

# Food supplements – analysis of composition and labelling of certain groups of products

Katarzyna Stoś<sup>1</sup>, Mirosław Jarosz<sup>2</sup>, Wioletta Bogusz-Kaliś<sup>1</sup>, Izabela Ziółkowska<sup>1</sup>, Grzegorz Osipiuk<sup>1</sup>

<sup>1</sup> Department of Food Safety, National Food and Nutrition Institute, Warsaw, Poland

<sup>2</sup> Department of Dietetics and Nutrition in Hospitals with Clinic of Metabolic Diseases and Gastroenterology, National Food and Nutrition Institute, Warsaw, Poland

**Abstract:** Food supplements are concentrated sources of vitamins and minerals or other substances with a nutritional or other physiological effect, the purpose of which is to supplement a normal diet. The aim of the study was analysis of the composition and labelling of certain food supplements. The object of the analysis was the documentation of 104 food supplements containing vitamins and/or minerals, or other substances evaluated in 2008 by the National Food and Nutrition Institute. The analysis showed that the largest groups of food supplements consisted of products containing plant components, vitamins and minerals. Maximum contents of vitamins and minerals in daily portions of evaluated food supplements did not exceed tolerable upper intake levels. The labelling of 94% of samples examined according to the monitoring process met the legal requirements.

**Key words:** food supplements, vitamins, minerals, plant components, labelling

## INTRODUCTION

In recent years in Poland there has been a visible increase in the popularity of food supplements. Food supplements may be an additional source of vitamins, minerals and other substances with a nutritional or other physiological effect. They may play an important role in the reduction of risk of health disorders [1-3].

The results of research on consumption of food supplements conducted in Poland in 2006 by OBOP (Ośrodek Badań Opinii Publicznej) showed that 22% of respondents consumed at least one food supplement [4]. The results of research made in 2008 by OBOP showed that 54% of all respondents consumed multi-vitamins products [5]. Results of the study carried out in 2000 by the National Food and Nutrition Institute showed that 14% of respondents used food supplements [6].

Food supplements are foodstuffs the purpose of which is to supplement a normal diet, and are concentrated sources of vitamins, minerals or other substances with a nutritional or other physiological effect, alone or in combination, marketed in dose form, e.g. capsules, pastilles, tablets, pills sachets of powder, ampoules of liquids, drop dispensing bottles, and other similar forms of liquids and powders designed to be taken in measured small unit quantities, excluding products with a medicinal effect in the meaning of pharmaceutical law [7, 8].

Apart from vitamins and minerals, food supplement may also contain other active substances, e.g. amino acids, fatty acids, fibre, plant ingredients, among others [1].

In Poland, there is lack of detailed requirements applying to some aspects of the composition of food supplements, including maximum amounts of vitamins and minerals and the lists of other allowed substances, including plant ingredients. With regard to the above, it seems reasonable to carry out analysis

of the composition of food supplements made available on the Polish market.

The purpose of the study was analysis of the composition and labelling of certain food supplements.

## MATERIALS AND METHODS

The object of the analysis was the documentation of 104 food supplements, containing vitamins and/or minerals or other substances, evaluated in 2008 by the National Food and Nutrition Institute (NFNI). During the analysis, the content of vitamins and minerals in relation to the Recommended Daily Allowance (RDA) [9] and Tolerable Upper Intake Levels (UL) [10, 11] were taken into account. The food supplements were also examined with respect to their intended use.

Additionally, the monitoring data on the labelling of 267 samples of food supplements inspected in 2008 by the Voivodeship Sanitary Inspection was analysed.

Compliance with valid Polish and European legislation was taken into account. The maximum amounts of vitamins and minerals in a daily portion of the evaluated products were compared with the RDA presented in the Polish regulation: Regulation by the Minister of Health of 9 October 2007 in the matter of composition and labeling of dietary supplements [9]. The regulation was later amended by the Regulation by the Minister of Health of 18 May 2010 changing the regulation in the matter of composition and labeling of dietary supplements [12].

Other important Polish legislative Acts applying to food supplements were also taken into account:

- Act of 25 August 2006 in the matter of food and nutrition safety [7];
- Regulation by the Minister of Agriculture and Rural Areas Development of 10 June 2007 in the matter of labeling food products [13].

The most important requirements for food supplements are included in the European Union legislation: Directive 2002/46/EC, Commission Regulation (EC), No. 1170/2009, and Regulation (EC) No. 1924/2006 [14-16].

Corresponding author: Katarzyna Stoś, Powsińska 61/63, Department of Food Safety, National Food and Nutrition Institute, 02-903 Warsaw, Poland  
Tel.: (22) 55-09-795. Fax: (22) 842-11-03  
E-mail: kstos@izz.waw.pl

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## RESULTS AND DISCUSSION

Analysis of the composition of food supplements showed that the maximum amounts of vitamins in a daily portion of the evaluated products (Table 1) covered the RDA in the range from 100 % (pantothenic acid) to 500 % (vitamin B<sub>2</sub>, vitamin B<sub>6</sub>, vitamin C).

The maximum amounts of fat-soluble vitamins in a daily portion of the products with respect to the RDA were as follows: vitamin A – 101 % RDA, vitamin D – 200 % RDA, vitamin E – 450 % RDA.

The amounts of vitamins in a daily portion of the evaluated products did not exceed Tolerable Upper Intake Levels (UL). The Scientific Committee for Food (SCF) and European Food Safety Authority (EFSA) did not set the UL for vitamin B<sub>1</sub> (thiamine), vitamin B<sub>2</sub> (riboflavin), vitamin B<sub>12</sub>, vitamin C, pantothenic acid and biotin [10,11].

**Table 1** Minimum and maximum levels of vitamins in a daily portion of certain food supplements.

Minimum and maximum levels of vitamins in a daily portion of certain food supplements					
Vitamins	Minimum level	Maximum level	UL (EFSA) <sup>a</sup>	RDA <sup>b</sup>	RDA <sup>c</sup>
Vitamin A	150 µg	810 µg	3,000 µg	800 µg	800 µg
Vitamin D	0.1 µg	10 µg	50 µg	5 µg	5 µg
Vitamin E	2 mg	45 mg	300 mg	10 mg	12 mg
Vitamin B <sub>1</sub>	0.42 mg	4.8 mg	-	1.4 mg	1.1 mg
Vitamin B <sub>2</sub>	0.8 mg	8 mg	-	1.6 mg	1.4 mg
Pantothenic acid	1.8 mg	6 mg	-	6 mg	6 mg
Vitamin B <sub>12</sub>	0.35 µg	2 µg	-	1 µg	2.5 µg
Niacin	5 mg	72 mg	900 mg (nicotinamide)	18 mg	16 mg
Vitamin B <sub>6</sub>	0.03 mg	10 mg	25 mg	2 mg	1.4 mg
Folic acid	50 µg	300 µg	1,000 µg	200 µg	200 µg
Biotin	30 µg	200 µg	-	150 µg (0.15 mg)	50 µg
Vitamin C	18 mg	300 mg	-	60 mg	80 mg

**UL (EFSA)<sup>a</sup>** – Tolerable upper intake levels for vitamins and minerals. Scientific Committee for Food, Scientific Panel of Dietetic Products, Nutrition and Allergies. European Food Safety Authority (EFSA), Brussels 2006.  
**RDA<sup>b</sup>** – set out in Annex 3 of regulation: Regulation by the Minister of Health of 9 October 2007 in the matter of composition and labeling of dietary supplements.  
**RDA<sup>c</sup>** – based on Commission Directive 2008/100/EC of 28 October 2008, amending Council Directive 90/496/EEC on nutrition labelling for foodstuffs regarding recommended daily allowances, energy conversion factors and definitions.

The maximum amounts of minerals in a daily portion of the products (Table 2) usually did not exceed the RDA set in the Polish regulation of 2007 [9]. Only the maximum iron content exceeded RDA (142 % of RDA). The maximum levels of other minerals in a daily portion of the products with respect to RDA were as follows: calcium – 75 % RDA, magnesium – 83 % RDA, iodine – 50 % RDA, phosphorus – 12 % RDA, zinc – 100 % RDA. For the minerals: cooper, manganese, potassium, selenium and chromium, the RDA levels were not set out in the above-mentioned regulation. The amounts of minerals in a daily portion of the evaluated products did not exceed tolerable upper intake levels.

Tables 1 and 2 also include the RDA levels set out in Directive 2008/100/EC of 10 June 2002 [8].

**Table 2** Minimum and maximum levels of minerals in a daily portion of certain food supplements.

Minimum and maximum levels of minerals in a daily portion of certain food supplements					
Minerals	Minimum level	Maximum level	UL (EFSA) <sup>a</sup>	RDA <sup>b</sup>	RDA <sup>c</sup>
Calcium	4.4 mg	600 mg	2500 mg	800 mg	800 mg
Magnesium	10 mg	250 mg	250 mg	300 mg	375 mg
Iron	0.18 mg	20 mg	-	14 mg	14 mg
Cooper	0.28 mg	1 mg	5 mg	-	1 mg
Iodine	16 µg	75 µg	600 µg	150 µg	150 µg
Zinc	2 mg	15 mg	25 mg	15 mg	10 mg
Manganese	1 mg	3 mg	-	-	2 mg
Potassium	10 mg	400 mg	-	-	2,000 mg
Selenium	8 µg	100 µg	300 µg	-	55 µg
Chromium	90 µg	90 µg	-	-	40 µg
Phosphorus	14.5 mg	96 mg	4,000 mg	800 mg	700 mg

**UL (EFSA)<sup>a</sup>** – Tolerable upper intake levels for vitamins and minerals. Scientific Committee for Food, Scientific Panel of Dietetic Products, Nutrition and Allergies. European Food Safety Authority (EFSA), Brussels 2006.  
**RDA<sup>b</sup>** – set out in Annex 3 of regulation: Regulation by the Minister of Health of 9 October 2007 in the matter of composition and labeling of dietary supplements.  
**RDA<sup>c</sup>** – set out in Commission Directive 2008/100/EC of 28 October 2008, amending Council Directive 90/496/EEC on nutrition labelling for foodstuffs regarding recommended daily allowances, energy conversion factors and definitions.

The task of setting the maximum levels of vitamins and minerals in food supplements (Maximum Supplement Levels – MSL) is still being carried out. The current results of this work published in 2007 by the European Commission (EC). By taking into account the potential risk of excessive intake, three groups of vitamins and minerals have been proposed: a group with no evidence of health risks within ranges currently consumed (vitamin B<sub>1</sub>, vitamin B<sub>2</sub>, biotin, vitamin B<sub>12</sub>, pantothenic acid, vitamin K, chromium), a group with low risk of exceeding the tolerable upper intake level (vitamin B<sub>6</sub>, vitamin C, vitamin D, vitamin E, nicotinamide, molybdenum, phosphorus, selenium, magnesium, folic acid), and a group with potential risk of exceeding the UL (vitamin A, beta-carotene, calcium, cooper, fluoride, iodine, iron, manganese, zinc). Maximum Supplement Levels (MSLs) have been proposed for vitamins and minerals with low risk of exceeding the the UL, as well as for those with potential risk at excessive intakes [11].

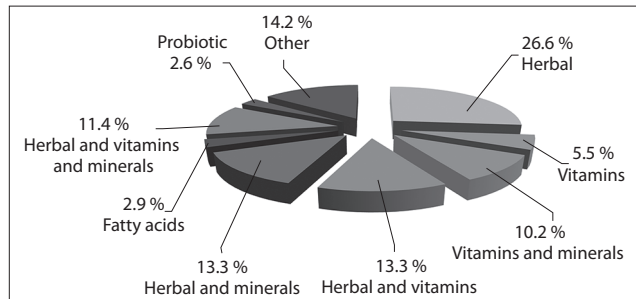
The maximum amounts of vitamins and minerals in a daily portion of the evaluated products usually did not exceed the MSL. The maximum contents of magnesium, iron and zinc in daily portions of the evaluated products were the same as the MSLs proposed by EC. Only the maximum content of manganese (3 mg) exceeded the MSL (2 mg).

Apart from vitamins and minerals, food supplements may also contain plant components. The most common plant components present in the composition of the evaluated food supplements where: *Ginseng* root, *Hibiscus* flower, *Verbascum* leaf, *Taraxacum officinale* root, *Melissa officinalis* leaf, *Humulus lupulus* hop, *Tilia* flower, *Rosa canina* L. fruit, *Cinnamomum* bark, *Ortosiphon aristatus* leaf, *Glycyrrhiza* L. root, green tea, inulin, and plant fibre.

The other substances with a nutritional or other physiological effect often present in the evaluated food supplements were: L-carnitine, caffeine, taurine and omega-3 fatty acids.

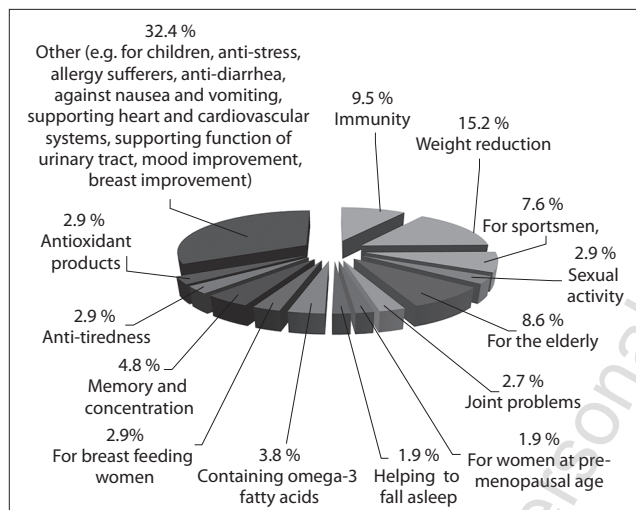
The largest group of assessed food supplements (Figure 1) was that containing only plant ingredients (26.6 %). There were also

food supplements containing the following: plant ingredients and vitamins (13.3 %), plant ingredients and minerals (13.3 %), vitamins and minerals (10.2 %), vitamins (5.5 %), fatty acids (2.9 %) and probiotics (2.6 %), among others.



**Figure 1** Classification of food supplements according to composition.

The largest groups of evaluated food supplements consisted of products intended for weight reduction, products supporting immunity, products for sportsmen and for the elderly (Figure 2). There were also many other products, e.g. enhancing memory and concentration, containing omega-3 fatty acids, antioxidant products, products intended for children, for people with joint problems, anti-tiredness products, products for breast feeding women.



**Figure 2** Classification of food supplements according to purpose of use.

Additionally, examination of the monitoring data on the labelling of 267 samples of food supplements showed that 94% met the labelling requirements. Among the disqualified samples, 9 were produced in Poland and 7 were produced outside the EU. The most common reasons for incorrect labelling were: lack of information about the content of active ingredients in a daily portion, lack of information about the amounts of active ingredients stated in numerical form, declaration of therapeutic effect, lack of the phrase 'food supplement' on the label, etc.

## CONCLUSIONS

– Analysis of food supplements evaluated in 2008 by the National Food and Nutrition Institute [in 2008] showed that the most popular ingredients were plant preparations, vitamins and minerals.

– The biggest groups of food supplements were products intended for weight reduction, increase of immunity, for elderly people, and for sportsman.

– Maximum contents of vitamins and minerals in daily portions of evaluated food supplements did not exceed tolerable upper intake levels.

– 94 % of samples of food supplements assessed in 2008 under the monitoring process met the labelling requirements.

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