SCIENTIFIC OPINION

Scientific Opinion on the substantiation of health claims related to boron and maintenance of bone (ID 218, 219) and maintenance of joints (ID 219, 220) pursuant to Article 13(1) of Regulation (EC) No 1924/2006[1]

EFSA Panel on Dietetic Products, Nutrition and Allergies (NDA)[2]

European Food Safety Authority (EFSA), Parma, Italy

SUMMARY

Following a request from the European Commission, the Panel on Dietetic Products, Nutrition and Allergies was asked to provide a scientific opinion on a list of health claims pursuant to Article 13 of Regulation 1924/2006. This opinion addresses the scientific substantiation of health claims in relation to boron and the following claimed effects: maintenance of bone and maintenance of joints. The scientific substantiation is based on the information provided by the Member States in the consolidated list of Article 13 health claims and references that EFSA has received from Member States or directly from stakeholders.

The food constituent that is the subject of the health claims is boron, which occurs in foods as borate and boric acid and is measurable in foods by established methods. The Panel considers that boron is sufficiently characterised.

Maintenance of bone

The claimed effects are "bone health" and "bone metabolism" "involved in bone metabolism". The Panel assumes that the target group is the general population. In the context of the proposed wordings, the Panel notes that these claimed effects relate to the maintenance of normal bone. The Panel considers that the maintenance of normal bone is beneficial to human health.

In weighing the evidence, the Panel took into account that, although some animal studies report adverse effects of dietary deprivation of boron on calcium balance, bone calcification and bone strength that can be corrected by increasing boron intake, no consistent effect of boron intake on meaningful markers of bone health has been observed in humans.

The Panel concludes that a cause and effect relationship has not been established between the consumption of boron and the maintenance of normal bone.

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Maintenance of joints

The claimed effect is "joint health". The Panel assumes that the target group is the general population. The Panel considers that the maintenance of normal joints is beneficial to human health.

In weighing the evidence, the Panel took into account that the evidence provided does not establish that patients with osteoarthritis are representative of the general population with regard to the status of joint tissues, or that results obtained in studies on subjects with osteoarthritis can be extrapolated to the maintenance or improvement of the structure or function of joints in the general population.

The Panel concludes that a cause and effect relationship has not been established between the consumption of boron and the maintenance of normal joints.

KEY WORDS

Boron, bone, joints, health claims.

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The members of the Working Group on Claims: Jean-Louis Bresson, Albert Flynn, Marina Heinonen, Hannu Korhonen, Martinus Løvik, Ambroise Martin, Hildegard Przyrembel, Seppo Salminen, Sean (J.J.) Strain, Inge Tetens, Henk van den Berg, Hendrik van Loveren and Hans Verhagen.

The members of the Claims Sub-Working Group on Bone/Teeth/Connective Tissue: Rikke Andersen, Olivier Bruyère, Albert Flynn, Ingegerd Johansson, Jukka Meurman and Hildegard Przyrembel.

INFORMATION AS PROVIDED IN THE CONSOLIDATED LIST

The consolidated list of health claims pursuant to Article 13 of Regulation (EC) No 1924/2006[3] submitted by Member States contains main entry claims with corresponding conditions of use and literature from similar health claims. The information provided in the consolidated list for the health claims which are the subject of this opinion is given in Table 1.

Table 1. Main entry health claims related to boron, including conditions of use from similar claims, as proposed in the Consolidated List.

ID	Food or Food constituent	Health Relationship	Proposed wording
218	Boron	Bone health	Boron is important for the normal structure of bone.
	Conditions of use - Refs 3-8: 3mg Boron per day. Must meet minimum requirements for use of the claim "source of [name of vitamin/s] and/or [name of mineral/s]" as per Annex to Regulation 1924/2006. - 0.8 – 1,5 mg of boric acid. Must meet minimum requirements for use of the claim "source of [name of vitamin/s] and/or [name of mineral/s]" as per Annex to Regulation 1924/2006. - 3 mg per day - Food supplement with 3mg of boron in the daily dose		
219	**Food or Food constituent**	**Health Relationship**	**Proposed wording**
	Boron	Joint Health/Bone Metabolism	Boron may help maintain joint and bone health. Boron involved in joint health. Boron required for joint health. Boron required for bone health. Boron involved in bone metabolism.
	Conditions of use - Must meet minimum requirements for use of the claim "source of [name of vitamin/s] and/or [name of mineral/s]" as per Annex to Regulation 1924/2006.		
220	**Food or Food constituent**	**Health Relationship**	**Proposed wording**
	Boron as boric acid	Joint health	Boron helps build and maintain healthy joints. Boron helps maintain the flexibility and mobility of the joints.
	Conditions of use - 0.8 – 1,5 mg of boric acid. Must meet minimum requirements for use of the claim "source of [name of vitamin/s] and/or [name of mineral/s]" as per Annex to Regulation 1924/2006.		

[3] Regulation (EC) No 1924/2006 of the European Parliament and of the Council of 20 December 2006 on nutrition and health claims made on foods. OJ L 404, 30.12.2006, p. 9–25.

ASSESSMENT

1. Characterisation of the food/constituent

The food constituent that is the subject of the health claims is boron, which occurs in foods as borate and boric acid and is measurable by established methods.

The Panel considers that the food constituent, boron, which is the subject of the health claims is sufficiently characterised.

2. Relevance of the claimed effect to human health

2.1. Maintenance of bone (ID 218, 219)

The claimed effects are "bone health" and "bone metabolism" "involved in bone metabolism". The Panel assumes that the target group is the general population.

In the context of the proposed wordings, the Panel notes that these claimed effects relate to the maintenance of normal bone.

The Panel considers that the maintenance of normal bone is beneficial to human health.

2.2. Maintenance of joints (ID 219, 220)

The claimed effect is "joint health". The Panel assumes that the target group is the general population.

In the context of the proposed wordings, the Panel notes that these claimed effects relate to the maintenance of normal joints.

The Panel considers that the maintenance of normal joints is beneficial to human health.

3. Scientific substantiation of the claimed effect

Boron has not been established to be an essential nutrient for humans and a dietary requirement for boron in humans has not been determined. Boron can act as an inhibitor of activity for a wide variety of enzymes *in vitro*; however, no boron-dependent enzyme has been identified. There is evidence that dietary boron may influence the metabolism of steroid hormones and some nutrients, including calcium, magnesium, and vitamin D, but the mechanisms for these effects are unknown. No specific physiological function for boron has been identified in higher animals or humans (EFSA, 2004; IoM, 2001; SCF, 1993; EVM, 2003; Devirian and Volpe, 2003).

3.1. Maintenance of bone (ID 218, 219)

Studies of dietary deprivation of boron in animals (rats, pigs, chickens) have reported adverse effects on calcium balance, bone calcification and bone strength that can be corrected by increasing boron intake. The effects of low boron intakes appear to be more marked when accompanied by low status for other nutrients (e.g. vitamin D, magnesium) (Hegsted et al., 1991; Nielsen, 1990; Nielsen and Shuler, 1992; Armstrong and Spears, 2001; Armstrong et al., 2002; Hunt, 1989; Hunt et al., 1994; Kurtoglu et al., 2001; Naghii et al., 2006; Rico et al., 2002; Sheng et al., 2001; Wilson and Ruszler, 1998).

There is some evidence that, in humans, boron intake within the usual dietary range may influence the metabolism and utilisation of calcium. Increasing boron intake from 0.33 to 3.33 mg/d in healthy

postmenopausal women over a 3-week period resulted in elevated urinary calcium excretion and apparent positive calcium balance. There was no effect on plasma sex steroid levels or urinary excretion of pyridinium crosslink markers of bone turnover (Beattie and Peace, 1993). Supplementation of a low boron (0.36 mg/d), low magnesium (109 mg/d) diet with 3 mg boron in healthy postmenopausal women over a 24-day period resulted in reduced urinary calcium excretion. When dietary intake of magnesium was increased over a further 24-day period to 300 mg/d, urinary calcium excretion was increased (Hunt et al., 1997). However, boron supplementation (3 mg/d) of the usual diet over one year had no effect on urinary calcium excretion or bone mineral density in female college students (Volpe et al., 1993; Meacham et al., 1994, Meacham et al., 1995). The Panel considers that these studies do not establish a role for boron in the normal structure or function of bone in humans.

In weighing the evidence, the Panel took into account that, although some animal studies report adverse effects of dietary deprivation of boron on calcium balance, bone calcification and bone strength that can be corrected by increasing boron intake, no consistent effect of boron intake on meaningful markers of bone health have been observed in humans.

The Panel concludes that a cause and effect relationship has not been established between the consumption of boron and the maintenance of normal bone.

3.2. Maintenance of joints (ID 219, 220)

Most of the references provided for the substantiation of this claim were related to osteoporosis and not directly pertinent to the claimed effect.

The only human study presented was on the effects of boron in patients with severe osteoarthritis (OA) (Travers et al., 1990). OA is the most common joint disease worldwide (Issa and Sharma, 2006; Corti and Rigon, 2003; Arden and Nevitt, 2006) and a major cause of disability (Hunter et al., 2008; Pollard and Johnston, 2006; Sarzi-Puttini et al., 2005; Ethgen et al., 2004).

The Panel considers that the evidence provided does not establish that patients with OA are representative of the general population with regard to the status of joint tissues, or that results obtained in studies on subjects with OA relating to the treatment of symptoms of this disease (e.g. erosion of articular cartilage, reduced mobility of joints) can be extrapolated to the maintenance of the normal structure or function of joints in the general population. Therefore, no conclusions can be drawn form the study presented in relation to the claimed effect.

The Panel concludes that a cause and effect relationship has not been established between the consumption of boron and the maintenance of normal joints.

CONCLUSIONS

On the basis of the data presented, the Panel concludes that:

- The food constituent, boron, which is the subject of the health claims is sufficiently characterised.

Maintenance of bone (ID 218, 219)

- The claimed effects are “important for the normal structure of bone”, “maintain bone health”, “involved in bone metabolism”. The target group is the general population. Maintenance of normal bone is beneficial to human health.

- A cause and effect relationship has not been established between the consumption of boron and the maintenance of normal bone.

Maintenance of joints (ID 219, 220)

- The claimed effects are "build and maintain healthy joints", "maintain the flexibility and mobility of the joints". The target group is the general population. Maintenance of normal joints is beneficial to human health.

- A cause and effect relationship has not been established between the consumption of boron and the maintenance of normal joints.

DOCUMENTATION PROVIDED TO EFSA

Health claims pursuant to Article 13 of Regulation (EC) No 1924/2006 (No: EFSA-Q-2008-1005, EFSA-Q-2008-1006, EFSA-Q-2008-1007). The scientific substantiation is based on the information provided by the Members States in the consolidated list of Article 13 health claims and references that EFSA has received from Member States or directly from stakeholders.

The full list of supporting references as provided to EFSA is available on: http://www.efsa.europa.eu/panels/nda/claims/article13.htm

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APPENDICES

APPENDIX A

BACKGROUND AND TERMS OF REFERENCE AS PROVIDED BY THE EUROPEAN COMMISSION

The Regulation 1924/2006 on nutrition and health claims made on foods[4] (hereinafter "the Regulation") entered into force on 19th January 2007.

Article 13 of the Regulation foresees that the Commission shall adopt a Community list of permitted health claims other than those referring to the reduction of disease risk and to children's development and health. This Community list shall be adopted through the Regulatory Committee procedure and following consultation of the European Food Safety Authority (EFSA).

Health claims are defined as "any claim that states, suggests or implies that a relationship exists between a food category, a food or one of its constituents and health".

In accordance with Article 13 (1) health claims other than those referring to the reduction of disease risk and to children's development and health are health claims describing or referring to:

a) the role of a nutrient or other substance in growth, development and the functions of the body; or

b) psychological and behavioural functions; or

c) without prejudice to Directive 96/8/EC, slimming or weight-control or a reduction in the sense of hunger or an increase in the sense of satiety or to the reduction of the available energy from the diet.

To be included in the Community list of permitted health claims, the claims shall be:

(i) based on generally accepted scientific evidence; and

(ii) well understood by the average consumer.

Member States provided the Commission with lists of claims as referred to in Article 13 (1) by 31 January 2008 accompanied by the conditions applying to them and by references to the relevant scientific justification. These lists have been consolidated into the list which forms the basis for the EFSA consultation in accordance with Article 13 (3).

ISSUES THAT NEED TO BE CONSIDERED

IMPORTANCE AND PERTINENCE OF THE FOOD[5]

Foods are commonly involved in many different functions[6] of the body, and for one single food many health claims may therefore be scientifically true. Therefore, the relative importance of food e.g. nutrients in relation to other nutrients for the expressed beneficial effect should be considered: for functions affected by a large number of dietary factors it should be considered whether a reference to a single food is scientifically pertinent.

[4] OJ L12, 18/01/2007
[5] The term 'food' when used in this Terms of Reference refers to a food constituent, the food or the food category.
[6] The term 'function' when used in this Terms of Reference refers to health claims in Article 13(1)(a), (b) and (c).

It should also be considered if the information on the characteristics of the food contains aspects pertinent to the beneficial effect.

SUBSTANTIATION OF CLAIMS BY GENERALLY ACCEPTABLE SCIENTIFIC EVIDENCE

Scientific substantiation is the main aspect to be taken into account to authorise health claims. Claims should be scientifically substantiated by taking into account the totality of the available scientific data, and by weighing the evidence, and shall demonstrate the extent to which:

(a) the claimed effect of the food is beneficial for human health,

(b) a cause and effect relationship is established between consumption of the food and the claimed effect in humans (such as: the strength, consistency, specificity, dose-response, and biological plausibility of the relationship),

(c) the quantity of the food and pattern of consumption required to obtain the claimed effect could reasonably be achieved as part of a balanced diet,

(d) the specific study group(s) in which the evidence was obtained is representative of the target population for which the claim is intended.

EFSA has mentioned in its scientific and technical guidance for the preparation and presentation of the application for authorisation of health claims consistent criteria for the potential sources of scientific data. Such sources may not be available for all health claims. Nevertheless it will be relevant and important that EFSA comments on the availability and quality of such data in order to allow the regulator to judge and make a risk management decision about the acceptability of health claims included in the submitted list.

The scientific evidence about the role of a food on a nutritional or physiological function is not enough to justify the claim. The beneficial effect of the dietary intake has also to be demonstrated. Moreover, the beneficial effect should be significant i.e. satisfactorily demonstrate to beneficially affect identified functions in the body in a way which is relevant to health. Although an appreciation of the beneficial effect in relation to the nutritional status of the European population may be of interest, the presence or absence of the actual need for a nutrient or other substance with nutritional or physiological effect for that population should not, however, condition such considerations.

Different types of effects can be claimed. Claims referring to the maintenance of a function may be distinct from claims referring to the improvement of a function. EFSA may wish to comment whether such different claims comply with the criteria laid down in the Regulation.

WORDING OF HEALTH CLAIMS

Scientific substantiation of health claims is the main aspect on which EFSA's opinion is requested. However, the wording of health claims should also be commented by EFSA in its opinion.

There is potentially a plethora of expressions that may be used to convey the relationship between the food and the function. This may be due to commercial practices, consumer perception and linguistic or cultural differences across the EU. Nevertheless, the wording used to make health claims should be truthful, clear, reliable and useful to the consumer in choosing a healthy diet.

In addition to fulfilling the general principles and conditions of the Regulation laid down in Article 3 and 5, Article 13(1)(a) stipulates that health claims shall describe or refer to "the role of a nutrient or other substance in growth, development and the functions of the body". Therefore, the requirement to

describe or refer to the 'role' of a nutrient or substance in growth, development and the functions of the body should be carefully considered.

The specificity of the wording is very important. Health claims such as "Substance X supports the function of the joints" may not sufficiently do so, whereas a claim such as "Substance X helps maintain the flexibility of the joints" would. In the first example of a claim it is unclear which of the various functions of the joints is described or referred to contrary to the latter example which specifies this by using the word "flexibility".

The clarity of the wording is very important. The guiding principle should be that the description or reference to the role of the nutrient or other substance shall be clear and unambiguous and therefore be specified to the extent possible i.e. descriptive words/ terms which can have multiple meanings should be avoided. To this end, wordings like "strengthens your natural defences" or "contain antioxidants" should be considered as well as "may" or "might" as opposed to words like "contributes", "aids" or "helps".

In addition, for functions affected by a large number of dietary factors it should be considered whether wordings such as "indispensable", "necessary", "essential" and "important" reflects the strength of the scientific evidence.

Similar alternative wordings as mentioned above are used for claims relating to different relationships between the various foods and health. It is not the intention of the regulator to adopt a detailed and rigid list of claims where all possible wordings for the different claims are approved. Therefore, it is not required that EFSA comments on each individual wording for each claim unless the wording is strictly pertinent to a specific claim. It would be appreciated though that EFSA may consider and comment generally on such elements relating to wording to ensure the compliance with the criteria laid down in the Regulation.

In doing so the explanation provided for in recital 16 of the Regulation on the notion of the average consumer should be recalled. In addition, such assessment should take into account the particular perspective and/or knowledge in the target group of the claim, if such is indicated or implied.

TERMS OF REFERENCE

HEALTH CLAIMS OTHER THAN THOSE REFERRING TO THE REDUCTION OF DISEASE RISK AND TO CHILDREN'S DEVELOPMENT AND HEALTH

EFSA should in particular consider, and provide advice on the following aspects:

- Whether adequate information is provided on the characteristics of the food pertinent to the beneficial effect.

- Whether the beneficial effect of the food on the function is substantiated by generally accepted scientific evidence by taking into account the totality of the available scientific data, and by weighing the evidence. In this context EFSA is invited to comment on the nature and quality of the totality of the evidence provided according to consistent criteria.

- The specific importance of the food for the claimed effect. For functions affected by a large number of dietary factors whether a reference to a single food is scientifically pertinent.

In addition, EFSA should consider the claimed effect on the function, and provide advice on the extent to which:

- the claimed effect of the food in the identified function is beneficial.

- a cause and effect relationship has been established between consumption of the food and the claimed effect in humans and whether the magnitude of the effect is related to the quantity consumed.

- where appropriate, the effect on the function is significant in relation to the quantity of the food proposed to be consumed and if this quantity could reasonably be consumed as part of a balanced diet.

- the specific study group(s) in which the evidence was obtained is representative of the target population for which the claim is intended.

- the wordings used to express the claimed effect reflect the scientific evidence and complies with the criteria laid down in the Regulation.

When considering these elements EFSA should also provide advice, when appropriate:

- on the appropriate application of Article 10 (2) (c) and (d) in the Regulation, which provides for additional labelling requirements addressed to persons who should avoid using the food; and/or warnings for products that are likely to present a health risk if consumed to excess.

APPENDIX B

EFSA DISCAIMER

The present opinion does not constitute, and cannot be construed as, an authorisation to the marketing of the food/food constituent, a positive assessment of its safety, nor a decision on whether the food/food constituent is, or is not, classified as foodstuffs. It should be noted that such an assessment is not foreseen in the framework of Regulation (EC) No 1924/2006.

It should also be highlighted that the scope, the proposed wordings of the claims and the conditions of use as proposed in the Consolidated List may be subject to changes, pending the outcome of the authorisation procedure foreseen in Article 13(3) of Regulation (EC) No 1924/2006.

GLOSSARY / ABBREVIATIONS

OA Osteoarthritis