Measurement of Uranium Concentrations in Human Blood in Some the Regions of Baghdad Governorate

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Abstract

The aim of this research is to determine the concentrations of uranium in human blood in some regions of Baghdad governorate and to determine the level of contamination with uranium for these regions during the (2003) war. The results obtained have shown that the maximum uranium concentration in blood samples was found (0.256 ppm) in AL-Zaifranea region and AL-Sader city,while the minimum in AL-Shab region (0.052 ppm) ,the minimum of uranium concentration in the blood samples was found to be (0.008 ppm) (male,39 years old) lived in AL-Shab region, while the maximum of uranium concentration in the blood samples was found to be (0.44 ppm) (female, 55 years old) lived in AL-Sader city.

Introduction

The function of the blood is to deliver nutrients, hormones and oxygen to tissues, collect and dispose of the wastes from cellular metabolism, deliver specialized cells to tissues for protection agent the external environment, and prevent leakage by closing holes in blood vessels [1]. The blood consists of cells surrounded by a liquid matrix, which circulates through the heart and blood vessels. Total blood volume in females is (4-5) litters, males is (5-6) litters, cells and cells fragments it is about (55%) [2]. All blood cells develop from stem or precursor cells that are produced principally in the bone marrow [3]

The Uranium enters the bodies through the food, water and air. When you breathe uranium dust, some of it is exhaled and some stays in lung. The size of the uranium dust particles and how easily they dissolve determines where in the body the uranium goes and how it leaves your body [4].

The uranium Inside the body by absorption of inhaled uranium into the circulation system depends on the rate at which the particle is dissolved in the lung and on their interactions with lung legend [5]. Soluble depleted uranium particles deposited in the lung usually dissolve, and the depleted uranium moves into the blood within days or weeks, while the insoluble particles tend to remain in the lung or lymph nodes for months or years [6]. The soluble particles will be absorbed in the blood and remove from it to other organs where these particles accumulate .Absorption through the gut depends upon the availability of various depleted uranium compounds to which an individual has been exposed [3].

Uranium dust may consist of small, fine particles and coarse, big particles. The big particles are caught in the nose, sinuses, and upper part of the lung where they are blown out or pushed to the throat and swallowed. The small particles are inhaled down to the lower part of lung. If they do not dissolve easily, they stay there for many years and cause most of the radiation dose to lung from uranium; they may gradually dissolve and go into blood. If the particles do dissolve easily, they go into the blood more quickly [4].

Experimental Part

The present study of uranium concentration in human blood from different

regions of Baghdad (AL-Zaifranea, AL-AL-Binuq , Haiy-Diyala, AL-Taji, AL-Mansur, AL-Shab, Abu-Ghreab, AL-Sader city, AL-Doura and AL-Ameen) is made by using nuclear track detectors (CR-39) thickness (250 μm) and area approximate to (1×1 cm^2), and taking a special data such as (age, gender and place) were also recorded.

The powdered blood samples (0.4 g) weight were pressed into a pellet of (1cm) diameter and (1mm) thickness, the pellets were covered with (CR-39) detector and put in a plate of paraffin wax at a distance of (5 cm) from the neutron source (^{241}Am-^{9}Be) as shown Fig. (1).

After the irradiation time (one month), the (CR-39) track detectors were etched in (6.25N) (NaOH) solution at temperature of (60 ^{0}C) for (6 h) ,and the tracks density were recorded using the optical microscope with magnification (400 x).

The density of the fission tracks (ρ) in the samples was calculated according to the following relation [7].

$$\text{Track density } (\rho) = \frac{\text{Average number of total pits (tracks)}}{\text{Area of field view}} \quad \text{........ (1)}$$

The uranium concentrations in the blood samples were measured by the comparison between track densities registed on the detectors of the sample pellet and that of the standard blood sample pellets [8] from the relation as shown Fig. (2).

$C_X = \rho_X \cdot (C_S / \rho_S)$ …... (2)

When: slope = (ρ_S / C_S)

Where:

C_X: uranium concentration in the unknown sample (ppm).

C_S: uranium concentration in the standard sample (ppm).

ρ_X: track density of the unknown sample (tracks/mm^2).

ρ_S: track density of the standard sample (tracks/mm^2).

Results and Discussion

In this study (50) blood samples of injured people males and females were taken from (10) regions in Baghdad governorate as shown in Fig. (3) present the locations of collected blood samples from all regions, all samples had been collected from the histopathology department and specialized surgical hospital from histopathology department for education laboratories in the medical City and specialized surgical hospital in Teaching Yarmook Hospital.

From table (1) it that:

1.The average of highest uranium concentrations found regions in AL-Zaifranea region and AL-Sader city (0.256 ppm), while the lowest average uranium concentration was in AL-Shab region (0.052 ppm) as shown in Fig. (4) .

2.The minimum of uranium concentrations in the blood samples for males and females is (0.008 ppm), for a male (39 years old) who has been living in AL-Shab region, and the maximum of uranium concentration in the blood samples for males and females were (0.44 ppm) for a female (55 years old) has been living in AL-Sader city as shown Fig. (4).

3.The uranium concentrations for females blood samples are larger than for males blood samples because the total blood volume in females is (4-5) litters, while in males is (5-6) litters [2].

4. Results show that the uranium concentration in the blood is below the allowed limit from (International Commission Radiation Protection) (ICRP) agency (0.115 ppm) [4], and if we compare the results with other studies that has been measured, the uranium concentration in injured human blood by using (CR-39) nuclear track detector, in Baghdad, ranged between (0.22-0.073 ppm) [4] and in southeast of Baghdad measured the uranium concentration in human blood from area situated in southeast of Baghdad ranged between (0.24-0.0521 ppm) [8].

The results show that the uranium concentration in the blood in AL-Zaifranea city and AL-Sader city is higher than the other regions and the other results regions show that the uranium concentration in the blood samples is below the allowed limit from other studies.

References

1. Emmanuel, C.B. (992),"Hematology; Introduction and Principles of Hematological Diagnosis ", London, Sydney,

2. Berence, M.R. and Veny, M (1987), " Physiology ", Sanders Company,

3. World Health Organization, WHO, (2001), "Depleted Uranium Sources, Exposure and Health Effects ".

4. Hassan, S.F. (2006), "Determination of Uranium Concentration in Human Blood in Some Governorates of Iraq ", Msc in Science of Physics, Al- Nahrain University.

5. Harley, N.H.; Foulkes, E.C.; Hilborne, L.H.; Hudson, A. and Antboy, C.R. (1999), " A Review of The Scientific Literature as it Pertains to Gulf War Illnesses ", 7, Depleted Uranium, RAND, National Defense Research Institute, Washington, USA.

6. Rostker, B Environmental Exposure Report, (2000), "Depleted Uranium in The Gulf(II) ", Office of The Seduced Assistant to The Secretary of Defense For Gulf War Illnesses, OSAGWI, Department of Defense, December, 13.

7. Amalds, O. Custball, N.H. and Nielsen, G.A. (1989), "Cs-137 in Montarq Soils", Health Physics, 57 No.6,P. 955-958.

8. كريم، محمود سالم " ،(2008) تحديد تراكيز اليورانيوم في الدم لمناطق من جنوب شرق بغداد باستخدام كاشف الأثر النووي (CR-39)" بحث منشور في مجلة كلية التربية، العدد الأول، ص259- ,266.

Table (1): Uranium concentrations in Blood Samples in all regions in Baghdad governorate

No. of Region	Region		Samples					Mean
			1	**2**	**3**	**4**	**5**	
1	**AL-Zaifranea**	**Uranium Concentration(ppm)**	O.39	0.32	0.28	0.19	0.1	0.256
		Track density (Track.mm^{-2})	27	22.3	19.5	13	7	17.75
		Gender	female	female	male	female	female	
		Age (year)	45	60	47	55	49	
2	**AL-Binuq**	**Uranium Concentration(ppm)**	O.25	0.14	0.092	0.075	0.011	0.11
		Track density (Track.mm^{-2})	17.4	7.9	6.4	5.2	0.76	7.8
		Gender	female	female	male	female	male	
		Age (year)	55	38	61	45	56	
3	**Haiy-Diyala**	**Uranium Concentration(ppm)**	O.21	0.11	0.092	0.062	0.061	0.107
		Track density (Track.mm^{-2})	14.6	7.5	6.4	4.3	4.2	7.4
		Gender	female	female	male	female	female	
		Age (year)	50	47	59	65	59	
4	**AL-Taji**	**Uranium Concentration(ppm)**	O.18	0.13	0.082	0.061	0.022	0.095
		Track density (Track.mm^{-2})	12.5	9.0	5.7	4.2	1.5	6.58
		Gender	male	female	female	female	female	
		Age (year)	46	54	54	60	47	

5	AL-Mansur	Uranium Concentration(ppm)	O.18	0.12	0.091	0.072	0.029	0.098
		Track density (Track .mm^{-2})	12.5	8.3	6.3	5.0	2.0	6.82
		Gender	male	female	female	female	male	
		Age (year)	47	60	34	36	34	

No. of Region	Region		Samples					Mean
			1	2	3	4	5	
6	AL-Shab	Uranium Concentration(ppm)	O.09	0.08	0.053	0.013	0.008	0.052
		Track density (Track .mm^{-2})	6.3	5.6	3.6	0.9	0.9	3.38
		Gender	female	female	female	male	male	
		Age (year)	42	55	44	38	39	
7	Abu-Ghreab	Uranium Concentration(ppm)	O.13	0.11	0.08	0.064	0.044	0.085
		Track density (Track .mm^{-2})	9.0	7.6	5.7	4.45	3.0	6.0
		Gender	female	female	male	female	male	
		Age (year)	39	44	56	34	30	
8	AL-Sader city	Uranium Concentration(ppm)	O.44	0.38	0.27	0.11	0.08	0.256
		Track density (Track .mm^{-2})	30.6	26.4	19.8	7.6	5.6	18.0
		Gender	female	female	female	female	male	
		Age (year)	55	47	57	39	41	
9	AL-Doura	Uranium Concentration(ppm)	O.14	0.12	0.091	0.077	0.011	0.087
		Track density (Track .mm^{-2})	9.7	8.2	6.3	5.3	0.8	6.06
		Gender	female	female	male	male	male	
		Age (year)	41	42	58	60	35	
10	AL-Ameen	Uranium Concentration(ppm)	O.23	0.21	0.13	0.094	0.081	0.149
		Track density (Track .mm^{-2})	16.0	14.6	9.0	6.5	5.6	10.34
		Gender	female	female	female	male	male	
		Age (year)	43	54	66	30	36	
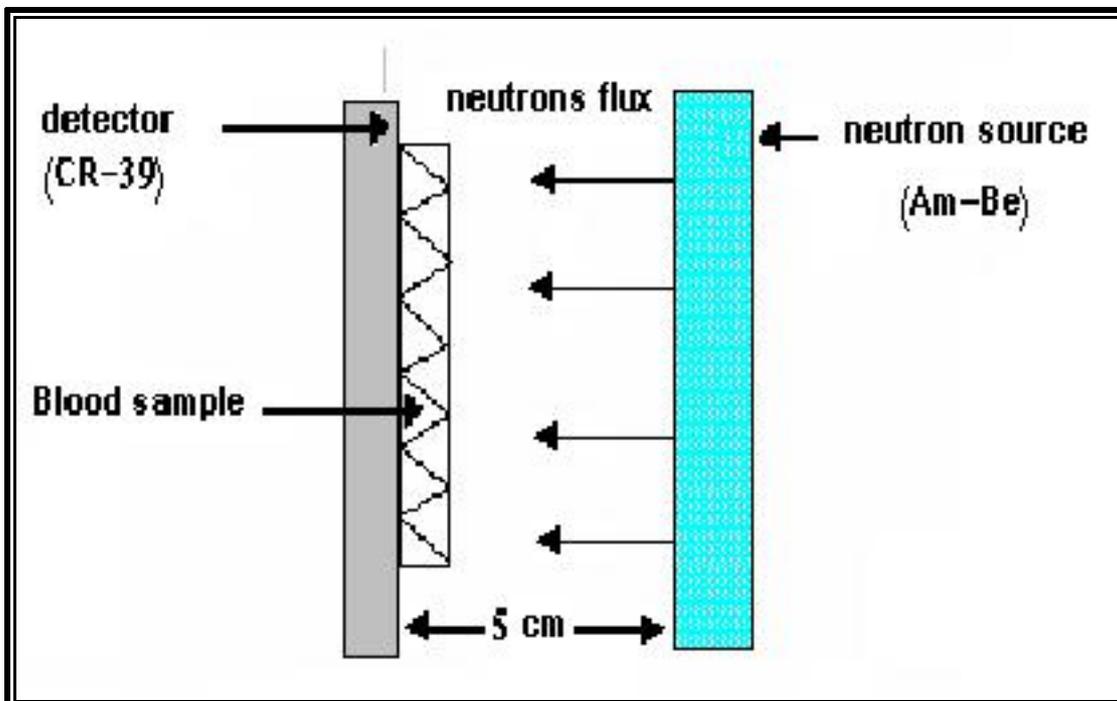
Fig. (1) The irradiation of the detectors and blood samples to the neutron source

Slope = 69.66 (track /ppm .mm^2)

Uranium Concentration (ppm)
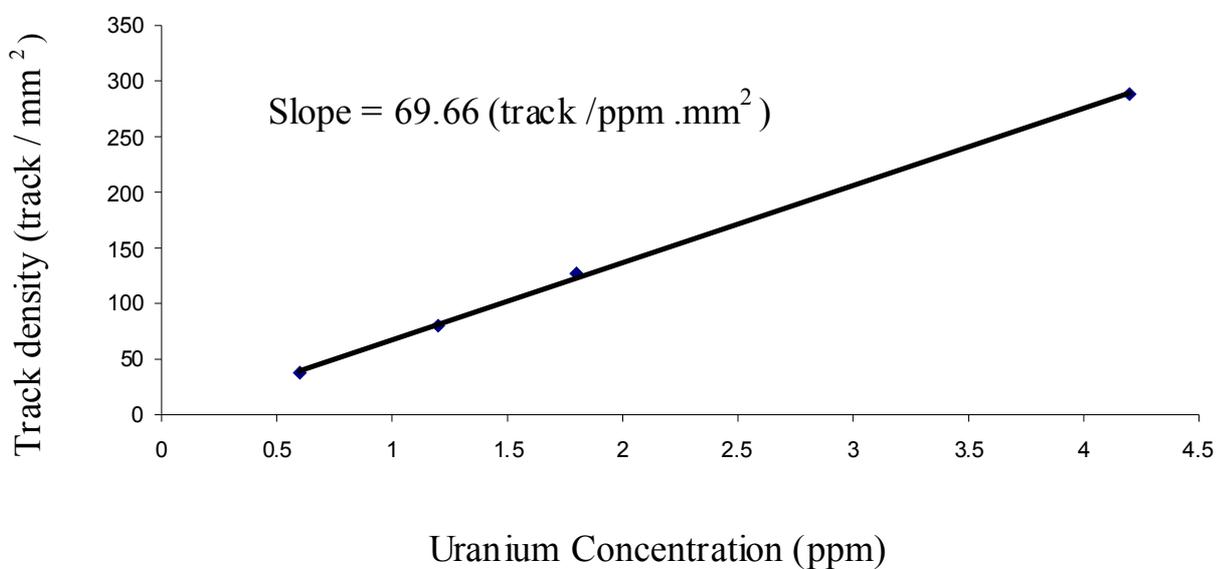
Fig.(2) The relation between track density and uranium concentration for standard samples
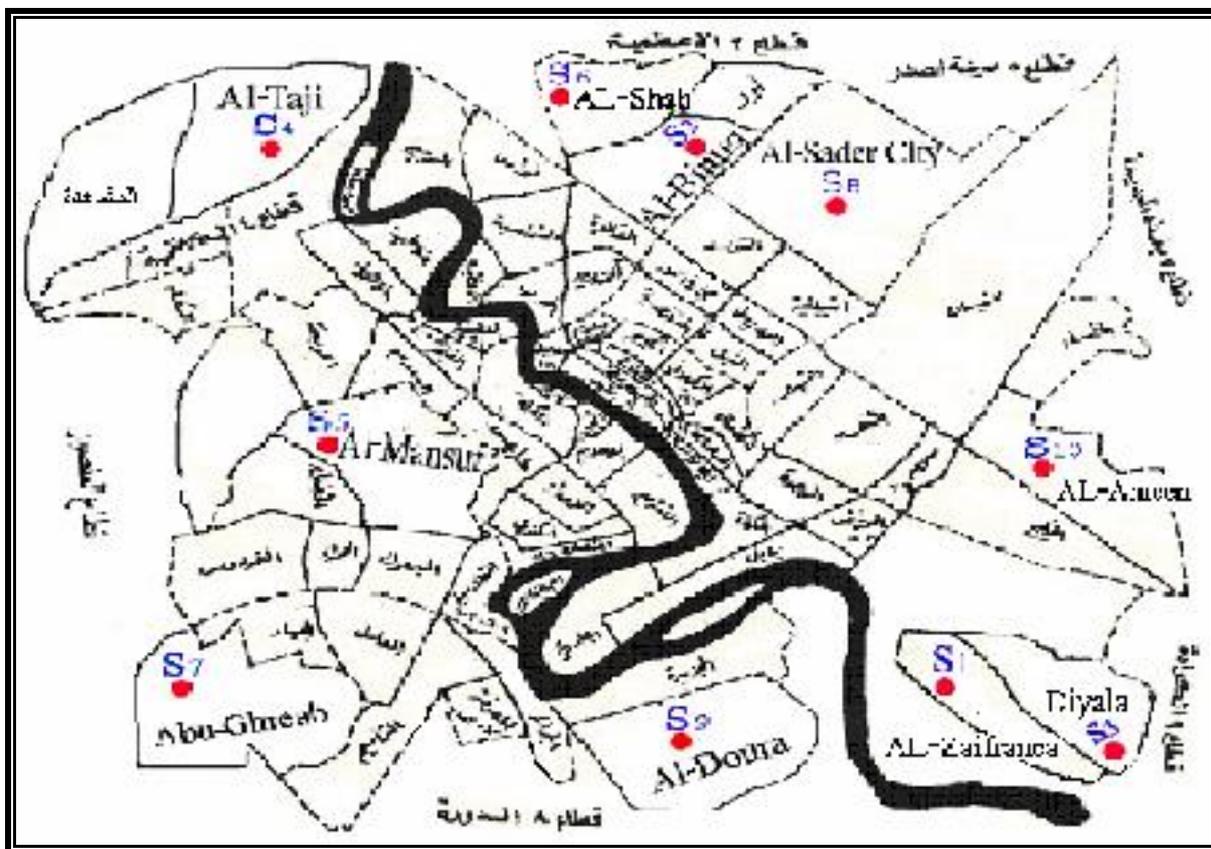
Fig.(3)The locations of collected blood samples from different sites in Baghdad governorate
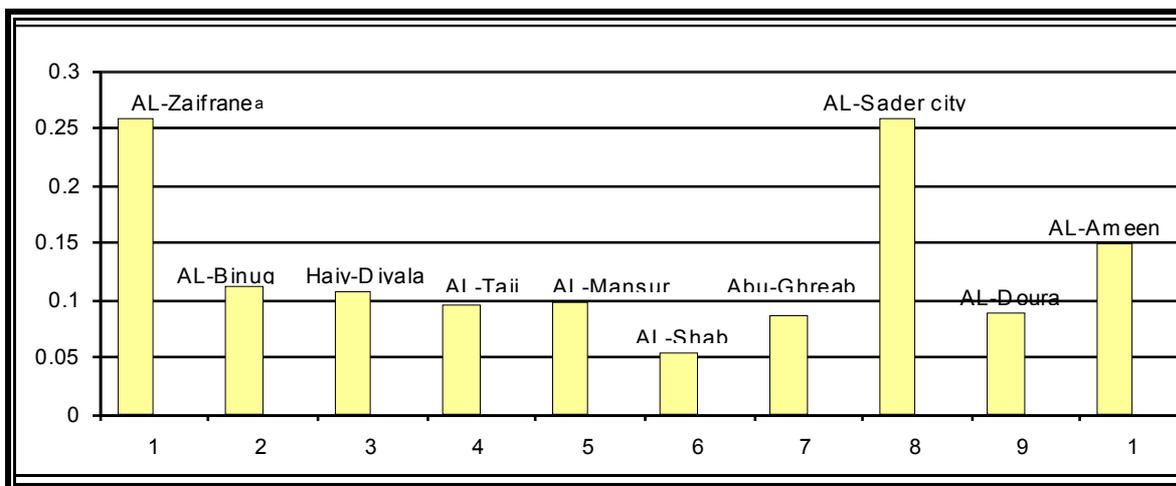
Fig.(4) Maximum and minimum of uranium concentrations (ppm) in blood samples in all regions studies

قياس تراكيز اليورانيوم في الدم البشري لبعض المناطق في محافظة بغداد

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الخلاصة

الهدف من هذا البحث هو ايجاد تركيز اليورانيوم في الدم البشري لبعض المناطق في محافظة بغداد وللتعرف على مدى تلوث لتلك المناطق بعد أحداث الحرب على العراق عام (2003) . أوضحت النتائج التي حصلنا عليها بأن أعلى تركيز لليورانيوم في نماذج الدم كان في منطقة الزعفرانية، و مدينة الصدر،اذ بلغ (0.256 ppm)، بينما كان اقل تركيز في منطقة الشعب حيث بلغ (0.052 ppm) ، اقل تركيز لليورانيوم في نماذج الدم (0.008 ppm) كان لرجل عمره (39) سنة يسكن في منطقة الشعب، بينما أعلى تركيز لليورانيوم في نماذج الدم كان لأمرأة عمرها (55) سنة تسكن في مدينة الصدر .