

**EFFECT OF FORMALIN ON RESPIRATORY SYSTEM  
OF ALBINO RATS:  
A HISTOLOGICAL STUDY**

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## *SUMMARY & CONCLUSION*

Formaldehyde (formalin) is a widely used industrial chemical and is also present in vehicle emissions & embalming fluid.

Widespread occurrence of formaldehyde alarmed scientists to see its possible effects on living systems. In a number of previous studies, it was found genotoxic and carcinogenic to animals including rats, monkeys and hamsters etc. Multiple studies were also done on humans to see its possible carcinogenic effects.

This study was conducted to see the histological effects of formalin on the respiratory tract of albino rats. 60 rats were taken for the experiment which were divided into 3 groups. 6 rats were used as controls while 3 subgroups of 18 rats each were exposed to formalin inhalation for 9, 18 and 36 days respectively.

After formalin exposure, tissues were collected from nasal cavity, larynx, trachea and lungs. Tissues were fixed in formalin, processed and tissue blocks were made in paraffin wax. 5-7  $\mu\text{m}$  thick sections were cut and stained with haematoxylin and eosin.

The sections were examined under low & high magnification and selected slides were photographed.

A number of microscopic changes in the form of cellular lesions and inflammatory lesions were noted and cell proliferative changes in the form of hypertrophy and hyperplasia were measured under high magnification with the help of eye piece micrometer in all 4 areas of respiratory tract in 25 randomly selected areas in the controls as well as in different exposure groups.

The cell proliferation (hypertrophy and hyperplasia) was considered in previous studies as an initiating and promotional event for the beginning of carcinoma. In this study, it was found in proximal part of respiratory tract i.e. nasal cavity and larynx while in trachea and lungs, no cell proliferation was found. This could be explained by the findings of previous authors stating that more than 90% of formaldehyde (HCHO) is deposited in the nasal cavity of rats.

Cell proliferative changes were found more in the lateral wall and septum of nose than roof and floor of nose which was attributed to regional differences in tissue susceptibility and airflow pattern.

Cell proliferative changes increase with increase in duration of exposure. This is correlated with the studies of

previous authors and could be due to time-dependent nature of formaldehyde toxicity.

Cytotoxic lesions including loss of cilia, cytoplasmic vacuolation and cellular degeneration were noted. The areas of lesions correlated with the areas of cell proliferation and were present more in lateral wall and septum of nose and found to increase with duration of exposure.

Nuclear lesions including altered nuclear staining and size were noted. Inflammatory lesions like inflammatory infiltrate, epithelial erosion, ulceration and epithelial detachment were found. Both nuclear and inflammatory lesions followed the same pattern of distribution as that of cytotoxic lesions.

As formaldehyde induced cellular degeneration followed by sustained cell replications was considered as a major determinant in HCHO induced nasal cancer in rats by previous authors, this subchronic exposure study can establish correlation between HCHO induced cell proliferation and nasal carcinogenesis. This can be further proved by long term HCHO exposure studies which will provide important information that can be utilized in consideration of mechanism & risk and in biologically based models of toxic response. This may also play

an important role in interspecies comparison for formaldehyde risk estimation.

## BIBLIOGRAPHY

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