

Immunomodulatory Effects of a Herbo –Mineral Ayurvedic Formulation on Cell Signalling Pathways in Experimental Models

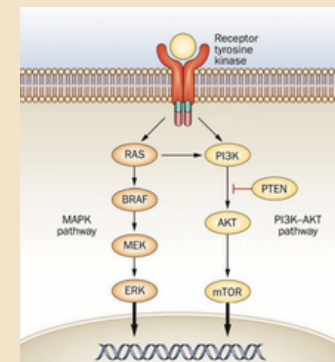


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Introduction

Cell signalling pathways such as MAPK (pERK1/2) and PI3K/AKT play a crucial role in immune regulation and cellular homeostasis. Disruptions in these pathways, often caused by agents like cyclophosphamide (CPH), can lead to immune suppression. IMMBO, a standardized Herbo-Mineral Ayurvedic formulation used for allergic rhinitis, has shown immunomodulatory potential. This study investigates its effects on MAPK and PI3K/AKT treating pathways in CPH-induced immune-suppressed Wistar rats.



Methods

Experimental Design

- Animal Model: Wistar albino rats (6-8 weeks old); immune suppression induced with CPH (100 mg/kg, Day 0)
- Treatment Groups:
 - G1 (Control) : Saline-treated
 - G2 (CPH Alone): Cyclophosphamide only
 - G3: Cyclo + Levamisole + SRBC
 - G4 (Levamisole, 20 mg/kg, p.o.): Reference group
 - IMMBO Groups: CPH + SRBC + IMMBO (200, 400, or 800 mg/kg)

Protein Extraction & Western Blot Analysis

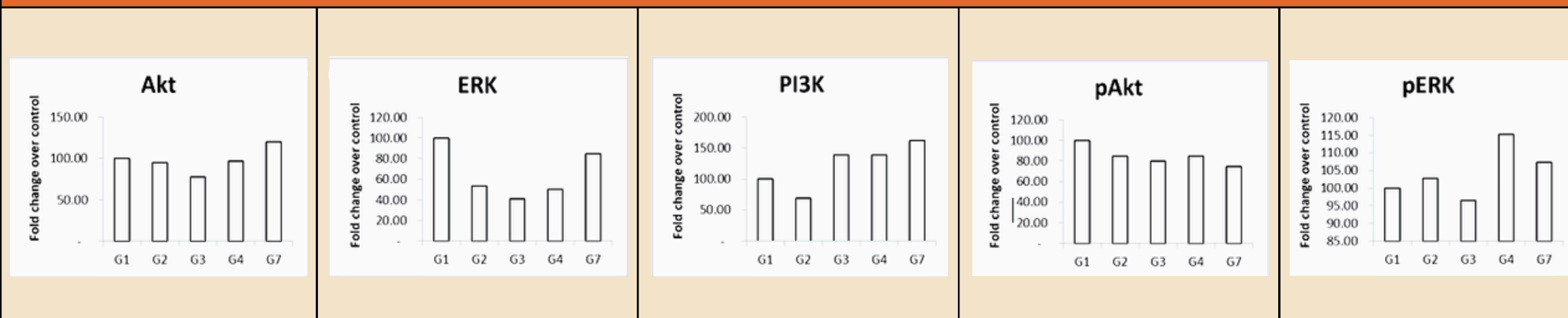
- Spleen Tissue Collection > Protein Extraction (RIPA buffer) Western Blotting (ERK, PI3K, Akt1, pAkt1, pERK1)
- Band intensities analyzed using ImageJ, normalized to GAPDH .. Quantification:
- Statistical Analysis One-way ANOVA with Dunnett's post-hoc test ($p \leq 0.05$).

Results

CPH significantly suppressed ERK and PI3K activation in spleen tissues. IMMBO's Immunomodulatory Effects

- ERK Activation: 800 mg/kg IMMBO restored ERK levels to near-control values.
- PI3K Activation: Even the lowest dose (200 mg/kg) normalized PI3K activation.
- Other Targets: No significant changes in Akt1, pAkt1, or pERK1.

Fig: Representation of fold-change in biomarkers normalized to GAPDH control



Conclusion

IMMBO reverses cyclophosphamide-induced immune suppression by restoring MAPK and PI3K activation, demonstrating its potential as a natural immunomodulatory agent. These findings provide a molecular basis for further research into IMMBO's therapeutic applications in immune-compromised conditions.

References

1. Zhang Z, Richmond A, Yan C. Immunomodulatory Properties of PI3K/AKT/mTOR and MAPK/MEK/ERK Inhibition Augment Response to Immune Checkpoint Blockade in Melanoma and Triple-Negative Breast Cancer. *Int J Mol Sci.* 2022;23(13):7353. | 2. Prakash VB, Sati ST, Rao YK, Prakash S, Negi N. Immunomodulatory Effects of a Herbo-Mineral Ayurvedic Formulation in Experimental Models. *Cureus.* 2024;16(4):e58913.

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