

FOOD ADDITIVES IN FOOD PRODUCTS FOR INFANTS AND YOUNG CHILDREN – COMPLIANCE WITH THE PREVAILING RULES AND REGULATIONS

SUBSTANCJE DODATKOWE W PRODUKTACH ŻYWNOŚCIOWYCH DLA NIEMOWLĄT I MAŁYCH DZIECI – ZGODNOŚĆ Z OBOWIĄZUJĄCYM PRAWODAWSTWEM

TERESA KRZYŚKO-ŁUPICKA^{1 A,D,G}
ŁUKASZ KRĘCIDŁO^{1 B}
MAGDALENA KRĘCIDŁO^{1 D,E,F}

¹Independent Department of Biotechnology and Molecular
Biology, University of Opole

A – przygotowanie projektu badania | study design, **B** – zbieranie danych | data collection, **C** – analiza statystyczna | statistical analysis, **D** – interpretacja danych | interpretation of data, **E** – przygotowanie maszynopisu | manuscript preparation, **F** – opracowanie piśmiennictwa | literature review, **G** – pozyskanie funduszy | sourcing of funding

SUMMARY

Background: Pursuant to Polish law, products for infants and young children constitute a special purpose food group, which is divided into three categories: infant formulae, follow-on formulae, and cereal-based foods and other baby foods. The ingredients lists for each product from every group are regulated by the regulation of the Minister of Public Health of November 22nd 2010.

Aim of the study: An analysis of the contents of products for infants and young children commercially available in the Opole region.

Material and methods: Food additives in 81 products were analysed, based on the contents provided by the producers. The food additives (categories of preparations) were used in accordance with the regulation on food additives and the regulation on special purpose food groups. However, some banned additives were treated as nutrients and sources of macroelements, in which case they were not listed as food additives.

Results: The most commonly used source of calcium were the phosphate and carbonate salts. The hypoallergenic infant formula Nestle NAN 1 HA, Nestle NAN 2 HA and HUMANA 2 HA contained the fewest additives. Ready-made meals, which constitute complementary foods, did not contain additives. Drinks and desserts contained only L-ascorbic acid.

Conclusions: Regardless of the manufacturer, the analysed products contained only substances which comply with the prevailing Polish and EU law. The least additives were found in modified hypoallergenic milks: Nestle NAN 1 HA and NESTLE NAN 2 HA and Humana 2 HA. Drinks and dessert jars contained only L-ascorbic acid (E300), and oat cookies for children contained potassium bicarbonate (E501).

KEYWORDS: infant and young children foods, Polish law, European regulations

STRESZCZENIE

Wstęp: Produkty dla niemowląt i małych dzieci, zgodnie z polskim prawem, należą do żywności przeznaczenia specjalnego i są podzielone na trzy kategorie preparatów: do żywienia początkowego, dalszego i uzupełniające

środki spożywcze. Skład produktów należących do każdej z kategorii jest regulowany Rozporządzeniem Ministra Zdrowia z dnia 22 listopada 2010 r.

Cel pracy: Przeanalizowanie składów produktów żywnościowych dla niemowląt i małych dzieci, dostępnych w obrocie handlowym na Opolszczyźnie.

Materiał i metody: Na podstawie podanych przez producentów składów przeanalizowano substancje dodatkowe w 81 produktach. Dodatki (kategorie preparatów) do żywności zostały użyte zgodnie z rozporządzeniem dotyczącym substancji dodatkowych, jak i rozporządzeniem odnośnie do żywności przeznaczenia specjalnego. Jednak niektóre niedozwolone dodatki potraktowano jako substancje odżywcze lub źródło makroelementów. W takich przypadkach dana substancja nie jest oznaczona w składzie jako dodatek do żywności.

Wyniki: Najczęściej stosowanym przez producentów źródłem wapnia były jego sole fosforanowe i węglanowe. Najmniej substancji dodatkowych zawierało mleko modyfikowane hipoalergiczne NESTLE NAN 1 HA, NESTLE NAN 2 HA i HUMANA 2 HA. Dania gotowe, wchodzące w skład żywności uzupełniającej, nie zawierały substancji dodatkowych, a napoje i desery w słoiczkach miały w swym składzie jedynie kwas L-askorbinowy.

Wnioski: Poddane analizie produkty, niezależnie od producenta, w swoim składzie zawierały tylko substancje zgodne z prawem obowiązującym na terenie Polski i Unii Europejskiej. Najmniej substancji dodatkowych miało mleko modyfikowane hipoalergiczne NESTLE NAN 1 HA, NESTLE NAN 2 HA i HUMANA 2 HA. Napoje i gotowe desery w słoiczkach w swoim składzie, jako substancję dodatkową, zawierały jedynie kwas L-askorbinowy (E300), a ciasteczka zbożowe dla dzieci wodorowęglan potasu (E501).

SŁOWA KLUCZOWE: żywność dla niemowląt i małych dzieci, prawo polskie, prawo europejskie

BACKGROUND

Food for infants and young children has to meet the nutritional needs of its consumers based on their age and nutritional requirements [1–2]. The food for infants, included in the three groups: infant formulae, follow-on formulae, and cereal-based foods and other baby foods, its content, placing on the market and labelling is regulated, since July 20th 2016, by the Regulation no 609/2013 of the European Parliament and of the Council [1]. This document contains the rules and regulations on foods for “certain and/or vulnerable population groups”, which also includes food for infants and young children. This term replaces the previous term: “special purpose food products”. The regulation provides unified rules and regulations and a unified list of nutrients, including those used as additives improving technological characteristics (previously there were three lists), which could be found in infant formulae, follow-on formulae, and cereal-based foods and other baby foods. The producer is now obligated to list the substances improving technological characteristics on the packaging of a product [1]. In

Polish Society’s of Gastroenterology, Hepatology and Nutrition standards of nutrition for children [3], the recommended mode of feeding an infant is breastfeeding for at least 6 initial months of life, preferably a year. If mother’s milk is insufficient or the mother cannot breastfeed the child, modified milk can be introduced [3–5]. The described standards were created based on the guidelines of the European Commission, WHO and UNICEF, and adapted to Polish conditions [4–5].

Introducing food additives to infant formulae, follow-on formulae, and cereal-based foods and other baby foods is regulated by a regulation of the Minister of Health [6]. These substances can act as emulsifiers, anti-oxidants, acidity regulators, raising agents, but it is forbidden to add colouring and sweetening substances [6–8]. There are 15 substances allowed in infant formulae, 20 in follow-on formulae and 65 in cereal-based foods and other baby foods (Table 1). Only substances improving the technological characteristics are marked with an “E” on packaging labels, the rest should be treated as enriching substances which are a source of amino-acids, vitamins and micro- and macroelements [7, 14].

Table 1. Allowed food additives (categories of formulae) in food products for infants and young children, divided by stages of the child’s development

Infant Formulae	Follow-on Formulae	Cereal-based Foods and Other Baby Foods
E270 E304 E306 E307	E270 E304 E306 E307	E170 E260 E261 E262 E263 E270 E296 E300 E301 E302 E304
E308 E309 E322 E330	E308 E309 E322 E330	E306 E307 E308 E309 E322 E325 E326 E327 E330 E331 E332
E331 E332 E338 E339	E331 E332 E338 E339	E333 E334 E335 E336 E338 E339 E340 E341 E354 E400 E401
E340 E412 E471 E472c	E340 E407 E410 E412	E402 E404 E410 E412 E414 E415 E440 E450(i) E471 E472a
E473	E440 E471 E472c E473	E472b E472c E500 E501 E503 E507 E524 E525 E526 E551 E575
		E1404 E1410 E1412 E1413 E1414 E1420 E1422 E1450 E1451

Source: Own study, [6].

AIM OF THE STUDY

The aim of this study was to show the contents and type of food additives in food products for infants and children up to 3 years old commercially available in the Opole region.

MATERIAL AND METHODS

We analysed the contents of 81 selected food products for infants and small children, from 8 producers: HUMANA, HIPPI, HOLLE, NESTLE, NUTRICIA, BABY SUN, AGUGU, and BABYDREAM. The products were divided into three categories:

- Infant formulae (12 products, 6 brands from 4 producers) – modified milk and modified hypoallergenic milk.

- Follow-on formulae (12 products, 6 brands from 4 producers) – modified milk and modified hypoallergenic milk.

- Cereal-based foods and other baby foods – rice-milk cereal, wheat-milk cereal, multigrain-milk cereal, gluten-free-milk cereal and semolina-milk cereal (12 products, 5 brands from 4 producers), ready-made meals in jars, with meat, vegetables, meat and vegetables (16 meals and soups, 7 brands from 6 producers), drinks (6 products, 1 brand from 1 producer), desserts, including fruit in jars (18 products, 6 brands from 5 producers), and sponge cookies (5 products, 4 brands from 3 producers).

A substance was classified as an additive, when the producer provided information on its application on the label, e.g. soy lethicin – emulsifier, and/or was marked with an “E” symbol with proper number, pursuant to the regulation of the Minister of Health of November 22nd 2010 on authorised food additives [6]. The nutritional substances were classified based on the Regulation no 609/2013 of the European Parliament and of the Council [3].

RESULTS

Irrespective of the producer, the analysed food products for infants and young children contained only the food additives authorised by the rules and regulations prevailing in Poland and in the European Union, even though some of the substances were treated as nutritional substances or sources of macroelements.

The following food additives were found in milk products for infants and labelled as:

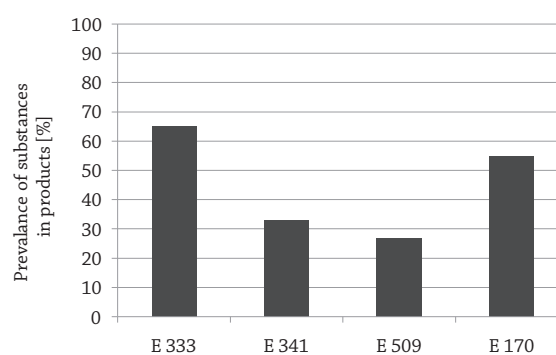
- Emulsifiers – soy lethicin (E322), citric acid esters of mono- and diglycerides of fatty acids (E471).

- Enriching substances (e.g. sources of calcium) – calcium citrate (E333), calcium carbonate (E170), tricalcium phosphate (E341) and calcium chloride (E509).

- Other, improving the technological characteristics and constituting sources of macroelements – potassium citrate (E332), trisodium citrate (E331), trisodium phosphate (E339), potassium phosphate (E340), potassium chloride (E508) and magnesium chloride (E511).

The analysed modified and hypoallergenic milk infant formulae contained emulsifiers, however modified milk contained only soy lethicin (E322) and hypoallergenic modified milk contained mainly citric acid esters of mono- and diglycerides of fatty acids (E471), or both emulsifiers (Bebiko 1 HA, Babilon 1 HA). Only Nestle NAN 1 HA milk was free of these substances. The least food additives were found in modified hypoallergenic milk brands NESTLE NAN 1 HA, NESTLE NAN 2 HA and HUMANA 2 HA.

Calcium is especially significant in infant nutrition. Its absorption depends on the form in which it is contained in food. The producers usually use tricalcium phosphate (E341) and calcium carbonate (E170), and to a lesser extent calcium citrate (E333) and calcium chloride (E509), as sources of calcium (Figure 1).



Source: Own study.

Figure 1. Sources of calcium in infant and follow-on formulae used by the producers

These substances were found in most of the milk products, although calcium citrate was found only in modified milk and calcium chloride in hypoallergenic modified milk. The occurrence of other food additives introduced as sources of macroelements varied, with the greatest variety noted in milk infant formulae. In this group of analysed food products the most frequently used food additives were: potassium chloride (E508) – in 72%, tricalcium phosphate (E341) – in 63% and calcium carbonate (E170) – in 54%.

The other food additives introduced as sources of macroelements depended on the type of the product, e.g. potassium phosphate was not found in modified milk and potassium citrate in hypoallergenic modified milk. The smallest number of substances, only four, was found in hypoallergenic modified milk Nestle NAN 1 HA (Table 2).

In milk follow-on formulae, the same groups of food additives were found and also labelled as emulsifiers, sources of calcium and substances improving the technological characteristics and constituting sources of macroelements. This category of products did not contain trisodium phosphate (E339) (Table 3). None of the analysed brands of hypoallergenic modified milk follow-on formulae contained salts of citric acid – calcium citrate (E333), potassium citrate (E332), trisodium

Table 2. Ingredients listed by the producer on labels of infant formulae

Ingredients listed on labels of products											
Name of the product	E322	E471	E331	E332	E333	E340	E341	E508	E509	E511	E170
Modified milk											
BEBIKO 1	+	-	+	+	+	-	-		+	-	+
BEBILON 1	+	-	+	+	+	-	-	+	+	-	+
GERBER 1	+	-	-	+	+	+	-	+	+	-	+
HIPP 1	+	-	-	-	-	-	-	-	-	-	-
HUMANA 1	+	-	+	+	+	-	-	+	+	-	-
NESTLE NAN 1	+	-	-	+	+	+	-	+	+	-	+
Hypoallergenic modified milk (HA)											
BEBIKO 1 HA	+	+	-	-	-	-	+	-	-	+	-
BEBILON 1 HA	+	+	-	-	-	-	+	-	-	+	-
HIPP 1 HA	-	+	-	-	-	-	-	+	+	-	-
HUMANA 1 HA	-	+	+	-	-	-	-	+	+	-	-
NESTLE NAN 1 HA	-	-	-	-	-	-	+	+	+	-	+

Source: Own study.

citrate (E331) or potassium chloride (E508), because these products constitute only a supplement of an infant's diet and do not need to meet their nutritional needs in 100% [1–2].

The analysis of products commercially available in the Opole region showed that the most products, 72%, contained soy lethicin (E322), used as an emulsifier.

Furthermore, hypoallergenic modified milk brands of infant formulae, which contained hydrolysed protein (labelled on HA packaging), more often than other products contained mono- and diglycerides of fatty acids (E471).

80% of the analysed cereal-based foods and other baby foods contained the following food additives:

Table 3. Ingredients listed by the producer on labels of follow-on formulae

Ingredients listed on labels of products											
Name of the product	E322	E471	E331	E332	E333	E340	E341	E508	E509	E511	E170
Modified milk											
BEBIKO 2	+	-	-	-	-	-	-	+	-	-	+
BEBILON 2	+	-	-	+	-	-	+	-	+	+	+
GERBER 2	+	+	-	-	+	-	-	-	-	+	-
HIPP 2	-	-	-	-	-	-	-	+	+	-	+
HUMANA 2	+	+	-	-	-	-	+	+	-	-	+
NESTLE NAN 2	+	-	+	-	+	+	+	-	-	+	-
Hypoallergenic modified milk (HA)											
BEBIKO 2 HA	+	+	-	-	-	+	+	-	+	-	-
BEBILON 2 HA	+	+	-	-	-	+	+	-	+	-	-
HIPP 2 HA	-	+	-	-	-	-	+	-	-	+	+
HUMANA 2 HA	-	-	-	-	-	-	-	-	-	-	+
NESTLE NAN 2 HA	-	-	-	-	-	-	+	-	-	+	-

Source: Own study.

soy lethicin (E322) as emulsifier and calcium carbonate (E170) as source of calcium. On the other hand, most of the products did not contain citric acid (E330), trisodium phosphate (E339) and potassium carbonate (E501), and locust bean gum (E410) was found only in gluten-free cereals (Table 4).

Table 4. Ingredients listed by the producer on labels of cereal-based foods and other baby foods

Ingredients listed on labels of products							
Name of the product	E170	E322	E410	E330	E339	E471	E501
Rice-milk cereal							
NESTLE	+	-	-	-	-	-	-
BOBOVITA	+	+	-	-	-	-	-
HUMANA	+	-	-	-	-	-	-
HIPP	+	-	-	-	-	-	-
Wheat-milk cereal							
NESTLE	+	-	-	-	-	-	-
BOBOVITA	+	+	-	-	-	-	-
HUMANA	+	-	-	+	-	-	+
HIPP	+	-	-	-	-	-	-
Semolina-milk cereal							
NESTLE	+	-	-	-	-	-	-
BOBOVITA	+	+	-	-	-	-	-
HIPP	+	-	-	-	-	-	-
Multigrain-milk cereal (5 grains, 8 grains)							
NESTLE	+	-	-	-	-	-	-
BOBOVITA	+	+	-	-	-	-	-
HUMANA	-	-	-	-	-	-	-
HOLLE	-	-	-	-	-	-	-
HIPP	+	-	-	-	-	-	-
Gluten-free cereal							
NESTLE	-	-	+	+	+	-	-
BOBOVITA	+	-	+	-	-	+	-

Source: Own study.

Ready-made meals are more and more used when feeding children between 1 and 3 years old. The analysed ready-made meals from such producers as: Agugu, BabyDream, Baby Sun, Bobovita, Gerber DoReMi and Gerber, HiPP, which constitute supplementary food did not contain any food additives. Their main ingredients were vegetables and different types of meat. Only in two cases, the contents of Gerber DoReMi baby dinners included mechanically separated meat (MSM).

All drinks and desserts in jars (BoboFruit, Baby Sun, Bobovita, Gerber, HiPP, BabyDream) contained a food additive – L-ascorbic acid (E300), listed as source of vitamin C.

In the case of oat cookies for children, all products contained gluten, as indicated on the packaging. Depending on the used raising agents, particular products were intended for different age groups. Cookies for the youngest children (starting from the 5th month of life), such as HiPP, contained only potassium hydrogen carbonate (E501). Only Miškopty from Nestle, for children 9 months old or older, contained soy lethicin

(E322) as an emulsifier. Despite the similarity of the food additives used by Nestle and Gerber, there is a difference in the age of the intended recipients of their products: cookies from Gerber are intended for children 12 months old or older and those from Nestle for 9 months old or older (Table 5), even though both products belong to one corporation – Nestle.

Table 5. Ingredients listed by the producer on labels of cookies constituting supplementary food for infants and young children

Ingredients listed on labels of products						
Name of the product	E170	E 500	E503	E 501	E341	E322
GERBER (12 months)	+	+	+	-	+	-
HiPP (10 months)	-	+	-	-	-	-
HiPP (5 months)	-	-	-	+	-	-
NESTLE (9 months)	-	+	+	-	+	+
BOBOVITA (8 months)	+	+	+	-	-	-

Source: Own study.

DISCUSSION

The contents of all groups of products intended for infants and young children are strictly regulated for the presence of food additives, nutrients and micro- and macroelements [3, 8]. It is one of the few groups of products with determined lowest and highest levels of content of particular nutrients [7]. Such strict regulations are dictated by the fact that infant milk formulae are usually the main source of nutrients and micro- and macroelements for infants. It is important that the sources of such macroelements as calcium, phosphorus or magnesium in modified milk are varied, similarly as in mother's milk. Both the content and the form of calcium in mother's milk is not constant and it can take the form of calcium carbonate, calcium chloride, calcium citrate and tricalcium phosphate and casein-related forms [14].

Food for infants and children up to three years old contains maltodextrins. Pursuant to the regulation of the Minister of Health on special purpose food groups of September 16th 2010, maltodextrins are authorised for use as a source of easily ingestible carbohydrates. The producers also use them for their emulsifying, filling, stabilizing, bonding, raising, extending freshness, sweetness reducing, highlighting taste and smell, and crystallisation delaying qualities [3, 9–12].

Another type of substances frequently added to these types of products are omega-3 acids, including eicosapentaenoic acid, pre- and probiotics, non-ingestible oligosaccharides, taurine and nucleotides. However, according to experts from the European Food Safety Authority (EFSA), there is no clear indication

that would require adding these substances to food for infants and young children [13].

CONCLUSIONS

1. The analysed products for infants and young children, irrespective of the producer, contained only substances authorised by the rules and regulations prevailing in Poland and in the European Union.

2. Among the analysed products, only ready-made meals did not contain any food additives.

REFERENCES

1. Rozporządzenie Parlamentu Europejskiego i Rady (UE) nr 609/2013 z dnia 12 czerwca 2013 r. w sprawie żywności przeznaczonej dla niemowląt i małych dzieci oraz żywności specjalnego przeznaczenia medycznego i środków spożywczych zastępujących całodzienną dietę, do kontroli masy ciała. (Dz.U. UE. L 181/35).
2. Ustawa z dnia 25 sierpnia 2006 r. o bezpieczeństwie żywności. (Dz.U. 2006 nr 171, poz. 1225).
3. Szajewska H, Horvath A, Rybak A, Socha P. Karmienie piersią. Stanowisko Polskiego Towarzystwa Gastroenterologii, Hepatologii i Żywienia Dzieci. *Stand Med, Pediatr* 2016; 13: 9–24.
4. Indicators for Assessing Infant and Young Child Feeding Practices. Part 1. Definitions. Geneva, Switzerland: World Health Organization; 2008.
5. Michaelsen KF, Weaver L, Branca F, Robertson A. Feeding and nutrition of infants and young children. Guidelines for the WHO European Region, with emphasis on the former Soviet countries. Denmark: World Health Organization; 2000. Updated reprint 2003.
6. Rozporządzenie Ministra Zdrowia z dnia 22 listopada 2010 r. w sprawie dozwolonych substancji dodatkowych. (Dz.U. 2010 nr 232, poz. 1525).
7. Cielecka E, Dereń K. Jakość żywności dla niemowląt i małych dzieci. *Probl Hig Epidemiol* 2011; 92 (2): 187–192.
8. Weker H, Wiech M. Żywność dla niemowląt i małych dzieci w świetle nowych regulacji prawnych. *Bromat Chem Toksykol* 2008; 41 (3): 883–887.
9. Fortuna T, Sobolewska J. Maltodekstryny i ich wykorzystanie w przemyśle spożywczym. *Żywn Nauka Technol Jakość* 2000; 23: 100–109.
10. Dokic-Baucal L, Dokic P, Jakovljevic J. Influence of different maltodextrins on properties of O/W emulsions. *Food Hydroc* 2004; 18: 233–239.
11. Fortuna T, Sobolewska-Zielińska J, Juszcak L. Wybrane właściwości reologiczne roztworów maltodekstryn ziemniaczanych. *Zesz Prob Post Nauk Rol* 2002; 489: 413–422.
12. Gibiński M, Korus J. Maltodekstryny jako skrobiowe zamienniki tłuszczu. *Biul Inst Hod Aklim Rośl* 2006; 239: 303–318.
13. EFSA NDA Panel (EFSA Panel on Dietetic Products, Nutrition and Allergies). Scientific Opinion on the essential composition of infant and follow-on formulae. *EFSA Journal* 2014; 12 (7): 3760.
14. EFSA NDA Panel (EFSA Panel on Dietetic Products, Nutrition and Allergies). Scientific Opinion on Dietary Reference Values for calcium. *EFSA Journal* 2015; 13 (5): 4101–4182.

Word count: 3518

• Tables: 5

• Figures: 1

• References: 14

Sources of funding

The review was financed from the employee's statutory research Teresa Krzyśko-Łupicka.

Conflicts of interests

The authors report that there were no conflicts of interest.

Cite this article as: Krzyśko-Łupicka T, Kręcidło Ł, Kręcidło M. Food additives in food products for infants and young children – compliance with the prevailing rules and regulations. *PU-HSP* 2016; 10, 4: 15–20.

Correspondence address:

Teresa Krzyśko-Łupicka
Independent Department of Biotechnology
and Molecular Biology
University of Opole
Kominka str. 6 a
45-035 Opole
phone: +48 77 401 6057
e-mail: teresak@uni.opole.pl

Received: 25.07.2016

Reviewed: 04.10.2016

Accepted: 30.11.2016