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Radioactivity Evaluation in Some of Types Powder Baby Milk in Iraqi Market Local

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Abstract--- *The aim of this research is to study different samples of powdered milk used for breast feeding for a group of milk samples available in the local of Iraqi markets. The research has noticed the difference in the composition of the effect for some types of milk. This difference may be due to the nature and characteristics of each sample. Radiation activity was known as alpha decay from uranium 238 series decay. Using a nuclear impact detector SSNTDs (CR-39). The results showed that the highest amount of radon was in the Novalac sample (418.8 Bq.m^{-3}) and the lowest was in the Golden Dialak sample (15.2 Bq.m^{-3}), the highest radium content was in the Novalac sample (23.03 Bq.kg^{-1}) and the lowest was in the Golden Dialak sample (0.83 Bq.kg^{-1}), All values obtained were within the limits allowed globally.*

Keywords--- *Radon, Radium and Baby Milk.*

I. INTRODUCTION

Breast milk is essential for newborn babies. It is the most suitable milk for them because it have many a good many characteristics. It is available at an appropriate temperature, ready to be prepared and always fresh, free of contaminated germs, which reduces the chance of gastrointestinal disease and safe from the first moment of birth. Helps to build the spine, teeth and bones and give the digestive system immunity to resist harmful bacteria that enter the stomach [11]

The infant formula is made from cows milk which has been modified to resemble breast milk, this gives the formula the right balance of nutrients and makes them easy to digest, most babies accept the composition of cow's milk well, but some do not accept it, especially those who are allergic to the proteins found in cow's milk so they need to change several types of milk to find the right milk for them [12]

Most of the milk available in the local market contains many ingredients such as proteins, carbohydrates, sodium, potassium, calcium, magnesium, iron, zinc, manganese, folic acid and a some of vitamins (like vitamin A, D3, E, K1, C, B1, B2, PP, B6, B12). These substances may contain a certain amount of radiation that may be affecting children [7]

Radon is the second main reason after smoking which cause cancer. Due to radon special properties (colorless, tasteless and odorless) it becomes very dangerous, since it is heavier than air, it enters the human lung without feeling it and being converted to a transparent radioactive liquid (polonium) and sticks to the lung walls. It's being a member of U-238 series which ends by Pb-208 daughter and due to its short half-life time (3.82 days) [9].

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When exposure to high concentration of radon for long time causes human tissues cell damages that's increased risk of cancer , radon gas found in dissolve drinking water or through food entering the stomach. That depend on some factors like level of radon concentration, duration of exposure, time of exposure and the individuals smoking habits. [2]

II. EXPERIMENTAL PART

Radiation background has been measured inside the laboratory for the possibility of radioactive nuclides or polluting materials that become a source of radiation due to the radioactivity of the natural earth chains of laboratory materials, walls and laboratory room air, or the presence of radioactive atoms of an industrial source, which radiation activity may interfere with the specific radiation activity on the net radiation activity of the sample studied was measured by placing an empty container (16 cm Length and 4.5 cm radius). nuclear reagent CR-39 (1.5 cm x 1.5 cm) in the down the container cover, face to face with the sample, used in calculating the number of tracks radiation activity of the studied models, sealing and storage for 60 days figure 1.

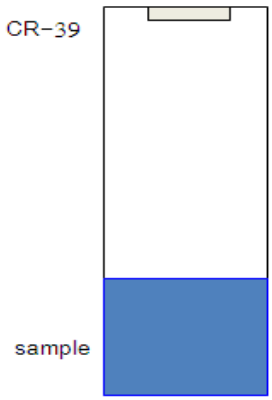

Fig. 1: Container storage

After the time of storage, begin the chemical etching process of the reagents (CR-39) by a water bath (figure 2) using a NaOH solution with a normality of 6.25 N for 6 hours at $70^{o} \pm 1^{o}C$ temperatures and then placing the reagents in an acid solution at a small concentration (5%) for five minutes.

Fig. 2: Show the water bath device

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After this, the detectors is washed with distilled water for five minutes and then leaves for drying in air. To be ready for counting using a optical microscope with a magnification of (600 x) to see and account the effects tracks on the detector. The radiation background is then calculated and subtracted from the radiation activity for each studied model for the purpose of obtaining the net activity radiology.

Radon concentration in (Bqm^{-3}) for samples at secular equilibrium is given by the following equation:

$$\mathbf{C_{Rn} = \rho / \eta T}$$

Where C_{Rn} is concentration of radon in samples (Bqm^{-3}), ρ is the track density (track cm^{-2}), T is the exposure time (day), η is the calibration coefficient of CR-39 detectors obtained from the experimental calibration (0.22 tracks $cm^{-2}day^{-1}/Bqm^{-3}$) [3-8-14].

To calculate the concentration of radium in samples we calculated using the following relation [1-4-6]

$$C_{Ra} = Ah\rho / \eta T_e\, m$$

Where C_{Ra} is the content of radium in ($Bq\ kg^{-1}$), h is the distance between the detector and the top of the sample, T_e is the effective exposure time in hours and given in relation, λ is decay constant of radon gas ($0.1814\ day^{-1}$), A is the area covered by the can (m^2) and T_e is the effective exposure time in hours and given in relation:

$$\mathbf{T_e = T + 1/\lambda\,(e^{-\lambda T} - 1)} \quad [5\text{-}10]$$

Table 1: Showing the values of Radon concentrations and Radium content for investigated milk samples

Number of samples	**Name of sample**	**Thickness of samples (cm)**	**Weight of samples (gm)**	**Concentration of Radon ($Bq.m^{-3}$)**	**content of Radium ($Bq.kg^{-1}$)**
1	Golden dielac	5.2	45.5	15.2	0.83
2	Novalac	5.0	60.0	418.8	23.03
3	Dielac 1	5.1	40.3	34.9	1.91
4	Dielac 2	5.0	55.6	104.7	5.75
5	Almudhish	5.0	48.8	39.4	2.16
6	Similac	5.1	46.6	69.8	3.83
7	Sirilac	5.1	45.2	34.9	1.91
8	Primalac	5.0	50.5	133.2	7.32
9	Bebelac	5.1	51.6	220.1	12.10
10	Aptamil	5.0	50.5	55.0	3.02
11	Kabrita	5.1	51.8	112.0	6.65
12	Quigoz	5.1	56.8	244.5	13.44
13	Liptomilk 2	5.0	58.4	322.2	17.72
14	Biomil	5.0	50.8	188.5	1.36
15	Herobeby	5.0	56.5	200.2	11.01

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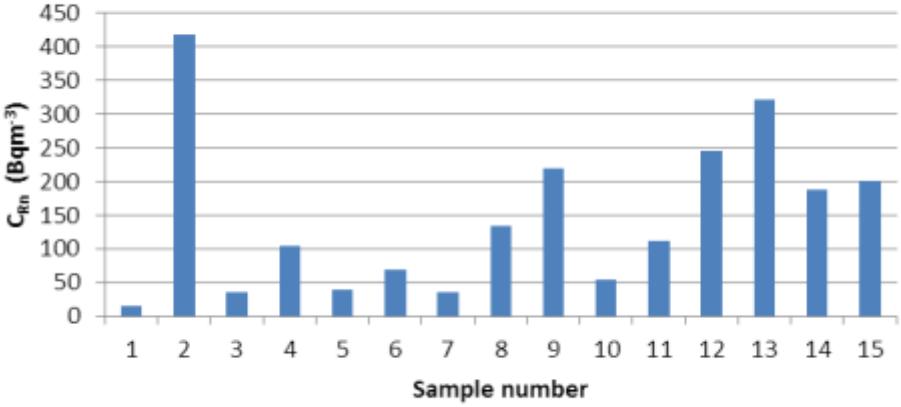

fig. 3 : Radon concentration (C_{Rn}) for samples

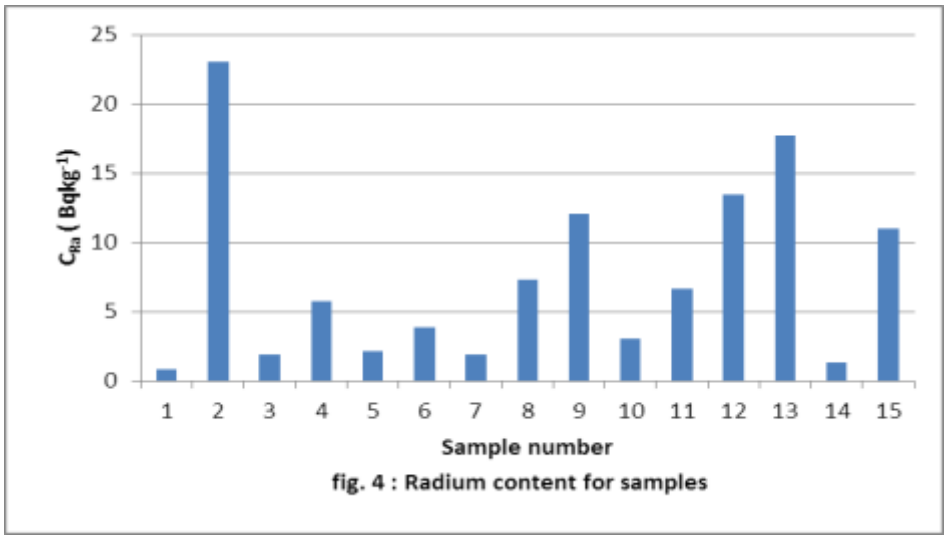

fig. 4 : Radium content for samples

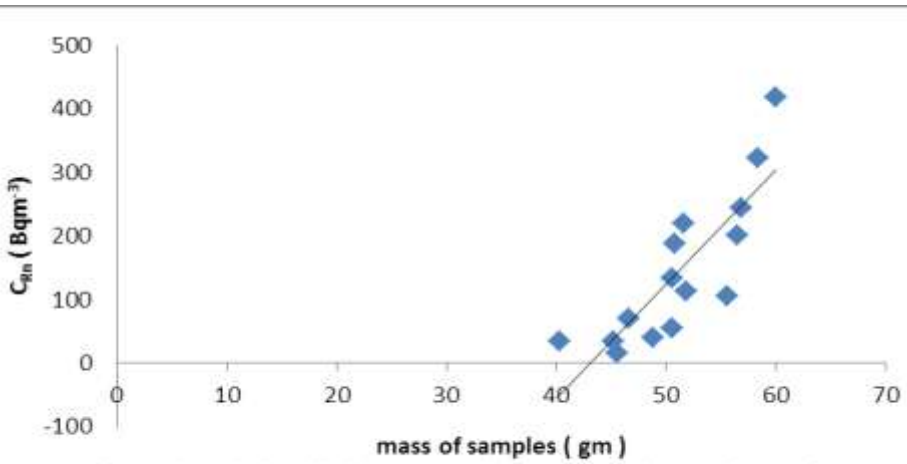

fig.5 : The relationship between radon concentration and mass of samples

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III. CONCLUSION

From the last table -1- , we can say the variations in the values in samples studied for radon concentrations because the difference in the chemical composition form of the samples, it was found that the activity concentrations depend on many physical properties of the sample; like the type of materials internal structure made it samples, the rang of solubility is difficult in water and grains size.

The higher value of radon concentration was 418.8 $Bq.m^{-3}$ in Novalac sample and the lower value was 15.2 Bqm^{-3} in Golden dielac sample, the higher value of radium content was 23.03 $Bq.kg^{-1}$ in Novalac sample and the lower value was 0.83 $Bq.kg^{-1}$ in Golden dielac sample. All samples are allowable of the rang recommendations by limits allowed globally. [2-13]. There are positive relationship between radon concentration (C_{Rn}) and mass of samples.

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