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Immunomodulatory Effects of Ayurvedic Drugs: A Review

KEYWORDS: Immunomodulatory, Katuki, Yashadabhasma, Muktabhasma, Swarnamakshika bhasma.

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ABSTRACT *In this review we have attempted to highlight the work on Immunomodulatory effects carried out in herbal, mineral, metal and gem stone viz. Katuki, Swarnamkshika, Yashada and Mukta. The results of these drugs revealed that potential of immunomodulatory activity. Clinical study can be undertaken in immunodeficiency disorder.*

Introduction:
Immunomodulation is a process which can alter the immune system of an organism by interfering with its functions and results in an enhancement of immune reactions either in immunostimulent or immunosuppressant. Immunomodulators are biological entities exerts effect by improving defense mechanism against disease and that have the capability to either augment or suppress an immune response. In addition to an altered immune response, modulation of haematopoiesis, including increased RBC and WBC counts, an increased PCV and enhanced macrophage activation, have also been reported.[1]

Modulation of immune responses to alleviate the diseases has been of interest for many years andthe concept of 'Rasayana' is based on related principles.[2] Rasayana, listed as a class in the texts of traditional Indian medicine literature, consists of a number of drugs reputed to promote physical and mental health, improve defense mechanisms of the body and enhance longevity. In Ayurveda particularly Rasayana is recommended for Immune system. Many herbs, minerals, metals, gem stones and some poisonous drugs also having property of Rasayana. Some studies proved that immunomodulatory effect of herbs, metals, minerals and gem stones. Among these I selected one from each group. By collecting the effect of different drugs helpful in further clinical study, that helpful in the treating of any immunodeficiency disorder. Keeping this in mind this review work is started.

1) Immunomodulator activity of Trikatu mega Ext.
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Materials and methods:Six-eight week old healthy, laboratory breed swiss albino mice of either sex, weighing 25±2g were used for the present study. A test solution of mega Exttract was prepared by dissolving it in acacia with distilled water for orally administration to animals. cyclophosphamide in a dose of 25 mg/kg p.o. was used as a reference standard immunomodulator activity for comparsion in this study.[3]

Results:
Table no.1: Effect of TrikatumegaExt on Phagocytic activity by carbon clearance test (Cheng et al., 2005)[4]

Group	Dose (mg/kg)	Phagocytic index Mean±SD
I-Control	10 ml/kg normal saline	0.013±0.003
II-Standard	cyclophosphamide (25 mg/kg)	0.034±0.004***
III- Dose I	100 mg Trikatu	0.017±0.003***
IV-Dose II	200 mg Trikatu	0.024±0.003***

All values are mean ± SD, *** P<0.001 when compared to control group

Table no. 2: Effect of TrikatumegaExt treatment in Delayed type hypersensitivity test by induced footpad oedema. (Dashputreet al., 2010)[5]

Group	Dose (mg/kg)	DTH response mm Mean±SD 4 hr.	24 hr.
I-Control	10 ml/kg normal saline	0.349±0.031	0.18±0.042
II-Standard	cyclophosphamide (25 mg)	0.833±0.047	0.81±0.032
III- Dose I	100 mg Trikatu	0.35±0.049	0.582±0.043
IV-Dose II	200 mg Trikatu	0.75±0.052	0.58±0.038

Conclude that TrikatumegaExt has immunomodulatory activity.Trikatucould be attributed to the presence of flavonoids, Alkaloids, tannins, saponin glycosides and phenolic compounds. It is already repoted that naturally occurring phenolic compounds have immunomodulatory activity

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2) Immunomodulatory effect of Yashada Bhasma
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Materials and methods

Drug: Yashadabhasma suspension

Human blood samples – 3 (A, B and C)

Parameters assessed are[6]

- Nitro blue tetrazolium test(NBT)
- Phagocytosis and Candidacidal assay
- Neutrophil and Chemotaxis test

Yashadabhasma (YB) suspensions

Ingradients	1% suspension	2% suspension	5% suspension
Yashadabhasma	1 gm	2gm	5gm
Compound powder of Tragakanth*	2 gm	4 gm	10 gm
Distilled water	100 ml	100 ml	100 ml

***Compound powder of Tragakanth[7]: 7.5 gmTragakanth, 10 gm each of gum acacia and soluble starch and 22.5 gm of finely powdered sucrose.**

Results:
Maximum stimulation was seen with 5% YB suspension in NBT.

The Candidacidal activity was seen to be better in all the concentration when compared to positive control used.

No much difference was seen in the results of 2% and 5% drug suspension but mean value indicates 5% suspension has better result comparatively in neutrophil locomotion and chemotaxis test.

Result revealed that 5% drug suspension showed significant results in all the four parameters i.e NBT, Phagocytosis, Candidacidal assay and Chemotaxis.

3) Immunomodulatory effect of Mukta (Freshwater cultured Pearl) bhasma
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Materials and methods

Drug: Muktabhasma (MB) in the dosage of 1, 0.5, 0.25, 0.125, 0.06

Human blood samples – 5 (A, B, C, D and E)

Parameters assessed are[6]

- Nitro blue tetrazolium test(NBT)
- Phagocytosis and Candidacidal assay
- Neutrophil and Chemotaxis test

Results:
Muktabhasma has shown significant ($p<0.001$) increase in the % of NBT stimulated cells particularly in lower doses.

MB 0.06mg shows significant increase in the phagocytic activity when compared to MB 1.0 mg.

MB 0.06mg showed highly significant (***$p<0.0001$) increase in the dead candida cells when compared to MB 1.0 mg. MB 0.125 and 0.25 mg showed significant increase (**$p<0.01$) as compared to MB 1.0 mg.

Muktabhasma has shown significant ($p<0.001$) neutrophil and chemotactic activity at the dose of 0.06mg and 0.125 mg when compared to MB 0.5 and 1.0 mg.

Increase in the NBT assay, Phagocytosis, Chemotaxis represents good Immunomodulatory effect of Mukta bhasma at the dose of 0.06mg. It suggests that in higher doses it may act as cytotoxic agent but acts as an immunostimulant when applied in smaller doses.

4) Immunomodulatory effect of Swarnamakshika Bhasma
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Materials and methods

Drug:Swarnamakshikabhasma (SMB) in the dosage of 1, 0.5, 0.25, 0.125, 0.06

Human blood samples – 3 (A, B and C)

Parameters assessed are[7]

- Nitro blue tetrazolium test(NBT)
- Phagocytosis and Candidacidal assay
- Neutrophil and Chemotaxis test

Results:
The doses of SMB 1.0 and 0.5 mg showed significant ($p<0.0077$) increase in the % 0f NBT stimulated cells except 0.25, 0.125 & 0.06 mg ($p< 0.05$) when compared to negative control group.

Positive control group showed significant ($p<0.001$) phagocytic activity at the dose of 0.6 mg when compared to different doses of SMB.

Positive control group showed significant ($p<0.001$) increase in the dead candida cells when compared to SMB 1.0 mg.

SMB showed significant difference in (***$p<0.001$) neutrophil and chemotactic activity at the dose of 1 and 0.5 mg when compared to negative control.

Swarnamakshika bhasma of 1mg showed statistically significant results.

DISCUSSION:
1) Discussion:
The role of phagocytosis is the removal of microorganisms and foreign bodies, dead or injured cells. The increase in the carbon clearance index reflects the enhancement of the phagocytic function of mononuclear macrophage and non-specific immunity. Trikatumega Herb appeared to enhance the phagocytic function by exhibiting a clearance rate of carbon by the cells of the reticuloendothelium system.

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Increase in DTH reaction in mice in response to T cell dependent antigen revealed the stimulatory effect of mega extract on T cells.

The results of Trikatumega Herb a potent immunostimulant, stimulating specific and nonspecific immune mechanisms.

2) Discussion:
In this study Yashadabhasma was subjected to assess Immunomodulatory activity in 3 different concentrations (1%, 2% and 5%) of Yashadabhasma solution. Result revealed that 5% drug suspension showed significant results in all the four parameters i.e NBT, Phagocytosis, Candidacidal assay and Chemotaxis.

3) Discussion:
In present study Muktabhasma was subjected to assess Immunomodulatory activity in five different doses for which parameters like NBT test, Phagocytosis & Candidacidal assay and Neutrophil locomotion & Chemotaxis assay were evaluated.

MB has significantly increased the intracellular reduction of NBT dye to formazan crystals by neutrophils confirming the intracellular killing property when compared to NC & PC.

By NBT test, MB confirms the Immunostimulating effect. This stimulated immunity further confirms the phagocytic function of neutrophils by engulfing the candida cells & also confirms the Candidacidal effect significantly which was near to PC value.

MB significantly increased the movement of neutrophils towards the foreign body which is most important step in phagocytosis process.

4) Discussion:
In present work Swarnamakshikabhasma was subjected to assess Immunomodulatory activity in three different samples for which parameters like NBT, phagocytosis, candidacidal assay and neutrophil locomotion and chemotactic assay were evaluated. SMB of 1mg showed statistically significant results. It also showed immunomodulaory effect in vitro. This helps in preventing the immune mediated liver damage especially in CCl_4.

Conclusion:
By analyzing above drugs results it proved that above mentioned drug having effect over Immunomodulatory activity in different dosage and in different form. Clinical study can be undertaken in immunodeficiency disorder.

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