

The Investigation of Effect of Alpha Lipoic Acid against Damage on Neonatal Rat Lung to Maternal Tobacco Smoke Exposure

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Abstract : This study was carried out to determine the histological and biochemical changes in the lungs of the rat pups exposed to tobacco smoke during pregnancy period and to investigate the protective effects of alpha lipoic acid, which is administered during pregnancy, on these changes. In our study, 24 six-week old Sprague-Dawley female rats weighing 160 ± 10 g were used (n:7). Rats were randomly divided into four equal groups: group I (control), group II (tobacco smoke), group III (tobacco smoke + alpha lipoic acid) and group IV (alpha lipoic acid). Rats in the group II, group III were exposed to tobacco smoke twice a day for one hour starting from eight weeks before mating and during pregnancy. In addition to tobacco smoke, 20 mg/kg of alpha lipoic acid was administered via oral gavage to the rats in the group III. Only alpha lipoic acid was administered to the rats in the group IV. Once after the delivery, all administrations were stopped. On the 7 and 21th days, the seven pups of all groups were decapitated. A portion of the lung was taken and stained with HE, PAS and Masson. In addition to immunohistochemical staining of surfactant protein A, vascular endothelial growth factor, caspase-3, TUNEL method was also used to determine apoptosis. Biochemical analyzes were performed with some part of the lung tissue specimens. In the histological evaluations performed under light microscopy, inflammatory cell increase, hemorrhagic areas, edema, interalveolar septal thickening, alveolar numbers decrease, degeneration of some bronchi and bronchial epithelium, epithelial cells that were fallen into the lumen and hyaline membrane formation were observed in tobacco smoke group. These findings were ameliorated in tobacco smoke + ALA group. Hyaline membrane formation was not detected in this group. The TUNEL positive cell numbers a significant increase was detected in the tobacco smoke group, whereas a significant decrease was detected in the tobacco smoke + ALA group. In terms of the immunoreactivity of both SP-A and VEGF, a significant decrease was observed in the tobacco smoke group, and a significant increase was observed in the tobacco smoke + ALA group. Regarding the immunoreactivity of caspase-3, there was a significant increase in the group of tobacco smoke and a significant decrease in the group of tobacco smoke + ALA. The malondialdehyde levels were determined to be significantly increased in the tobacco smoke group, and a significant decreased in the tobacco smoke + ALA. Glutathione and superoxide dismutase enzyme activities showed a significant decrease in the group of tobacco smoke and a significant increase in the tobacco smoke + ALA group. In conclusion, we suggest that the exposure to tobacco smoke during pregnancy leads to morphological, histopathological and functional changes on lung development by causing oxidative damage in lung tissues of neonatal rats and the maternal use of alpha lipoic acid can provide a protective effect on the neonatal lung development against this oxidative stress originating from tobacco smoke.

Keywords : alpha lipoic acid, lung, neonate, tobacco smoke, pregnancy

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