



Fat-soluble vitamins in food supplements: do the labels follow the recommended doses?

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provided by diet, mineral supplements (MS) are one of the largest growing category of FS used. Given the high prevalence of MS use among consumers and their potential for drug interactions [1], as well as adverse effects of excess consumption, special attention should be given to the Label Recommended Daily Dose (LRDD). As intake increases above the Tolerable Upper Intake Level (UL), the potential risk of experiencing adverse effects may rise [2]. The aim of this study was to evaluate if LRDD of MS are in conformity with the RDA defined by European Union Directive [3].

Materials and methods: A total of 210 FS sold in Portuguese pharmacies, supermarkets, health shops and on internet were examined for LRDD of 14 minerals (Ca, Cl, Cr, Cu, Fe, F, I, K, Mg, Mn, Mo, P, Se and Zn). Selection criteria: oral solid pharmaceutical forms for adults, containing any of the 14 minerals, as stated in the label, regardless of the purpose of its use.

Results: 56% of FS labels presented LRDD of at least one mineral > RDA and 6% of FS indicated LRDD > RDA, for 7 or more minerals. For most minerals (excluding Cl, F and K), Maximum Label Recommended Daily Dose (MLRDD) is much higher than RDA, with some FS mentioning doses of Se and Zn above UL defined by EFSA [2] (Table 1).

Discussion and conclusions: It is noteworthy that some minerals can be harmful in large doses with risk of oral and systemic manifestations: e.g. excess of Zn may promote hypocupremia, anemia, gait and balance disorders and paresthesias; excess of Se can cause alopecia, hair and nail brittleness and garlic odor to breath. This study revealed that, for most minerals, the majority of FS labels recommended daily doses above RDA and some even above UL. Therefore, it is crucial to review doses of minerals present in FS ensuring the safety of these products.

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Table 1. Results of FS containing minerals.

Mineral Unit	Ca mg	Cl mg	Cr µg	Cu mg	Fe Mg	F mg	I µg	K mg	Mg mg	Mn mg	Mo µg	P mg	Se µg	Zn mg
Number of FS	100	5	102	132	104	4	94	32	136	116	53	40	123	156
RDA	800	800	40	1	14	3.5	150	2000	375	2	50	700	55	10
LRDD > RDA (%)	5	0	49	31	21	0	16	0	7.4	34	34	2.5	49	50
UL	2500	ND	250	5	ND	7	600	ND	250*	ND	600	ND	300	25
LRDD > UL (%)	0	–	0	0	–	0	0	–	22	–	0	–	1	3
MLRDD*	2040	314	240	3	42	1.8	451	340	600	20	600	1215	400	31

*Does not include Mg present in diet; ND: Not defined

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Introduction: Adequate vitamins consumption is indispensable for the maintenance of health and to prevent disease. Both poor and overdose intakes may result in adverse health effects [1]. Recommended Daily Allowance (RDA) is the average daily level intake sufficient to meet the nutrient requirements of nearly all (97-98%) healthy individuals [2]; Tolerable Upper Intake Level (UL) is the maximum level of total chronic daily intake of a nutrient judged to be unlikely to pose a risk of adverse health effects to humans [3]. Owing the ability of fat-soluble vitamins to accumulate in the liver and adipose tissue, they present a higher potential for toxic effects than water-soluble vitamins. The aim of this study was to evaluate if daily doses of fat-vitamins (vit) mentioned in food supplements (FS) labels are in conformity with the RDA defined by European Union Directive [4].

Materials and methods: A total of 165 FS sold in Portuguese pharmacies, supermarkets, health shops and on internet were examined for indicated daily intake and dosage of vitA, vitD, vitE and vitK. Selection criteria: oral solid

pharmaceutical forms for adults, containing at least one fat-vitamin in its composition, as stated in the label, regardless of FS purpose.

Results: 48% of the FS labels presented doses of one fat-vitamin > RDA and 23% FS with 2 or more vitamins > RDA. Only 30% of FS indicated all fat-vitamins doses ≤ RDA. It is noteworthy that some FS presented daily doses above UL defined by EFSA [3] (Table 1).

Discussion and conclusions: Since fat-vitamins may be stored in the body and are slowly eliminated, the chronic intake of high doses should be monitored to prevent adverse effects of these vitamins (e.g. vitA: visual disorders, liver and kidney damage, birth defects; vitD: muscle and joint pain, cardiovascular and renal disorders; vitE: hemorrhage, higher risk of prostate cancer; vitK: coagulation disorders). This study revealed that the majority of FS labels recommended daily doses of fat-soluble vitamins above RDA, some even above UL. Therefore, it is crucial that doses of vitamins present in FS are reviewed ensuring the safety of these products.


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Table 1. Results of FS with fat-soluble vitamins.

Vitamin	A	D	E	K
N	73	142	95	32
RDA	800 µg	5 µg	12 mg	75 µg
N > RDA (%)	22 (30)	90 (63)	54 (57)	10 (31)
UL	3000 µg	100 µg	300 mg	n.d.
N > UL (%)	3 (4)	11 (8)	2 (2)	–

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FORENSIC SCIENCES AND FORENSIC PSYCHOLOGY

Assessing the content of a synthetic cannabinoid “research chemical” package

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Introduction: Over the past several years, a new class of psychoactive substances has emerged from the drug market.[1–3] These Novel Psychoactive Substances (NPS) are defined as “a new narcotic or psychotropic drug, in pure form or in preparation, that is not controlled by the United Nations drug conventions, but which may pose a public health threat comparable to that posed by substances listed in these conventions” [1]. The largest and most popular group of NPS is Synthetic Cannabinoids (SC). SC are used as a ‘legal’ alternative to Cannabis, which means that they produce similar psychotropic effects to those of Δ⁹-THC. These substances are easily bought on internet shops and both blends or ‘research chemicals’ come in packets [2,3]. These packets are advertised as containing a certain SC pure. Usually, pure substances from synthesis are very expensive. On contrary, SC 1g packets are sold for 10€ or less. In the present study, a SC called THJ-018 was bought in the internet as a ‘research chemical’ and its content was assessed by GC/MS and HPLC/DAD.

Materials and methods: THJ-018 was bought as a ‘research chemical’ >99% purity. A gas chromatography system coupled with a mass selective detector and an automated injector were used for the analysis of the packet content.