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FLOUR AND CONFECTIONERY PRODUCTS FOR CHILDREN. REQUIREMENTS FOR QUALITY AND SAFETY INDICATORS

Summary. The issue of safety and quality of children's and general nutrition products has gained great importance among doctors of pediatricians, doctors of narrow specialization, scientists of various fields of science, as well as in domestic and international trade. The proposed range of flour and confectionery products for children is diverse. Domestic and foreign manufacturers offer products that are packaged in colored consumer packaging that interests the child. Behind such a marketing move are "hidden" components that are used in production and have a negative effect on the body of both a child and an adult.

The quality of products intended for children's nutrition is first of all a list of product properties that are able to satisfy the physiological needs of the child's body in food products, based on their chemical composition and energy value.

The results of research on raw materials and components, which are advisable to use in the production of flour and confectionery products for children, are presented. The negative or positive effect of products on the child's body has been established. The results of the research will form the basis of the development of regulatory and technological documents for the production of fundamentally new products for children.

Key words: candies, confectionery, cookies, flour, quality, safety, snacks, structure, texture.

According to the current cooperation documents signed by the Governments of China and Ukraine, international cooperation in the field of ensuring the proper quality and safety of baby food products is allowed,



which is carried out by participating in the work of international organizations, concluding international agreements on the development of new types of baby food products and promising technologies of its production, harmonization of requirements for the quality and safety of healthy food with relevant international requirements, exchange of information on measures used to ensure the quality and safety of baby food, including issues of implementing a risk analysis system at enterprises and control (regulation) at critical points (HACCP) [1-4].

Nutrition is one of the most important factors affecting the health of the population. It ensures the normal development of children, contributes to the prevention of diseases, prolongation of life and creates conditions for adequate adaptation of a person to the natural environment. Therefore, the issue of children's healthy nutrition is one of the most important in the implementation of the state's social policy. A successful solution to the problem of child nutrition depends on the creation of conditions for the production of high-quality and safe food products.

Food is the only source of vital substances: proteins, fats and carbohydrates, minerals, trace elements and vitamins necessary for the growth and formation of the child's body. Proper nutrition contributes to an active life and resistance of the body to the adverse effects of the external environment. Thanks to the breakdown products of food substances through complex chemical transformations in the body, there is a continuous synthesis of proteins and protein substances, lipids, carbohydrates, mineral and other complex compounds, necessary to ensure the stability and renewal of morphological structures, the formation of functionally active compounds - enzymes, hormones.

A constant volume of energy is required for the implementation of synthesis processes. Energy exchange, one of the main manifestations of vital activity, thanks to which growth and development is carried out, high orderliness of exchange processes and functional organization of biological systems is ensured. The body receives the energy it needs, which is formed during the breakdown of carbohydrates and fats, to a lesser extent, proteins, which are used in the body, mainly as a building material for each cell, the basis for chemical processes and plays one of the key roles in the immune system.

The age of the child affects the required amount of energy. The younger the child, the greater the influx of energy required to cover the energy costs associated with its intensive growth, development, metabolism and maintenance of basic vital functions. Due to the functional immaturity of the central nervous system and a number of other organs and systems, the high tension of general processes, the child's growing body quickly reacts to a lack or excess in the nutrition of certain food substances due to a change in the most important functions - a violation of physical and mental

development, a disorder of the functioning of organs that carry the main functional burden of ensuring homeostasis, weakening natural and acquired immunity. Therefore, nutrition should correspond to the composition, quantity and quality of all components - proteins, fats, carbohydrates, mineral salts, micro-elements and vitamins to the age-related physiological needs of the child's body. All food substances, according to their role in the body, are divided into two groups: essential and replaceable. It is known that essential nutrients are those that cannot be synthesized in the body at all or are synthesized in an amount insufficient to satisfy the need for them. Proteins, vitamins, some fatty acids (polyunsaturated), minerals and water are essential nutrients.

The World Health Organization (WHO) in its own research on the state of health of people in the world [5]. notes the interrelationship of the influence of the quality and safety of nutrition on the occurrence of a number of diseases that gradually transition into a chronic phase, fig. 1.

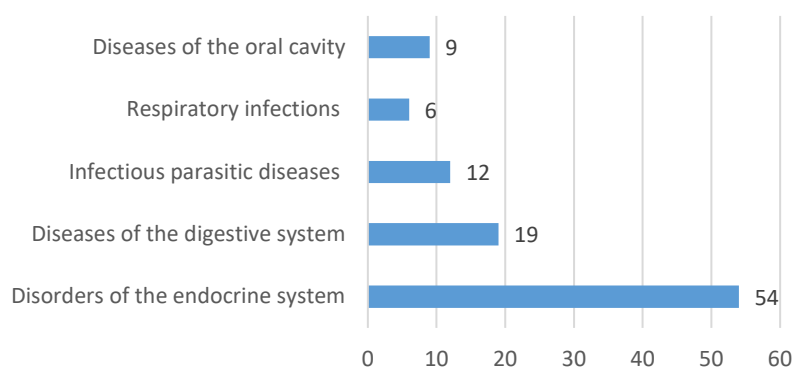


Figure 1. The influence of nutrition on the development of diseases in children and adolescents, %.

Scientists in the field of nutrition note that improper feeding of children leads to obesity, caries, and disruption of the proper functioning of the entire body. At the same time, lack of physical activity and negative eating habits affect the development of cardiovascular diseases and diabetes. It should be noted that negative effects are observed in children and adolescents of different ages regardless of skin color, social status, etc. [6 - 8].

The most common problem in the whole world is a disease of the endocrine system - obesity. Consumption among children of harmful foods, junk food (chips, salty crackers, sweet snacks, pizza) has increased, which has led to a significant increase in energy consumption due to "empty" calories. Over a significant period, the total daily energy consumption of children aged 2 to 6 years increased by 109 kcal (from 1475 to 1584). The epidemic level of childhood obesity is a big problem. However, in many cases, obesity can be prevented by the presence of specialized foods in the diet [7].



World experience shows that the so-called "snack" products with a low content of fats and added sugars should become alternative products for snacks for children and teenagers in the near future: cookies with a high fiber content and low fat and sugar content, whole grain cereal bars; low-fat snacks with low salt content, without preservatives and with natural flavors and colors.

Pediatricians and nutritionists have studied the potential impact of candy consumption on health risk factors in children and adults. Effects on body weight and disease risk indicators such as blood pressure, cholesterol and blood glucose levels have been studied. Evidence from cross-sectional studies challenges the notion that candy consumption is associated with an increased risk of cardiovascular disease or obesity in children and adults.

It has been established that moderate consumption of dark chocolate or cocoa can have a positive effect on health. This conclusion was based on a review of a significant amount of published research on the effects of cocoa on human cardiovascular function. A small amount of cocoa or chocolate consumption is associated with a number of positive effects on the state of the cardiovascular system. Clinical trials have confirmed short-term cardiovascular effects from consuming products rich in cocoa flavonoids.

In the production of flour and confectionery products for children, a wide range of components is used, which are not always useful and safe.

One of the main ingredients of confectionery products is fat. It participates in the formation of the characteristic structure of the product and its sensory characteristics included in the composition of the products.

The presence of fat in the product affects the shelf life of the product, rheological properties (softness, texture, structural integrity), technological properties (retention of air bubbles, heat exchange dough preparation, increase in shelf life) During the production of most types of flour confectionery, there is fat in which increased content of saturated fatty acids. Saturated fat consumption is believed to be associated with an increased risk of cardiovascular disease. Scientists in the field of nutrition and medicine recommend the desired consumption of fats in the amount of about 30% of the total caloric content of the diet. Saturated fats can account for no more than one third of them. It has been proven that the risk of cardiovascular diseases is reduced when replacing saturated fatty acids (FA) in food products with polyunsaturated (PAFA) with a sufficient amount of omega-3-PAFA and monounsaturated fatty acids (MAFA). Epidemiological studies carried out in a number of countries have proven a direct connection of trans isomers of fatty acids, the main source of which is hydrogenated fats, with cardiovascular diseases, breast cancer, shortening of the pregnancy period, disorders of the nervous system and vision in children, oncological diseases of the colon intestines, diabetes, obesity and allergies [6, 7].



It should be noted that the quality of the used fat significantly affects the nutritional value of the finished product, shelf life and stability during storage. During production, it is necessary to carry out input control on the main indicators of fat safety:

- fatty acid composition - shows the risk of changes in organoleptic parameters during storage as a result of oxidative and microbiological processes. According to the data of the fatty acid composition, it is possible to preliminarily estimate the rate of oxidative changes and identify the types of raw materials used;

- acid number - characterizes the degree of fat splitting and the presence of free fatty acids. The higher the acid number, the faster the fat spoiling process;

- induction period - an indicator that characterizes the stability of fat before oxidation processes and is expressed as the time interval between the moment when the fat sample reaches a given temperature and the moment when the rate of formation of oxidation products begins to increase rapidly. It is one of the methods of accelerated testing and a means of forecasting, which allows you to avoid long shelf life tests [9].

One of the main types of raw materials used in the production of traditional confectionery products is sugar. The recommended level of total daily intake of added sugar in the diet should not exceed 50 g per day, which is less than 10% of the caloric content of the diet at the rate of 2000 kcal per day for a person. These recommendations are included in the initiative of the World Health Organization (WHO), and are recommended for children older than 3 years and adults.

According to the data of the national examination of health and nutrition of the USA, the share of additional energy coming from added sugars was $14.3 \pm 0.2\%$ (in children from 2 to 8 years old), $16.2 \pm 0.2\%$ (in children and adolescents from 9 to 18 years old) and $13.1 \pm 0.2\%$ (in youth over 19 years old). The main sources of added sugars in the body of children and adolescents are sweet ready-made breakfast cereals, sweet bakery and confectionery products, drinks and yogurts [10].

The main ingredient of flour confectionery is high-grade wheat flour, the content of which in the recipe can vary from 55 to 65%. Wheat flour of the highest grade consists of finely ground particles of the central part of the endosperm and is practically free of bran (food fibers).

The production technology involves the loss of a large number of native vitamins and minerals, which are destroyed together with the peripheral parts of the grain. It has been proven that dietary fibers are an evolutionarily important component of food, play a significant role in normalizing the activity of the gastrointestinal tract, increase the mass of the muscle layer, affect the motor activity of the body, the rate of absorption of food substances in the small intestine, etc.



The use of flavorings and dyes is an integral part of the process of creating confectionery products. A big role here is played by traditions, habits, a sense of harmony that arises in the human body when eating food products with a certain pleasant taste and aroma. Most modern foods contain artificial flavors and colors that are originally chemicals. They are relatively cheap and more resistant to external influences compared to their natural counterparts.

It should be noted that the use of non-natural flavors, consistency and taste stabilizers, and thickeners in the production of products for children is prohibited. However, modern realities reflect otherwise. Food manufacturers are not always honest with consumers. This is due to a lot of competition in the market. To promote products, manufacturers use characters from children's movies for the sake of advertising, use inscriptions regarding the functionality of the product, do not fully indicate the composition of the product or the quantitative composition of the ingredients. To reduce the cost of the finished product, there are facts about the use of raw materials and auxiliary materials and components that are prohibited for the production of products for children.

The results of the conducted research will form the basis of further applied and fundamental research. Based on the received data, uniform technological requirements for quality and safety indicators will be created, which will be reflected in the regulatory and technological documentation for the production of flour and confectionery products for children.

References

1. Agreement on cooperation in the field of standardization, metrology, conformity assessment between the Ministry of Economic Development and Trade of Ukraine and the Main Directorate for Quality Control, Inspection and Quarantine of the People's Republic of China. Access mode: URL: <https://zakon.rada.gov.ua/laws/main/index>

2. Law of Ukraine "On Children's Nutrition" as amended by Laws No. 2746-VI dated 02.12.2010, No. 5460-VI dated 16.10.2012 [Electronic resource] // Government portal. The only web portal of executive authorities of Ukraine. - Access mode: <http://www.kmu.gov.ua>

3. Program of Ukrainian-Chinese investment cooperation in the agro-industrial complex. URL: <https://zakon.rada.gov.ua/laws/main/index>

4. Regulation (EU) of the European Parliament and the Council of Europe "On sanitary and hygienic rules for the production of food products" dated April 29, 2004 No. 852/2004. URL: https://zakon.rada.gov.ua/laws/show/984_002-04#Text

5. United Nations Children's Fund, UNICEF official website. Access mode: URL: <https://www.unicef.org>



6. WHO Library Cataloguing-in-Publication Data : Pocket book of hospital care for children: guidelines for the management of common childhood illnesses – 2nd ed./2013 ISBN 978 92 4 154837 3 URL: https://apps.who.int/iris/bitstream/handle/10665/81170/9789241548373_eng.pdf?sequence=1
7. Marinos Elia OrganizationOfNutritionalSupportWithinHospitals Monogrffia, BAPEN, August 2007. 33 p.
8. Kramarov S.O., Nadraga O.B., Pyra L.V., Pediatric Infectious Diseases: textbook et al. - 4th edition All-Ukrainian specialized education "Medicine", 2020, P-240
9. Kravtsiv R. Y., Paska M. Z., Oschypok I. M. Technology of fats: educational manual: Lviv, 2008. 112 p.
10. Mazurenko Igor, Shao Zhengzheng, Products for children with infectious diseases. Technologies and assortmen, Monograph. - Hunan University of Humanities, Science and Technology, China, Sumy National Agrarian University, Sumy, Ukraine, School of Food Science, Henan Institute of Science and Technology, Xinxiang, China, 2022. 296 p. ISBN 978-966-927-852-4

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БОРОШНЯНИ І КОНДИТЕРСЬКІ ВИРОБИ ДЛЯ ДІТЕЙ. ВИМОГИ ДО ПОКАЗНИКІВ ЯКОСТІ ТА БЕЗПЕЧНОСТІ

Анотація

Питання безпечності та якості продуктів дитячого та загального харчування набуло великої важливості серед докторів педіатрів, докторів вузької спеціалізації, вчених різних галузей науки, а також у внутрішній в міжнародній торгівлі. Запропонований асортимент продуктів борошняних та кондитерських виробів для дітей різноманітний. Вітчизняні та іноземні виробники пропонують продукти, які упаковані у кольорову споживчу тару, яка зацікавлює дитину. За таким маркетинговим ходом «сховані» компоненти які використані при виробництві та негативно впливають на організм як дитини так і дорослої людини.

Контроль за продуктами харчування – це обов'язкова регулятивна дія, яка здійснюється під час забезпечення виконання законів, стандартів та інших нормативних актів щодо продуктів харчування, державними або місцевими органами влади з метою захисту споживачів. Об'єктивний контроль сприяє безпечності всіх харчових продуктів під час виробництва, транспортування, зберігання, перероблення та розповсюдження, їх придатності до споживання, відповідності вимогам щодо безпечності та якості, а також гарантує те, що вони правдиво та ретельно промарковані.



Якість продуктів, які передбачені для харчування дітей це перш за все перелік властивостей продукту, які здатні задовольнити фізіологічні потреби організму дитини в продуктах харчування, виходячи з їх хімічного складу та енергетичної цінності. Паралельно встановлено, що не правельне харування, а саме використання у раціоні дитини блюд швидкого приготування та продуктів з використанням штучних барвників, загустовувчів, емульгаторів, стабілізаторів консистенції та смаку призводить до хронічних захворювань та порушенню правильної роботи усього організму. Негативний вплив відмічається у дітей та підлітків різного віку не залежно від кольору шкіри, соціального стану тощо.

Наведені результати досліджень сировини та компонентів, які доцільно використовувати при виробництві борошняних та кондитерських виробів для дітей. Встановлено негативний або позитивний вплив продуктів на організм дитини. Результати досліджень увійдуть в основу розроблення нормативних та технологічних документів на виробництво принципово-нових продуктів для дітей.

Ключові слова: безпечність, борошно, кондитерські вироби, печиво, снеки, структура, текстура, цукерки, якість.