



# THE EFFECT OF AIR FRESHENER EXPOSURE ON CORNEAL THICKNESS OF WHITE RAT (*RATTUS NORVEGICUS*)

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## INTRODUCTION

The use of air freshener often found in various place, such as offices, homes, and public areas. Air freshener if used unwisely it potentially injurious to health. Air freshener and cigarette smoke are the air pollutant agents often encountered indoors.

The chemicals in many air fresheners contain a substance similar to the content of cigarette smoke (Bekman, S., 2010). Some of the chemicals found in air freshener that is synthesized petroleum, acetone, phenol, toluene, benzyl acetate, limonene, formaldehyde, toluene, benzaldehyde (De Vader, *et al*, 2009). According to a report from the National Institute of Occupational Safety and Health (NIOSH, 2013) dangerous chemicals in the air freshener from the research include formaldehyde. Formaldehyde can cause irritation to skin, eyes, nose, and throat. High levels of exposure may cause some types of cancer (EPA, 2013). Spray air freshener and gel air freshener are the most used form of air freshener. Moreover, there are differences in the chemical composition between spray and gel air freshener. One part of the body that is most susceptible to the exposure of air freshener is the cornea.

This study was aimed to assess the effect of air fresheners on the corneal thickness, and compare the effect of spray and gel air freshener.

## MATERIALS AND METHODS

The study design is experimental, post-test only control group design. The study was conducted on 18 white rats (*Rattus norvegicus*) male, weight 200-300gram, Wistar, were divided into three experimental groups, the negative control group (without exposure of air freshener), the treatment group freshener spray (P1), and the treatment group freshener gel (P2). In the treatment group performed fragrances exposure for 8 hours / day for 15 days. Air freshener used for exposure in the study came from the same factory,

On day 16, subjects were sacrificed, taken his eye (cornea), fixed with 10% formalin solution, then histological preparations made by the method of paraffin blocks, with hematoxylin eosin staining techniques. Histological observation cornea was performed using a light microscope, at a magnification of 40x10, at 5 visual field. Measurement of the thickness of the cornea was carried out with the help of software Optilab, with micrometer-scale measurements. Data were analyzed statistically using Kruskal wallis statistical test, followed by Mann Whitnet Test.



## RESULT AND DISCUSSION

Kruskal Wallis statistical test results to the data the thickness of the cornea subject, the value  $p = 0.038$  ( $p < 0.05$ ) at 95% confidence level. Statistical test results showed that there are significant differences in the thickness of the cornea between the three groups of subjects were compared. Post hoc with Mann Whitney test showed a significant difference between the K groups and the treatment groups P2 ( $p=0.037$ ) and between K group and the treatment group P1 ( $p=0.025$ ). No significant difference was demonstrated between the treatments group P1 and P2 ( $p=0.631$ ).

Summary of statistical test corneal thickness of subjects in this study can be seen in Table 1 below:

Table 1: Thickness of the cornea subjects ( $\mu m$ )

Group	Average
Spray air freshener exposure group of (P1)	99.1850 ( $\pm 6.0129$ ) <sup>b</sup>
Gel air freshener exposure group of (P2)	94.0167 ( $\pm 7.0640$ ) <sup>b</sup>
Control Group (K)	78.4850 ( $\pm 2.6617$ ) <sup>a</sup>

Description: <sup>a, b</sup> different letters indicate significant differences in the statistical test Mann Whitney, at 95% confidence level

Corneal Histology subject of this study can be seen in Figures 1, 2 and 3 below:

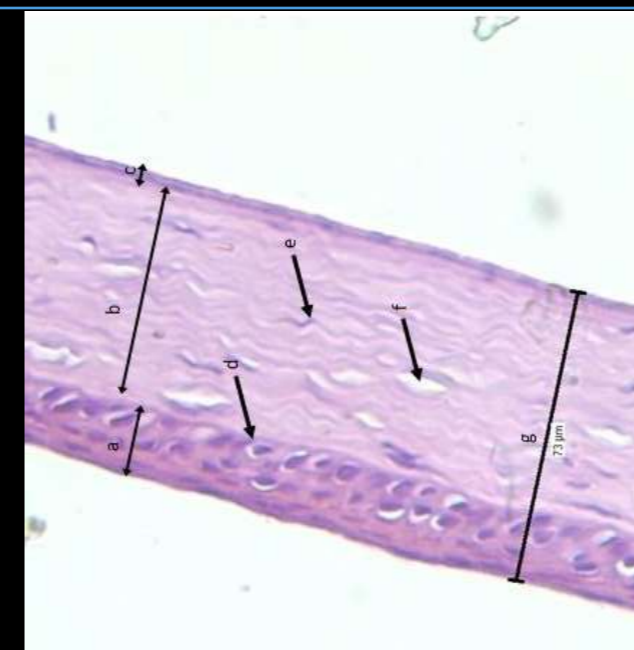


Figure 1  
Corneal histology of control group (K), (HE, 40x10)

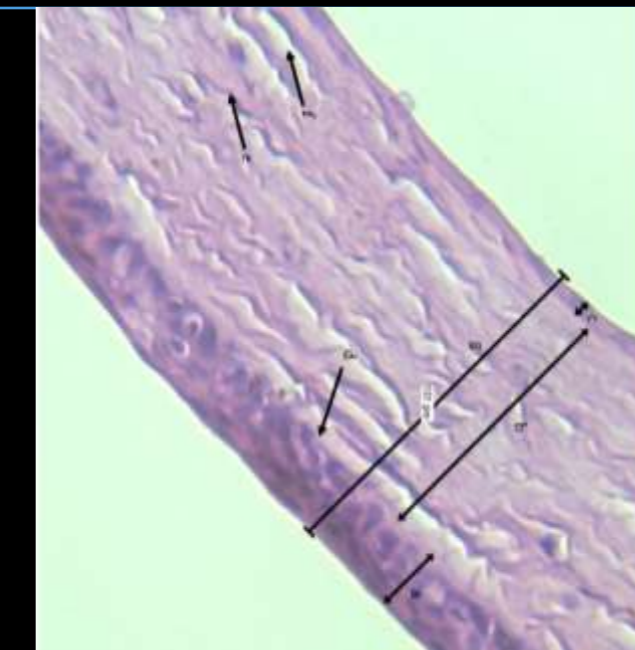


Figure 2  
Corneal histology of spray air freshener exposure group of (P1), (HE, 40x10)

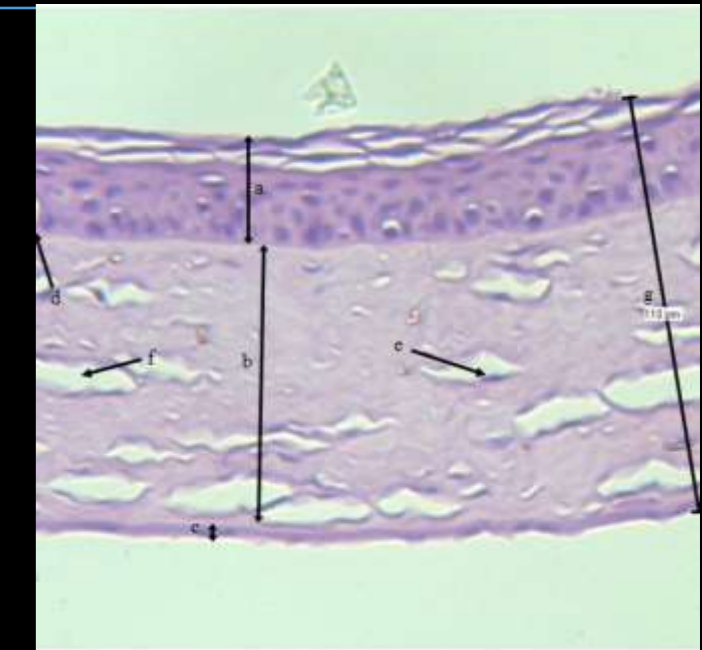


Figure 3  
Corneal histology of gel air freshener exposure group of (P2), (HE, 40x10)

The results of measuring the thickness of the cornea subject of the control group (K) as compared to the treatment group (P1 and P2) showed a statistically significant difference. Subject corneal treatment group (P1 and P2) thicker significantly compared with the control group. This suggests that exposure to spray or gel air freshener effect on corneal thickness. Cornea is a part of the organ of the eye which first exposed to the outside environment. Cornea is very easily impaired by the adverse effects of air pollution. The toxic effect of the concentration of chemical substances in the air freshener is a result of air freshener exposure by inhalation, ingestion, dermal contact and direct exposure to the visual system. Freshener direct exposure to the cornea without protection can lead to absorption of toxic materials on the visual system and the network is likely to cause toxicity to the eye (Cater, *et al.*, 2006).

Exposure air freshener cause thickening of the cornea of the eye. The results are consistent with research conducted by Cater, K. *et al* (2006) indicated that from the research reveals thickening of the cornea that has been exposed to the different types of fragrances.

One of the chemicals contained in air freshener is formaldehyde. Formaldehyde is a compound that is responsible for the moderate to severe irritation of the cornea. Formaldehyde is generally known for its ability to react with proteins, fats, and nucleic acids. Exposure to formaldehyde produces rapid metabolic imbalances and covalent bonding to DNA, RNA and proteins which cause cytotoxicity presentation. Formaldehyde can significantly increase the thickness of the cornea than other substances contained. In more severe irritation, formaldehyde capable of causing corneal edema involving the stroma even endothelium (Maurer, 2002).

Toxicity shown various types of air freshener is not only derived from the basic material, but from material enhancements. In the liquid air freshener, toxicity due to the addition of solvents (solvent). Toxicity increases in the use of liquid air freshener works by spraying. This is because the spray air freshener also contribute to added pressure gas (propellant) and produce highly concentrated chemicals (Hanson, *et al.*, 2008). In this study, subjects cornea P1 group had thicker corneas than P2 group, although the difference was not statistically significant.

## CONCLUSION

Result of this study, reveal that the exposure of air freshener increases the thickness of cornea. However, there is no significant difference in the corneal thickness between spray air freshener exposure group (P1) and gel air freshener exposure group (P2).

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