

## Chronic Intake of Separate and Combined Alcohol and Nicotine on Body Maintenance Among Albino Rats

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**ABSTRACT** Using 20 male rats that were housed in four groups of five rats each, the separate and combined effects of alcohol and nicotine was experimentally tested on body maintenance behaviour of food and water intake of rats. It was observed that while alcohol reduced food intake, nicotine rather increased food intake. However, there was a great reduction of food intake with the combined administration of the two drugs. On the other hand, alcohol intake facilitated increase of water intake as a result of its dehydration effect, whereas nicotine reduced the level of water intake. The combined administration of the two drugs further reduced water intake. The health and policy implications of these findings were discussed.

### INTRODUCTION

The use and subsequent abuse of drugs especially among our youths these days is very alarming, hence the “war” against drugs by the government in all ramifications. Two drugs that are commonly used by the youths because of the social acceptability and relative ease with which they are gotten are alcohol and nicotine. Alcohol is gotten from various alcohol beverages such as beer, gin, whisky, rum and so on, while nicotine is mainly from tobacco (cigarette) smoking. Alcohol belongs to a class of drugs known as sedatives and hypnotics, which produce a general lowering of the Central Nervous System (CNS). For Example, the polysynaptic structure of the Reticular Activating System (RAS) and certain cortical sites are particularly susceptible to alcohol (Greenberg, 1953). For most people, the hazardous effect of alcohol is not known (Oyefeso, 1991), hence its consumption is regarded as a hallmark of socialization, its pleasure therefore plays a vital role in its level of misuse with its attendant consequences. For example, with chronic consumption of alcohol the individual is likely to manifest a lack of concern for home, friends, health, and social status (Balogun and Adesuyan, 1995).

The general trend of research interest is that of effects of alcohol on social or other directed behaviours. One of such behaviours is body maintenance behaviour of the drug users. Maintenance behaviours are those that are directed at improving and sustaining the physical body such as face washing and body grooming in rats, sex, drinking, eating, sleeping, aggression and domi-

nance behaviour. It would therefore be interesting to investigate further the effects of alcohol on these behaviours as this would have implications for our youths health wise. Not only this, because our youths usually take this drug in conjunction with other drugs especially tobacco in social gatherings, it would be interesting to investigate the singular and interactive effects of both drugs i.e. alcohol and nicotine (tobacco) on body maintenance behaviour of food and water intake. This is predicated upon the assumption that indices of pathological disorders include among others, loss of appetite, loss of interest in self and people around or taking to consolation drinking (Balogun and Adesuyan, 1995), and because studies where the combined effects of these drugs on these behaviours have been investigated are rare if at all they exist.

Studies with rats have shown the effects of alcohol on each of these maintenance behaviour indices (e.g. Balogun and Adesuyan, 1995; Richardson and Ramsey, 1990; Miczek and Tidjey, 1989). Richardson and Ramsey (1990) found that fluid and food intake was reduced in rats when fed with ethanol as compared with when given ordinary drinking water even though the frequency was not affected. Dosage increase in ethanol injection was also reported to have negative relationship with drinking behaviour of rats. This was attributed to the depression of the CNS by the alcohol. On the other hand, nicotine appears to be the only pharmacologically active substance in tobacco smoke, apart from carcinogenic tars and carbon monoxide. Animal studies indicate that nicotine stimulates the release of norepinephrine and dopamine from

the brain tissue depending on the dose, increases or inhibits the release of acetylcholine, which decreases sensitivity to challenges if chronically administered (Marks et al., 1993, 1987).

The part of the brain that is responsible for food and water intake is the hypothalamus. When stimulated, there is higher need for food and/or water intake, therefore the animal or an individual consumes more just to maintain homeostasis. Although there is no instrument for measuring various drinking – smoking patterns, a number of reports have suggested the possibility of causal relation between the two. For example, it has been reported that there is a kind of interdependence between alcohol and tobacco ingestion such that the use of one facilitates or alters the pattern of use of the other (e.g. Griffith et al., 1976; Maletkzy and Klotter, 1974). The evidence that drinking behaviour can elicit eating comes mainly from experiments that examine the effects of dehydration on eating and food intake on rats. Such experiments generally find that dehydration or dipsogenic stimuli inhibit food intake (Deaux and Kakolewski, 1971; Kraly, 1990). Since it is common to find humans consuming both alcohol and cigarette together, especially among youths, it would be interesting to experimentally investigate the influence of both separate and combined intake of these drugs on body maintenance behaviour as reviewed above, using animals because of ethical consideration in the use of humans in an experiment of this nature. Besides, both man and rats are only different on their positions on the phylogenetic scale, so that the influence of these drugs on the rats can be extrapolated to man.

## METHODOLOGY

**Subjects:** Twenty (20) male albino rats were used in the present study. At the onset of the experiment, the rats weighed between 144 – 220 gms.

**Design:** The independent variable in the study was drug which has three categories namely; alcohol, nicotine, and alcohol and nicotine combined together. However, a placebo was added by introducing saline. This resulted in having four groups of five (5) subjects each. The independent variable is the body maintenance behaviour with food and water intake as indices. This resulted in a simple one way Analysis of Variance (ANOVA) design.

**Materials/Instruments:** The drugs used for the experiments were alcohol (98% ethanol diluted to 40% alcohol concentration) and nicotine (powder) dissolved in water on a concentration level of 1gm of nicotine to 1 ml of water. Alcohol was given to the subjects on 10mls per kg. Body weight.

**Procedure:** The rats were first placed in their cages for about three months to acclimatize before the commencement of the experiment and they were properly fed. Alcohol and saline were administered with the oral cannula, while nicotine was injected with needle and syringe. The rats, on commencement of the experiment, were treated according to their group and waited for about 30 minutes for the drugs to be properly and effectively ingested into the system before introducing them to food and water. Recording and collection of data took place the next day exactly the same time treatment stopped to allow for a 24 –hour effect. This was done for 14 days.

Quantity of food intake was measured by subtracting the weight of food pellets left in the tray plus spillage from the weight of the quantity that was served at the beginning of the experiment on a daily basis. On the other hand, water intake was measured by subtracting the volume of what was left in the drinking bottle from what the volume was at the beginning of the experiment every day.

## RESULTS

Tables 1a & b above show the results of the analysis carried out on the data where it was confirmed that there was indeed a significant effect of separate and combined effects of alcohol and nicotine on food and water intake by the rats at  $F(3,16) = 70.49$ ,  $p < .001$  and  $F(3,16) = 64.94$ ,  $p < .001$ , respectively.

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It was observed that rats given alcohol alone ate less when compared with those given

**Table1a: Summary of ANOVA showing the effects of separate and combined intake of alcohol and nicotine on food by the rats**

	Source	SS	df	MS	F	P
Food Intake	Between	33.5	3	11.7	70.49	< .001
	Within	2.5	16	0.16		
	Total	33.53	19			

**Table1b: Summary of ANOVA showing the effects of separate and combined intake of alcohol and nicotine on water intake by the rats**

	Between	49.76	3	16.59	64.94	< .001
Water Intake	Within	4.09	16	0.26		
	Total	49.80	19			

water alone, whereas those given nicotine ate more than the two groups. However, those rats that were given both drugs (combined) ate much less than all the groups. In other words, there was an indication of reduced appetite for rats that were given a combination of alcohol and nicotine.

Table 3 shows that both alcohol and nicotine have independent and joint effects on quantity of water consumed by the rats when compared with the rats given placebo (saline). While water intake was on the high level with alcohol, nicotine reduced the level of water intake and this was further reduced drastically by a combination of the two drugs when ingested.

## DISCUSSION

The results of the present study confirmed the expected influence of drugs on body

maintenance behaviour in rats, which can be extended to human beings. Based on the physiological disinhibition model of Ritchie (1965) that alcohol would produce suppressed consumption of food, it was observed that the rats who were given chronic administration of alcohol ate less than those that were given only water. This was a confirmation of the findings of Oyarekua (1992) and Ogunnoiki (1985).

The mechanism of alcohol involves depressing the CNS, inhibiting the metabolic function of the intestine thereby giving false information of satiation. The import of this is that the animal may eventually starve to death coupled with the fact that alcohol "eats" away the intestine. On the other hand, the rats consumed more food than any other group. Though it was expected that nicotine, the active ingredient in tobacco would inhibit food intake, the contrary was observed in this study. Several

**Table 2: Summary table for Scheffe test on food intake**

Source	N	Mean	Difference			
			1	2	3	4
Saline	5	81.652	-			
Alcohol	5	71.928	9.724	-		
Nicotine	5	98.824	-17.172	-26.896	-	
Alcohol + Nicotine	5	64.164	17.488	7.764	34.660	-

• All significant at  $p < .001$

**Table 3: Summary of Scheffe test on water intake**

Source	N	Mean	Difference			
			1	2	3	4
Saline	5	148.792	-			
Alcohol	5	161.074	-12.282	-		
Nicotine	5	137.994	10.798	23.080	-	
Alcohol + Nicotine	5	118.120	30.672	42.954	19.874	-

All significant at  $p < .001$

studies have demonstrated that certain doses of drugs facilitate increase in food intake (e.g. Sangers and McCarthy, 1981, 1980). These authors found that several doses of morphine facilitated increase in eating which was greatest 24 hours after administration. However, because of the interdependence of the two drugs in the present study, the combined effect of these drugs on food intake was tested. It was observed that there was a significant effect of this on food intake even though it was on reduced level. That is, if both drugs are taken together, food intake would be greatly reduced. Authors have found a correlation between alcohol and tobacco (Ayers et al., 1976; Maletzky and Klotter, 1974). For those who indulge in consumption of the two drugs together the danger for their health is great.

Since both food and water intake go together, even though we can survive on water alone for sometime, the consequences of these two drugs were tested on water intake as well. While it was observed that there was a high level of water consumption with the rats treated with alcohol alone, followed by nicotine group, there was a great reduction of water intake in rats treated with the combination of the drugs. Alcohol leads to dehydration, which sometimes inhibit food intake (Rolls and Rolls, 1982). The implication of this is that where water is not available the rats or individual will starve to death. And for those taking the drugs together, there is double danger of not being motivated to drink and eat leading to loss of weight and eventual death.

The policy implication of these findings lies in the fact that tobacco and alcohol which are readily available at affordable prices should be controlled, especially among the youths of our society. The youth, they say is the leader of tomorrow. If by omission or commission we allow them to destroy themselves now, who then will lead us tomorrow? The primary need of any animal (human inclusive) is that of basic survival through the insurance of continued existence of its specie. One thing that can ensure that is adequate body maintenance through food and water intake. We must not allow the use of this socially acceptable drugs bring an end to such

people that consume them separately or in a combined form.

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