

SCIENTIFIC OPINION

Inability to assess the safety of lithium-enriched yeast added for nutritional purposes as a source of lithium in food supplements and the bioavailability of lithium from this source, based on the supporting dossier¹

Scientific Statement of the Panel on Food Additives and Nutrient Sources added to Food (ANS)

(Question No EFSA-Q-2005-192)

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PANEL MEMBERS

F. Aguilar, U.R. Charrondiere, B. Dusemund, P. Galtier, J. Gilbert, D.M. Gott, S. Grilli, R. Guertler, G.E.N. Kass, J. Koenig, C. Lambré, J-C. Larsen, J-C. Leblanc, A. Mortensen, D. Parent-Massin, I. Pratt, I.M.C.M. Rietjens, I. Stankovic, P. Tobback, T. Verguieva, R.A. Woutersen.

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BACKGROUND AS PROVIDED BY THE EUROPEAN COMMISSION

The European Community legislation lists nutritional substances that may be used for nutritional purposes in certain categories of foods as sources of certain nutrients.

The Commission has received a request for the evaluation of lithium-enriched yeast added for nutritional purposes to food supplements. The relevant Community legislative measure is:

- Directive 2002/46/EC of the European Parliament and of the Council on the approximation of the laws of the Member States relating to food supplements².

TERMS OF REFERENCE AS PROVIDED BY THE EUROPEAN COMMISSION

In accordance with Article 29 (1) (a) of Regulation (EC) No 178/2002, the European Commission asks the European Food Safety Authority to provide a scientific opinion, based on its consideration of the safety and bioavailability of lithium-enriched yeast added for nutritional purposes to food supplements.

² OJ L 183, 12.7.2002, p.51.

STATEMENT

1. Introduction

Following a request from the European Commission to the European Food Safety Authority (EFSA), the Scientific Panel on Food Additives and Nutrient Sources added to Food (ANS) was asked to provide a scientific opinion on the safety of lithium-enriched yeast added for nutritional purposes as a source of lithium in food supplements and on the bioavailability of lithium from this source.

2. Summary of the information provided in the supporting dossier on lithium-enriched yeast

Lithium-enriched yeast is derived from cultures of specified strains of *Saccharomyces cerevisiae* grown in the presence of lithium carbonate. Fermentation takes place at a specified temperature and pressure for defined periods of time. This is followed by increasing the temperature to kill the yeast. The cell wall is ruptured enzymatically to release the contents which are then spray dried.

The petitioner has provided some general information on the manufacturing process.

According to the petitioner, lithium in lithium-enriched yeast is naturally integrated by the growing yeast into its own structure and occurs therefore in the way lithium would be present in any food material.

The petitioner states that the integration will be “chemically multi-formatted by the organism and therefore, its chemical name, formula, chemical family and CAS registry number is undefined”. Further details on the characterisation of the fermentation products are not provided.

Lithium-enriched yeast is described by the petitioner as an amorphous hygroscopic cream powder with a slight yeast odour which is water soluble at 20 °C. The petitioner states that lithium is present at 1% of the yeast matrix. The majority of the remaining 99% is made up of enzymatically ruptured yeast cells. The petitioner also provides microbiological specifications. Specifications for lead, mercury, cadmium and arsenic are not provided. The petitioner states that the identification of the source has been also achieved by using X-ray Photoelectron Spectroscopy (XPS) and a comparative elemental analysis for carbon, hydrogen, and nitrogen (C:H:N analysis) of the starter yeast and the lithium-enriched yeast.

The petitioner reports that lithium-enriched yeast is stable in foods and food supplements for a minimum of three years, although no data were provided to support this statement. In addition, the petitioner states that the determination of the source has been carried out by an analytical method based on the analysis of total lithium by Atomic Absorption Spectroscopy (AAS).

The proposed use, according to the petitioner, is to provide a source of lithium supplied as a nutrient in food supplements, which mirrors its natural occurrence in food. Lithium-enriched yeast is used by food supplement manufacturers as an ingredient in tablets, caplets, capsules, chewable tablets, effervescent powders and liquids that are food supplements. The method of incorporation is determined by the individual manufacturers, as appropriate for the particular

type of finished product. According to the petitioner, the quantities added are product-dependent and are generally in the range of 0.5 to 2 mg/day.

No specific information is provided on the bioavailability of lithium from lithium-enriched yeast, other than a statement that lithium from lithium-enriched yeast is thought to be more bioavailable than that from lithium carbonate. According to the petitioner, no specific data on metabolism and distribution are available for lithium-enriched yeast, but the metabolic fate and biological distribution of lithium from lithium-enriched yeast is expected to be similar to that of other sources of lithium in the diet. The mechanism by which lithium is transported in the body has not been defined.

No toxicological data were provided on the source.

3. Assessment

The Panel notes that *Saccharomyces cerevisiae* has a qualified presumption of safety (EFSA, 2008) but considers that this presumption of safety might not be applicable to the specific conditions of culture of the yeasts in the presence of a high quantity of lithium.

According to the petitioner lithium-enriched yeast is safe. Although not explicitly stated in the dossier, the argument for the safety of lithium-enriched yeast appears to be based on lithium being a normal constituent of the diet, and the long history of use of *Saccharomyces cerevisiae* in fermented food and beverages. The assumption is that, provided there is no overload of normal metabolic pathways, fermentation within eukaryotic cells will produce organic lithium compounds, not further defined but with a metabolic fate and biological distribution similar to that of other sources of lithium in the diet.

Further chemical characterisation of the fermentation product was not provided.

According to the petitioner, the difference in the C:H:N ratio between the starter yeast (9.8:1.5:1) and the lithium-enriched yeast (6.0:0.9:1) supports the hypothesis that changes within the yeast due to lithium incorporation into the internal structure of the yeast may have modified the overall composition of the yeast. However, the Panel considers that the C:H:N analysis is not relevant to compare the starter yeast and the lithium-enriched yeast and that such a difference in the C:H:N ratio would not in any case provide a clear evidence of incorporation of lithium or change in the structure of the yeast.

According to the petitioner, the differences between the FTIR spectra of lithium-enriched yeasts and the starter yeast reference spectrum suggest changes in composition and structure within the yeast. The Panel considers that the FTIR spectra provided do not demonstrate the existence of coordinate bonds between lithium and the yeast biomass.

Overall, the Panel notes that the petitioner has insufficiently chemically characterised the product and therefore has not demonstrated that lithium from lithium-enriched yeast has a metabolic fate and biological distribution similar to that of other food sources of lithium in the diet.

Lithium from lithium-enriched yeast is stated by the petitioner to be more bioavailable than lithium from other, inorganic, lithium compounds (e.g. lithium carbonate). The Panel notes that it is not possible to assess the bioavailability of lithium from lithium-enriched yeast since neither data nor suitable supporting references were provided.

The Panel notes that neither safety data nor suitable supporting references were provided to support the assumption of safety of lithium-enriched yeast.

The Panel notes that neither the EFSA Scientific Panel on Dietetic Products, Nutrition and Allergies (NDA) nor other authorities have established dietary reference values for lithium. There is no evidence that it is essential for humans.

CONCLUSIONS

The Panel concludes that due to the lack of an appropriate dossier supporting the use of lithium-enriched yeast in food supplements, the bioavailability of lithium from lithium-enriched yeast and the safety of lithium-enriched yeast cannot be assessed.

Key words:

Lithium, lithium carbonate, lithium-enriched yeasts, food supplements, yeast.

DOCUMENTATION PROVIDED TO EFSA

Technical dossier, 2005. Bio-transformed Lithium Proposed for Addition to Annex II of Directive 2002/46/EC of the European Parliament and of the Council Relating to Food Supplements Submitted by Higher Nature Ltd UK. Original submission June 2005. Additional information submitted January 2008 and October 2008.

REFERENCES

EFSA (European Food Safety Authority), 2008. Opinion of the Scientific Panel on Biological Hazards on the maintenance of the list of QPS microorganisms intentionally added to food or feed. *The EFSA Journal* (2008) 923, 1-48.

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GLOSSARY / ABBREVIATIONS

AAS	Atomic Absorption Spectroscopy
ANS	Scientific Panel on Food Additives and Nutrient Sources added to Food
AOAC	Association of Official Analytical Chemists
CAS	Chemical Abstracts Service
EC	European Commission
EFSA	European Food Safety Authority
FTIR	Fourier Transform Infra Red
NDA	Scientific Panel on Dietetic Products, Nutrition and Allergies
XPS	X-ray Photoelectron Spectroscopy