The present study was planned to ascertain the acute toxic effects of oral administration of BaP on liver, lungs and erythrocytes of male swiss albino mice and to determine whether pretreatment of curcumin alone and with piperine to BaP exposed mice could modulate the toxic effects to any extent.

Male Swiss albino mice, 6-8 weeks old, weighing 26 ± 2 g received curcumin (100 mg kg⁻¹ body weight) and piperine (20 mg kg⁻¹ body weight) separately as well as in combination orally in corn oil for seven days as pretreatments. Normal mice and mice pretreated with curcumin and piperine separately and in combination received benzo(a)pyrene (125 mg kg⁻¹ body weight) dissolved in corn oil (10 ml kg⁻¹ body weight) orally after two hours of the pretreatments. The animals in all five groups were housed in polypropylene cages bedded with rice husk and provided ad-libitum access to clean drinking water and standard animal pellet diet throughout the experiment. The important findings of the present study are summarised below:

LPO and protein carbonyl levels were significantly elevated and increased frequency of micronuclei were observed in BaP treated mice as compared to normal mice. Administration of curcumin and curcumin plus piperine with BaP challenge, significantly lowered the elevated levels of LPO, protein carbonyl and reduced the frequency of micronuclei formation in bone marrow. The concentration of GSH was significantly decreased in the BaP treated group when compared with normal group, which was significantly elevated following pretreatments with curcumin and curcumin plus piperine. Pretreatment of piperine with BaP treatment did not alter the levels of
LPO, protein carbonyl and GSH in liver and lungs tissue as compared to the BaP treated group.

The activities of antioxidant enzymes such as CAT, SOD, GR and GPx were significantly lowered in the BaP treated group when compared with normal control group. Administration of curcumin and curcumin plus piperine for seven days before single dose of BaP elevated significantly the activities of GR, SOD, CAT and GPx as compared to the BaP treated group. Combined administration of curcumin plus piperine followed by BaP treatment significantly increased the the activities of GR, SOD, CAT and GPx in liver and lung with respect to BaP and curcumin treated mice and the increase was more pronounced when seen in context with comparison of curcumin plus BaP with BaP treated group thereby indicating that piperine does act as an adjuvant. Pretreatment of piperine followed by BaP exposure did not alter the activities of GR, SOD, CAT and GPx in liver and lungs as compared to BaP treated group.

A significant increase in DNA damage was observed in both the liver and lung after a single dose of BaP. However, pretreatment with curcumin and curcumin plus piperine showed an appreciable reduction in DNA damage. The extent of DNA damage was more in lungs as compared to liver. Supplementation of curcumin and curcumin plus piperine for seven days significantly prevented the DNA damage in both the organs. However, the combined pretreatment with curcumin plus piperine exhibited higher genoprotective potential as assessed against BaP induced DNA damage. Pretreatment of piperine followed by BaP exposure did not statistically alter the level of DNA damage in both lung and liver compared to BaP treated group.

Scanning electron microscopical study of the erythrocytes revealed drastic alterations in the topography of erythrocytes in BaP
treated mice. These alterations in the surface architecture of erythrocytes were reversed significantly in curcumin plus BaP treated mice. Further, the improvement was more evident in curcumin plus piperine plus BaP treated group as compared to curcumin plus BaP treated group. Piperine plus BaP treatment to mice did not show any recovery as compared to BaP treated group in the topography of erythrocytes.

The activities of EROD and PROD were significantly induced in lung and liver of BaP treated mice as compared to normal mice. Administration of curcumin and curcumin plus piperine with BaP challenge significantly inhibited the enhanced activities of EROD and PROD. The pretreatment of curcumin plus piperine was more effective in induction of hepatic EROD as compared to curcumin pretreated mice.

QR activity was significantly elevated in the BaP treated group when compared with normal control groups but no significant change was assessed in GST activity. However, in curcumin and curcumin plus piperine pretreated mice exposed to BaP, the activity of GST and QR in lung and liver were increased significantly with respect to BaP treated group. Pretreatment of curcumin plus piperine was more effective in induction of GST activity in liver and lung when compared to curcumin treated mice but the combined pretreatment did not bring about any appreciable change in QR in case of both liver and lung when compared with Curcumin plus BaP treated mice. Piperine pretreatment followed by BaP exposure did not alter the activity of EROD, PROD, GST and QR in liver and lung as compared to BaP treated group.

The present study therefore concludes that oral pretreatment of curcumin alongwith piperine is effective in providing protection against genotoxicity and oxidative stress induced by benzo(a)pyrene.