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EFFECT OF ORAL ADMINISTRATION OF "GADAGI" TEA ON THE LEVELS OF SOME HORMONES IN RATS.

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ABSTRACT

Effect of oral administration of "Gadagi" tea on some hormones was assessed on healthy male albino rats which were grouped and administered with different doses i.e low dose, standard dose and high dose of "sak'',"sada" and "magani" respectively for a period of four weeks. Animals that were not administered with the tea constituted the control group. At the end of fourth week, the animals were sacrificed and their serum adrenaline, insulin, adrenacorticotrophic hormone (ACTH) and glucagon were determined. Mean serum ACTH level was found to be significantly lower ($P<0.05$) at low dose level of "sak", standard and high dose levels of "sada" and at low dose of "magani" than that of the control group. Mean serum insulin level of rats administered with "sada" at low dose level was found to be significantly lower ($P<0.05$) than that of the control rats. Mean serum glucagon level was found to be significantly higher ($P<0.05$) in standard dose group of "sak", low and standard dose groups of "sada" and "magani" than that of the control group. This indicates an increase level of conversion of glycogen into glucose for energy generation. Therefore, from the results of the study, the increase in the power of endurance experienced by the "Gadagi" tea users could be associated with an increase in glucagon level and probable decrease in insulin level.

KEYWORDS: "Gadagi" tea, Hormones, Oral, Rats.

INTRODUCTION

"Gadagi" tea is a composite used as a stimulant mostly by drivers and commercial motorcyclists in Kano and some parts of Northern Nigeria. Its preparation is not radically different from the way normal tea is prepared. It is a mixture of sugar and tea of highland brand boiled in water with some plant products such as African mahogany (Khaya senegalensis), lemon grass (Cymbopogon citratus) and mint plant (Mentha palustris). These are what make it different from the conventional or older brands of stimulants such as coffee and kolanut. Other silent users are tailors and labourers involved in strenuous jobs. Those who take it believe that it can increase their power of endurance to pursue long lasting mental or physical work without fatigue (Gadanya *et al*., 2011).

Endurance is defined as the ability to sustain a specific activity for a long time. It could be associated with secretion of hormones involved in metabolism of carbohydrates and fats particularly adrenaline, insulin, glucagon and adrenacorticotrophic hormones, which are released during stressful condition to improve the force of muscular contraction and delay the onset of fatigue (Alan and Cathy, 2001). The sensitivity of these hormones is normally increased during endurance training.

Hormones have an integral role in daily physiological function of humans. Physical and psychological stressors are known to stimulate unique responses. Physical stress, more specifically, exercise mode (strength training vs. endurance training), intensity (Linnamo *et al*., 2005) and duration (Tremblay *et al*., 2004) influence hormonal concentrations that initiate various physiological cascades that may contribute to muscle hypertrophy (Kraemer and Ratamess, 2005), increased capillary density and initiation of mitochondrial biogenesis. Rest/recovery after exercise also plays a considerable role in maintaining homeostasis, while training status may augment or attenuate specific acute responses (Ritva and Keijo, 2013)

Therefore, this research work is aimed at finding out the possible effect of "Gadagi" tea consumption on serum adrenaline, insulin, adrenacorticotrophic hormone (ACTH) and glucagon levels.

MATERIALS AND METHODS

Sample Collection and Preparation

Samples of "sak", "sada" and "magani" types of Gadagi" tea were obtained from Kofar Wambai Market, Kano, Nigeria (one of the oldest and the most popular "Gadagi" tea market). Methods of preparation of the 3 types of the tea was previously published (Gadanya *et al*., 2011a).

Experimental Design

Fifty (50) experimental male albino rats were divided into four groups based on the type of Gadagi tea i.e. one control group and three experimental groups (for the three types of "Gadagi" tea). The control group consisted of five rats while the other three groups were further divided into three equal sub – groups each consisting of five rats. The three sub groups were for

Standard dose (760mg/kg,830mg/kg,730mg/kg for "sak', and "magani" respectively); Lowdose (380mg/kg,41 5mg/kg,365mg/kg,315mg/kg for "sak","sada" and "magani" respectively) and high dose (1500mg/kg, 1700mg/kg and 1460mg/kg for "sak'',"sada" and "magani" groups respectively) (Gadanya, 2011).They were administered with the tea orally using syringe once daily for a period of four weeks (the dose and type of the tea administered were considered). At fourth week, all the rats were sacrificed. Blood samples were taken for analysis of serum insulin, glucagon, adrenaline and adrenacorticotrophic hormone levels.

Biochemical and Statistical Analysis

Serum insulin, glucagon, adrenaline and adrenacorticotrophic hormone levels were estimated using enzyme linked immunosorbent assay (ELISA) principle (Kamiya, 2009; R and D. 2009). Data collected were subjected to Analysis of variance (ANOVA) as described by (Steel and Torrie, 1980) using the General Linear Model (SPSS for Windows) procedure of SAS Institute Incorporated, Cary, NC, USA (Version 8.2), (SAS, 2009).

RESULTS

From the result of this study, mean serum ACTH level was found to be significantly lower ($P<0.05$) at low dose level of "sak", standard and high dose levels of "sada" and at low dose of "magani" than that of the control group (Tables 1,2 and 3). Mean serum insulin level of rats administered with "sada" at low dose level was found to be significantly lower ($P<0.05$) than that of the control rats (Table 2). Mean serum glucagon level was found to be significantly higher ($P<0.05$) in standard dose group of "sak", low and standard dose groups of "sada" and "magani" than that of the control group (Tables 1,2 and 3).

DISCUSSION

The main hormones regulating energy production (metabolism) are glucagon, growth hormone, glucocorticoids, the thyroid hormones as well as adrenaline and insulin. These enable the body to perform strenuous physical activity by keeping glucose levels in the blood at a normal level. Falling levels of these hormones are a signal for fatigue. Regular training triggers important adaptation processes associated with their secretion (Mathias, 2016).

Other important hormones are the glucocorticoids (steroid hormones) produced in the adrenal cortex. Glucocorticoids protect the body from the negative effects of on-going stresses. These include hunger, thirst, extreme temperature, injury, infection and severe physical or psychological stress (Mathias, 2016).

Adrenaline and ACTH are produced during stressful condition to improve the force of muscular contraction and delay the onset of fatique (Alan, 2010). Glucagon is the antagonist of insulin. It is produced in the pancreas and mobilizes the body's energy reserves, for example, by increasing the neogenesis of glucose from amino acids in the liver. It is released when glucose level in the blood is low (hypoglycemia), causing the liver to convert stored glycogen into glucose and release it into the blood stream. Action of adrenaline and glucagon opposes that of insulin because, they encourage the conversion of glycogen into glucose.

The experimental rats used for this study were used to physical disturbance because they were daily disturbed when handled for oral administration of the tea. They probably developed tolerance to such disturbance and became very simple to handle particularly towards the end of the study. This could probably be responsible for the lower level of stress during the period of sacrifice which could have led to the lower mean serum adrenaline and ACTH observed (Tables 1, 2 and 3). On the other hand, the control rats became more difficult to handle during the period of sacrifice probably because they were not used to any physical disturbance (i.e they were not handled for any oral administration). This could probably be responsible for higher level of stress and higher levels of mean serum adrenaline and ACTH observed in the control group when compared with the experimental groups. Also, 40% of the control rats were found to have serum adrenaline level above the normal assay range.

Insulin causes hypoglycemia, and inhibition of lipolysis and proteolysis (Nelson, and Cox, 2008). Thus, consumption of the tea could be associated with hyperglycemia and increase in lipolysis and proteolysis because mean serum insulin level of rats administered with "sada" at low dose level was found to be significantly lower ($P<0.05$) than that of the control rats (Table 2).The significant increase ($P<0.05$) in mean serum glucagon level observed in standard dose group of "sak", low and standard dose groups of "sada" and "magani" (Tables 1,2 and 3), indicates an increase level of conversion of glycogen into glucose for energy generation.

CONCLUSION

This study shows that, the increase in the power of endurance experienced by the "Gadagi" tea users could be associated with an increase in glucagon level and probable decrease in insulin level.

TABLE I: Serum Adrenaline, Insulin, Adrenacorticotrophic Hormone (ACTH) and Glucagon Levels in Albino Rats Orally Administered with "Sak" for four (4) weeks.

Group	Dose (mg/Kg)	Adrenaline (µg/L)	Insulin (mu/L)	ACTH (ng/L)	Glucagon (ng/L)
Control	-	36.40 ± 1.18	5.10± 2.06	45.80a± 13.20[a]	19.20± 3.70[b]
Low Dose	380	22.60 ± 12.84	7.04 ± 3.58	16.04± 4.68[a]	22.00 ± 6.16
Standard Dose	760	20.80 ± 7.79	4.64 ± 2.85	21.20 ± 20.85	36.40 ± 14.43[b]
High Dose	1520	15.80 ±7.79	3.32 ± 1.97	29.30 ± 15.15	14.60 ±5.68

Results are presented as mean ± standard deviation. Values bearing similar superscript in the same column are significantly different (P<0.05).

TABLE II: Serum Adrenaline, Insulin, Adrenacorticotrophic Hormone (ACTH) and Glucagon Levels in Albino Rats Orally Administered with "Sada" for Four (4) Weeks.

Group	Dose (mg/Kg)	Adr (µg/L)	Insulin (mu/L)	ACTH (ng/L)	Gluc (ng/L)
Control	-	36.40 ±1.18	5.10 ± 2.06[a]	45.92± 13.14[b,c]	19.20b± 3.70[d,c]
Low Dose	435	22.00 ± 7.45	9.18 ± 2.80[a]	21.42 ± 21.66	46.40 ± 19.20[d]
Standard Dose	870	24.80± 4.21	3.22 ± 1.64	19.40 ± 10.45[b]	44.80 ± 12.15[c]
High Dose	1740	21.00 ±3.39	2.78 ± 0.76	15.08 ± 4.90	29.20 ±13.77

Results are presented as mean ± standard deviation. Values bearing similar superscript in the same column are significantly different (P<0.05).

TABLE III: Serum Adrenaline, Insulin, Adrenacorticotrophic Hormone (ACTH) and Glucagon Levels in Albino Rats Orally Administered with "Sada" for Four (4) Weeks.

Group	Dose (mg/kg)	Adr (µg/L)	Insulin (mu/L)	ACTH (ng/L)	Glucagon (ng/L)
Control	-	36.40 ±1.18	5.10 ± 2.06	45.92±13.14a	19.20± 3.70[b]
Low Dose	365	32.80 ± 22.91	2.76 ± 1.23	10.60± 2.07a	19.20 ± 9.44[b]
Standard Dose	730	32.80 ± 22.91	3.70 ± 1.23	40.60 ± 25.12	40.00 ±16.91[b]
High Dose	1460	24.80 ±13.66	3.92 ± 4.01	40.78 ±24.93	20.20 ±11.21

Results are presented as mean ± standard deviation. Values bearing similar superscript in the same column are significantly different ($P<0.05$).

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