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Investigation of Tumor Markers Effect on Human Blood Plasma, Leukocyte and Erythrocyte Total Antioxidant Status

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Abstract

Carcinoembryonic antigen (CEA) and (CA15-3), antigens that are sometimes found in an increased amount in the blood of people who have certain cancers, other diseases, or who smoke. In this study we aimed that clarified correlation amount of CEA and CA15-3 between total antioxidant status. For this aim, ABTS, chromogenic substrate was used to measure of variation of total antioxidant status. The resultant ABTS radical cation is blue-green in color, with the degree of suppression of color production being proportional to the antioxidant concentration (CEA and CA15-3) of the added sample. TAS% was decreased in the presence, tumor marker (CA15-3)of plasma and white blood cells $3.9x10^{-3}$ kU/L and $15.6x10^{-3}$ in erythrocyte kU/L. CAE exchange with the TAS in plasma was examined; the marker is increased in proportion to the concentration of TAS%. $1.6x10^{-3}$ concentration of leukocytes TAS% had the lowest value. Obtaining data show that the amount increasing of total antioxidant status is parallel to the increasing amount of CEA and CA15-3.

Keywords: CA15-3 (Cancer Antigen 15-3), Carcinoembryonic Antigen (CEA), Total Antioxidant Status (TAS), Tumor marker.

Contents

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1. Introduction

Tumor marker, a substance sometimes found in the blood, other body fluids, or tissues. A high level of tumor marker may mean that a certain type of cancer is in the body. Examples of tumor markers include CA 125 (ovarian cancer), CA 15-3 (breast cancer), CEA (ovarian, lung, breast, pancreas, and gastrointestinal tract cancers), and PSA (prostate cancer). Tumor marker also called biomarker [1,2]. Measurements of tumor marker levels can be useful when used along with x-rays or other tests in the detection and diagnosis of some types of cancer[3].

In addition to their role in cancer diagnosis, some tumor marker levels are measured before treatment to help doctors plan appropriate therapy. In some types of cancer, tumor marker levels reflect the stage of the disease and can be useful in predicting how well the disease will respond to treatment. Tumor marker levels may also be measured during treatment to monitor a patient's response to treatment. A decrease or return to normal in the level of a tumor marker may indicate that the cancer has responded favorably to therapy. If the tumor marker level rises, it may indicate that the cancer is growing. Finally, measurements of tumor marker levels may be used after treatment has ended as a part of follow up care to check for recurrence [3].

Elevated CA15-3 (Cancer Antigen 15-3), Carcinoembryonic Antigen (CEA), levels can also occur in patients with noncancerous conditions, including inflammatory bowel disease, pancreatitis, and liver disease. Tobacco use can also contribute to Higher than normal levels of CEA and CA15-3. The antioxidant system has many components. The antioxidant is most important defense system to cancer for body. Antioxidants work by scavenging potentially hazardous free radicals, thus preventing structural damage to cells.

Free radical damage to any of these components can cause a reduction in the overall antioxidant status of an individual. Reduction in total antioxidant status has been implicated in several disease states, such as cancer and heart disease. High intakes of certain antioxidants have been associated with a reduced risk of certain diseases. For example higher levels of Vitamin E have been associated with lowered risk of mortality from ischaemic heart disease and other factors involved in cardiovascular disease high intakes of Vitamin C and beta-carotene have been associated with a reduced risk of some cancers [4].

Total antioxidant status allows assessment of the performance of the entire antioxidant system [4,5]. Because the measurement of different antioxidant molecules separately is not particle and their antioxidant effects are additive, the total antioxidant of a sample is measured, and this is called total antioxidant capacity (TAC), total antioxidant activity (TAA), total antioxidant power (TAOP) [6]. It was aimed that to find an answer for tumor marker whatever effect to total antioxidant status.

2. Materials and Methods

Blood Samples: Blood plasma, leukocyte and erythrocyte samples were obtained from healthy subjects who admitted to blood bank in in Ataturk University Hospital. Plasma, leukocyte and erythrocyte samples obtained were centrifuged at 5000 rpm for 30 min. The plasma removed from leukocyte and erythrocyte samples using with automatic pipet. Than the leukocyte was removed with automatic pipet and was washed three times with physiological serum. It was lysized with 1:10 v/v distillated water. The erythrocyte was lysized with 1/15 v/v distillated water. The plasma leukocyte and erythrocyte samples were run immediately or stored at -20 ^{o}C.

Tumor Marker: Tumor markers manufactured by EURO/DPC Ltd. Carcinoembryonic antigen (CEA) and CA15-3 was prepared to be stock solution. CEA High adjustor (48 mg/L) dissolved in deionized water. CA15-3 marker was prepared to be minimum concentration CE15-3 High adjustor (117 kU/L)in 3.0 mL deionized water. Let stand for 30 minutes then mix by gentle swirling or inversion. Then,100, 400, 600, 800, 1100 mL were used for measuring total antioxidant status in this stock solution.

Total Antioxidant Status (TAS): The Total antioxidant status was measured using a colorimetric assay. The chromogenic ABTS® (2,2´-Azino-di[3-ethylbenzthiazoline sulphonate]) is incubated with a peroxidase and hydrogen peroxide to produce the ABTS radicalcation. The ABTS radical is detectable due to its blue-green color which is measured at 600 nm at 37°C. The resultant cation is blue-green in color, with the degree of suppression of color production being proportional to the antioxidant concentration of the added sample.

$$HX\text{-}Fe^{III} + H_2O_2 \longrightarrow X\text{-}[Fe^{IV} = 0] + H_2O$$

$$ABTS^{®} + X\text{-}[Fe^{IV} = 0] \longrightarrow ABTS^{®*+} + HX\text{–}Fe^{III}$$

Antioxidants in the sample of plasma suppress the formation of the radical cation to a degree which is proportional to their concentration [7, 8].

3. Results and Discussion

In this study for explanation connection total antioxidant status with carcinoembryonic antigen (CEA) or CA15-3 (Cancer Antigen 15-3) 100, 400, 600, 800, 1100ml (48X 10^{-3}mg/mL or 117 x 10^{-3}kU/mL) concentration CAE or CA 15-3 was added to reaction mixture at 600 nm at 37°C. Than changing of total antioxidant status (TAS%) was measured and illustrated in (Figure 1 and 2).

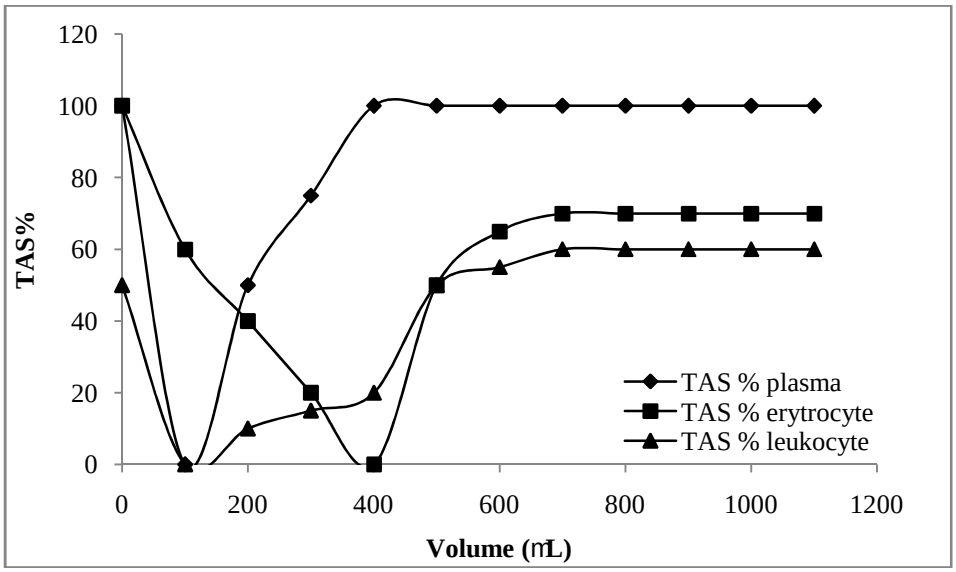

Figure 1. Changing of total antioxidant status with different antigen CA15-3 (Cancer Antigen 15-3) concentration.

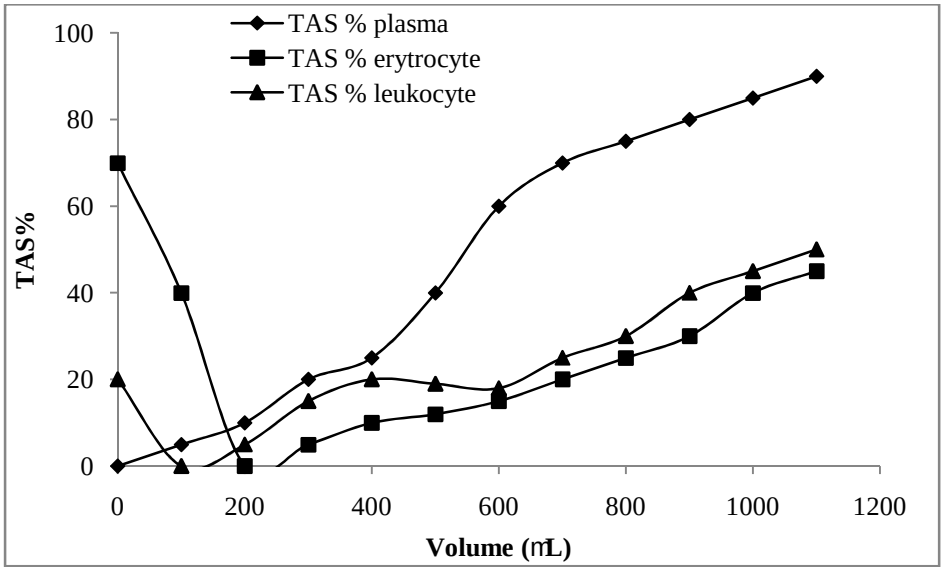

Figure 2. Changing of total antioxidant status with different carcinoembryonic antigen CEA concentration.

TAS% was decreased in the presence, tumor marker (CA15-3) of plasma and white blood cells$3.9x10^{-3}$ kU/L and $15.6x10^{3}$ in erythrocyte kU/L (in Figure.1). It was understood that tumor marker in the presence of high concentrations in plasma increasing to TAS% studied concentrations, only the erythrocytes TAS% of the more lower than control (Figure.1). CAE exchange with theTAS in plasma was examined; the marker is increased in proportion to the concentration of TAS%. $1.6x10^{-3}$concentration of leukocytes TAS% had the lowest value. The higher concentration was shown in Figure.2 to increase in TAS%. CAE in the presence of varying concentrations increased in erythrocytes TAS%, but has a lower value from control.

Carcinoembryonic antigen (CEA and CA15-3) is normally found in small amounts in the blood of most healthy people, but may become elevated in people who have cancer conditions. The primary use of CEA is in monitoring colorectal cancer, especially when the disease has metastasized. CEA and CA15-3 are also used after treatment to check for recurrence of colorectal cancer. A wide variety of other cancers can produce elevated levels of this tumor marker, including melanoma, lymphoma, and cancers of the breast, lung, pancreas, stomach, cervix, bladder, kidney, thyroid, liver, and ovary. Tumor cell can generate large amounts of hydrogen peroxide that may contribute to mutation and damage of normal tissues, and therefore facilitate tumor growth and invasion [7,8]. Perhaps, body which protect against oxidative stress is associated with high levels of CEA or CA15-3. Scientists continue to study these uses of tumor markers as well as their potential role in the early detection and diagnosis of cancer. The patient's doctor can explain the role of tumor markers in detection, diagnosis, or treatment for that person [9,10].

Kopañski et al investigated changes of the total antioxidative status of blood cells erythrocytes TAS and of the CA19-9, CEA and AFP concentrations in serum. It was confirmed that in all the patients in whom the recurrence and/or the dissemination occurred of the cancer, the average erythrocytes TAS value increased 5.5 times by comparison with the period before progression and 7 times in comparison with the patients without recurrence and/or dissemination of the cancer [8, 11, 12]. Carcinoembryonic antigen (CEA) and CA15-3 (Cancer Antigen 15-3) suppress the formation of the radical cation concentration depended on its concentration. Results from this study, all concentration of carcino embryonic antigen (CEA) and CA15-3 (Cancer Antigen 15-3) increased total antioxidant status.

4. Conclusion

This results show that increasing total antioxidant status to bound amount of CEA or CA15-3 is one of the type defense mechanism for smoking, some sick and some cancer kind. Total antioxidant status defense to body from changing abnormal status for a certain period. Red glutathione is one part of the oxidative defense systems. Similarly, another study about glutathione status in the blood of patients with breast cancer shows direct proportional increasing red glutathione amount in the blood of patients with breast cancer [8].

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