JSIANE : Vol. 3, Issue 4, 2023, Page 67-68 ISSN (Online) 2583-2093

Journal of Science Innovations and Nature of Earth

Journal homepage : www.jsiane.com

The Effect of Nitrogen Dioxide and Sulphur Dioxide on Brain and Total Lipid Content of Albino Rat

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https://doi.org/10.59436/jsiane.120.2583-2093

Abstract

The present work was undertaken to investigate, the combined effect of nitrogen dioxide and sulphur dioxide on food consumption, body weight, brain weight and brain total lipid content in albino rats for 15 and 30 days. Combined gas exposure with nitrogen dioxide and sulphur dioxide resulted in significant reduction of food consumption ($p<0.001$), body weight ($p<0.01$) and brain total lipid ($p<0.001$) in comparison to control rats. The decrement in food consumption, body weight, brain weight and brain total lipid content in albino rat after combined exposure of nitrogen dioxide and sulphur dioxide is the result of inflammatory action of toxic gases.

Keywords : Nitrogen Dioxide, sulphur Dioxide, brain total lipid, albino rat

Received 15.09.2023 **Revised 21.10.2023** **Accepted 25.12.2023**

Introduction

Environmental pollution has become a global problem over the last century. Environmental pollution agency (EPA) regards the air pollutants as among top environmental threat to human health. Nitrogen dioxide and sulphur dioxide are considered to be a serious air pollutants, which are released by combustion of coal, wood, natural gases transportation, coal based power plants an automobiles exhaust etc into environment. These gaseous pollutants are the chief constituent of photochemical smog is detrimental to plants, animals and human beings. (SO_2) harms human health by reacting with the moisture in the nose, nasal cavity and throat and which destroys the nerves in the respiratory system present (Ozturk 2005). Sperm motility and serum testosterone levels in rats decreased by exposure to 100 mg/L NaF or/and 15 ppm SO_2 (Zhang *et al*., 2006)

These toxic gases inhale through lung from where it enters the blood, which is an important vital constituent of body. Brain is responsible for co- ordination and control of various activities like voluntary movement in the animals. The main objective of the present study is to observe the effect of air pollutants on the brain total lipid of albino rat, Rattus norvegicus (Berkenhout). Ultrafine particle and motorcycle fine particle have negative effect on the mice's liver (Noor *et al*. 2023).

Material and Methods

Twenty male wiser albino rats, Rattus norvegicus were selected for present experiment study. The colony of wiser albino rat was breed at the animal house of zoology department. These rats kept in polypropylene cages and good laboratory conditions. The rats were fed on balanced diet (Hindustan Lever, India Ltd., New Delhi) and water ad libitum.The experimental albino rats were grouped into sets randomly, one control set "A" was exposed to ambient air and two experiment set "B" and "c" were exposed to combined gases (20ppm NO_2 + 20ppm SO_2) and (40ppm NO_2 + 40ppm SO_2) for two hour per day for 15 and 30 days in the fumigation chamber (Model AP=07,SFC=120). The nitrogen dioxide gas was prepared by the method Saltzman, 1954 and Levaggi *et al*. (1972). Sulphur dioxide was prepared by method by singh and Rao (1970).

The assessment of food consumption of each albino rat of control and the experimental sets were fixed interval time, while body weight of each albino rat control and exposed by gases (20ppm NO_2 + 20ppm SO_2) and (40ppm NO_2 + 40ppm SO_2) for 15 and 30 days. The results were statistically analyzed by student't' test.

Result and Discussion

The values of food consumption, body weight, brain weight and brain content are given in table-

In the present study, the decrement in the food consumption and body weight of albino rats is the result of combined toxicity of gases NO_2 and SO_2. The decrease in body weight in albino rat after inhalation of toxic gases (stephens *et al*. 1987) and decrease the body weight in mice after inhalation of NO_2 gas (azoulary *et al*. 1987). Haider and Hasan (1984) have observed decrease the body weight after exposed by SO_2 and H_2S in guinea pig. During inhalation of NO_2 gas decrease in food consumption and body weight (Umezu *et al*. 1993). Inhalation of combined gases of both NO_2 and SO_2 gas decrease the total lipid count and brain weight. Agarwal and Pandey (1999) has reported the reduction in brain total lipid due to elevation in lipid peroxidation in albino rats and Yaricoglu *et al*. (1999) and Meng (1999) reported in mice while Yaricoglu *et al*. (2006) reported in rats after inhalation of SO_2 gas. SO_2 and NO_2 gas are toxic for lipid peroxidation due to formation of free radicals (Motley *et al*. 1985, Curtis *et al*. 1988). Air pollution affect the birth rate, birth retardation and birth weight (Liu *et al*. 2003). Saidi *et al*. (2020) have observed that chromium caused a perturbation in biochemical parameters, blood glucose, triglycerides, cholesterol, ALP, ALT, AST, and LDH, an increase in oxidative stress in male rats exposed by 15 mg/kg Cr for 30 days.

Table. 1. Food Consumption, Body Weight, Brain Weight and Brain Total lipid Content after exposure to NO_2 + SO_2 in Albino Rats

Parameter	Days (1 hr/ day)	Control Set (4)	Experiment Sets (5) Concentration of combined gases (NO_2 + SO_2)	
			20ppm + 20ppm	40ppm + 40ppm
		Mean ± S. Em	Mean ± S. Em	Mean ± S. Em
Food consumption (g/rat/day)	15	5.67 ± 0.046	5.57 ± 0.041	5.47 ± 0.052
	30	5.63 ± 0.034	5.31 ± 0.093	5.12 ± 0.066
Body weight (g)	15	111.4± 2.891	107.6 ± 2.502	100.8 ± 2.596
	30	110.0 ±1.703	102.4 ± 2.040	98.0 ± 3.521
Brain weight (g)	15	1.86 ± 0.025	1.84 ± 0.023	1.78 ± 0.026
	30	1.86 ± 0.014	1.79 ± 0.018	1.74 ± 0.033
Brain total lipid (mg/g)	15	8.09 ± 0.009	8.07 ± 0.007	8.06 ± 0.006
	30	8.12 ± 0.003	8.09 ± 0.005	8.04 ± 0.008

(4) - no. of observation, ppm- per part million S.Em- standard error of mean

References

Agarwal, A. and Panday, A.K. (1999). Effect of SO2 toxicity on the brain total lipid and cholesterol level of Rattus norvegicus (Berkenhout). Proc. Acad. Environ. Biol., 8(1): 87-90.

Azoulay, E., Bouley, G., Muffat-Joly, J. and Pocidalo, J.J. (1987). Evidence for humoral immunodepression in nitrogen dioxide exposed mice : influence of food restriction and stress. Environ. Res., 42(2): 446-454.

Curtis, J.F., Hughes, M.F., Mason, R.P. and Eling, T.E. (1988). Peroxidase- catalyzed of(bi) sulfite: reaction of free radical metabolites of (bi) sulfite with ( ) 7,8 dihydroxy -7,8-dihydrobenzo[a]- pyrene. C cinogensis, 9(11):2015-2021.

Farahani, H. and Hasan,M. (1990). Effect of NO2 on lipid and lipid peroxidation in the CNS of the guinea pig.J.pharmacol. Toxicol.,66(2):146-149.

Haider, S.S., Hasan, M. and Islam, F. (1980). Effect of air polluctant hydrogen sulfide on the levels of the total lipids, phospholipids and cholesterol in different regions of the guinea pig brain. Ind. J . Exp. Biol.,18:418-420.

Haider, S.S. and Hasan, M. (1984). Neurochemical changes by inhalation of environmental pollutants sulfurdioxide and hydrogen sulfide: degradation of total lipids, elevation of total lipids peroxidation of enzyme activity in discrete region of the guinea pig brain and spina cord. Ind.Hlth. 22:23-31.

Levaggi, D.A., Wayman, S. Feldstein, M.1972. Method for the production of the nitric oxide Environ Sci. Technol.,6:250.

Liu S., Krewski D., Shi Y., Chen Y. and Burnett R.T. (2003). Association between gaseous air pollutants and adverse pregnancy outcomes in Vancouver, Canada, Environ. Health Perspect ., 111(14), 1773-1778.

Meng, Z. (2003). Oxidative damage of sulphur dioxide on various organs of mice: sulphur dioxide is a systemic oxidative damage agent. Inhal. Toxicol., 15: 181-195.

Mottley, C., Harman, L.S. and Mason, R.P. (1985). Microsomal reduction of bisulfate (aqueous sulfur dioxide)- sulfur dioxide anion free radical formation by cytochrome P-450. Biochem. Pharmacol., 34(16) : 3005-3008.

Noor, J.A., Wardayo, A.Y.P., Juswano, U.P. and Adi, E.T.P. (2023). The effect of motorcyclr fine and ultrafine particle matters on the Mice's Liver. Polish Journal of Environmental Studies. 32(5).

Ozturk M. (2005). Sehir lci Bolgelerde Hava Kirliliginin Saglik Uzerine Etkileri, Cevre Ve orman Bakanligi, Ankara/ Turkey.

Saidi, M., Aouacheri, O. and Saka, S. (2020). Protective effect of curcuma against chromium hepatotoxicity in Rats. Phytothérapie 18:148–155.

Yargicoglu, P., agar, A., Gumuslu, S., bilmen, s. and Oguz, Y. (1999). Age-related alterations in antioxidant enzymes, lipid peroxide levels, and somatosensory-evoked potentials : effects of sulfur dioxide. Arch. Environ. Contam. Toxicil., 37: 554-560.

Yargicoglu, P., Sahin, E., Gumuslu, S. and agar, A. (2006). The effect of sulphur dioxide inhalation on active avoidance learning, antioxidant status and lipid peroxidation during aging. Neurotoxicology, 45:120-125.

Zhang, J., Liang, C., Ma, J. and Zhou, B. (2006). Effects of sodium floride and sulfur dioxide on oxidative stress and antioxidant defenses in rat testes, Floride, 39(3): 185-190.