



## Research Article

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# Effect of Garlic (*Allium sativum*) and Onion (*Allium cepa*) on an Aluminum induced kidney damage of a Wister Rat

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## Abstract

Several researches have been done to find out the effects of plant materials on the human body. This research was done to find out some questions: does aqueous extract of garlic and onions have an effect on the microanatomy of the kidneys of a Wister rat? Does onion and garlic have an effect on the body and weight of the Wister rat? During this research we were able to collect the plant materials and animals. Using the crude method, we extracted the aqueous form of the plant materials and stored them for administration. We also grouped the animals into 6 groups where we administered the aqueous form of the plants and metal to them. After 8 days the animals were sacrificed by Cervical dislocation and blood was collected from their eyes. The kidneys were also removed and placed in bouidin's fluid for histological preparation, observation, and morphological studies. This research has some limitations like; financial limitations and limited data. At the end of the Garlic (*Allium sativum*) and onion (*Allium cepa*) had no significant effect on the aluminum induced kidney damage of the wistar rat. Further studies should be done to further investigate the effects of Garlic and Onion on the kidneys.

**Keywords:** Aluminum, Cardiovascular Diseases, Heavy metals, Microanatomy.

## INTRODUCTION

Garlic and onion consumption as species has recently increased at an alarming rate in West Africa. Many people believe that garlic and onions have a panacea effect on the body and can help treat and cure various diseases [1]. *Allium cepa* (onions) was used as a medicinal plant in ancient times, either alone or in combination with herbs, to treat a variety of illnesses [2, 3]. *Allium cepa* (onion) is commonly thought of as a vegetable, but it has a long history of medicinal use. Onions are perennials that are grown for culinary purposes all over the world. Onions are members of the lily family as well. Onions come in a variety of varieties. Many of them (for example, onion bulbs) are white, red, or yellow in color. Their stems and leaves are green, and their leaves are hollow and about 3 ft (1m) long. The onion plant produces very few flowers, some white and some purple. The bulb grows mostly beneath the ground and is necessary for both viands and medication [4]. Onions have many medical applications, including active maintenance of the circulatory system, use as a diuretic to reduce swelling on the body, promotes the reduction of arteriosclerosis by lowering blood cholesterol levels and preventing blood clotting, used to nurse and is hypoglycemic.

Onion extracts can be used to nurse and prevent certain fungal and bacterial infections. Onion extracts can also be used to treat skin wounds and pricks, to remove warts, to stimulate hair growth, and even to remove unwanted skin blemishes. Warm onion extracts can be inserted into the ear to relieve ear pain. Baked onions are used to extract pus from abscesses [5, 6].

Garlic (*Allium sativum*) is a species of onion in the *Allium* genus. The onion, shallot, leek, chive, and Chinese onion are close relatives [7]. It is classified as a vegetable. Garlic plants have edible leaves and flowers, and the bulb contains 10-20 cloves. It is covered in a paper-like husk, which is usually removed before eating [8]. Garlic is a native of Central Asia and northeastern Iran, and it has long been used as a seasoning around the world. It has a long history of human consumption and use dating back several thousands of years. Garlic is a highly aromatic bulb crop that has been grown for thousands of years.

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It is well-known throughout the world for its flavor and medicinal properties, which include having a preventive effect in some cardiovascular diseases, regulating blood pressure, lowering blood sugar and cholesterol levels, being effective against bacterial, fungal, and viral infections, boosting the immune system, and having antitumor and antioxidant properties [9].

Heavy metals are naturally occurring elements with a high atomic weight and a density that is at least 5 times that of water [10]. Under the assumption that heaviness and toxicity are linked, heavy metals include metalloids such as arsenic, which can cause toxicity at low levels of exposure [11]. Their numerous industrial, domestic, agricultural, medicinal, and technological applications have resulted in their widespread environmental distribution. Their toxicity is determined by several factors, including the dose, route of exposure, and chemical species, as well as the exposed individuals' age, gender, genetics, and nutritional status. Arsenic, cadmium, chromium, lead, and mercury are among the priority metals of public health significance due to their high toxicity.

Human exposure has also increased dramatically due to an exponential increase in their use in a variety of industrial, agricultural, domestic, and technological applications [12]. Geogenic, industrial, agricultural, pharmaceutical, domestic effluents, and atmospheric sources have all been identified as sources of heavy metals in the environment [13]. These metallic elements are considered systemic toxicants that have been shown to cause organ damage at low levels of exposure. According to the United States Environmental Protection Agency and the International Agency for Research on Cancer, they are also classified as human carcinogens (known or probable). This review examines their environmental occurrence, production and use, human exposure potential, and molecular mechanisms of toxicity, genotoxicity, and carcinogenicity [14].

Aluminum has the atomic number 13 and is a chemical element. It is a nonmagnetic ductile metal with the symbol Al that is silvery white and light in weight. It is the most abundant metallic element in the earth's crust and the most common nonferrous metal. Aluminum accounts for up to 8% of the earth's crust by mass. Bauxite is the primary ore of aluminum. Because aluminum metal is highly reactive, native specimens are scarce and limited to extreme reducing environments [15]. The kidneys are bean-shaped retroperitoneal structures located between the transverse processes of T12-L3 vertebrae, with the left kidney superior to the right. The kidneys perform important functions such as filtration and excretion of metabolic waste products such as urea and ammonia, regulation of necessary electrolytes, stimulation of red blood cell production, regulation of blood pressure via the renin-angiotensin-aldosterone system, and glucose and amino acid reabsorption, as well as hormonal function via erythropoietin, calcitriol, and vitamin D activation [16]. The purpose of this study is to investigate the effect of garlic (*Allium sativum*) and onion (*Allium cepa*) on an aluminum-induced kidney of a wister rat, and evidence will be obtained from the findings.

The following hypothesis would be validated by the study:

HO1: Garlic (*Allium sativum*) and Onion (*Allium cepa*) have no effect on a Wister Rat's Aluminum-induced kidney damage.

## MATERIAL AND METHODS

### Study design

Quantitative research method will be used for the purpose of this study. According to [17] he posits that research design is a plan, structure, and strategy of investigation put in place to obtain answers to research questions or problems already hypothesized.

### Materials used for the study

The materials used for this study include: Refrigerator, Incubator, Bunsen burner, Beakers, Conical flasks, Wash hand basins, Tray, Mesh sieve, Filter papers, Funnel, Test tubes, Glass rods, Sterile screw capped bottles, Cannula, Blender, Gloves, Animal cages, Beads, Masking tapes, Markers, Bouin fluid, Dissecting kit, Face mask, Measuring scales, Feed and Water.

The plant samples (i.e. the bulbs of *Allium sativum* and *Allium cepa*) were collected from Karu, a Local government area in Nasarawa state, central Nigeria. While the Wister rats were collected from the National Veterinary Research Institute Vom, Plateau State Nigeria.

Extraction of plant phytochemicals was done using crude extraction method. The 36 experimental animals were grouped into 6 groups;

Group 1: Control group; here the experimental animals were feed only with water and feed.

Group 2: Metal group; here the experimental animals were administered only 2ml of the metal which was Aluminum

Group 3: Extract group; here the experimental animals were administered only the plant extract which is garlic and onions.

Group 4: Low dose; here the experimental animals were administered a low dose of the extract 2ml and heavy metal.

Group5: Medium dose; Here the experimental animals were administered a medium does of the extract 4ml and heavy metal.

Group 6: High dose; Here the experimental animals were administered a high dose of the extract 6ml and heavy metal.

The organ harvested (kidney) was observed for gross changes and was weighed using a weighing balance. The weight of the organ (Kidney) was also recorded. The tissue collected (kidney) was processed using the standard histological technique for routine histology using the following steps for H&E. After which the tissue was observed for histological changes under the light microscope. The tissue was then snapped with a digital camera for further slides.

The data collected from the experimental animals' weight and blood samples were analyzed using the SPSS version 20. ANOVA was used to determine the different groups of animals during study, P value of less than 0.05 will be considered significant.

## RESULTS

The 1 table shows the mean value of urea (mg/dl), pot (mmol/L), cre (meq/L), chloride (mg/dl), bicar (mg/dl) are 13.5340, 23.0300, 0.9200, 27.0000 and 94.0000 respectively. Basically, the mean value of garlic, onion & aluminium (independent variable) is 103.55260 and SOL (dependent variable) has a mean value of 145.6500. The mean value of these variable is far higher than other component of the study.

The table 2 shows various t-test value of several variable. But the one sample t-test that has high important is the t test value of garlic, onion & aluminium (independent variable) and SOD (dependent variable) is 7.411 and 69.525, which is more than the test value of 0.05, indicate the strength of the statistic. The test of significance shows that this relationship is significant at  $p=0.000<0.05$ . Therefore, based on observed findings the null hypothesis earlier stated is hereby rejected and the alternate upheld.

Thus, there is an effect of the extract of garlic and onions on the microanatomy of the kidneys of a Wister rat.

Table 3 shows the description of the paired variable of garlic, onion and aluminum which has a mean 117.38848 and sod [mmol/L] which has a mean of 47.2428.

The paired sample table 4 show correlation of 0.378 between the paired variable of garlic, onion, and aluminum as one pair with sod (mmol/L) as another dependence variable.

**Table 1:** One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
UREA (MG/DL)	5	13.5340	1.14683	0.51288
SOD (MMOL/L)	5	145.6500	4.68279	2.09421
POT (MMOL/L)	5	23.0300	2.65905	1.18916
CRE (MEQ/L)	5	0.9200	0.14832	0.06633
CHLO (MG/DL)	5	27.0000	5.78792	2.58844
BICAR (MG/DL)	5	94.0000	11.18034	5.00000
GARLIC & ONION & ALUMINIUM	10	103.55260	44.163831	13.965829

Source: SPSS Output

**Table 2:** One-Sample Test

	Test Value = 0.05					
	T	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
UREA (MG/DL)	26.291	4	.000	13.48400	12.0600	14.9080
SOD (MMOL/L)	69.525	4	.000	145.60000	139.7855	151.4145
POT (MMOL/L)	19.325	4	.000	22.98000	19.6784	26.2816
CRE (MEQ/L)	13.116	4	.000	0.87000	0.6858	1.0542
CHLO (MG/DL)	10.412	4	.000	26.95000	19.7634	34.1366
BICAR (MG/DL)	18.790	4	.000	93.95000	80.0678	107.8322
GARLIC & ONION & ALUMINIUM	7.411	9	.000	103.502600	71.90970	135.09550

Source: SPSS Output

**Table 3:** Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	GARLIC & ONION & ALUMINIUM	117.38848	25	47.551690	9.510338
	SOD (MMOL/L)	47.2428	25	50.62919	10.12584

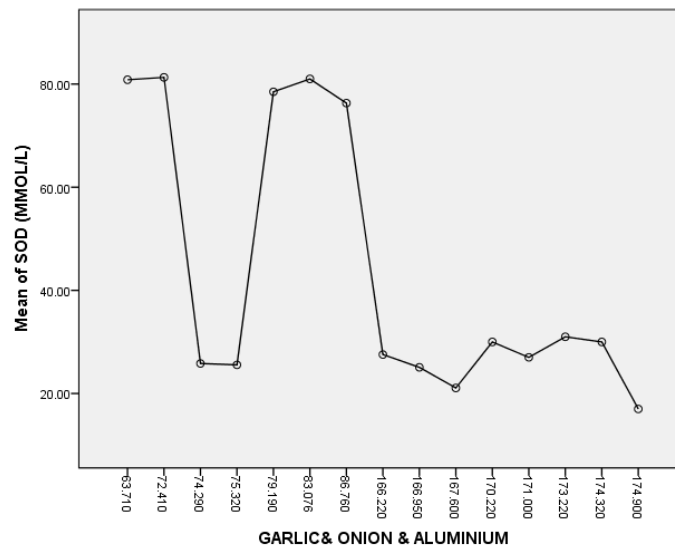
Source: SPSS Output

**Table 4:** Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	GARLIC & ONION & ALUMINIUM & SOD (MMOL/L)	25	0.378	0.062

Source: SPSS Output

**Means Plots**



From the result of t-test analysis in the table above, it was discovered that the t-observed (4.302) which is greater than the Alpha Value, it would be observed that all Hypothesis for the research work should be accepted.

## DISCUSSION

Garlic and onions have been known to have medicinal properties since ancient times [1]. Garlic and onions are both vegetables that act as antioxidants due to chemical properties [7]. Onion extracts can be used to nurse and prevent certain fungal and bacterial infections. Onion extracts can also be applied to wounds and pricks in the skin, to remove warts, to stimulate hair growth, and even to remove unwanted skin blemishes. Warm onion extracts can be inserted into the ear to relieve ear pain, and baked onions can be used to draw pus from abscesses [5, 6]. On the other hand, garlic is renowned worldwide for its flavor and medicinal properties, which include a preventive characteristic in some cardiovascular diseases, regulation of blood pressure, lowering blood sugar and cholesterol levels, effectiveness against bacterial, fungal, and viral infections, immune system enhancement, and antitumor and antioxidant properties [9].

Aluminum is a very reactive and backward metal [15], but it has been exposed to the environment due to industrial, agricultural, and domestic use.

The kidney histology in the high metal group showed induced oxidative stress and suppressed kidney function, whereas the kidney histology in the low metal group showed no significant change. The findings of this study also show that garlic and onions have no effect on the kidney histology of a wistar rat, but they are important as antioxidants and have many other functions. A light microscope was used for histological examination.

This study looks into how garlic and onions could be used as therapeutics to treat the effects of aluminum-induced kidney damage in a wistar rat.

I believe that additional research should be conducted to better understand the therapeutic effects of garlic and onions on aluminum-induced kidney damage in wistar rats. I also recommend better research preparation and more time to properly investigate the effects of these extracts on aluminum-induced kidney damage.

Finally, I believe that garlic and onions are beneficial and can be used in many medicinal researches, and that they are necessary for the development of therapeutics to establish new ways to improve medicine, the scientific and research body at large.

## CONCLUSION

This is the first study to look at the effects of *Allium cepa* and *Allium sativum* extract on the kidney histology of aluminum-induced kidneys in rats. Our findings indicated that *Allium cepa* and *Allium sativum* extracts have no effect on kidney histology parameters. The findings of this study highlight the use of *Allium cepa* and *Allium sativum* as potent antioxidant supplementary foods.

Recent research has also looked into the effects of garlic (*Allium sativum*) and onion (*Allium cepa*) on an aluminum-induced kidney in a Wistar rat. From the regression analysis, it can be concluded that Garlic (*Allium sativum*) and Onion (*Allium cepa*) has a significant impact on the aluminum induced kidney of a Wistar rat at 5% significance level. Finally, conclusion can be made that Garlic (*Allium sativum*) and Onion (*Allium cepa*) has a significant impact on the aluminum induced kidney of a Wistar rat at 5% significance level.

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## Conflict of Interest

None declared.

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