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Effects Of Ethanol On The Gastro-doudenal Wall of Wistar Rats

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ABSTRACT

Oral ingestion of alcoholic beverages is implicated in the multiple gastro intestinal disorders and complications in digestion, which commonly accompany alcohol consumption or abuse.

Different concentrations of ethanol in the range of 10%, 20%, and 30% v/v which are experimental equivalents of alcoholic contents of lager beer, whisky and dry gin were orally given to 3 groups of adult Wistar rats A, B and C respectively for 30 days; and thereafter, histological examination of the gastro-duodenal wall was conducted.

Excoriations of the wall in addition to gross emaciation and anorexia, severest in the group C rats were observed.

Apart from the well-known effects such as emaciation and nausea, loss of nervous coordination, fluid and electrolyte balance were presently observed, indicative of a possible more serious clinical complications of alcohol abuse.

Keywords: Ethanol; Clinical implications; Gastro-duodenal wall; Wistar rats.

The consumption of alcoholic beverages is a common practice by those who benefit from its stimulating and intoxicating effects. The resultant side effects and complications of heavy or excessive drinking include malnutrition, poor dietary intakes, frequent and non-specific digestive disorders such as malabsorption, gastritis and epigastric discomforts in man (Morgan, 1982; Schapira 1990). The deleterious effects of alcohol on the gastro-intestinal wall had been implicated in the multiple gastro-intestinal discomforts accompanying heavy drinking and this is presently experimented in the Wistar rat.

MATERIALS AND METHODS

Forty healthy adult Wistar rats (20 males and 20 females) weighing between 200g and 250g were procured for the experiment. They were kept in the Animal holdings of Department of Human Anatomy, the room kept tidy with clean distilled water and rat pellet provided adequately. The animals were grouped into four: A, B, C and D with each group consisting of 10 rats (5 males and 5 females). Each animal in groups A, B and C received 0.79g/kg of 10%, 20% and 30%v/v ethanol respectively by incubations using the oesophageal tube for 30 days. The group D rats that received normal saline in lieu of ethanol, served as control. The ethanol dosages used are experimental equivalents of the alcoholic contents of larger beer, whisky and dry gin for groups A, B, and C respectively.

Ethanol dosage administered is equivalent of the normal g/ml weight. Daily weights of the animals were recorded through out the 30 days. The animals were sacrificed on day 31 by chloroform inhalation,; the stomach and small intestine were excised and fixed in 10% formol saline. Cross sections of the tissue were histologically processed and stained with iron haematoxylin and eosin.

RESULTS

The experimental rats were emaciated and depreciated gradually in weights; this was most severe in the group C rats as shown in Table 1. Histological sections revealed extortion and excoriations of the stomach, duodenum, and the jejunum severest in the group C rats. Gastric and neck cells were sparse in the stomach; portions of the Peyer's patches were eroded in the duodenum (Fig. 1 &2)

DISCUSSION

The emaciation in the experimental rats is not unexpected since chronic and heavy drinkers are associated with loss of appetite, malnourishment, and nausea. Alcohol provides about 30kj/g of energy requirements, though it does not provide equivalent caloric food intake value and contains only minimal

amount of nutrients, vitamins and minerals for body requirements in man (Schapira, 1990).

Ethanol easily penetrates through cell membrane and absorbed in increasing amounts from mucosa of the mouth, oesophagus and the small intestine. Circumstances such as gastric emptying or absence of nutrients commonly associated with the alcoholics enhance alcohol absorption and this could facilitate erosion of the gastric and intestinal mucosa, especially if taken on empty stomach and in high concentration, hence, chronic alcoholics are associated with symptoms of gastritis like anorexia, nausea and epigastric discomforts (Lieber, 1988). Erosion of the Peyer's patches in the duodenum of the ethanol-administered rats is peculiar as these are common sites of ulceration, haemorrhage and perforations (Ham and Cormack, 1979).

In addition to the multiple ethanol induced gastro-intestinal disorders, the nausea and diarrhoea common in heavy drinkers may produce fluid and electrolyte disturbances. Moreover, low serum potassium level is common in heavy drinkers and this could be complicated in cardiac arrhythmias, which results if potentiated by respiratory alkalosis, which follows alcohol withdrawal (Thierney et al., 1996; Guyton and Hills, 1996; Sabiu et al., 2000).

The well-known effects of alcohol may be reflected in the response of the pituitary gland to osmotic stimuli, usually resulting in inhibition of antidiuretic hormone release, and also to the reversible inhibition of the hormone of the synthesis; thus, inadequate release in drinkers who ingest excessive volumes of low salt alcoholic drinks, causing loss of body fluid and nausea (Rix and Rix, 1983; Edwards et al., 1995), which usually results in body emaciation, loss of nervous co-ordination and possible foetal anomalies in the pregnant alcoholics, (Adebisi, 2002; 2003a,b).

Table 1: Pre-And Post-Experimental Weights of Rats Following Ethanol Ingestion For 30 Days

Groups:	A	B	C	D
Pre-Experimental weight Range (g)	200-230	200-230	200-230	200-230
Mean	220	220	220	220
Post-Experimental weight Range (g)	190-210	180-195	165-180	230-265
Mean	205	190	175	240

Statistical analysis using X^2 at $P < 0.05$ is non-significant.

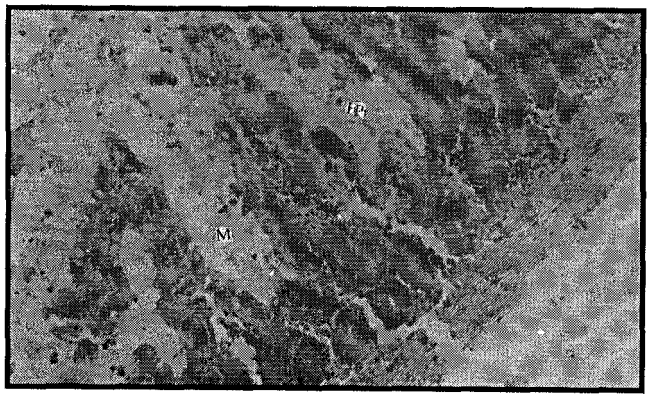

Fig: 1- Cross section of the stomach of group C rats. Note the eroded mucosa, M; and Peyer's Patches, EP (H&Ex400).

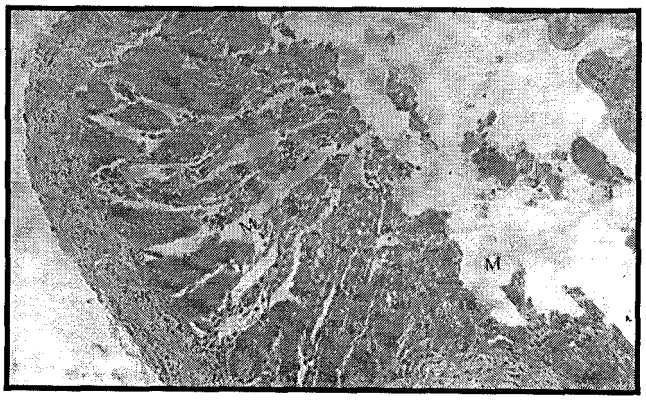

Fig. 2 - Cross section of the duodenum of the group C rats. Note the excoriated mucosa, M. (H&E x 400)

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