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Anticancer Potentials of Aqueous Tinospora cordifolia and Its Bioactive Polysaccharide, Arabinogalactan on Benzo(a)Pyrene Induced Pulmonary Tumorigenesis: A Study with Relevance to Blood Based Biomarkers

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Abstract : Aim: To evaluate the potential of Aqueous Tinospora cordifolia stem extract (Aq.Tc) and Arabinogalactan (AG) on pulmonary carcinogenesis and associated tumor markers. Background: Lung cancer is one of the most frequent malignancy with high mortality rate due to limitation of early detection resulting in low cure rates. Current research effort focuses on identifying some blood-based biomarkers like CEA, ctDNA and LDH which may have potential to detect cancer at an early stage, evaluation of therapeutic response and its recurrence. Medicinal plants and their active components have been widely investigated for their anticancer potentials. Aqueous preparation of T. Cordifolia extract is enriched in the polysaccharide fraction i.e., AG when compared with other types of extract. Moreover, reports are available of polysaccharide fraction of T. Cordifolia in in vitro lung cancer models which showed profound anti-metastatic activity against these cell lines. However, not much has been explored about its effect in in vivo lung cancer models and the underlying mechanism involved. Experimental Design: Mice were randomly segregated into six groups. Group I animals served as control. Group II animals were administered with Aq. Tc extract (200 mg/kg b.w.) p.o.on the alternate days. Group III animals were fed with AG (7.5 mg/kg b.w.) p.o. on the alternate days (thrice a week). Group IV animals were installed with Benzo(a)pyrene (50 mg/kg b.w.), i.p. twice within an interval of two weeks. Group V animals received Aq. Tc extract as in group II along with it B(a)P was installed after two weeks of Aq. Tc administration following the same protocol as for group IV. Group VI animals received AG as in group III along with it B(a)P was installed after two weeks of AG administration. Results: Administration of B(a)P to mice resulted in increased tumor incidence, multiplicity and pulmonary somatic index with concomitant increase in serum/plasma markers like CEA, ctDNA, LDH and TNF-α.Aq.Tc and AG supplementation significantly attenuated these alterations at different stages of tumorigenesis thereby showing potent anti-cancer effect in lung cancer. A pronounced decrease in serum/plasma markers were observed in animals treated with Aq.Tc as compared to those fed with AG. Also, extensive hyperproliferation of alveolar epithelium was prominent in B(a)P induced lung tumors. However, treatment of Aq.Tc and AG to lung tumor bearing mice exhibited reduced alveolar damage evident from decreased number of hyperchromatic irregular nuclei. A direct correlation between the concentration of tumor markers and the intensity of lung cancer was observed in animals bearing cancer co-treated with Aq.Tc and AG. Conclusion: These findings substantiate the chemopreventive potential of Aq.Tc and AG against lung tumorigenesis. Interestingly, Aq.Tc was found to be more effective in modulating the cancer as reflected by various observations which may be attributed to the synergism offered by various components of Aq.Tc. Further studies are in progress to understand the underlined mechanism in inhibiting lung tumorigenesis by Aq.Tc and AG.

Keywords : Arabinogalactan, Benzo(a)pyrene B(a)P, carcinoembryonic antigen (CEA), circulating tumor DNA (ctDNA), lactate dehydrogenase (LDH), Tinospora cordifolia

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