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RESEARCH ARTICLE

DOES BLOOD pH CHANGE IN CANCER PATIENTS?

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ABSTRACT

Background: The pH of our blood is tightly regulated by a complex system of buffers which remains at work consistently to maintain the pH range from 7.35 to 7.45 that is slightly more alkaline than pure water. Blood needs to maintain a pH of 7.35 to 7.45 for cells to function properly and all of the proteins that work in our body has to maintain a specific geometric shape to function. The three-dimensional shapes of the proteins in our body are affected by the tiniest changes in the pH of body fluids. Thus present study has been undertaken to evaluate any change in blood pH of cancer patients.
Materials and Methods: Blood samples of 200 individuals were taken for the study which was divided into 3 groups. Group A- 40 individuals without cancer, Group B - 70 cancer patients prior treatment and Group C - 70 cancer patients during treatment. pH meter was used for assay.
Results: There was no significant statistical difference ($p>0.05$) observed in all groups as compared to normal during the period of the study.
Conclusion: This study showed that blood pH does not alter in cancer patients prior treatment and during treatment, hence consumption of acidic or alkaline food and even cancer chemotherapy are not responsible for making any change in blood pH of an individual.

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INTRODUCTION

The pH scale ranges from 0 to 14 and liquid which has a pH of 7 is considered to be neutral (pure water is generally considered to have a neutral pH). Fluids which have pH below 7 like lemon juice and coffee are considered to be acidic and fluids which have a pH above 7 like human blood and milk of magnesia are considered to be alkaline. Human life requires a tightly controlled pH level in the serum of about 7.4 (a slightly alkaline range of 7.35 to 7.45) to survive (Waugh and Grant, 2007). When we ingest foods and liquids, the end products of digestion and assimilation of nutrients often results in an acid or alkaline-forming effect and the end products are sometimes called acid ash or alkaline ash. At the same time our cells produce energy on a continual basis and a number of different acids are formed and released into our body fluids. These acids generated by our everyday metabolic activities which are unavoidable as long as our body has to generate energy to survive, thus it will produce a continuous supply of acids. So there are two main forces at work on a daily basis that can disrupt the pH of our body fluids these forces are the acid or alkaline-forming effects of foods and liquids that we ingest, and the acids that we generate through regular metabolic activities. Fortunately, our body has three major mechanisms at work at all times to prevent these forces from shifting the pH of our blood outside of the 7.35 to 7.45 range. These mechanisms are Buffer Systems (Carbonic Acid-Bicarbonate Buffer System, Protein Buffer System, Phosphate Buffer System),

Exhalation of Carbon Dioxide and Elimination of Hydrogen Ions via Kidneys

It is believed that cancer thrives in an acidic environment and cannot survive in an alkaline environment. Hence cancer cells make our body even more acidic as they produce lactic acid. Thus present study has been undertaken to evaluate any change in blood pH of cancer patients.

MATERIALS AND METHODS

Blood samples of 200 individuals were taken for the study which was divided into 3 groups. Group A- 40 individuals without cancer, Group B - 70 cancer patients prior treatment and Group C - 70 cancer patients during treatment. pH meter was used for assay.

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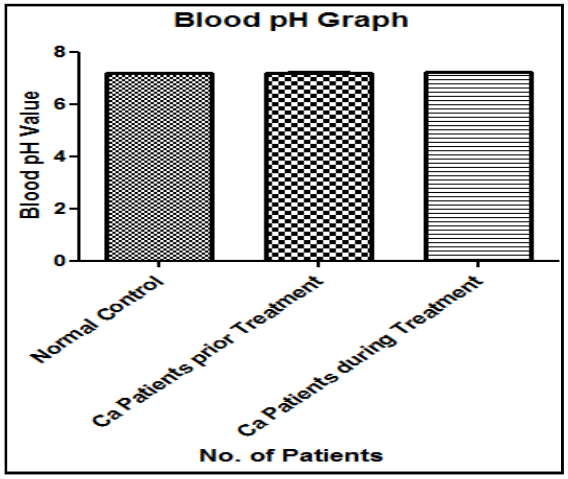
RESULTS AND DISCUSSION

There was no significant statistical difference ($p>0.05$) observed in all groups as compared to normal during the period of the study.

Normal Control (n=40)	Ca Pts. Prior Treatment (n=70)	Ca Pts. During Treatment (n=70
7.19 ± 0.0094	7.20 ± 0.0083	7.21 ± 0.0089

Values are expressed as Mean ± SEM & $p>0.05$ by ANOVA followed by Dunnett's test.



The pH in our body varies from one area to another with the highest acidity in the stomach (pH of 1.35 to 3.5) to provide digestion and protect against opportunistic bacteria. But even in the stomach, the layer just outside the epithelium is quite basic to prevent mucosal injury. It has been suggested that decreased gastric lining secretion of bicarbonates and a decrease in the alkaline/acid secretion in duodenal ulcer patients may play a significant role in duodenal ulcers (11). The skin is quite acidic (pH 4–6.5) to provide an acid mantle as a protective barrier to the environment against microbial overgrowth. There is a gradient from the outer horny layer (pH 4) to the basal layer (pH 6.9) (Malov and Kulikov, 1998). It has been seen in the vagina where a pH of less than 4.7 protects against microbial overgrowth (Ohman and Vahlquist, 1994). The urine may have a variable pH from acid to alkaline depending on the need for balancing the internal environment. Similarly foods can be categorized by the potential renal acid loads (PRALs). Fruits, vegetables, fruit juices, potatoes, and alkali-rich and low phosphorus beverages (red and white wine, mineral soda waters) having a negative acid load. Whereas, grain products, meats, dairy products, fish, and alkali poor and low phosphorus beverages (e.g., pale beers, cocoa) have relatively high acid loads (Ferris *et al*., 2006). Measurement of pH of the urine (reviewed in a recent study with two morning specimens done over a five-year span) did not predict bone fractures or loss of bone mineral density (Remer, 2000). However, this may not be reflective of being on an alkaline or acid diet throughout this time. It has been suggested that the effectiveness of chemotherapeutic agents is markedly influenced by pH. Many agents such as epirubicin and adriamycin require an alkaline media to be more effective. Another drugs, such as cisplatin, mitomycin C, and thiotepa, are more cytotoxic in an acid media (Groos *et al*., 1986). Cell death correlates with acidosis and intracellular pH shifts higher (more alkaline) after chemotherapy may reflect response to chemotherapy (Smith *et al*., 1991). It has been observed that inducing metabolic alkalosis may be useful in enhancing some treatment regimes by using sodium bicarbonate, carbicab, and furosemide (Raghunand and Gillies, 2001). Extracellular alkalinization by using bicarbonate helpful to enhance the effect of chemotherapy by manipulation of tumour pH (Raghunand *et al*., 1999). However there is no scientific literature establishing the benefit of an alkaline diet for the prevention of cancer at this time. In the present investigation, data obtained with the help of electronic pH meter showed no difference in blood pH of cancer patients prior treatment and during treatment, hence consumption of acidic or alkaline food and even cancer chemotherapy are not responsible for making any change in blood pH of an individual.

Conclusion

In the present study, pH meter showed to be a useful tool in the measurement and comparison of the blood pH in people with and without cancer patients. On the basis of data obtained it can be concluded that there is no difference in pH is to be observed between normal blood and blood from cancer patients. However this study needs to be carried out in greater number of cases for the exact relation between blood pH and cancer.

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