

# Effect of Onions Extracts on Prostate-specific Antigen and Acid Phosphatase in Wistar Rat

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## ABSTRACT

**Aim:** This study was carried out to determine the potential effect of onions extract on prostate-specific antigen (PSA) and acid phosphatase (AP) in Wistar rat. **Materials and Methods:** Twenty-four adult male rats weighing between 100 g and 120 g were assigned into four groups of six rats each. Group A served as a healthy control group. Group B, C, and D were administered with extract of onions with a dose concentration of 0.25 ml/kg, 0.5 ml/kg, and 1.0 ml/kg body weight, respectively, for 28 days. **Results:** The results obtained showed that administration of onion extract caused a significant decrease in PSA and total acid phosphatase when compared with the control group ( $P < 0.05$ ). These changes in PSA and total AP were dose-dependent. **Conclusion:** This observation probably implies that onions extract could probably be beneficial in the treatment and prevention of prostate cancer.

**Key words:** Onions, prostate-specific antigen, total acid phosphatase

## INTRODUCTION

*Allium cepa*, known as onions, belong to vegetables that have characteristic pungent flavors and some medicinal properties. It varies in size, shape, color, and flavor. The major types are red, yellow, and white onions. Their taste can range from sweet and juicy to sharp, spicy, and pungent, often depending on the season.<sup>[1]</sup>

The consumption of fresh onions leads to watery eyes. Onions have a reputation for making people cry during the cutting or chopping process. This response may be due to a gas known as syn-Propanethial-S-oxide. This chemical is a compound liquid that acts as a lachrymatory agent that causes tears or stings in the eyes.<sup>[2]</sup>

Although onions may also possess health benefits, which include reduction of the risk of some cancers, atherosclerosis, and some skin problem, onions are a nutrient-dense food.

This implies they are high in vitamins, minerals, antioxidants, and organosulfur while being low in calories. This may help counter free radical compounds.<sup>[3]</sup>

An antioxidant may help counter the formation of free radical compounds that have links to prostate cancer. Prostate cancer is a common type of cancer in males, but it is highly treatable in the early stages. It begins in the prostate gland, which sits between the penis and the bladder.<sup>[4]</sup>

The prostate has various functions, which include producing the fluid that nourishes and transports sperm as well as secreting prostate-specific antigen (PSA), a protein that helps semen retain its liquid state and aiding urine control.<sup>[5]</sup>

Prostate cancer main cancer affects males in Nigeria. It is characterized by the following; difficulty starting and maintaining urination, a frequent urge to urinate especially at

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night, blood in the urine or semen, painful urination, in some cases, pain on ejaculation, difficulty getting or maintaining an erection, pain or discomfort when sitting if the prostate is enlarged.<sup>[6]</sup>

Other features in the advanced stage include bone pain, especially in the hips, thighs, or shoulders, swelling in the legs or feet, weight loss, tiredness, changes in bowel habits, as well as back pain.<sup>[7]</sup>

The prostate gland is involved in sexual reproduction. Prostate cancer and many of its treatments affect fertility in several ways. An enzyme that acts to liberate phosphate under acidic conditions and is made in the liver, spleen, and bone marrow and prostate gland is known as acid phosphatase (AP). Abnormally high serum levels of AP may indicate infection, injury, or prostate cancer.<sup>[8]</sup>

Prostate cancer develops when specific changes occur, usually in glandular cells. Like all cancers, prostate cancer begins when a mass of cells has grown out of control and begins invading other tissues. Cells become cancerous due to the accumulation of defects, or mutations, in their DNA.<sup>[9]</sup>

Most of the time, cells are able to detect and repair DNA damage. If a cell is severely damaged and cannot repair itself, it undergoes so-called programmed cell death or apoptosis. Cancer occurs when damaged cells grow, divide, and spread abnormally instead of self-destructing as they should. Cancerous or precancerous cells in the prostate gland are called prostatic intraepithelial neoplasia.<sup>[10]</sup>

Similarly, AP is a form of the enzyme engaged in freeing attached phosphoryl groups from other molecules during digestion. It is stored in lysosomes and functions when this fuse with the endosomes, which are acidified; while they function, it has an acid pH optimum. This enzyme is found in many animal and plant species. The relevance of onions in prostate cancer is very scarce in literature as well as the mechanism in which it works. APs are enzymes that are capable of hydrolyzing phosphate esters in an acidic environment.<sup>[11]</sup>

Prostatic AP (PAP), which is produced in the prostate, was the first major serum marker for prostate cancer. Metastasis of prostate cancer beyond the capsule, particularly to the bone, causes a rise in AP level, with the level increasing in correspondence to the extent of the disease. PAP was used widely for screening, staging, and post-treatment monitoring in prostate cancer, but its use has largely been displaced by that of PSA.<sup>[12]</sup>

This present study was carried out to determine the effective potential of the extracts of onions in parameters for assessing prostate cancer.

## MATERIALS AND METHODS

### Material

The onions were bought from an Orie market in Umuamusa Njaba LGA Imo State, Nigeria between July 10, 2019, and July 12, 2019. The leaves were identified and authenticated by Botanist Imo State University Owerri, Nigeria.

### Preparation of *A. cepa*

The onions were washed thoroughly to remove dust and sand particles. It was then pounded. Then, it was filtered using 1 mm sieve and the liquid collected.

### Experiment animals

Twenty four apparently healthy adult male Wistar rats weighing between 100 g and 120 g were used for the study. They were kept in a clean plastic cage and housed in the experimental animal house of Imo State University. The Wistar rats were acclimatized for a period of 14 days, during which they were fed properly with commercially prepared growers mash made by Grand Cereals Ltd. and distilled water was provided *ad libitum*. The study was approved by the institutional Ethical Committee.

### Experimental design

The animals were randomly assigned into four groups of six rats each. Each group was treated either with distilled Wistar only or with a single dose of variable doses of onion extracts. These are classified as follows; Group A is the control that was only administered with the rat diet. Group B, C, and D were administered with extract of onions with a dose concentration of 0.25 m/kg, 0.5 ml/kg, and 1.0 ml/kg body weight, respectively, for 28 days.

### Blood collection

After treatment with onion extract for 28 days, all the animals (Group A to D) were weighed and anesthetized in a glass jar containing cotton wool soaked in chloroform. Blood samples were collected by cardiac puncture using a sterile needle and syringe. The blood samples were put into EDTA containers properly labeled for analysis within 24 h of collection.

Prostate-specific antigen assay: The PSA level was measured by the enzyme-linked immunoabsorbent assay while the total AP spectrophotometric method.<sup>[13]</sup>

### Statistical analysis

All results were expressed as mean  $\pm$  standard deviation. The data were analyzed using a one-way analysis of variance followed by student's *t*-test.  $P < 0.05$  was considered statistically significant.

## RESULTS

Table 1 shows the enzyme-linked immunoabsorbent assay and total acid phosphatase concentrations among different groups.

**Table 1:** The enzyme-linked immunoabsorbent assay and total acid phosphatase concentrations among different groups**Group PSA (ng/L) ACP (U/L)**

A.	2.40 ± 0.025	0.06 ± 2.20
B.	2.00 ± 0.064	0.00 ± 2.09
C.	0.99 ± 0.02*	2.63 ± 0.11*
D.	0.58 ± 0.02*	1.31 ± 0.26*

\*Significantly significant when compared with control (Group A) at  $P < 0.05$

## DISCUSSION

The effect of onions on PSA and ACP in Wistar rats was evaluated. Onions is a plant that possesses medicinal properties.<sup>[14]</sup> In this study, administration with onion extracts produced a significant decrease in the PSA concentration in rats when compared with the control. This could be due to enhancement in the interaction of antioxidants. This is in agreement with the work of Freedlan *et al.*<sup>[15]</sup> This study showed that the consumption of onion extracts decreased the level of PSA in a concentration-dependent manner, with the highest concentration showing the best effect. Several factors, including lifestyle, affect the level of PSA. This probably indicates that onion extracts may have a 5 $\alpha$ -reductase inhibitory activity, which prevents the development of benign prostatic hyperplasia. PSA is a protein produced by the prostate gland.<sup>[16]</sup> It may be produced by normal and malignant cells of the prostate gland. The PSA test measures the level of PSA in adult males' blood. The decreased level of PSA in groups administered with onion extract may be an indication that onions have a therapeutic effect on prostate cancer. The level of PSA is commonly increased in an adult male with prostate cancer.<sup>[17]</sup>

In the same vein, it was observed that the level of AP was significantly reduced, particularly at a higher concentration of onions extract when compared with the control. This is in line with the work of Minakata and Asan.<sup>[18]</sup> APs are a family of enzymes that are widespread in nature and can be found in many animal and plant species. Human APs are normally found at low concentrations. However, pronounced changes in their synthesis occur in particular diseases, where unusually high or low enzyme expression is seen as part of the pathophysiological process. This observation suggests that APs could be diagnostically useful as serological and histological markers of disease and could also be of use in the investigation of the pathophysiology of the associated disease.<sup>[19,20]</sup>

## CONCLUSION

PSA and AP were decreased in animals administered with onion extract. Hence, onion extract could probably

be beneficial in the prevention and treatment of prostate cancer.

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