

# Terms of the introduction of certain food products into the diet of children of the first year of life

Términos de introducción de ciertos productos alimenticios en la dieta de los niños del primer año de vida

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## Abstract

To assess the terms of the introduction of certain foods in the diet of children of the first year of life-based on 5 Children's Clinics in St. Petersburg, an anonymous survey was conducted among 534 mothers whose children received breast milk up to a year and older. The study showed that in most cases, mothers make their children drink water, tea, and juice in the first year of life in target dates. However, a significant number of mothers begin to introduce these liquids into the baby's diet earlier. The first complementary foods -fruit and vegetable puree- most of the children received timely (79.8% and 81.1%, respectively). The second complementary foods (cereal porridge) in 71.5% of cases were introduced in due time and 24.5% - later than term. The third complementary foods (meat puree), as well as other protein products, which include cottage cheese paste, egg yolk, and fish puree, children in most cases received later than term. 24.9% of mothers introduced meat puree, 20.7% - cottage cheese paste, 30.0% - egg yolk and 17.9% - fish puree earlier. Only 35.5% of mothers started to give fermented milk products on time, and 46.8% later. Whole milk in its natural form was received earlier than term by 61.4% of children. Thus, water, juice, tea, fruit and vegetable puree, as well as cereal was introduced into the diet of the child in the recommended time, and meat puree, cottage cheese paste, egg yolk, dairy products, fish puree and whole milk later than the established period.

**Keywords:** food, juice, puree, baby.

## Resumen

Con el fin de evaluar los términos de la introducción de ciertos alimentos en la dieta de los niños del primer año de vida sobre la base de 5 clínicas infantiles en San Petersburgo, se realizó una encuesta anónima entre 534 madres cuyos hijos recibieron leche materna hasta un año y más. El estudio mostró que, en la mayoría de los casos, las madres hacen que sus hijos beban agua, té y jugo en el primer año de vida en las fechas previstas. Sin embargo, un número significativo de madres comienzan a introducir estos líquidos en la dieta del bebé antes. Los primeros alimentos complementarios -puré de frutas y verduras- la mayoría de los niños recibieron oportunamente (79.8% y 81.1%, respectivamente). Los segundos alimentos complementarios (papilla de cereales) en el 71,5% de los casos se introdujeron a su debido tiempo y el 24,5%, más tarde que el término. Los terceros alimentos complementarios (puré de carne), así como otros productos proteicos, que incluyen pasta de queso cottage, yema de huevo y puré de pescado, en la mayoría de los casos, los niños reciben más tarde. 24,9% de las madres introdujeron puré de carne, 20,7% -pasta de queso cottage, 30,0% -yema de huevo y 17,9%- puré de pescado antes. Solo el 35,5% de las madres comenzaron a dar productos lácteos fermentados a tiempo, y el 46,8% más tarde. El 61,4% de los niños recibió leche entera en su forma natural antes del término. Por lo tanto, el agua, el jugo, el té, el puré de frutas y verduras, así como el cereal, se introdujeron en la dieta del niño en el tiempo recomendado, y el puré de carne, pasta de queso cottage, yema de huevo, productos lácteos, puré de pescado y leche entera más tarde que el periodo establecido.

**Palabras clave:** comida, jugo, puré, bebé.

## Introduction

Children's age is distinguished, first of all, by the processes of intensive growth and development<sup>1,2</sup>. Rational nutrition of the child plays a key role in this and contributes to the formation of resistance of the child's body to the effects of infections and other adverse environmental factors<sup>3</sup>. There is no doubt

that the optimal nutrition for infants is the mother's milk<sup>4</sup>. It is a source of all easily digestible nutrients and biologically active compounds necessary for a child<sup>5,6,27</sup>. In recent years, there was a positive trend in increasing the proportion of children who are naturally fed from 3 to 6 months<sup>7,8,9</sup>, which is most

likely due to the introduction of the “National program for optimizing the feeding of children of the first year of life in the Russian Federation” in the territory of the Russian Federation in 2009. But at the same time, the proportion of children who are breastfed at the age of 6-12 months, after the jump in 2011, did not show significant dynamics, which is clearly shown in figure 1.

The World Health Organization (WHO) recommends continued exclusive breastfeeding for children up to 6 months, and to start later with complementary feeding.<sup>10</sup> In the second semester of the first year of life, the child begins to move actively, so his body requires additional energy and nutrients<sup>11</sup>. Accordingly, the introduction of complementary foods becomes necessary for normal psychomotor and physical development.

The recommendation to maintain exclusive breastfeeding for the first six months of age is supported because it promotes optimal growth and prevents comorbidities, influences cognitive development, and recent findings show that it participates in the early prevention of chronic diseases. However, considering renal, immunological, gastrointestinal, and neurological development, it is recommended initiating the introduction of complementary food between weeks 17 and 26.

Complementary foods are the introduction to the diet of any food different from breast milk or artificial mixture that ensures the growth and proper development of the child. The timing of the introduction of complementary foods is set individually for each child, taking into account the peculiarities of the development of the digestive system, the excretory organs, the level of metabolism, as well as the degree of development and functioning of the central nervous system, that is, his readiness to perceive new food<sup>12,13</sup>. According to modern ideas, the introduction of the first products can be started as early as 4 months and as the first complementary foods, as a rule, fruit or vegetable puree is used. Then the second complementary foods are introduced - cereal (porridge). As a third complementary food, according to experts in the field of baby food, it is advisable to use meat puree<sup>14,15</sup>. In this case,

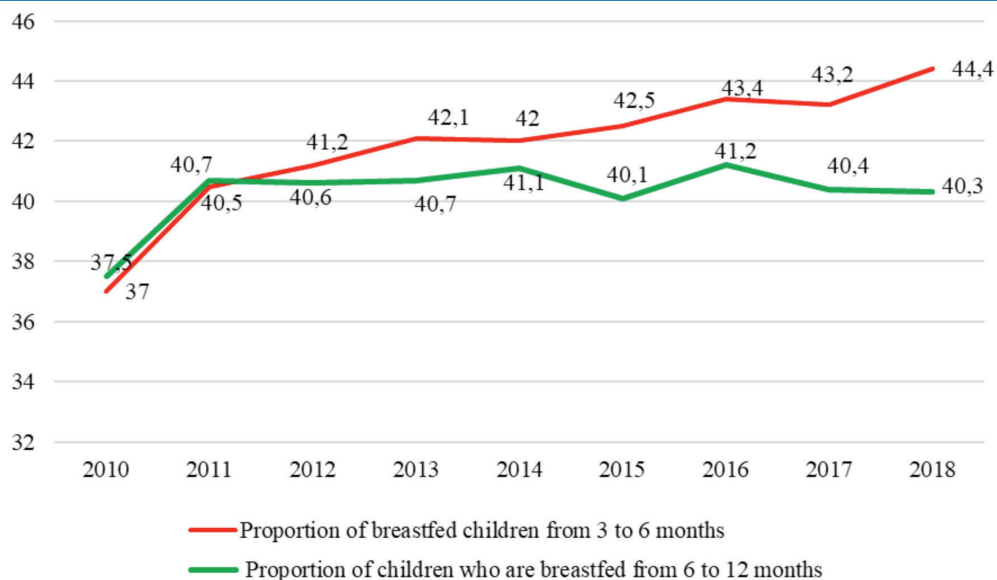
feeding exclusively with breast milk should be left in the first and last feeding<sup>16, 17, 18</sup>.

When assigning complementary foods they should adhere to the following rules:

- The introduction of each new product begins with a small amount, gradually (5-7 days) increasing to the required volume; at the same time, they monitor carefully the tolerability of the introduced product.
- The new product (dish) should be given in the first half of the day, to mark the possible reaction to its introduction.
- Vegetable complementary foods begin with one type of vegetables, then they gradually introduce other products of this group. The introduction of fruit purees and cereals also begins with monocomponent products.
- Complementary foods are given with a spoon, before breastfeeding or infant formula.
- New products are not introduced if the child is sick, as well as during the period of preventive vaccinations<sup>19</sup>.

The timing of the introduction of complementary foods has a significant impact on the child's body<sup>20</sup>. The introduction of complementary foods earlier than 4 months of life contributes to the development of functional disorders of the digestive tract in a child (constipation, vomiting, regurgitation, intestinal colic, etc.). Also, the child's body, not adapted to the use of other food, can respond with the development of food sensitization. However, late complementary foods can also cause a negative reaction of the body, which can lead to pathological conditions, the occurrence of which is associated with a deficiency of nutrients, vitamins, and trace elements; contribute to the violation of the consumption of semi-liquid and thicker food<sup>21,22</sup>. Accordingly, the study of the timing of the introduction of certain foods in the diet of children in the first year of life is an urgent topic for research. Thus we conducted the assessment of the timing of the introduction of certain foods in the diet of children in the first year of life.

Figure 1. Dynamics of the specific weight of children who are breastfed from 3 to 6 months and 6 to 12 months in 2010-2018 in the Russian Federation (expressed in %)



## Materials and Methods

The study was conducted based on 5 children's polyclinics (departments) of St. Petersburg by random sampling. According to a specially developed form "Questionnaire of the mother of a one-year-old child", an anonymous survey was conducted of 534 mothers whose children received breast milk up to a year and older. The majority of mothers were 20-34 years old (84.6%). 15-19 year old women were 8.7%, 20-24 year old -20.6%, 25-29 year old -36.4%, 30-34 year old -27.6%, 35-39 year old -5.8% and 40 year old and older-0.9%. The average age of the respondents was  $26.3 \pm 0.09$  years. The mother independently filled out the questionnaire after children visited local pediatricians or specialist doctors during the medical examination provided by the Order of Ministry of Healthcare after the child reaches 1 year<sup>23</sup>. Mathematical data processing was carried out using Microsoft Excel and the statistical software package PASW STATISTICS.

## Research results and their discussion

In the guidelines of the World Health Organization "Feeding and nutrition of infants and young children" for the European region, it is noted that a child with breast milk receives the amount of fluid that he needs. Accordingly, there is no need to introduce additional fluids, as they replace more saturated and rich in various nutrients breast milk, thereby preventing

breastfeeding. Giving liquids can lead to the child's dyspeptic disorders. Experts in the field of baby food do not recommend giving the child water and other liquids, except breast milk, up to six months<sup>24</sup>. However, many pediatricians believe that it is possible to give child water from three months of life. The survey showed that 76.4% of mothers started to give to the infant drinking water earlier than 3 months, and 23.6% at the optimal time. Terms of separate liquids and products in a diet of the child are presented in the introduction of Table 1.

Half of the mothers started giving the baby juice at 4-6 months, as recommended by pediatricians and nutritionists (50.8%). About a third of women (36.1%) began to give the child juice later than the recommended time, and earlier 13.1% of respondents.

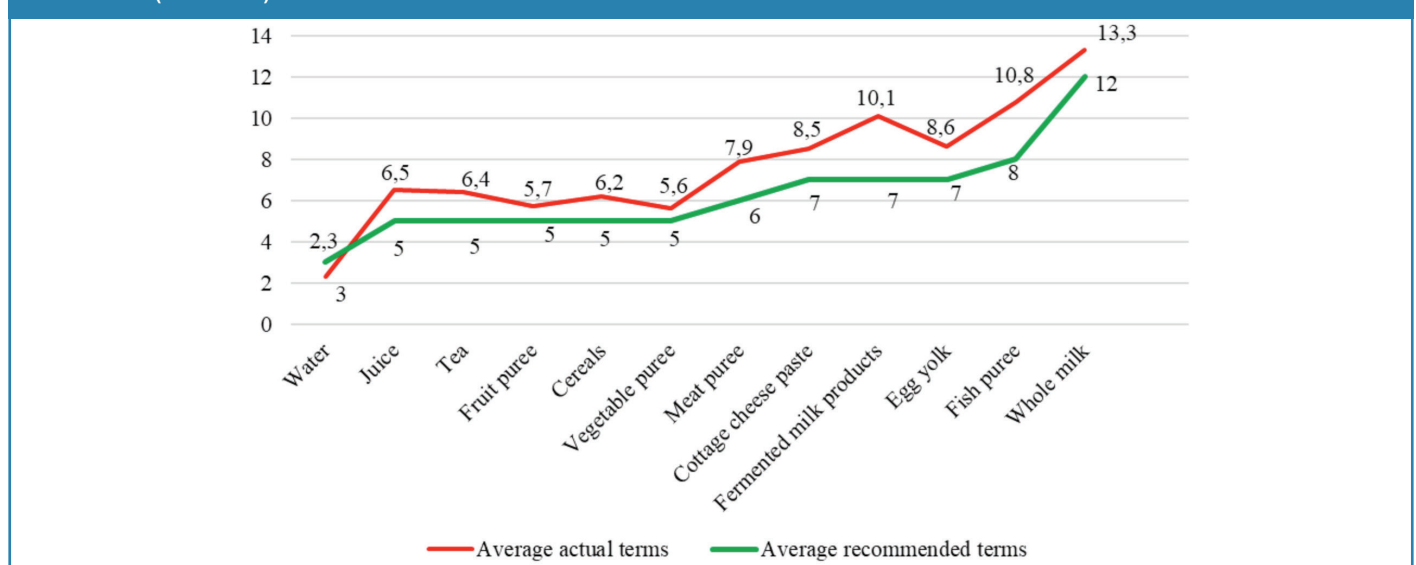
The majority of mothers began to give the child tea (herbal decoctions) in the prescribed period of 4-6 months (42.1%), 21.9% of women participating in the survey gave the child tea earlier, and later 36.0%.

Thus, it was found that on average, respondents began to give child water in  $2.27 \pm 0.11$  months, juice in  $6.52 \pm 0.10$  months and tea (herbal decoctions) in  $6.40 \pm 0.10$  months. A comparative analysis of the actual and recommended average timing of the introduction of certain liquids and products in the diet of the child is presented in figure 2.

**Table 1. Terms of introduction of separate liquids and products in a diet of the child (expressed in % to total)**

Type of complementary foods, product	Up to 3 months inclusive	4-6 months	7 months	8 months	9-12 months	After 12 months	Total
Water	76,4	20,1	3,5	-	-	-	100,0
Juice	13,1	50,8	33,1	2,4	0,6	-	100,0
Tea	21,9	42,1	32,8	2,8	0,4	-	100,0
Fruit puree	1,5	79,8	7,4	8,2	3,1	0	100,0
Vegetable puree	2,1	81,1	12,3	0,5	2,0	2,0	100,0
Cereals	4,0	71,5	15,9	5,5	1,9	1,2	100,0
Meat puree	0,0	24,9	13,7	31,2	30,2	0,0	100,0
Cottage cheese paste (cottage cheese)	0,6	20,1	11,5	22,8	41,1	3,9	100,0
Egg yolk	0,6	29,4	10,6	18,3	34,4	6,7	100,0
Kefir and dairy products	3,4	8,1	6,3	35,5	34,1	12,6	100,0
Fish puree	0,0	6,9	4,1	17,9	64,9	6,2	100,0
Whole milk	3,6	7,2	2,4	0,6	47,6	38,6	100,0

**Figure 2. The actual average and recommended timing of the introduction of separate liquids and products in the diet of the child (in months)**



According to the general recommendations, it is advisable to start the first complementary foods with fruit puree not earlier than 4 months of the child's life. Then vegetable and grain products are introduced into the diet. However, several deviations in the timing of the introduction of complementary foods, in the form of a later introduction of puree, taking into account the changed ideas about optimal nutrition, has a positive character. Several experts in the field of baby food believe that it is advisable to give vegetables at the beginning and only then fruits<sup>25</sup>. Most mothers who participated in the study began to give fruit puree at 4-6 months (79.8%). Before the recommended terms, 1.5% of women introduced puree and later 18.7%. The average time of the introduction of fruit complementary foods was  $5.74 \pm 0.12$  months.

Vegetable puree is the primary source of vegetable protein, carbohydrates, vitamins, trace elements, and dietary fiber. As can be seen from Table 1, the majority of mothers began to introduce vegetables at the recommended time (81.1%). 2.1% of women fed the child vegetable puree earlier, and later 19.6%. On average, mothers gave the child a vegetable puree at  $5.68 \pm 0.10$  months.

Grain product (cereals) is of great importance among the various types of complementary foods. Cereals are high nutritional value and a source of almost all elementary substances, such as proteins, fats, carbohydrates and all kinds of vitamins. Grain product is the second complementary foods, which is introduced about a month after the first. Following the recommendations of pediatricians and nutritionists, 71.5% of respondents gave second complementary food to their child in the optimal time, but 4.0% of women began to introduce it before 4-6 months, and 24.5% after 7 months. Average terms of the beginning of the use of grain porridge by the child made  $6.15 \pm 0.09$  months.

Meat puree and cottage cheese paste (cottage cheese) are not introduced into the diet earlier than 5.5 months. Meat complementary foods are the main source of protein of animal origin and many other trace elements. The most optimal timing of feeding meat puree is considered 7 months, in which 13.7% of mothers began its introduction. Earlier this term, it was given by 24.9% of women, and later 61.4%. Cottage cheese and egg yolk is also advisable to introduce no earlier than 7 months. These products are an essential resource of milk protein and fat, as well as more than 20 trace elements and vitamins A, B and D. Cottage cheese paste (cottage cheese) in the optimal time was introduced by 11.5% of mothers, earlier 20.7% of women, and later 67.8%. 10.6% of mothers gave their children egg yolk in 7 months, earlier 30.0%, and later 59.4%. On average, mothers began to give the child meat puree in  $7.88 \pm 0.10$  months, cottage cheese paste (cottage cheese) - in  $8.50 \pm 0.07$  months, egg yolk -  $8.59 \pm 0.08$  months.

The subject of discussion of experts in the field of baby food is the late assignment of meat puree (often from 8-9 months), as well as a later introduction to the diet of cottage cheese and egg yolk. The introduction by mothers who participated in the study, of meat puree, cottage cheese and yolk later than

the terms, according to some authors of the study, can be considered appropriate and justified<sup>26</sup>.

Fermented milk products – this is an important part of the diet, but these complementary foods are not recommended to be introduced earlier than eight months of age, as these products can adversely affect the child's body. 35.5% of women started to give fermented milk products on time, 17.7% of mothers introduced them earlier, and 46.8% later. The average time of introduction of kefir and fermented milk products was  $10.10 \pm 0.12$  months.

Fish is a source of protein and various amino acids, B vitamins, phosphorus, and calcium. Fish begin to introduce into the diet of children from the age of eight months with caution, taking into account that an allergic reaction can develop. The fish puree was given to children from eight months by 17.9% of mothers, before this period 11.0% of women, and later 71.1%. Mothers began to introduce fish into the diet at an average of  $10.75 \pm 0.11$  months.

Whole milk according to modern recommendations in its natural form should not be present in the diet of children under one year. However, only 38.6% of the respondents followed the prescription. The average timing of the beginning of the use of whole milk by a child was  $13.32 \pm 0.09$  months.

It was found that there is no statistically significant difference between the actual and recommended timing of the introduction of water, juice, tea, fruit puree, vegetable puree, and cereal porridge, that is, the timing corresponds to the optimal. The presence of a statistically significant difference between the actual and recommended timing of the introduction of meat puree, cottage cheese paste, egg yolk, dairy products, fish puree, and whole milk confirmed the introduction into the diet of these products later than the optimal timing.

## Conclusions

1. Mothers in most cases begin to give the child water in the first year of life in due time. However, a significant number of mothers introduce liquids into the child's diet earlier than the recommended period.
2. The first complementary foods about 80% of mothers introduced on time. The second complementary foods 71.5% of children were given in due time, and 24.5% - later. The third complementary foods (meat puree), as well as other protein products, which include cottage cheese paste, egg yolk and fish puree, mothers in most cases introduced later than term. Meat puree was introduced earlier by 24.9% of mothers, cottage cheese paste (cottage cheese) – 20.7% of women, egg yolk - 30.0%, and fish puree - 17.9%.
4. Dairy products, including kefir, fermented milk products, and whole milk, most mothers did not introduce in a timely manner. Only 35.5% of mothers started to give fermented milk products on time, and later 46.8%.

Whole milk in its natural form was introduced earlier than the term by 61.4% of mothers.

Thus, water, juice, tea, the first and second complementary foods were introduced into the child's diet in the recommended time, and meat puree, cottage cheese paste, egg yolk, dairy products, fish puree and whole milk later than the established dates, which was confirmed by this study.

## References

1. World Health Organization. Levels and trends in child mortality. Geneva, 2012; 32.
2. Ivanov D.O., Moiseeva K.E., Shevtsova O.G., Kharbediya Sh.D., Berezkina E.N. Descriptive and analytical statistics of particular predictors of infant mortality. *International Journal of Pharmaceutical Research*. 2019; 1<sup>11</sup>: 873-878.
3. Yurev V. K., Yureva, V. V., Moiseeva K.E. Some aspects of organization of nutrition of children of early age. *Modern problems of science and education*. 2017; 6: 25-33.
4. Yurev V.K., Moiseeva K.E., Kharbediya Sh.D., Alekseeva A.V., Berezkina E.N., Orel V.I. Some aspects of the evaluation of the breast feeding organization in obstetric hospitals and children's clinics. *Revista Latinoamericana de Hipertension*. 2019; 14<sup>3</sup>: 246-250.
5. Maastrup R. et al. Breastfeeding progression in preterm infants is influenced by factors in infants, mothers and clinical practice: the results of a national cohort study with high breastfeeding initiation rates. *PLoS One*. 2014; 9<sup>9</sup>. Article ID e108208.
6. Yurev V.K., Moiseeva K.E., Alekseeva AV. Main reasons for refusals from breastfeeding. *Social aspects of health*. 2019; 65<sup>2</sup>. URL: <http://vestnik.mednet.ru/content/view/1059/30/lang.ru/> DOI: 10.21045/2071-5021-2019-65-2-5 (access date: 10.10.2019).
7. The main indicators of mother and child health, the activities of the child protection and maternity services in the Russian Federation in 2014. URL: <https://mednet.ru/images/stories/files/CMT/materinstvo2015.pdf>. (access date: 08.10.2019).
8. The main indicators of mother and child health, the activities of the child protection and maternity services in the Russian Federation in 2016. URL: <https://mednet.ru/images/stories/files/statistika/maternity2017.doc>. (access date: 08.10.2019).
9. The main indicators of mother and child health, the activities of the child protection and maternity services in the Russian Federation in 2018. URL: [https://mednet.ru/images/materials/statistika/13!\\_osnovnye\\_pokazateli\\_zdorovya\\_materi\\_i\\_rebenkadeyatelnostj\\_sluzhby\\_ohrany\\_detstva\\_i\\_rodovspomozheniya\\_2018.doc](https://mednet.ru/images/materials/statistika/13!_osnovnye_pokazateli_zdorovya_materi_i_rebenkadeyatelnostj_sluzhby_ohrany_detstva_i_rodovspomozheniya_2018.doc). (access date: 08.10.2019).
10. National infant and young child assessment tool: practices, policies and programmes. 2003; 34.
11. Why invest, and what it will take to improve breastfeeding practices? Rollins, Nigel C et al. *The Lancet*, Volume 387, Issue 10017, 491 – 504.
12. Bulatova E.M., Bogdanova N.M. Shabalov A.M., Razheva V.A., Gavrina I.A. Complementary foods – an important component of the child's diet: the impact on health and ways to optimize. *Pediatrician*. 2018; 9<sup>2</sup>: 22-29.
13. Ivanov D.O. Guide to Perinatology. SPb.: Informnavigator. 2015; 1216.
14. Kon I.Ya., Gmshinskaya M.V., Abramova T.V. Features of introduction of complementary foods based on fruits and vegetables in the diet of children at risk for food allergies and / or having allergies. *Russian Journal of Perinatology and Pediatrics* 2012; 6:102-106.
15. Makarova S.G. Practical recommendations for the introduction of complementary foods. *Pediatric pharmacology*. 2015; 12<sup>6</sup>: 697-704.
16. Dobbins B. R. The real costs of prematurity. *Breastfeeding Medicine*. 2011; 6<sup>5</sup>: 287.
17. Victora C.G., Bahl R, Barros A.J.D., França G.V.A, Horton S., Krasevec J., et al. Breastfeeding in the 21st century: epidemiology, mechanisms, and lifelength effect. *Lancet*. 2016; 387: 475–490.
18. Agosti M, Tandoi F, Morlacchi L, Bossi A. Nutritional and metabolic programming during the first thousand days of life. *Pediatr Med Chir*. 2017; 39<sup>2</sup>: 157
19. The national program of optimization of feeding of children of the first year of life in the Russian Federation. M., 2019. 64p.
20. Kharbediya Sh.D., Moiseeva K.E., Alexandrova M.N. Medical and social characteristics of families having children with chronic diseases. *Modern problems of science and education*. 2017; 3: 45-52.
21. Ventura A.K., Worobey J. Early influences on the development of food preferences. *Curr Biol* 2013; 23<sup>9</sup>: 401-408.
22. Fewtrell M., Bronsky J., Campoy C. Complementary Feeding: A Position Paper by the European Society for Paediatric Gastroenterology, Hepatology, and Nutrition (ESPGHAN) Committee on Nutrition. *J Pediatr Gastroenterol Nutr* 2017; 64 1: 119-132.
23. Order of the Ministry of Health of the Russian Federation dated 10.08.2017 No. 514N "On the procedure for preventive medical examinations of minors". Access mode: <https://rg.ru/2012/08/22/minzdrav-prikaz514n-site-dok.html> (Access date: 08.10.2019).
24. Pyryeva E.A., Safronova A.I., Gmshinskaya M.V. New products in the nutrition of young children and their role in the formation of eating behavior. *Russian Journal of Perinatology and Pediatrics*. 2019; 64<sup>1</sup>: 130-135.
25. Medrazhevskaya Ya.A., Fick L.A. Comparative analysis of awareness in modern moms on the rules of introduction of complementary foods. *Universum: medicine and pharmacology*. 2018; 8<sup>53</sup>: 4-6.
26. Bogdanova N.M., Bulatova E.M., Razheva V.A., Gavrina I.A. Role of complementary foods in the formation of proper eating behavior in children of the first year of life. *Issues of Modern Pediatrics*. 2016; 15<sup>1</sup>: 82–86.
27. Naronova N.A., Surnina E.A., Cheraneva Yu.A. Estimation of the values of the immunity and viscosity of dairy mixtures in different types of water. *International Journal of Medicine and Psychology*. 2019. Vol. 2. Issue 4. P. 43–46.