

# Effect of Echinacea on Human Immune Responses In Vivo

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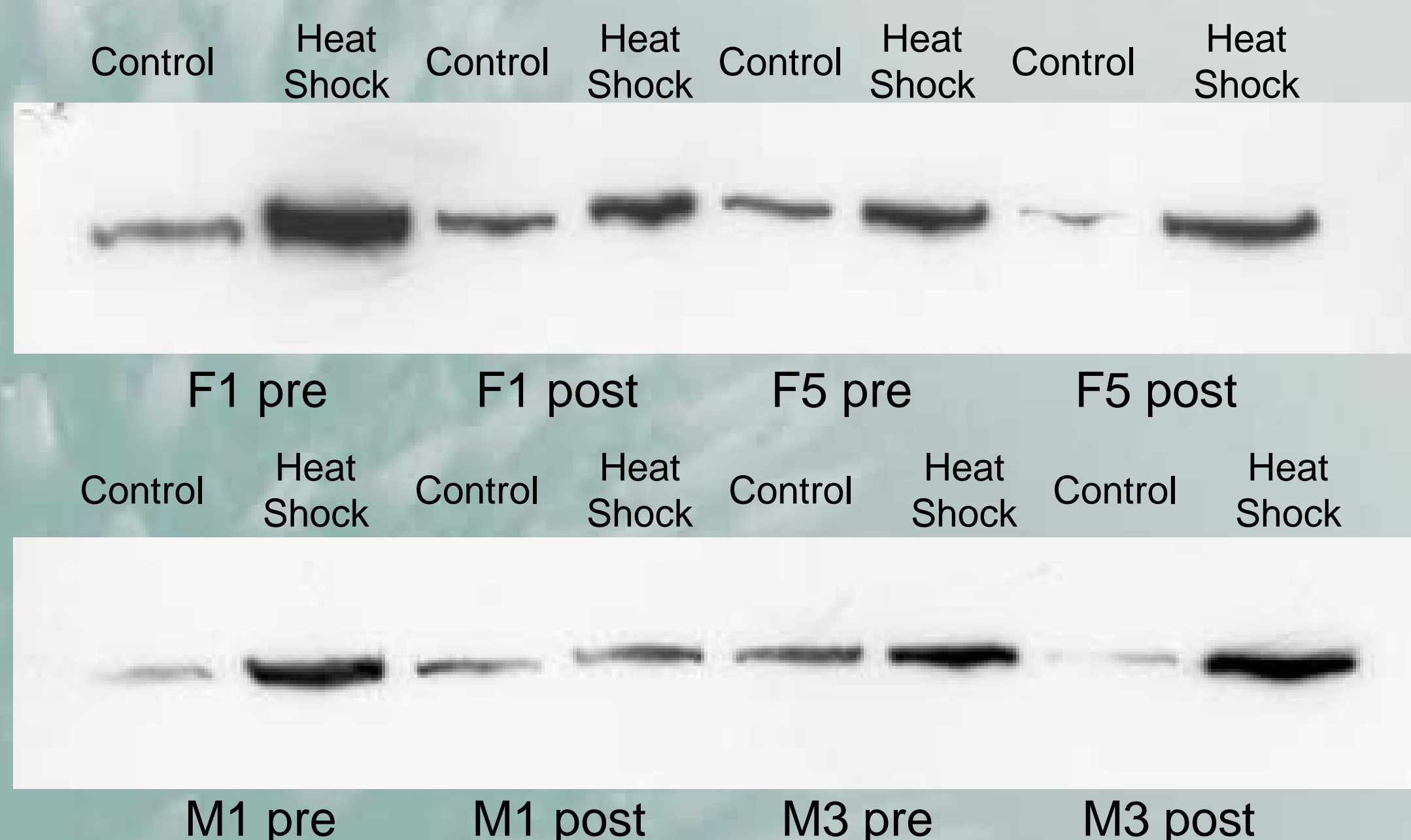
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## INTRODUCTION

Although Echinacea has been used for many years as an immunomodulator [1], its mode of action is still unclear. As such, this study investigated the potential immunomodulatory effects of an Echinacea preparation by measuring leucocyte heat shock protein 70 (hsp70) expression as a biomarker of the immune response. Hsps are among the most highly conserved proteins in nature and are found in all organisms. They are expressed constitutively as well as induced in response to mild, generally non-lethal stress such as inflammation and microbial infections. There is increasing evidence that hsps play key roles as prominent antigens in the humoral and cellular immune responses mediated by antibodies and T cells respectively [2,3]. The involvement of altered hsp expression in a number of disease states has emphasised the important role of these proteins in the modulation of the immune response [4].

The present study was a pilot scale clinical trial involving eleven subjects (five male, six female), orally dosed with the tablet form of an ethanolic extract of two species of *Echinacea* – *purpurea* and *angustifolia*. The aim of the study was to investigate the potential immunomodulatory effects of *Echinacea* in healthy subjects by measuring leucocyte hsp70 expression as a biomarker of the immune response. Haematology alterations in response to chronic dosing with Echinacea were also examined.

## Results



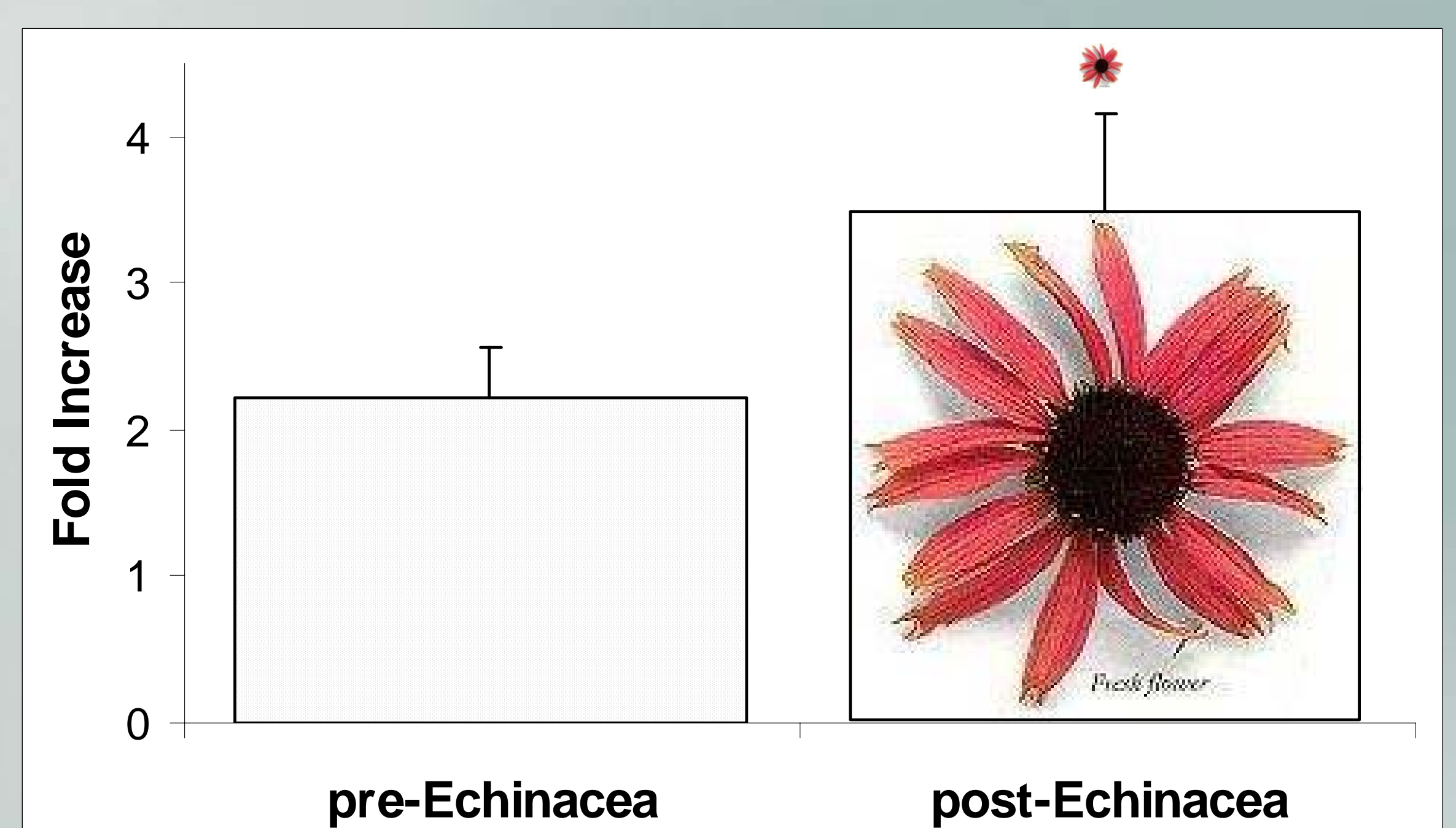
**Figure 1:** Representative Western immunoblots for hsp70 expression in human leucocytes.

Control (37°C), Heat shock (42.5°C), pre = before Echinacea intake, post = after 2 weeks Echinacea supplementation.

	Before Echinacea	After Echinacea
Red cell counts ( $10^{12}/L$ )	4.84 ± 0.15	4.81 ± 0.16
Haemoglobin (g/L)	146 ± 4	146 ± 4
White cell counts ( $10^9/L$ )	6.6 ± 0.4	7.2 ± 0.3 *
Neutrophils ( $10^9/L$ )	3.6 ± 0.3	4.0 ± 0.3
Lymphocytes ( $10^9/L$ )	2.2 ± 0.1	2.3 ± 0.1
Monocytes ( $10^9/L$ )	0.4 ± 0.0	0.5 ± 0.0
Eosinophils ( $10^9/L$ )	0.3 ± 0.1	0.3 ± 0.0
Basophils ( $10^9/L$ )	0.0 ± 0.0	0.0 ± 0.0
Platelets ( $10^9/L$ )	276 ± 20	272 ± 15

**Table 1:** Comparison of blood haematology before and after two weeks supplementation with Echinacea.

All values are mean ± SE (n = 11). \* p = 0.043



**Figure 2:** Effect of Echinacea on Hsp70 expression.

Data is expressed as fold increases of the ratio of hsp70 expression at 42.5°C relative to that measured at 37°C.

Values are mean ± SE (n = 11). \* p = 0.029

Heat shock increased hsp70 expression levels in leucocytes.

Although neither basal nor heat shock hsp70 levels were different, there was a significantly greater fold increase in hsp70 after Echinacea supplementation.

Total white cell counts increased after Echinacea supplementation.

- Differential cell counts displayed only non-significant increases after Echinacea supplementation.

Plasma alkylamide levels were 12 ± 2 ng/mL plasma one hour after ingestion of one Echinacea tablet.

## Summary

Echinacea may alter an immune response through:

- Increased white cell counts.
- Altered expression of leucocyte hsp70 in response to heat shock.

These are indicative of an improved immune response.

## Methods

Echinacea Premium Tablets containing 675 mg of *E. purpurea* root extract and 600 mg of *E. angustifolia* root extract prepared by ethanol extraction were obtained from MediHerb, Warwick, Australia. Eleven individuals with BMI 19-30 participated in the study. Fasting, baseline blood samples were collected on day 1. Participants then consumed 2 Echinacea tablets per day for 14 days. A further blood sample was collected on day 15. Leucocytes were isolated and incubated at either 37°C or 42.5°C for 1 hour. They were then allowed to recover for 3 hours at 37°C prior to protein extraction. Hsp70 expression was measured using western immunoblots and densitometric analysis. Blood was also assessed using standard haematological analyses. Plasma alkylamide levels were determined by LC-MS [5].

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