

EFFECT OF CONSUMPTION OF INSTANT NOODLES ON LIVER FUNCTION MARKERS AND LIVER HISTOLOGY OF ADULT ALBINO RATS

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Abstract

The study was conducted to ascertain the effects of consumption of instant noodles on liver function markers and liver histology of adult albino rats. Twenty (20) adult albino rats were used in the study. The rats were divided into four groups of five rats each. At the end of adaptation, the rats were fed for 28 days. The control rats (group 1) were fed with rat chow. Group 2 was given crushed minimie instant noodles without seasoning. Group 3 was given crushed minimie instant noodles with 50% seasoning and group 4 rats were fed with crushed minimie instant noodles with 100% seasoning. At the end of the feeding exercise blood samples were collected and liver harvested. There was a significant ($P < 0.05$) increase in AST in group 4 when compared to control. There was also a significant increase ($P < 0.05$) in ALT in group 4 when compared to control group. There was no histopathological damage in groups 1 and 2 rats liver. Histopathological damage was observed in the rats (groups 3 & 4) fed with noodles and seasoning. The seasoning was seen to be unsafe for the albino rats considering its effects on liver function markers and liver histology. It is therefore recommended that consumers of instant noodles should use very minimal amounts of the seasoning or avoid it entirely until further studies are carried out.

Key words: liver function markers, liver histology, instant noodles, seasoning, albino rats.

Introduction

Noodles are a kind of food produced from unleavened dough which is rolled flat and cut, stretched or extruded, into long strips or strings. Noodles can be stored in the refrigerator for short-term or dried and stored for use in the future. (en.m.wikipedia.org/wiki/N).

Nigeria is the thirteenth largest consumer of instant noodles in the world. (Zumdahl, 2009). Noodles can be consumed as snack or as part of a major meal. The instant noodles main constituents are wheat flour, vegetable oil, iodized salt, sodium polyphosphate, sodium carbonate, potassium carbonate, quargumtartrazine and antioxidants, tertiary butyl hydroquinone (TBHQ). The seasoning powder (spices) contains iodized salt, monosodium glutamate, sugar, hydrolyzed vegetable protein, soy powder, pepper, garlic powder, chicken flavor and chili powder (Sanni, Daniel, Friday, Karachi & Oglala 2013), The constituents of noodles have been implicated in causing teratogenic or carcinogenic changes in rats (Mountiho, Bertges & Assis, 2007). Instant noodles are usually prepared for consumption using the seasoning. Thus the rate of consumption of the noodles is proportional to the rate of consumption of the seasoning.

The liver is the biggest solid organ and is of great importance in metabolism. In humans, it is situated in the right upper quadrant of the abdomen, below the diaphragm. A total loss of liver function could lead to death within minutes. (Ozougwu&Eyo,2014).

Safety of processed foods is a matter of public health concern. Many food industries turnout different chemicals in order to increase the acceptance of their brands. All ultra-processed foods containing artificial food colours, flavours, enhancers of taste and certain

preservatives have harmful effects to health (Liu, 2008). Monosodium glutamate is one of the most used spices in instant noodles. And consumption of this additive has been shown to cause metabolic disorders including hypolipidaemia, hyperglycemia and oxidative damage to tissue (Nagara, 2006). The long term consumption of instant noodles may affect the functions of the liver. It is therefore necessary to investigate the effect of consumption of instant noodles on liver function markers and liver histology of adult albino rats.

Materials and Methods

Animal handling

Twenty (20) albino rats were purchased from Nanofarms in Irete, Imo state, Nigeria. They were fed and housed in plastic cages with steel melting in a well ventilated house. They were maintained at 27°C to 30°C with 12 hours natural light and 12 hours of darkness. They were allowed free access to water and rat chow. The animals were acclimatized for 7 days.

Experimental design

At the end of adaptation period the rats were divided into four groups of five animals each and were fed for 28 days as shown below:

- Group 1 - fed with rat chow only.
- Group 2 - fed with crushed instant noodles without seasoning
- Group 3 - fed with crushed instant noodles with 50% seasoning
- Group 4 - fed with crushed instant noodles with 100% seasoning.

At the end of 28 days the animals were anaesthetized with diethyl ether. Blood was collected from each animal via the retro-orbital sinus with 70 μ l heparinized capillary tube and put in plain sample bottles for biochemical analysis. The animals were then sacrificed by cervical dislocation and the liver of the animals in each group were

harvested and fixed in 10% formalin for histological procedure. These were done following acceptable ethics in the use of experimental animals.

Assay of liver function markers aspartateaminotransferase (AST) and Alanineaminotranferase (ALT) were determined as described by Reitman and Frankel (1957) using assay kits.

Serum alkaline phosphatase (ALP) was determined as described by Klein et al (1960)

Results

Table 1: AST, ALT and ALP activity in adult albino rats

Groups	Treatment	AST(IU/L)	ALT(IU/L)	ALP(IU/L)
1.	Fed with rat chow only	9.60±1.81 ^a	5.80±1.30 ^a	82.70± 11.82 ^a
2.	Fed with noodles without seasoning	9.60±2.07 ^a	6.00±0.70 ^a	81.40±5.59 ^a
3.	Fed with noodles with 50% seasoning	12.20±4.32 ^a	7.40±2.07 ^{ab}	80.00±5.70 ^a
4.	fed with noodles with 100% seasoning	17.20±0.83 ^a	8.80±1.78 ^b	80.00±4.79 ^a

Results are shown as N±SD. N is the mean of five samples. SD is the standard deviation. Superscripts with different alphabets are significantly different (P<0.05)

Histology of the liver of albino rats used in the study

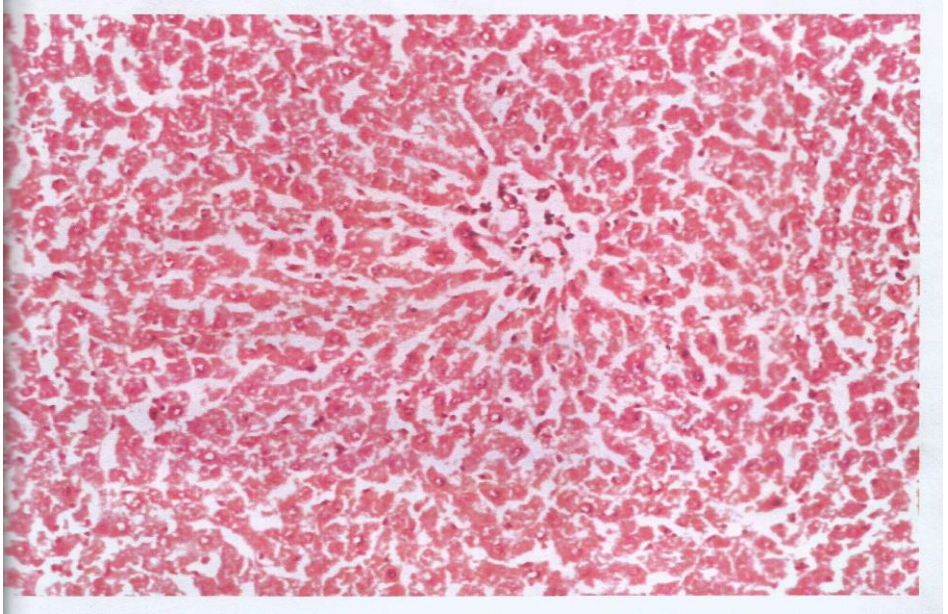


Fig1 : There is no histopathological damage

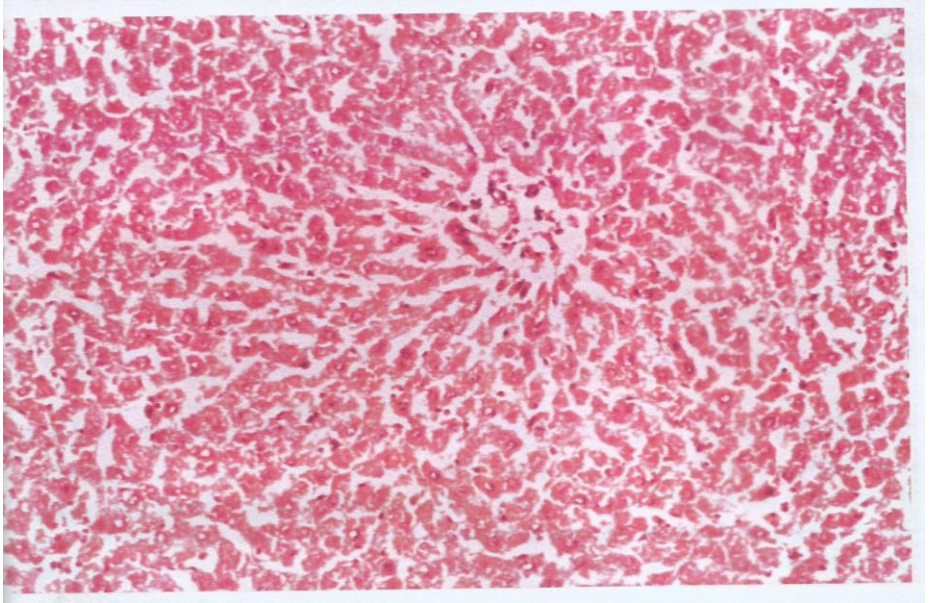


Fig 2: There is no histopathological damage



Fig 3: Histological section of the liver shows enlarged central vein with scanty tissue stroma displaying hepatocytes with ballooning degeneration. There are few cystically dilated spaces in areas. The lamina and sinusoidal arrangement is distorted. There is a histopathological damage.

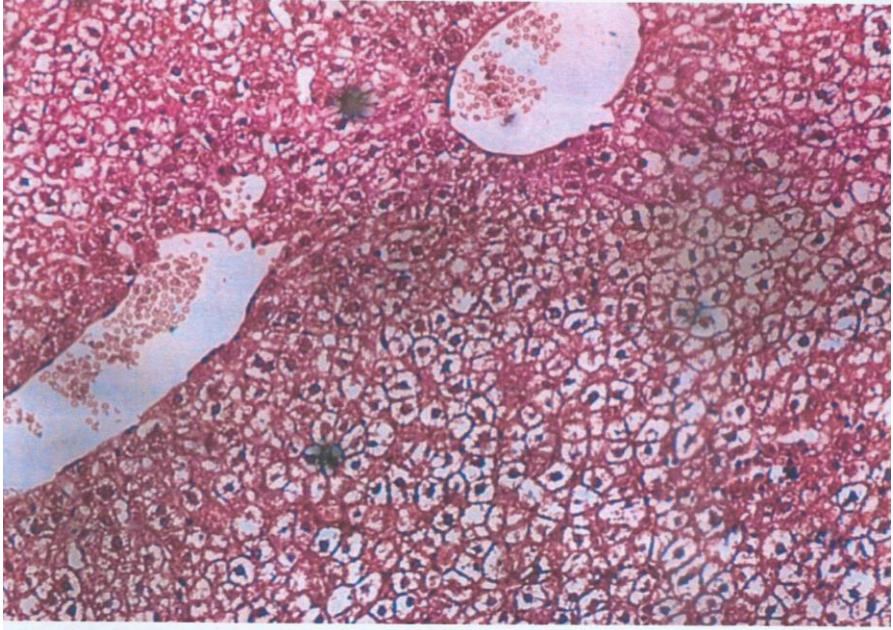


Fig 4: Histological section of the liver shows enlarged central vein with scanty tissue stroma displaying hepatocytes with ballooning degeneration. There are few cystically dilated spaces in areas. The lamina and sinusoidal arrangement is distorted. There is more histopathological damage than seen in figure 3

Discussion

There was a significant ($P < 0.05$) increase in the AST of the albino rats fed with instant noodles and 100% seasoning. Hence the 100% seasoning increased the AST concentration in the serum. A significant increase was also observed in ALT in the group fed with instant noodles and 100% seasoning when compared to groups 1 and 2.

There was no significant difference in AST, ALT and ALP levels in the control group (fed with rat chow) and group 2 (fed with noodles

without seasoning). So animals fed with noodles only, had normal liver function. In group 3 animals (fed with noodles and 50% seasoning) the AST activity increased. The highest AST activity was recorded in group 4 animals (fed with noodles and 100% seasoning). Increased activities of AST and ALT in the serum are markers of liver injury (Milinkovic, Peric, Stojevic, Zdetar & Pirsljin, 2005). Changes in the activities of these enzymes indicate injury to organelles such as mitochondria leading to release of soluble enzymes like AST (Dahiru, John, & Umaru, 2003). High levels of ALT may indicate liver damage from hepatitis, infection, cirrhosis, liver cancer, or other liver diseases. (<https://medlineplus.gov/lab-tests>)

The results of histology are shown in figures 1 to 4. From the results, it was observed that the animals in group 1 (that is the control group) as seen in figure 1 had normal histological findings. The animals in group 2 (figure 2) that were fed with noodles without seasoning showed no histopathological damage. In animals in group 3 (figure 3) that were fed with noodles and 50% of the seasoning, the histological section of the liver showed enlarged central vein with scanty tissue stroma displaying hepatocytes with ballooning degeneration; there are few cystically dilated spaces in areas. The lamina and sinusoidal arrangement is distorted.

In group four animals (figure 4) that were fed with noodle and 100% of seasoning there was histopathological damage (same as seen in group 3 but more severe). The histopathological damage to the liver tissue may be as a result of some of the components of the seasoning. According to (Choy, May & Small 2012). Tertiary butyl hydroquinone (TBHQ) a chemical preservative in form of butane which is used in production of the seasoning of the noodles caused asthma, rhinitis and dermatitis to the consumer. Monosodium glutamate according to (Liu, & Sequero, 2008), contributes to the shrinking of organs and also cause cerebral pain, trunk and facial flushing to people who are sensitive to

it; dilatation of the central vein, which contained lysed red blood cells, cyto-architectural distortions of the hepatocytes, atrophic and degenerative changes on the liver of animals. It is one of the active ingredients found in instant noodles seasoning which may be harmful to the liver at higher doses and affect the functions of the liver.

Conclusion

Within the limits of the study it can be deduced that the consumption of instant noodles with the seasoning had adverse effects on the liver of the albino rats

Recommendation

It is recommended that consumers of instant noodles should use very minimal amount of the seasoning or avoid it entirely until further studies are carried out.

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