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EFFECT OF CRUDE GARLIC EXTRACT ON NICOTINE INDUCED HYPERGLYCAEMIA AND HYPERLIPIDEMIA IN RATS

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SUMMARY

The effect of curde garlic extract on nicotine induced hyperglycaemia and hyperlipidaemia has been studied in albino rats. Four groups of 6 rats each were used. A control group received saline, a second group received 1mg/kg nicotine i.p., the third group received 305 per kg body weight o acqueous garlic extract orally and the fourth group, nicotine + garlic (i.p). These were sacrified 24 hours after last treatment. Serum cholesterol, glucose and triglycerides were assayed by standrd procedures. Garlic treated rats had lower serum cholesterol, triglyceride and glucose levels. The Nicotine + garlic combination also decreased the levels o these parameters but less than the garlic group. Nicotine group had higher levels of the parameters but less than the garlic group. Nicotine group had higher levels of the parameters. Effects of garlic alone and garlic + nicotine was significant (P<0.050. The results show that garlic reduces nicotine-induced hyperglyceamia and hyperlipidaemia in rats.

RESUME

L'extrait d'ail cru sur L'hypoglycemie et l' hyperlipidemie cause par la nicotine a ete etudie chez les rats albinos. quatre (4) groups desix (6) rats chacun etaient utilises. un groupe de controle recevait une soluton de sel, un deuxieme (2e) groupe recevait 1 mg/kg de nicotine, le troisieme (3e) recevait..... par kg de poids corporel d' ail dillue administre oralement et le quatrieme (4e-), de la nicotine qlus du l' ail. ils etaient (tues) 24 Heures apres le dernien traitement le serum, du cholesterole, glucose et tuglyceudes etaient preleves par les methods standards. Les rats traite's au l'ail avaient les plus bas taux de cholesterole, triglycerides et glucose. La combinaison de nicotine plus l'aile reduisait aussi le niveau de ces pasametres mais moins que dans le groupe administr'e a' l'ail. Le groupe administre a la nicotine avait les taux plus eleves mais moins que ceux du l'aile. Le effects de l'ail seul et de l'ail plus nicotine etait significatifs (P<0.05). Les resultats montrent que l'ail reduit l' hyperglycemie et l'hyperlipidemic cause par la nicotine chez les rats.

Nicotine is an alkaloid found in products such s cigars, cigarettes and coffee, but mainly isolated from tobacco leaf called *Nicotiana tabacum*. The free base is a liquid, but the alkaloid is usually found s the hydrogen trtrate or sulphate. Nicotine, in its pure form is odorless and on exposure to air becomes dark brown in colour and takes the characteristics smell of tobacco (Dusek et al., 1989). It is considered to be the most widely used stimulant next to caffeine (Hansen, 1984, Chopra, 1955 and bobboi, et al., 1984).

Nicotine, like all other drugs is subject to various degrees of use or misuse. It may be used casually or with the same compulsiveness as socially unaccepted drug, especially through smoking. As nicotine is drawn into the system, adverse effects may manifest as hyperglycaemia and hypercholesteremia (Zlatkis and Boyle, 1980; Handel Zilversmith, 1957; maida and Howlett, 1990).

Garlic (*Allium sativum*, Linn) is a condiment, which for several years has been used in India, Egypt and China for its medicinal purposes. It has been used for conditions like, fever, cough, digestive disorders and respiratory diseases like pulmonary tuberculosis (Rothenburg, 1976). Garlic is also used in Nigeria especially in the Northern part of nigeria as a condiment and for medicinal purposes. Because of these attributes, it was thought worthwhile to find out whether the crude garlic extract can alleviate some of the risk factors associated with smoking such as nicotine induced hyperglycaemia and hypercholesteremia.

MATERIALS AND METHODS

Preparation of Crude Garlic Extract

Garlic cloves were obtained from the local market. These were then cleared of any adhering dried material. A 30g portion was homogenized in 70ml of distilled water. The mixture was strained through cheese cloth and the filtrate was kept for subsequent studies. The concentration was estimated and expressed in W/V. Dilutions were made with distilled water.

Treatment Protocol

Twenty four (24) male albino rats of Wistar strain weighing between 250 – 250g, obtained from the department of Biochemistry animal house were used for the study. They were divided into four groups of Six rats each.

Group I rats served as control and were given portable water ad libitum. Group II rats was given 1mg/kg body weight of nitocine (BDH) subcutaneously. The dose of nicotine administered was the dose that gave significantly high-levels of both blood glucose and serum cholesterol during earlier experiments (Optimum dose determinations). Rats in Group III were given 30% crude garlic extract per kilogram body weight. The treatment was done once daily for 7 weeks. The animals were allowed free access to food and water during the course of the treatment. Animals were sacrificed 24 hour after the last drug administration. Blood samples were collected and serum samples prepared for analysis.

Biochemical Analysis

Serum cholesterol was estimated by the method of Zlatkis et. Al., (1980). Glucose was assayed by the glucose oxidase method (Trinder, 1969) while triglycerides were assayed by the method of Van Handel and Zilversmith (1957) and Kritchevsky (1991).

RESULTS

The effects of crude garlic extracts on serum cholesterol and triglyceride, and on blood glucose is shown in Table I. Rats treated with 1mg/ml of Nicotine had serum cholesterol level of 339.8 ± 17.8mg/dl as compared with the control value of 131.4 ± 8.8mg/dl, thus showing a significant (P<0.05) lower level 117.5 ± 7.6mg/dl of serum cholesterol compared with the control. Rats that received a combination of Nicotine and Garlic extract produced an elevated level of serum cholesterol as compared with the control value. There was a significant (P<0.05) decrease when the serum cholesterol level of animals treated with garlic alone was compared with those treated with Nicotine alone. A combination of Nicotine and Garlic treated animals also showed a significantly (P<0.05) decreased cholesterol level (137 ± 6.5mg/dl) when compared with Nicotine treated rats. On the other hand animals treated with nicotine and garlic concurrently, had a significantly increased level of serum cholesterol when compared with garlic treated rats (Table 1).

Table I:
The Effect of Crude Garlic Extract on Some Biochemical Parameters in Rats Pretreated with Nicotine

S/No	TREATMENT	N	SERUM CHOLESTEROL (mg/100nl)	SERUM TRIGLYCERIDE(mg/100nl)	BLOOD GLUCOSE(mg/100nl)
I	Control	6	131.4 ± 8.8	32.60 ± 2.0	80.0 ± 0.9
II	Nicotine	6	339.8 ± 17.8*	46.50 ± 4.0*	133.3 ± 4.0*
III	Garlic	6	117.5 ± 7.6[a]	8.40 ± 0.5*[a]	68.2 ± 1.2*[a]
IV	Nicotine+Garlic	6	137.0 ± 6.5[a]	20.60 ± 1.6*[a]	93.0 ± 2.4*[a]

*I Vs. II, III, IV *P<0.05); II Vs. III and IV a = P<)>0.05); III Vs. IV a = P<0.05); N = number of animals per group. Values are means ± S.E.M.*

Serum triglyceride levels significantly (P<0.05) increased in the nicotine treated rats but decreased, in the garlic alone and a combination garlic and nicotine treated rats, when compared with control values. The triglyceride level of the nicotine treated rats was 46.50 ± 4.0mg/dl as compared with the level (8.40 ± 0.5mg/dl) of garlic treated rats. This showed a significant (P<0.05) decrease. The serum triglyceride level of animals of animals treated with a combination of nicotine and garlic was also significantly reduced (P<0.05) as compared with the nicotine treated group. But when compared with the garlic treated group, the combination of nitocine and garlic had significantly higher level of serum triglyceride.

The level of blood glucose also followed a similar pattern. For example, the blood glucose level (133.3 ± 1.6mg/dl) of the Nicotine treated rats was significantly (P<0.05) higher than that (80.0 ± 0.9mg/dl) of the control group but when compared to the control group, the blood glucose level (68.2 ± 1.2) of the garlic treated animals was significantly lower than those of the control and the nicotine group. Also, the nicotine and garlic combination treated rat had a blood glucose level (93.0 ± 2.4mg/dl) which was significantly (P<0.05) lower than the blood glucose level of the nicotine treated group.

The results of this study has shown that garlic (raw or extracted oil) possess possible cholesterol, triglyceride, blood glucose level, lowering activity.

DISCUSSION

Nicotine a drug that is dependence producing elicits an increase in numbers of nicotine binding sites in the brains of chronically treated animals. This increase in binding is due to an increase in receptor density with no increase in affinity (Ref). Because nicotine receptors are subject to profound and prolonged

desensitization on exposure to the drug resulting in functional blockage. It has been suggested that this underlies the mechanism of agonist – induced up regulation (Wannacott, 1990). In the present study, the administration of 1mg/kg of nicotine to rats produced profound central nervous system effects which manifested as decreased food intake, transient convulsion, artificial paralysis and loss of weight. These changes may be explained in the light of up-regulation of central nicotine receptor binding sites leading to initial stimulation and later diminished responsiveness or tolerance. According to Kritchevesky (1991), and Balfour (1982) nicotine also indirectly affects the satiety center.

Administration of nicotine (1mg/kg) to the animals also raised the serum cholesterol, triglycerides and glucose levels. This is consistent with the reports of Dusek and Girdano (1989) and Schienalbein (1982) that nicotine causes the elevation of plasma free fatty acids which may serve as building blocks for the synthesis of both cholesterol and triglycerides. The hyperglycaeamia recorded may due to the stimulation of adenylceclase enzyme in tissues resulting in the production of camp. Increased cAmp levels in blood stimulates glycogenolysis thus increasing the levels of glucose in the blood (ref.).

The crude extract of garlic caused a decrease in the levels of cholesterol, TG and glucose. This result is also consistent with the finding of Bobboi et. al., (1984), that garlic oil has hypolipidemic and hypoglycaemic effects in experimental animals. It is plausible to suggest that, the unsaturated side chains of garlic oil might have oxidized the reduced pyridine nucleotide which are necessary for fatty acid synthesis or might have inactive thiol groupings (Kritchevsky, 1991, and Sodimu et al., 1984). There is also the possibility that the garlic oil might have reduced the levels of NADPH, trhus affecting the HMG-COA reduction reaction and finally reducing the rate of cholesterol synthesis.

The present study has shown that crude garlic extract has the potential of significantly lowering the blood cholesterol, triglycerides and glucose levels of near normal levels in nicotine treated rats.

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