



THE DETECTION OF SOME MINERALS IN INFANT FORMULA AVAILABLE IN LOCAL MARKETS.

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ABSTRACT

This study was conducted in Baghdad Governorate for the period from February to August 2021 for the purpose of investigating the levels of some minerals such as calcium, iron, zinc, copper and lead in powdered infant formula available in local markets and comparing them with the permissible international, Arab and Iraqi levels. The study included the examination and analysis of (10) ten samples of powdered infant formula for different brands: (Similac Gold 1, 2 and 3) (Kikoz 1, 2 and 3) (Dielac 1) and (Novalac Genio and 2). The results showed variations in the concentration of calcium, iron, zinc, copper and lead. The results of these levels in the concentrations of some minerals are than the permissible limits, and thus the above models are suitable for human consumption.

Keywords: - Infant formula, progesterone, testosterone, minerals, heavy metals.

الكشف عن بعض المعادن في حليب الاطفال المتوفر في الاسواق المحلية

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الخلاصة

اجريت هذه الدراسة في محافظة بغداد للفترة من شباط لغاية آب 2021 للتحري عن مستويات بعض المعادن مثل الكالسيوم والحديد والزنك والنحاس والرصاص في حليب الاطفال المجفف المتوفر في الاسواق المحلية ومقارنتها مع المستويات العالمية والعربية والعراقية المسموح بها، اذ تضمنت الدراسة فحص وتحليل (10) عشر عينات من حليب الاطفال المجفف وعلامات تجارية مختلفة هي (سيميلاك جولد 1,2,3) (كيكوز 1,2,3) (ديالاك 1) (نوفالاك جينو و2). وقد اظهرت النتائج تباين في تركيز كل من الكالسيوم والحديد والزنك والنحاس والرصاص وجاءت نتائج هذه المستويات في تراكم بعض المعادن ضمن الحدود المسموح بها وبذلك تكون النماذج اعلاه صالحة للاستهلاك البشري.

الكلمات المفتاحية: حليب الأطفال، البروجسترون، التستوستيرون، المعادن، المعادن الثقيلة.

INTRODUCTION

Milk is the natural secretion of the mammary glands of all mammalians, which meets the nutritional needs of the body better than any other food (Taher & Ali, 2014, Al-Rudha *et al.* 2021). Milk is a vital and important food for human health, as it includes proteins, carbohydrates, fats, minerals and vitamins essential for growth and health maintenance during the three stages of human life, childhood, adolescence and old age (Taher & Ali, 2016; Henoon *et al.* 2020). It provides suitable conditions for rapid growth to build harmonious muscles, bones and endocrine glands, as well as for elderly people, as it represents at this stage a source of basic calcium to maintain bone integrity (Taher & Ali, 2014). Cow's milk naturally contains a number of hormones of protein and steroid origin, which are in low concentrations compared to the contents of mother's milk, but in powdered milk it must be free of hormones and antibiotics according to international, Arab and Iraqi specifications (Hamed 2021). Milk is

also a vital indicator of industrial pollution, as it is considered one of the main sources of danger that threaten human life due to the increase in toxic and dangerous heavy metals in the environment.

With the increase in technological development and the excessive use of these metals in the manufacture of various materials, heavy metals are widely spread in the environment and the level of these toxic metals in milk and milk products depends on the environmental conditions and different manufacturing processes (Al-Rudha *et al.*, 2021; Taher & Ali, 2016). The environment in which we live is deteriorating at an unprecedented rate and this is shown in the pollution of water, air, soil and food chain in the biosphere (Taher & Ali, 2014). Some of these elements are useful and some are harmful. Few of the elements are basic and necessary for the body of the living creature. The problem of milk and its products for heavy metals residues is one of the main challenges and problems that affect the health of the consumer, as lead, copper; nickel and cadmium are heavy metals that have a significant impact on human health. They are considered cumulative toxins that cause cancer, renal failure, anemia and inhibit calcium absorption (Kamel *et al.*, 2015). Which poses a threat to the health of the consumer, so milk represents a good vital indicator of environmental pollution because it can contain different amounts of toxic pollutants, including minerals, as well as hormones and antibiotics (Taher & Ali, 2016). In view of the lack of studies on the detection of some elements in milk in general and infant formula in particular in Iraq, the current study aimed to estimate the levels of residues of calcium, iron, zinc, copper and lead in infant formula available in local markets, which is one of the important foods in Feeding the infant after the importance of mother's milk, which is the food made from animal milk with/or from animal products other than milk or a vegan products that proves the validity of its use for this purpose after modification and manufacturing to be similar to mother's milk and suitable for feeding the infant when breastfeeding is not possible according to distinct specifications from not containing: Heavy metals and permissible proportions of minerals and elements (IQS/1094, 1986). In view of the frequent consumption and import of it, and to ensure the safety and health of the infant, this study was prepared as indicated above.

MATERIALS AND METHODS

Sample collection

Samples of infant formula were collected from local markets in Baghdad governorate for the period from July to August 2021 with different brands as shown in (Table 1). The examination and analysis were carried out in the laboratories of Market Research and Consumer Protection Center / University of Baghdad.

Table (1): Symbol of Milk Sample.

No.	Samples	Symbol
1	Similac Gold1	M1
2	Similac Gold2	M2
3	Similac Gold3	M3
4	Guigoz1	M4
5	Guigoz2	M5
6	Guigoz3	M6
7	Dielac1	M7
8	Dielac	M8
9	Novalac Genio	M9
10	Novalac2	M10

The determination of metal concentration

The concentration of minerals (Ca, Fe, Zn, Cu, Pb) was estimated using a Shimadzu atomic absorption spectrometer AA7000 according to the method of (Anestasio *et al* 2006), where in the beginning the digestion of the samples was carried out according to the above method, and then the minerals were measured in the atomic absorption device in the laboratories of the Market Research and Consumer Protection Center/ University of Baghdad, Iraq.

RESULTS AND DISCUSSION

Label information:

From (Table2), we note the following:

1. **Trademark:** All the study sample bore the trade mark in both Arabic and English language
2. **Producer's name:** 100% of the study sample bears the name and company of the producer
3. **Packaging type:** 90% of the study sample is metallic, while 10% of the sample is cellphone
4. **Packaging Shape:** All study samples are cylindrical in shape
5. **Package capacity:** 40% of the study sample is 800 gm, 50% of the sample is 400 gm, and 10% of the study sample is 300 gm
6. **Batch number:** 100% of the study sample bears the lot number of the product
7. **Country of origin:** All the study sample bears the country of origin, which are international countries
8. **Validity period:** 100% of the study sample carries the validity period, which is within the permissible limits as mentioned (Alsoufi *et al*, 2020 ; Alsoufi *et al*, 2022) .

Table (2): Representation of the indication card data survey for powdered infant formula available in the local markets.

Brand name in Arabic	Brand name in English	Product name	Package type	Package shape	Package size	Batch No.	Provenance	ProdDate	Expiry Date	Notes
سيميلاك جولد1	Similac Gold1	Abbott Ireland, coatehill, co. cavan	Metal	Cylindrical	800 gram	20441 NT 239 00:46	Ireland	25/08/2020	25/02/2022	New & Improved Formula With HMO Free Olean Oil Natural Vitamin E DHA + Lutein
سيميلاك جولد2	Similac Gold2	Abbott Ireland, coatehill, co. cavan	Metal	Cylindrical	800 gram	23302 NT335 13:38	Ireland	29/11/2020	29/11/2022	From birth to 16 months From 6 to 12 months
سيميلاك جولد3	Similac Gold3	Abbott Ireland, coatehill, co.	Metal	Cylindrical	800 gram	23322 NT 335 21:59	Ireland	29/11/2020	29/11/2022	From 1 to 3 years

		cavan								
كيكوز 1	Guigoz 1	Nestlé Nederland	Metal	Cylindrical	400 gram	035203 46AB 15:47	Netherland	12/ 2020	11/ 2022	From birth to 6 months
كيكوز 2	Guigoz 2	Nestlé France	Metal	Cylindrical	400 gram	016908 0661 01:54	France	06/ 2020	11/ 2021	From 6 to 12 months
كيكوز 3	Guigoz 3	Nestlé France	Metal	Cylindrical	400 gram	028508 0664 06:21	France	10/ 2020	03/ 2022	1- 3 years
ديلاك 1	Dielac 1	Abdulkarim Alwan Foodstuff Trading Dubai	Metal	Cylindrical	400 gram	0103- R1-2- 29 B- NO.44	Vietnam	30/10/2 020	29/10/ 2022	Fortified with Vitamins & Minerals from Switzerland (from birth)
ديلاك	Dielac	Vinamilk Vietnam	Silphon	Rectangular	300 gram	AC110 7 16:28 B.NO.0 7	New Zealand	07/ 2021	06/ 2023	Milk for adults and children from New Zealand, rich in vitamin A and D3
نوفالاك جينيرو	Novalac Genio	Novalac Nutrition Products	Metal	Cylindrical	800 gram	135325 10 005025 01:46	France	09/10/2 020	08/04/ 2022	Natural vanilla flavor omega3, omega6 from 1-3 years
نوفالاك 2	Novalac2	Novalac Nutrition Products	Metal	Cylindrical	400 gram	140206 17 052050 12:40	Germany	16/ 03/ 2021	15/09/ 2022	Optimum formula derived from cow's milk from the sixth month

Packaging Shape: All study samples are cylindrical in shape

Metal concentrations

The results of (Table, 3) show that the calcium concentration matches the international, Arab and Iraqi standards. While we note an increase in the amount of iron and zinc in all

samples from the permissible limits, and a decrease in the concentration of copper in (Table, 3), while there are concentrations of lead in all samples except for the Novalac Genio sample that is free from it, and this does not conform to the international, Arab and Iraqi specifications that Indicates that milk samples should be free of lead (IQS/1094/1986).

Through (table, 3), we note that the concentration of calcium Ca is within the permissible limits as indicated by the Iraqi standard No. (5132) for nutritional formula and formula for medical purposes for the infant, as well as the Iraqi standard specification No. (2105) for baby food for the second age stage.

As for the concentration of iron Fe, it is within the limits allowed by the specification of the nutritional composition, as well as the specification of the second age stage.

As for the concentration of zinc Zn, the proportions of this element in all the study sample were within the permissible limits in the relational standard specifications for the first age group of children from the age of one month to six months and the second age group from the age of six months to 12 months.

As for the concentration of copper Cu, it is also within the limits allowed by the two specifications above. As for the concentration of lead Pb, it was within the concentrations determined for heavy metal residues in the presence of the product (IQS/2105/1998; IQS/5132/2020).

Table (3): Conc. of some metals in infant milk.

No.	Samples	Ca Ppm	Fe Ppm	Zn ppm	Cu ppm	Pb ppm
1	Similac Gold 1	86.3874	2.0517	5.6039	0.0869	0.0015
2	Similac Gold 2	99.1450	2.9800	7.6999	0.1522	0.0017
3	Similac Gold 3	101.0352	3.0479	7.0595	0.0940	0.0025
4	Guigoz 1	100.2617	2.3136	8.5628	0.1964	0.0006
5	Guigoz 2	102.3985	2.6421	6.9226	0.1999	0.0018
6	Guigoz 3	99.6768	2.6719	7.4071	0.1717	0.0004
7	Dielac1	98.1637	3.4062	10.8040	0.3924	0.0017
8	Dielac	101.5041	0.5519	4.6195	0.1215	0.0020
9	Novalac Genio	87.6202	1.6255	3.7447	0.0261	0.0000
10	Novalac 2	97.1146	2.5647	6.2121	0.0763	0.0019

CONCLUSION

In this study all the sample of milk is in the allow limits so the results of these levels in the concentrations of some minerals are in the permissible limits, and thus the above models are suitable for human consumption.



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