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EFFECTS OF LONG-TERM CONSUMPTION OF INDOMIE NOODLES ON THE BODY AND BRAIN WEIGHTS OF ADULT WISTAR RATS

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ABSTRACT

Background of Study: The effect of long-term consumption of indomie noodles the body and brain weights of adult Wistar rats was carefully studied. **Method**: Twenty four adult Wistar rats, with average weight of 200g were randomly assigned into three groups (A,B,C): Two treatments (n_{1+} n_2=16) and control (n_3=8) groups. The rats in the treatment group A received cooked un-seasoned indomie noodles, those in B received cooked seasoned indomie noodles while rats in group C (control) received normal rat feeds for thirty days. All animals were given distilled water liberally throughout the period of the experiment. The weight of the rats were measured daily during the period of the study. The rats were sacrificed by cervical dislocation on the thirty-first day of the experiment and their brains were carefully dissected out, weighed using Mettler Toledo weighing balance. The weight obtained from the control and treatments groups were recorded and compared statistically using the unpaired sample T-test and symmetric measured test of the Statistical Package for Social Sciences (SPSS). **Results**: The results of this experiment revealed significant ($p < 0.05$) increases in body weights and significant decrease ($p < 0.05$) in brain weights (g) and relative brain weights (%) of the animals treated with instant noodles as compared to their corresponding control animals. **Conclusion**: Long-term consumption of indomie noodles could therefore have adverse effects on the body and brain weights of adult Wistar rats.

KEYWORDS: *Body, Brain, weight,* Indomie Noodles, *Wistar rats.*

INTRODUCTION

Noodles have become one of the most staple and popular foods in many parts of the world including Nigeria. The noodles are quick and easy to make, and can be eaten as a snack or as part of a main meal. People can easily carry them to work or on trips, and cook them easily based on its versatility. The instant noodles main constituents are wheat flour, vegetable oil, iodized salt, sodium polyphosphate, sodium carbonate, potassium carbonate, guargum, tartrazine and antioxidant (TBHQ). The seasoning powder (spices) contains iodized salt, monosodium glutamate (621), sugar, hydrolysed vegetable protein, soy powder, pepper, garlic powder, chicken flavour and chili powder (Sanni *et al*., 2013). The constituents of noodles have been implicated in causing teratogenic or carcinogenic changes in rats (Moutinho *et al*., 2007). Industrial food manufacturers market monosodium glutamate (MSG) as a flavour enhancer because it balances, blends and rounds the total perception of other tastes (Loliger, 2000; Yamaguchi, 1991). Glutamate has been found to be a crucial component of the taste of cheese, seafood, meat broth and other foods (Ninomiya, 1998). L-glutament is a multifunctional amino acid involved in taste perception, intermediary metabolism and excitatory neurotransmission (Kondoh *et al.*, 2009). Glutamate plays physiological and nutritional roles by initiating digestion in the stomach as well as anticipating subsequent processes in the small intestine and liver (Uneyama *et al*., 2008). Glutamate intake may be associated with increased risk of overweight independent of physical activity and total energy intake (He *et al*., 2008). Monosodium glutamate is one of the commonly and widely used food spices in our daily diets (Walker and Lupein, 2000). However, consumption of this food addictive has been shown to cause metabolic disorders including hyperlipidaemia, hyperglycaemia and oxidative damage to tissues (Dinz *et al.*, 2005; Nagata *et al.*, 2006), could cause brain lesion (Mallick, 2005), “Indomie” a brand of instant noodles made by De – united Foods PLC was the first to be introduced to Nigeria in 1988 and today there are well over eight brands in the Nigeria markets (Udeogu *et al*., 2014). Despite the wide consumption of noodles in Nigeria, the products are regarded as unhealthy (Junk) food (Gunathilake and Abeyrathne, 2008). This is orchestrated by the fact that the conventional instant noodles are high in carbohydrate (<70%) and low in protein, fibre, vitamins and minerals (Udeogu *et al*., 2014). There is also the problem of gluten allergenicity (Udeogu *et al*., 2014). Knowing the various benefits and some consequences of some of the constituents of the indomie noodles is not enough; it would therefore be worthwhile to examine the effects of long-term consumption of indomie noodles on the body and brain weights of adult wistar rats.

MATERIALS AND METHODS

EXPERIMENTAL ANIMALS: The ethical clearance was obtained from the Research Ethical committee of Achievers University, Owo before the commencement of this research. Twenty-four adult Wistar rats with an average weight of about 170g were obtained and maintained in the Animal Holdings of the Department of Basic Medical Sciences, College of Natural and Applied Sciences, Achievers University, Owo, Ondo State, Nigeria. The rats were randomly assigned into three groups: A, B and C (n=8). Group A and B served as treatment groups while group C served as control.

INDOMIE NOODLES CONSUMPTION: The indomie noodles were obtained from retailer stores in Owo market, Ondo State, Nigeria. The rats in the treatment group A were fed with cooked indomie noodles; animals in group B received cooked indomie noodles with the seasoning powder (spices) while the control animals received the normal rats feeds obtained from Opeyemi Feeds, Okedogbon Owo, Ondo State, Nigeria for thirty days. The body weights of the animals were taken daily. The ingredients contained in the indomie noodles were: wheat flour, vegetable oil, iodized salt, sodium polyphosphate, sodium carbonate, potassium carbonate, guargum, tartrazine and antioxidant (TBHQ). The seasoning powder (spices) contains iodized salt, monosodium glutamate (621), sugar, hydrolysed vegetable protein, soy powder, pepper, garlic powder and chicken flavour. The animals were sacrificed through cervical dislocation on the thirty-first day of the experiment and the brain of each animal was extracted, weighed and recorded using Mettler Toledo weighing balance. The values obtained from the control and treatment groups were recorded and compared statistically using the unpaired sample T-test and symmetric measured test of the Statistical Package for Social Sciences (SPSS version 21).

RESULTS

The findings of the experiment revealed that there was a significant ($p < 0.05$) increase in the body weight and a significant ($p < 0.05$) decrease in the brain weight (g) and relative brain weight (%) of the animals treated with indomie noodles as compared to their corresponding control animals (Table1, Figure, 1,2, & 3).

DISCUSSION

The findings of the experiment revealed that there was a significant ($p < 0.05$) increase in the body weight (g) and a significant ($p < 0.05$) decrease in the brain weight (g) and relative brain weight (%) of the treated animals with indomie noodles as compared to their corresponding

control animals.

It could therefore be inferred from the study that prolonged consumption of indomie noodles may have been accounted for the significant ($p < 0.05$) increase in the body weight and the significant ($p < 0.05$) decrease in the brain weight (g) of the treated animals. The significant weight gain reported in this study could also be due to the high rate of catabolism caused by the effects of high availability of insulin induced by the sweetening constituents of the indomie noodles thereby causing increase in the rate of lipid storage in the adipose tissues (Vasanti *et al., 2006*). This supports an existing hypothesis that an increase in sweeteners consumption can be associated with increased risk of weight gain (Malik *et al,* 2010) because of decreased satiety and incomplete compensatory reduction in energy intake (Bray, 2007; Anton *et al*, 2010). This work is in line with the suggestion by population-based San Antonio Heart Study group (2008), that artificial sweeteners consumption might support the fuelling of overweight and obesity (Fowler *et al,* 2008; Vasanti *et al., 2006*). The significant increase in the body weight of the treated animals could be due to monosodium glutamate intake, which may be associated with increased risk of overweight independent of physical activity, and total energy intake (He *et al*., 2008). It has been reported that long-term consumption of energy drinks and zidovudine significantly ($p < 0.05$) increases body weight (Adjene *et al*., 2014; Igbigbi *et al*., 2014). Indomie noodles consumption enhances fat deposition and body weight in this study but significantly, ($p < 0.05$) decreases the brain weight of the treated animals. Regulation of brain water content and therefore of the volume is critical for maintaining the intracranial pressure within tolerable limits (Johanson, 1995). In this study, indomie noodles could have acted as toxins to the cells of the brain thus affecting their cellular integrity and causing a defect in membrane permeability and cell volume homeostasis (Johanson, 1995). As brain tissue swells or shrinks, the activity of the cellular transporters is approximately modified by the up or down regulations as reported in the case of hyponatremia or hypernatremia (Johanson, 1995). However, there are many different causes of cell swelling or shrinkage, including drug poisoning, water intoxication, hypoxia, and acute hyponatremia (Johanson, 1995). Brain swellings can lead to severe cytotoxic edema and may lead to marked reduction in the size of the ventricular system and basal cisterns (Johanson, 1995). The significant ($p < 0.05$) decrease in the brain weight (g) and relative brain weight (%) of the treated animals in this experiment, may have been due to the neurotoxic effect of the indomie noodles on the neuronal cells of the brain of adult Wistar rats. It has been documented that chronic administration of efavirenz resulted in a significant

($p < 0.05$) decrease in the body and brain weights of adult Wistar rats (Adjene and Onwumelu, 2009). This report advances further the vulnerability of the brain to long-term consumption of indomie noodles.

It is probable that the results obtained in this experiment may suggest a likely evidence of the microanatomical and oxidative damages to the brain of adult Wistar rat. Therefore, we recommend histological and biochemical studies aimed at corroborating these observations.

CONCLUSION AND RECOMMENDATION

The study revealed that long-term consumption of indomie noodles could result in significant ($p < 0.05$) increase in body weight and significant ($p < 0.05$) decrease in brain and relative brain weight (%) of adult Wistar rats. We suggest further studies aimed at corroborating these observations in humans.

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The research was solely founded by the authors.

Conflict of Interest

There is no conflicting interest of any form.

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