Evaluation of activity of a Herbal formulation “Pentapala 04” on the lung lipids against ova albumin and aluminium hydroxide induced lung damage in rats.

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ABSTRACT:

The aqueous extract was found to be more effective on the surfactant system of lung against ova albumin and aluminium hydroxide induced lung damage in albino wistar rats. The rats were divided into 3 groups of four animals each, namely group I, II and III which served as control, toxic and post treatment groups respectively. Our results showed increased Lung Body-Weight Index (LBI) and decreased lung lipid content in the toxic group of animals. But the levels of lipid content and Lung Body-Weight Index were restored in post-treated group of animals, which might be due to the protective activity of “Pentapala-04”.

Key Words: Ova albumin, aluminium hydroxide, lung lipids, Lung Body-Weight Index (LBI).

INTRODUCTION

The lung is an active metabolic organ, which is lined with high surface-active materials like lipids mainly phospholipids and some specific proteins. Lamellar bodies are lipid-rich organelles in the lung and contain a variety of lysosomal hydrolases, and such enzymes are also found in lung lavage. The lysosomal character of these organelles may play a degradative role. Lipids mediate the stimulatory effect, and increase in molecular weight of the cytosolic enzyme in liver form 200,000 to a mean of 1.3 x 10^6. Fatty acids were reported to stimulate phosphatidylcholine synthesis and promote translocation of cytidyl transferases form cytosol to microsomes.

Medicinal plants have been used traditionally in the Ayurvedic system of medicine for the management of asthma and have been scientifically proven to have anti-asthmatic properties. Hence, the present study involves the use of a herbal formulation “Pentapala-04” which includes the extract of five medicinal plants viz., Adhatoda vasica: Nees., Ocimum sanctum; Linn., Coleus aromaticus; Benth., Glycyrrhiza glabra; Linn., and Alpinia galangal; Sw., against ova albumin and aluminium hydroxide induced lung damage in rats.

MATERIALS AND METHODS

PREPARATION OF EXTRACTS:

A polyherbal drug “Pentapala-04” consists of five different plants viz, Adhatoda vasica; Nees. Ocimum sanctum; Linn. Coleus...
aromaticus; Benth. Glycyrrhiza; Linn. and Alpinia galanga; Sw. The young and fresh leaves and roots were collected from palani Hills, Coimbatore (TamilNadu, India). Aqueous extract (6.25%) was prepared under boiling water (<100°C) at normal pressure. The aqueous extract was subjected to studies in laboratory animals.

EXPERIMENTAL DESIGN AND ANIMAL SENSITIZATION:

Albino wistar rats (150-200g) were bred in the central animal house, P.S.G. Institute of Medical College, Coimbatore. The animals were fed with a pellet diet [Hindustan Lever Ltd; Mumbai] and water ad libitum. The animals were maintained in their respective controlled light and temperature conditions for 30 days.

Animals were divided into three groups of four animals each Group I, II and III served as control, toxic and post treated groups respectively. Group II and Group III animals were sensitized by subcutaneous injection of 1 ml saline containing 1 mg of ova albumin and 200 mg of aluminium hydride. Group III rats were post treated with “Pentapala 04” (0.2ml/kg body wt) extract, twice a day form 2nd day to 9th day after sensitization.

After 9th day of treatment, the whole rats were fasted overnight and sacrificed by cervical decapitation. Lungs were excised immediately, and weight (wet and dry) was determined, then biochemical assays were carried out.

LUNG BODY- WEIGHT INDEX (LABI)

The lungs were removed, freed from adhering tissues, blood and weighed. The LBI was calculated by the formula

\[
\text{LBI} = \left( \frac{\text{Lung weight}}{\text{Body weight}} \right) \times 100
\]

BIOCHEMICAL ANALYSIS OF LUNG:

From the lung tissue, we extracted lipids by the method as described by Folch et al., (1957). these lipids were used to assay the triglycerides, free cholesterol, total cholesterol, phospholipids and fatty acids according to method described by Rice (1970), Sperry and Webb (1950), Parckhand Jung (1970) Rouser et al., (1970), and Horn (1981) respectively.

RESULT AND DISCUSSION

Results are expressed as mean ± SEM. Statistical significance between control, toxic, and post treated groups were analyzed using student’s test.

Table 1 shows that there is significant (P<0.001) increase of LBI in the toxigen as compared to the control group. Similar results have been reported by Abraham et al., (1992). LBI might be increased due to pulmonary edema and haemorrhage. After the treatment with “Pentapala-04” there was a significant (P<0.001) decrease in LBI as compared to toxic group. Our result is in accordance with sharma et al., (1987).

Effect of “Pentapala-04” on the lung lipids is depicted in the table II. In the toxic group, the lipid profile like cholesterol, phospholipids, free fatty acid, and triglycerides were reduced significantly (P<0.001) when compared to control group. While in treated rats, there are significant (P<0.0014) increased levels of above said lipid profiles as compared to toxic rats.
Asthma is characterized by airway hyper-responsiveness, which is an exaggerated airway narrowing in response to many stimuli. Asthma has become the most common chronic disease in the world and epidemiological studies suggest that its prevalence, severity, and mortality rate are rising. The commonly used anti-asthmatic drugs like bronchodilators and â agonists may rapidly relieve asthmatic symptoms but they may not control the underlying inflammation. Since asthma is a chronic inflammatory condition, it may be more logical to adopt anti-inflammatory treatment to control the inflammation. Anti-inflammatory treatment includes the use of corticosteroids which are very effective in the treatment of asthma, but corticosteroids are costly and if given systemically, have severe adverse effects.

Thus our studies provide experimental evidence for the protection of surfactant systems of lung by “Pentapala-04” without any side effects.

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Table I
Effect of “Pentapala – 04” on the Lung Body – Weight index in experimental and control rats.

|                     | Control (Group I) | Toxic (Group II) | Treated (Group III) |
|---------------------|-------------------|------------------|---------------------|
| Wet Weight lung(g)  | 1.71 ± 0.14       | 2.12±0.09a**     | 1.55±0.06b***      |
| Dry Weight lung(g)  | 0.16±0.02         | 0.28±0.02a***    | 0.15±0.012b***     |
| LBI (%)             | 0.95±0.02         | 1.27±0.06a***    | 0.93±0.012b***     |

Each value represent the Mean ± SEM. (n=4).
Statistical Comparison

a-Group II Compared with Group I
b-Group III Compared with Group II
**Significant (P<0.01), *** Highly significant (P<0.001)
Units=mg/g.tissue

Table II
Effect of “Pentapala-04” on the Lipid profile of the lung tissue in experimental and control rats.

|                      | Control (Group I) | Toxic (Group II) | Treated (Group III) |
|----------------------|-------------------|------------------|--------------------|
| Total Cholesterol    | 3.21 ±0.37        | 2.54±0.06***     | 3.11±0.13b****     |
| Free Cholesterol     | 1.20±0.08         | 0.67±0.12a***    | 1.00±0.06b****     |
| Phospholipids        | 14.02±0.51        | 12.55±0.38a ****| 13.78±0.36b****    |
| Free fatty acids     | 6.93±0.42         | 3.90±0.68a ****  | 5.86±0.14b****     |
| Triglycerides        | 3.78±0.12         | 2.47±0.11a ****  | 3.57±0.10b****     |

Each value represent the Mean±SEM.n=4).
**Statistical Comparison**

a-Group II Compared with Group I
B-Group III Compared with GroupII
**Significant (P<0.01), ***Highly significant (P<0.001)
units=mg/g. tissue