

Occurrence of Aspartame in Foodstuffs in Cyprus and Relevant Risk Assessment*

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INTRODUCTION

The incidence and levels of several food additives (colours, preservatives, sweeteners, antioxidants, emulsifiers etc) in locally produced and imported foodstuffs (confectionery, sauces, dressings, spices, dried fruit, snacks, oils, fats and products, drinks, ice-creams, bakery products, milk/meat/fish products etc) are monitored and controlled systematically by the State General Laboratory (SGL) of Cyprus, which is the official food control laboratory, since 1980's⁽¹⁾.

The control is performed according to the relevant National Monitoring & Control Programme and the requirements of the EU legislation for official control of food additives^(2,3) and in the spirit of relevant documents/reports of E.C about the monitoring and assessment of food additive intake in the E.U^(4b+c). Attention and priority is given to synthetic colours, preservatives (sorbic and benzoic acid, sulphur dioxide, propionic acid) and synthetic sweeteners (aspartame, saccharin, acesulfame-K, cyclamates) with emphasis in aspartame.

The basic aim of the control is to keep the levels of additives in foodstuffs and their dietary intake at safety levels and to cover: (i) Basic and frequently consumed foodstuffs in high quantities with emphasis to the food consumed by children, (ii) the toxicologically most important and most frequently used additives e.g. azodyes and synthetic sweeteners, (iii) previously known non complying samples and the information from RASFF system of EU.

Aspartame is a very hot issue because there is a variety of reduced energy or sugar free foodstuffs that people can consume, such as soft drinks, ice tea, squashes, fruit & vegetable juices, flavoured mineral waters, energy drinks, milk-based desserts, candies, jelly, chewing gums, fruit yoghurts, ice cream, etc.

Nowadays, the European Food Safety Authority (EFSA) is focused in the studies of aspartame due to its potential for carcinogenicity. The Scientific Panel of EFSA is working on the studies of aspartame.⁽⁵⁾ Overall, the EFSA Panel concluded, on the basis of all evidence currently available including the last published European Ramazzini Foundation (ERF), study that there is no indication of any genotoxic or carcinogenic potential of aspartame and that there is no reason to revise the previously established ADI for aspartame of 40 mg/kg bw/day.

RESULTS

Levels of Aspartame

Results of previous year's control for several food additives have been published or presented elsewhere ⁽¹⁾. Updated analytical results of the official control and monitoring for aspartame for the years 2002-2009 are presented in Table 1. The results of Table 1 for the years 2002-2009 are based on relevant analytical data sent already to EFSA for the years 1999-2009.

Food Consumption Data

The updated food consumption data for Cyprus were calculated from the data of the Statistical Service of Cyprus for the Household Budget Survey (HBS) for a family of an average income, for 131 food items for the years 2003/4. The average consumed quantities for a specific food item were calculated as follows:

$$(1) \text{ Average Daily Food Availability (g/person/day) = (specific annual expenditure) / (price index per food unit) * (food unit expressed in grams according to priced index) / (365 days) / (3.1 average number of households members).}$$

The above food consumption data give information about the average food availability and they exist as a data base in the State General Laboratory of Cyprus. They are favourably compared with similar results for 11 other European countries especially Mediterranean (DAFNE EU project 1997 for Nutrition and European Eating Habits).

More specifically the food consumption data used for the dietary intake assessment of aspartame are showed in Table 2. This table includes food groups/items that are the mainly consumed and contributing to the intake of aspartame.

Dietary Intake Assessment of Aspartame

Using the food consumption data of Table 2 and the occurrence data of Table 1 for the real levels/concentrations of aspartame in several foodstuffs, the total calculated intake of aspartame for adults and children is showed in Table 3 and 4 respectively and was calculated in $\mu\text{g/kg bw/day}$ for 60kg body weight for adults and 15kg body weight for children.

The results of the above calculations were compared with the respective value of ADI (= 40mg/kg bw/day) for aspartame. The calculations of the daily intake for aspartame for each food group/item were done according to the equation:

$$(2) \mu\text{g/kg b.w/day} = \text{concentr. } (\mu\text{g/g}) \times \text{daily consumption (g/person/day)} / \text{b.w (kg)}.$$

Table 1: Occurrence data of Aspartame in foodstuffs in Cyprus 2002-2009†

Food group/item	Subgroup/item	No of Samples	mg/kg or mg/ml			
			min	mean	median	max
Non-alcoholic drinks	soft drinks	9	3,5	48,7	52,0	122,0
	soft drinks-diet	65	3,5	244,2	204,3	598,0
	ice-tea	8	3,5	87,9	69,5	215,0
	fruit juices	16	3,5	66,3	17,8	212,6
	lemonade, orange etc squashes	16	3,5	38,5	3,5	188,0
	flavoured mineral water	18	3,5	87,1	61,4	509,0
Confectionery (sweets, candies)	Jelly	16	422	635,2	614,3	1005,0
	Chewing Gums	9	3,5	520,2	632,0	1079,0
	Candies	22	3,5	151,7	3,5	596,0
Milk & Milk Products	Yoghurt Dessert	39	3,5	184,1	156,0	671,0
	Milk-based flavoured dessert (including ice-cream)	8	3,5	160,4	103,0	736,4

† The data of this table are based on data of 2002-2009 sent to EFSA and are produced within the National official control programme of additives in Cyprus .Results below the limit of detection are included in the calculations at half the limit of detection (LOD= 7,0 mg/kg).

Table 2: Food consumption data for Cyprus (HBS 2003/2004) used for calculation of aspartame intake

Food group/ item	g/person/day
Soft drinks	19,71
Soft drinks-diet	19,71
Ice tea	19,71
Fruit juices	34,94
Lemonade, orange etc Squashes	19,71
Flavoured Mineral Water	111,00
Jelly	131,56
Chewing Gums	1,50 (estimated consumption)
Candies	10,00
Yoghurt desserts	47,70
Milk-based flavoured desserts (including ice-cream)	127,33

Table 3: Total Intake of Aspartame in Cyprus ADI=40mg/kgb.w./day, for adults 60kg b.w.

Food group/ item	No of samples	Daily intake (mg/kg b.w./day) (%ADI)			
		min	mean	median	max
Soft drinks	9	0,0011 (0)	0,016 (0)	0,017 (0)	0,040 (0,1)
Soft drinks-diet	65	0,0011 (0)	0,080 (0,2)	0,067 (0,2)	0,196 (0,5)
Ice tea	8	0,0011 (0)	0,029 (0,1)	0,023 (0,1)	0,071 (0,2)
Fruit juices	16	0,0020 (0)	0,037 (0,1)	0,010 (0)	0,124 (0,3)
Lemonade, orange etc Squashes	16	0,0011 (0)	0,013 (0)	0,001 (0)	0,062 (0,2)
Flavoured Mineral Water	18	0,0065 (0)	0,161 (0,4)	0,114 (0,3)	0,942 (2,4)
Jelly	16	0,925 (2,3)	1,393 (3,5)	1,347 (3,4)	2,204 (5,5)
Chewing Gums	9	0,0001(0)	0,013 (0)	0,016 (0)	0,027 (0,1)
Candies	22	0,0006(0)	0,025 (0,1)	0,0006 (0)	0,099 (0,2)
Yoghurt desserts	39	0,0028(0)	0,146 (0,4)	0,124 (0,3)	0,533 (1,3)
Milk-based flavoured desserts (including ice-cream)	9	0,0074 (0)	0,340 (0,9)	0,219 (0,5)	1,56 (3,9)
TOTAL	227	0,95 (2,4)	2,26 (5,6)	1,94 (4,8)	5,86 (14,7)

Table 4: Total Intake of Aspartame in Cyprus ADI=40mg/kgb.w./day, for children 15kg b.w.

Food group/ item	No of samples	Daily intake (mg/kg b.w./day) (%ADI)			
		min	mean	median	max
Soft drinks	9	0,0046 (0)	0,064 (0,2)	0,068 (0,2)	0,160 (0,4)
Soft drinks-diet	65	0,0046 (0)	0,321 (0,8)	0,269 (0,7)	0,786 (2,0)
Ice tea	8	0,0046 (0)	0,116 (0,3)	0,091 (0,2)	0,283 (0,7)
Fruit juices	16	0,0082 (0)	0,154 (0,4)	0,041 (0,1)	0,495 (1,2)
Lemonade, orange etc Squashes	16	0,0046 (0)	0,051 (0,1)	0,0046 (0)	0,247 (0,6)
Flavoured Mineral Water	18	0,026 (0,1)	0,644 (1,6)	0,454 (1,1)	3,767 (9,4)
Jelly	16	3,701 (9,3)	5,571 (13,9)	5,387 (13,5)	8,815 (22,0)
Chewing Gums	9	0,0004 (0)	0,052 (0,1)	0,063 (0,2)	0,108 (0,3)
Candies	22	0,0023 (0)	0,101 (0,3)	0,0023 (0)	0,397 (1,0)
Yoghurt desserts	39	0,0111 (0)	0,585 (1,5)	0,496 (1,2)	2,134 (5,3)
Milk-based flavoured desserts (including ice-cream)	9	0,030 (0,1)	0,750 (1,9)	0,840 (2,1)	0,030 (0,1)
TOTAL	227	3,80 (9,5)	8,41 (21,0)	7,72 (19,3)	17,22 (43,1)

DISCUSSION

Levels, monitoring and official control

As shown from Table 1, most of the examined samples were within the requirements of the relevant EU legislations.

These results, indicate the effectiveness of the applied monitoring and control programme, as well as the need of constant surveillance and control at critical control points (import, primary storage industry etc) in order to prevent unfit products entering Cyprus and EU market and to keep the intake of aspartame and other additives at safe levels⁽⁴⁾.

Assessment of dietary intake of aspartame

From the results of Tables 3 & 4 we can see that the estimated aspartame intake mean value is 5,6 % ADI and max value is 14,7 % ADI for adults and mean value is 21 % ADI and max value 43,1 % ADI for children. The estimation of dietary intake for children cannot be neglected and must be taken into account seriously.

The results for adults are comparable with previous estimations for Cyprus^(4a) and relevant data for other E.U member states e.g. U. K and the Netherlands, the last being produced by combining national data on food consumption with the maximum permitted usage levels for the additive^(4c).

Having in mind the above results, the monitoring and control of food additives including aspartame must continue. Furthermore the assessment of the dietary intake of additives must be done by member states for the mean adult population and for vulnerable population groups e.g children and in accordance with the spirit of the relevant documents of European Commission^(3a,4b, 4c) so as to keep the intake of additives at safe levels.

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