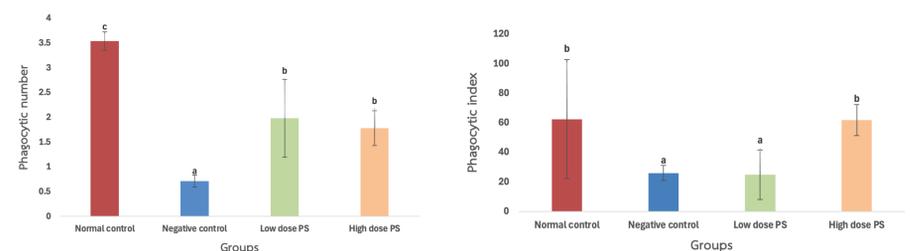


Figure 2 Phagocytic number in different experimental groups.

Figure 3 Phagocytic index in different experimental groups.

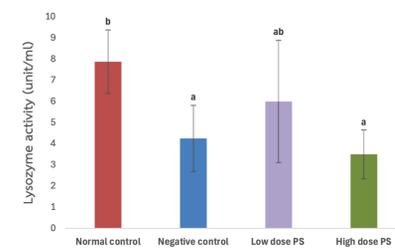


Figure 4 lysozyme activity in different experimental groups.

a,b,c in Figure 1-3 indicate statistically significant differences between groups ($p < 0.05$). Data are expressed as mean \pm SD.

Conclusion

Protein hydrolysate from *Arthrospira platensis* exhibits immunostimulatory effects in cyclophosphamide-induced immunosuppressed rats, as measured by phagocytosis activity and lysozyme activity.

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