DETERMINATION OF ZINC LEVEL IN BLOOD - SERUM BY NEUTRON ACTIVATION ANALYSIS (N.A.A.)

Damia Thamer AL-Ani*

Date of acceptance 21/12/2002

ABSTRACT

Zinc level in serum was measured from patients suffering from cancer and healthy individuals. Hundred from each individuals were classified into three groups according to their age, the groups were (10-25) ,(26-40)and (41-65) years .

To determined zinc concentration instrumental neutron activation technique was used.

The ^{65}Zn isotope produced by the reaction $^{64}Zn(n,\gamma)^{65}Zn$

$T_{1/2}$=224 days, was used to determine the blood serum zinc level in patients which show lower level than that of healthy individuals, over ten repeated analysis the precision of the method was 2.1%.

Introduction

Zinc information concerning the concentration of zinc in the body fluids has become increasingly important because the role of zinc in both normal and abnormal growth is better recognized {1-4}.

The history of the significance of zinc in nutrition and in – clinical medicine and public health is nil .{5,6} .

Zinc are transported to cell bound to proteins , predominantly albumin ,- macroglobuline but only free zinc ions seem to be biologically active {7,8}.

The function of macroglobuline is regulated zinc itself and enhances its interaction with cytokinase and protease which indirectly influence immune function {9}.

Zinc is critical to the functions of more than 100 enzymes, which indicate that zinc deficiency rapidly diminishes antibody and cell – mediated responses in both humen and animals {10–11}.

Various diseases associated with an impaired immune response are characterized by low plasma zinc levels or noticeable zinc deficiency {12}.

The impairment of immune function has been attributed to zinc deficiency in other condition like malnutrition and certain malignancies as well (13). Singh etal show that the distribution of serum zinc into the liver within the acute phase reaction caused by increased production of proinflammatory cytokines mainly interleukin, which in some cases related to leukemia {14}.

The aim of the present work is to find the relationship between serum zinc level and cancer disease.

Materials and Methods

2-1 Blood Samples:

Three groups of blood donors of different age range from (10- 65) years old patients suffering from various types of cancer and other healthy individuals were studied the age factor was taken in consideration.

A 10 ml of blood was collected in a polyethylene centrifuge tube, which already been cleaned with double distlled water. The blood samples centrifuged to separate serum from blood. One ml of serum was pipetted in a clean polyethylene capsule ready for irradiation.

AL – Kindy Medical College / University of Baghdad

2-2 Irradiation:

The irradiation took place at IRT-5000 for 6 hours in thermal neutron flux of 2.3×10^{13} n/cm^2 .s .external flux monitoring such as iron rings packed with each sample layer which used for flux correction. The samples were one ml of blood serum of patients, healthy and zinc standard were taken individually in polyenthlene capsules closed well and put altogether with blank in an aluminum container.

2-3 Gamma –Ray Spectrometry:

After leaving the irradiated samples for 4 weeks to decay ,these samples were counted in a 89 cc coaxial well – type germanium detector , the counting time was 3000 sec. The detector was coupled via analog – to digital converter (ADC) in to HP – 1000 computer through a CAMAC system. The gamma – ray spectra are analyzed by a computer program which determine the total peak area .the doctor resolution was measured as function of energy and was found to be 2.5 KeV at 1332.5 ke for ^{60}Co source.

Results and Discussion

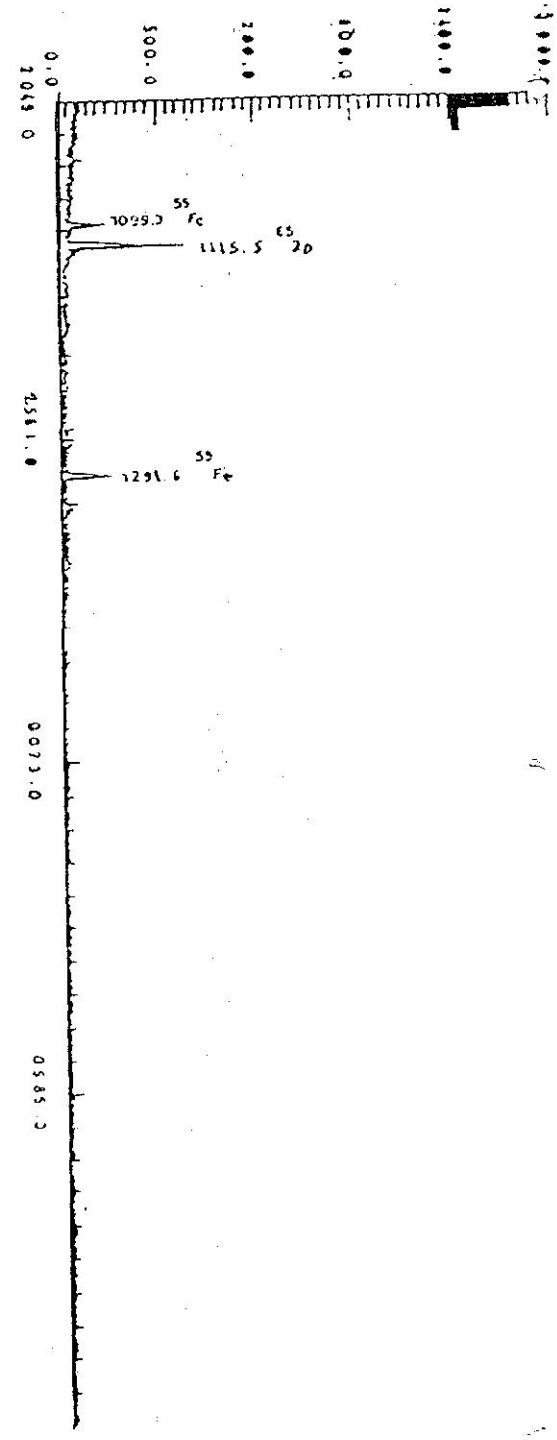
Fig 1 and 2 represent the gamma – ray spectrum of serum after 4weeks – decay period of healthy and patient persons respectively Peak 1115 .5KeV of ^{65}zn was used to determine the zinc concentration in ng /ml. The results are presented in table 1 arranged according to the age .The results show that zinc level in blood serum of healthy is about twice that of the patient persons .The precision over ten analysis was 2.1 %.

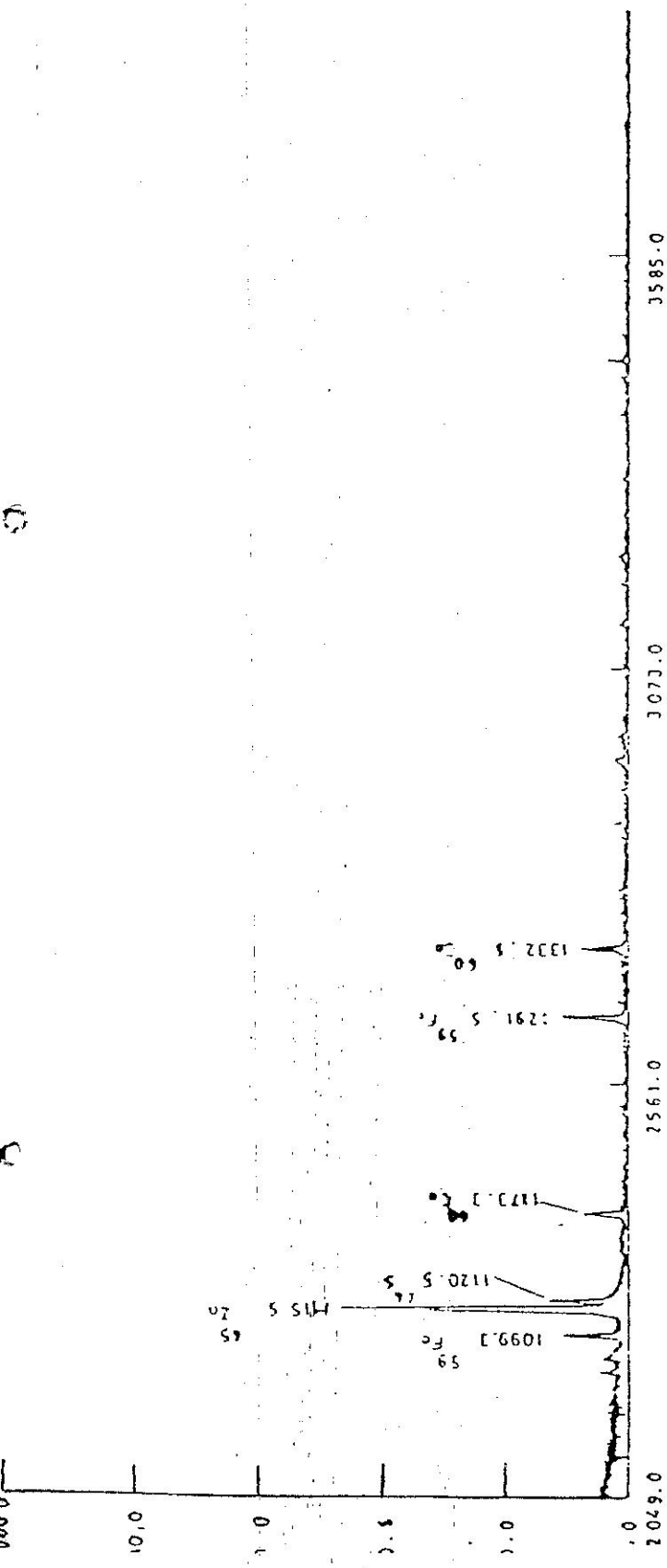
Table 1: Zinc level in blood serum (ng /ml)

Groups	Patients			Control individuals		
	NO. OF Samples	MEAN ±SD	RANGE	NO.OF Samples	MEAN±SD	RANGE
10-25	60	125.0±9.2	10–152	40	256.6±4.5	25–30
26-40	20	162.1±3.1	155–9.1	40	30.1±6.1	30–33
41-65	20	21.4.0±3.8	20–22	20	50.3±7.6	49–52

4. Conclusion:

The results obtained in this study show a direct relation between cancer and zinc levels in blood serum which lead to conclusion that the zinc level in blood serum may be considered as one of the reasons stand behind the various types of cancer studied in this work. Results obtained in this work agree with that given in various reports mentioned in the references also this results make a good entrance to further studies of the relationship between blood - serum zinc level and cancer.





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قياس تركيز عنصر الزنك في مصل الدم باستخدام طريقة التحليل بالتنشيط النيتروني

ضمياء ثامر العاني*

* كلية الطب الكندي / جامعة بغداد

الخلاصة

لقد تم قياس تركيز عنصر الزنك لمائة نموذج مصل دم من مرضى مصابين بأمراض سرطانية مختلفة وأشخاص غير مصابين وقد تم توزيع المرضى المصابين منهم وغير المصابين إلى ثلاثة مجاميع حسب فئاتهم العمرية وكالاتي(10–25) ،(26–40)،(41–65) سنة.

ولكي يتم تعيين عنصر الزنك في مصل الدم استخدمت طريقة التنشيط النيتروني لأن نظير الزنك ^{65}Zn يمكن الحصول عليه من تفاعل ^{64}Zn n، γ ^{65}Zn وبعمر النصف 224 يوما .

لقد أظهرت النتائج إن تركيز الزنك في دم المصابين اقل منه عند غيرهم بنسبة 50% تقريبا ولقد كانت دقة طريقة القياس (بعد اعادتها عشر مرات) بحدود 2.1 %.