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News and Views

Is Potassium Hydroxide Safe as a Source of Nutrient in Food Supplements? An Expert Opinion

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Abstract

Diet and nutrition have recently become a primary focus of public health worldwide. Food supplements (FSs), used to integrate common diets, are a highly marketed category of food products. This has positioned healthcare professionals (e.g., pharmacists) to have critical roles in their distribution and monitoring. Following a serious case of intoxication due to ingestion of potassium hydroxide (KOH) as a nutrient source in a FS, a technical analysis was carried out to assess the admissible levels of vitamins and minerals in such products. KOH, known for its high potential hydrogen (pH) and caustic properties, poses safety risks if not properly diluted. The EU Regulation 1169/2011 regulates the provision of food information to consumers and establishes minimum significant quantities for nutrients in all food products, including K, which must not exceed certain levels to ensure safety. The use of KOH as a unique K source has been shown to create high alkalinity, posing potential risks when dissolved in water for human consumption. Safer alternative forms of K are available for FS. This underscores the need for continuous regulatory oversight and involvement of public decision makers to ensure consumer safety, given the broad variability in FS formulations and their increasing market share.

Keywords: diet; food supplements; food safety; potassium hydroxide; nutrients

1. Introduction

In recent years, diet and nutrition have increasingly become the focus of the health needs of the population worldwide [1]. The categorization of foods used to supplement the common diet encompasses foods for specific groups of populations, fortified foods, and food supplements (FSs) [2]. FSs are food products intended to integrate the common diet and are the category of food products most marketed worldwide. As a result, healthcare professionals play a crucial role in dispensing and monitoring their consumption [3].

2. Case Study

Following the report of a serious case of intoxication due to the intake of potassium hydroxide (KOH) as a source of nutrients contained in a FS, a scientific opinion was released (A.Z.) regarding the value of vitamins and minerals admissible in foods used to supplement the diet [4]. In this case, the adverse reaction appeared as a caustic, corrosive, and harmful reaction due to the accidental ingestion of a food supplement containing KOH in liquid form and taken undiluted [5,6]. The concentration of the substance made the solution caustic with a very high pH of greater than 12. EU Regulation 1169/2011 establishes that to determine a significant amount of vitamins and minerals in foods, at least a value of 15% of the total nutritional reference value (NRV) of the food must be considered [3,7]. KOH is on the list of vitamins and minerals and their forms which can be added to foods, including FSs [3,7]. Annex II of (EC) Regulation 1170/2009 lists the other forms of K that can be used in the formulation of FSs (Table 1, Ref. [6]). The NRV of K established by Regulation 1169/2001 is 2000 mg; thus, a significant quantity for daily reference intake is at least 300 mg. Different types of FSs containing K are on the European market. Generally, formulated as powders or tablets to be taken with water, these products guarantee a K supply no less than 15% of the NVR value and are compliant with the provisions of Regulation (EU) 1169/2011. To evaluate the potential caustic effect associated with the consumption of an FS containing KOH as the unique source of K and dissolved in 200 mL water, a model of calculation was applied. This model calculated the pH values corresponding to the ingestion of specific amounts of K. The model predicted that the solvent vehicle should be deionized water. It is noteworthy that these calculations are only relevant for pure water without any buffering capacity. Table 2 illustrates some numerical examples of pH calculated as a function of the amount in mg K. The calculated values highlight that the use of KOH as unique source of K in FSs inevitably determines a strong alkaline characteristic. In particular, our search showed how the intake of about 430 mg KOH in 200 mL water, corresponding to 300 mg K (15% NRV), is incompatible with the characteristics of water for human consumption (pH 6.5–9.5). Fur-

Table 1. Forms of potassium that can be used in the formulation of food supplements according to EU Regulation 1170/2009.

Forms of potassium that can be used in the formulation of food supplements according to the EU Regulation [6]	
potassium citrate	potassium chloride
potassium iodide	potassium gluconate
potassium iodate	potassium glycerophosphate
potassium bicarbonate	potassium lactate
potassium carbonate	potassium L-pidolate
potassium malate	potassium salts of orthophosphoric acid
potassium molybdate	potassium fluoride

Table 2. Numerical examples of potential hydrogen (pH) calculated as a function of the amount in mg potassium (% expresses the nutrient reference values).

mg KOH	mg K	% NRV K	pH
0.00014	0.0001	0.00%	7.4
0.0072	0.005	0.00%	9.1
0.0144	0.01	0.00%	9.4
0.0287	0.02	0.00%	9.7
0.0574	0.04	0.00%	10
0.0862	0.06	0.00%	10.1
0.1436	0.1	0.01%	10.4
0.2154	0.15	0.01%	10.5
0.2872	0.2	0.01%	10.7
0.359	0.25	0.01%	10.8
0.43	0.3	0.02%	10.8
0.72	0.5	0.03%	11.1
1.01	0.7	0.04%	11.2
1.29	0.9	0.05%	11.3
2.87	2	0.10%	11.7
5.74	4	0.20%	12
8.62	6	0.30%	12.1
14.36	10	0.50%	12.4
28.72	20	1.00%	12.7
43.08	30	1.50%	12.8
71.79	50	2.50%	13.1
143.59	100	5.00%	13.4
287.18	200	10.00%	13.7
430.77	300	15.00%	13.8
717.95	500	25.00%	14.1
1435.9	1000	50.00%	14.4
2871.79	2000	100.00%	14.7

thermore, it should be noted that to obtain a ready-to-use solution with a pH range between 6.5 and 9, no more than 10 µg KOH should be administered. Clearly this amount would be negligible in terms of contribution to the NRV of K.

3. Conclusion—Expert Opinion

In conclusion, considering that other forms of K can be used in FSs without significant risk to consumers, the use of KOH as unique source of K in FSs should be avoided due to its chemical and physical properties. FSs are products that increasingly occupy a significant market share in Western countries. The freedom of consumer access to this market, as well as the wide variability of ingredients and substances contained in these products, should focus on regulations aimed to protect consumer safety. This brief technical note aimed to highlight how, in the face of a large number of FS varieties that differ in form and composition, adequate regulatory surveillance is crucial to monitor the consumption of these products to protect public health. For healthcare professionals such as in other fields of work, this critical issue could represent an opportunity to carve out a key role in the healthcare landscape to safeguard the health and safety of consumers [8]. Strengthening regulations would help safeguard public health while leveraging scientific evidence to guide safe FS use. Consequently, this brief note underlines the importance of developing further regulatory tools aimed at controlling the market, highlighting the scientific evidence supporting the nutritional and physiological aspects that characterize supplements and guarantee consumer safety.

Availability of Data and Materials

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

Author Contributions

AZ designed the research study and wrote the original draft of the manuscript. FF analyzed the data. Both authors contributed to editorial changes in the manuscript. Both authors read and approved the final manuscript. Both authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

Not applicable.

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Conflict of Interest

AZ declares that the opinions expressed are of a personal nature and do not in any way commit the responsibility of the Administrations to which him belongs.

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