

## SCIENTIFIC OPINION

### **Scientific Opinion on the substantiation of health claims related to vitamin B6 and contribution to normal homocysteine metabolism (ID 73, 76, 199), maintenance of normal bone (ID 74), maintenance of normal teeth (ID 74), maintenance of normal hair (ID 74), maintenance of normal skin (ID 74), maintenance of normal nails (ID 74), contribution to normal energy-yielding metabolism (ID 75, 214), contribution to normal psychological functions (ID 77), reduction of tiredness and fatigue (ID 78), and contribution to normal cysteine synthesis (ID 4283) pursuant to Article 13(1) of Regulation (EC) No 1924/2006<sup>1</sup>**

**EFSA Panel on Dietetic Products, Nutrition and Allergies (NDA)<sup>2, 3</sup>**

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 (EC) No 1924/2006. This opinion addresses the scientific substantiation of health claims in relation to vitamin B6 and contribution to normal homocysteine metabolism, maintenance of normal bone, maintenance of normal teeth, maintenance of normal hair, maintenance of normal skin, maintenance of normal nails, contribution to normal energy-yielding metabolism, contribution to normal psychological functions, reduction of tiredness and fatigue, and contribution to normal cysteine synthesis. The scientific substantiation is based on the information provided by the Member

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<sup>1</sup> On request from the European Commission, Question No EFSA-Q-2008-860, EFSA-Q-2008-861, EFSA-Q-2008-863, EFSA-Q-2008-986, adopted on 30 April 2010 and Question No EFSA-Q-2008-862, EFSA-Q-2008-864, EFSA-Q-2008-865, EFSA-Q-2008-1001, EFSA-Q-2010-00236, adopted on 09 July 2010.

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<sup>3</sup> Acknowledgement: The Panel wishes to thank for the preparatory work on this scientific opinion Henk van den Berg and the members of the Working Group on Claims: Carlo Agostoni, Jean-Louis Bresson, Susan Fairweather-Tait, Albert Flynn, Ines Golly, Marina Heinonen, Hannu Korhonen, Martinus Løvik, Ambroise Martin, Hildegard Przyrembel, Seppo Salminen, Yolanda Sanz, Sean (J.J.) Strain, Inge Tetens, Hendrik van Loveren and Hans Verhagen. The members of the Claims Sub-Working Group on Mental/Nervous System: Jacques Rigo, Astrid Schloerscheidt, Barbara Stewart-Knox, Sean (J.J.) Strain, and Peter Willatts.

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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 vitamin B6, which is a well recognised nutrient and is measurable in foods by established methods. The Panel considers that vitamin B6 is sufficiently characterised.

#### **Contribution to normal homocysteine metabolism**

The claimed effects are “homocysteine levels”, “homocysteine metabolism”, and “heart health”. The target population is assumed to be the general population. The Panel considers that contribution to normal homocysteine metabolism is a beneficial physiological effect.

Impaired condensation of homocysteine with serine causing mild, moderate, or severe elevations in plasma homocysteine is among the symptoms of vitamin B6 deficiency.

The Panel concludes that a cause and effect relationship has been established between the dietary intake of vitamin B6 and contribution to normal homocysteine metabolism.

#### **Maintenance of normal bone**

The claimed effect is “bone/teeth/hair/skin and nail health”. The target population is assumed to be the general population. The Panel considers that maintenance of normal bone is a beneficial physiological effect.

No references have been provided from which conclusions could be drawn for the scientific substantiation of the claimed effect.

The Panel concludes that a cause and effect relationship has not been established between the dietary intake of vitamin B6 and maintenance of normal bone.

#### **Maintenance of normal teeth**

The claimed effect is “bone/teeth/hair/skin and nail health”. The target population is assumed to be the general population. The Panel considers that maintenance of normal teeth is a beneficial physiological effect.

No references have been provided from which conclusions could be drawn for the scientific substantiation of the claimed effect.

The Panel concludes that a cause and effect relationship has not been established between the dietary intake of vitamin B6 and maintenance of normal teeth.

#### **Maintenance of normal hair**

The claimed effect is “bone/teeth/hair/skin and nail health”. The target population is assumed to be the general population. The Panel considers that maintenance of normal hair is a beneficial physiological effect.

No references have been provided from which conclusions could be drawn for the scientific substantiation of the claimed effect.

The Panel concludes that a cause and effect relationship has not been established between the dietary intake of vitamin B6 and maintenance of normal hair.

### **Maintenance of normal skin**

The claimed effect is “bone/teeth/hair/skin and nail health”. The target population is assumed to be the general population. The Panel considers that maintenance of normal skin is a beneficial physiological effect.

No references have been provided from which conclusions could be drawn for the scientific substantiation of the claimed effect.

The Panel concludes that a cause and effect relationship has not been established between the dietary intake of vitamin B6 and maintenance of normal skin.

### **Maintenance of normal nails**

The claimed effect is “bone/teeth/hair/skin and nail health”. The target population is assumed to be the general population. The Panel considers that maintenance of normal nails is a beneficial physiological effect.

No references have been provided from which conclusions could be drawn for the scientific substantiation of the claimed effect.

The Panel concludes that a cause and effect relationship has not been established between the dietary intake of vitamin B6 and maintenance of normal nails.

### **Contribution to normal energy-yielding metabolism**

The claimed effects are “energy and vitality” and “muscle metabolism: shares in biochemical reaction which are needed for muscle contraction”. The target population is assumed to be the general population. The Panel considers that contribution to normal energy-yielding metabolism is a beneficial physiological effect.

Vitamin B6, as pyridoxal-phosphate, has a well established role in the provision of glucose.

The Panel concludes that a cause and effect relationship has been established between the dietary intake of vitamin B6 and contribution to normal energy-yielding metabolism.

### **Contribution to normal psychological functions**

The claimed effect is “the role of vitamins and minerals in mental performance (where mental performance stands for those aspects of brain and nerve functions which determine aspects like concentration, learning, memory and reasoning)”. The target population is assumed to be the general population. The Panel considers that contribution to normal psychological functions, which encompass cognitive and affective domains, is a beneficial physiological effect.

One of the symptoms of vitamin B6 deficiency is confusion, implying impairment of normal psychological functions.

The Panel concludes that a cause and effect relationship has been established between the dietary intake of vitamin B6 and contribution to normal psychological functions.

### **Reduction of tiredness and fatigue**

The claimed effect is “vitamin/mineral supplementation to reduce fatigue and tiredness in situations of inadequate micronutrient status”. The target population is assumed to be the general population. The Panel considers that reduction of tiredness and fatigue is a beneficial physiological effect.

Vitamin B6 deficiency can cause microcytic, hypochromic anaemia in which the haemoglobin concentration of erythrocytes is reduced, which may lead to symptoms of weakness, tiredness or fatigue.

The Panel concludes that a cause and effect relationship has been established between the dietary intake of vitamin B6 and reduction of tiredness and fatigue.

#### **Contribution to normal cysteine synthesis**

The claimed effect is “cystine synthesis and incorporation in keratin”. The target population is assumed to be the general population. The Panel considers that contribution to normal cysteine synthesis is a beneficial physiological effect.

Vitamin B6, as pyridoxal-phosphate, has a well established role in the synthesis of cysteine.

The Panel concludes that a cause and effect relationship has been established between the dietary intake of vitamin B6 and contribution to normal cysteine synthesis.

#### **Conditions and possible restrictions of use**

The Panel considers that in order to bear the claims a food should be at least a source of vitamin B6 as per Annex to Regulation (EC) No 1924/2006. Such amounts can be easily consumed as part of a balanced diet. The target population is the general population.

#### **KEY WORDS**

Vitamin B6, homocysteine, bone, teeth, hair, skin, nails, energy, metabolism, psychological, fatigue, cysteine, health claims.

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**BACKGROUND AS PROVIDED BY THE EUROPEAN COMMISSION**

See Appendix A

**TERMS OF REFERENCE AS PROVIDED BY THE EUROPEAN COMMISSION**

See Appendix A

**EFSA DISCLAIMER**

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## INFORMATION AS PROVIDED IN THE CONSOLIDATED LIST

The consolidated list of health claims pursuant to Article 13 of Regulation (EC) No 1924/2006<sup>4</sup> submitted by Member States contains main entry claims with corresponding conditions of use and literature from similar health claims. EFSA has screened all health claims contained in the original consolidated list of Article 13 health claims which was received by EFSA in 2008 using six criteria established by the NDA Panel to identify claims for which EFSA considered sufficient information had been provided for evaluation and those for which more information or clarification was needed before evaluation could be carried out<sup>5</sup>. The clarifications which were received by EFSA through the screening process have been included in the consolidated list. This additional information will serve as clarification to the originally provided information. The information provided in the consolidated list for the health claims which are the subject of this opinion is tabulated in Appendix C.

## ASSESSMENT

### 1. Characterisation of the food/constituent

The food constituent that is the subject of the health claims is vitamin B6, which is a group of compounds comprising three free forms, pyridoxine, pyridoxal, pyridoxamine, and their 5'-phosphates derivatives (PNP, PLP and PMP). Vitamin B6 occurs naturally in foods, mainly as pyridoxal phosphate (animals), pyridoxine beta-glucoside (plants) and some pyridoxyl peptides (processed foods). Vitamin B6 is a well recognised nutrient and is measurable in foods by established methods.

Vitamin B6 is authorised for addition to foods (Annex I of the Regulation (EC) No 1925/2006<sup>6</sup> and Annex I of Directive 2002/46/EC<sup>7</sup>). This evaluation applies to vitamin B6 naturally present in foods and those forms authorised for addition to foods (Annex II of the Regulation (EC) No 1925/2006, and Annex II of Directive 2002/46/EC).

The Panel considers that the food constituent, vitamin B6, which is the subject of the health claims is sufficiently characterised.

### 2. Relevance of the claimed effect to human health

#### 2.1. Contribution to normal homocysteine metabolism (ID 73, 76, 199)

The claimed effects are “homocysteine levels”, “homocysteine metabolism” and “heart health”. The Panel assumes that the target population is the general population.

In the context of the proposed wording for ID 76, the Panel assumes that the claimed effect refers to homocysteine metabolism.

The Panel considers that contribution to normal homocysteine metabolism is a beneficial physiological effect.

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<sup>4</sup> 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.

<sup>5</sup> Briefing document for stakeholders on the evaluation of Article 13.1, 13.5 and 14 health claims: <http://www.efsa.europa.eu/en/ndameetings/docs/nda100601-ax01.pdf>

<sup>6</sup> Regulation (EC) No 1925/2006 of the European Parliament and of the Council of 20 December 2006 on the addition of vitamins and minerals and of certain other substances to foods. OJ L 404, 30.12.2006, p. 26–38.

<sup>7</sup> Directive 2002/46/EC of the European Parliament and of the Council of 10 June 2002 on the approximation of the laws of the Member States relating to food supplements. OJ L 183, 12.7.2002, p. 51–57.

## **2.2. Maintenance of normal bone (ID 74)**

The claimed effect is “bone/teeth/hair/skin and nail health”. The Panel assumes that the target population is the general population.

The Panel considers that maintenance of normal bone is a beneficial physiological effect.

## **2.3. Maintenance of normal teeth (ID 74)**

The claimed effect is “bone/teeth/hair/skin and nail health”. The Panel assumes that the target population is the general population.

The Panel considers that maintenance of normal teeth is a beneficial physiological effect.

## **2.4. Maintenance of normal hair (ID 74)**

The claimed effect is “bone/teeth/hair/skin and nail health”. The Panel assumes that the target population is the general population.

The Panel considers that maintenance of normal hair is a beneficial physiological effect.

## **2.5. Maintenance of normal skin (ID 74)**

The claimed effect is “bone/teeth/hair/skin and nail health”. The Panel assumes that the target population is the general population.

The Panel considers that maintenance of normal skin is a beneficial physiological effect.

## **2.6. Maintenance of normal nails (ID 74)**

The claimed effect is “bone/teeth/hair/skin and nail health”. The Panel assumes that the target population is the general population.

The Panel considers that maintenance of normal nails is a beneficial physiological effect.

## **2.7. Contribution to normal energy-yielding metabolism (ID 75, 214)**

The claimed effects are “energy and vitality” and “muscle metabolism: shares in biochemical reaction which are needed for muscle contraction”. The Panel assumes that the target population is the general population.

In the context of the clarifications provided by Member States, the Panel assumes that the claimed effects are related to energy-yielding metabolism.

The Panel considers that contribution to normal energy-yielding metabolism is a beneficial physiological effect.

## **2.8. Contribution to normal psychological functions (ID 77)**

The claimed effect is “The role of vitamins and minerals in mental performance (where mental performance stands for those aspects of brain and nerve functions which determine aspects like concentration, learning, memory and reasoning)”. The Panel assumes that the target population is the general population.



The Panel considers that contribution to normal psychological functions, which encompass cognitive and affective domains, is a beneficial physiological effect.

### **2.9. Reduction of tiredness and fatigue (ID 78)**

The claimed effect is “vitamin/mineral supplementation to reduce fatigue and tiredness in situations of inadequate micronutrient status”. The Panel assumes that the target population is the general population.

The Panel considers that the reduction of tiredness and fatigue is a beneficial physiological effect.

### **2.10. Contribution to normal cysteine synthesis (ID 4283)**

The claimed effect is “cystine synthesis and incorporation in keratin”. The Panel assumes that the target population is the general population.

The Panel assumes that the claimed effect relates to the synthesis of cysteine. Cysteine is a significant determinant of the tertiary structure of many proteins through a role in the formation of disulfide bonds within and between protein molecules.

The Panel considers that contribution to normal cysteine synthesis is a beneficial physiological effect.

## **3. Scientific substantiation of the claimed effect**

Vitamin B6 functions as a coenzyme in a variety of enzymatic reactions in the metabolism of amino acids, one-carbon units, lipids, the pathways of gluconeogenesis, haem, and neurotransmitter biosynthesis (McCormick, 2006; Mackey et al., 2006).

### **3.1. Contribution to normal homocysteine metabolism (ID 73, 76, 199)**

The transsulphuration pathway is an alternative metabolic route to remethylation of homocysteine to methionine. The pathway utilises the pyridoxal phosphate-dependent enzymes, cystathionine  $\beta$ -synthase and cystathionine  $\gamma$ -lyase, and catabolises homocysteine through condensation with serine to cystathionine, followed by cleavage of that molecule to produce cysteine and  $\alpha$ -ketobutyrate (Mackey et al., 2006).

Under conditions of maximal metabolic efficiency, plasma concentration of homocysteine ranges from 4 to 10  $\mu\text{mol/L}$ . Metabolic blocks in homocysteine metabolism lead to accumulation of intracellular homocysteine with subsequent export into the blood. Depending on the magnitude of the metabolic impairment, plasma homocysteine can rise to varying degrees. Hyperhomocysteinemia is also caused by B vitamin deficiencies. Deficiencies of folate, vitamin B6 and vitamin B12 lead to impaired homocysteine metabolism causing mild, moderate, or severe elevations in plasma homocysteine, depending on the severity of the deficiency, as well as the coexistence of genetic or other factors that interfere with homocysteine metabolism (Miller, 2005).

The Panel concludes that a cause and effect relationship has been established between the dietary intake of vitamin B6 and contribution to normal homocysteine metabolism.

### **3.2. Maintenance of normal bone (ID 74)**

A total of 16 references were provided, including six textbooks, two opinions of scientific bodies, one review, five human studies and two other publications. Most of the studies dealt with the role of

homocysteine as a putative risk factor for osteoporosis. The Panel considers that no conclusions can be drawn from these references for the scientific substantiation of the claimed effect.

The Panel concludes that a cause and effect relationship has not been established between the dietary intake of vitamin B6 and maintenance of normal bone.

### **3.3. Maintenance of normal teeth (ID 74)**

A total of 16 references were provided, including six textbooks, two opinions of scientific bodies, one review, five human studies and two other publications, on outcomes unrelated to the claimed effect. The Panel considers that no conclusions can be drawn from these references for the scientific substantiation of the claimed effect.

The Panel concludes that a cause and effect relationship has not been established between the dietary intake of vitamin B6 and maintenance of normal teeth.

### **3.4. Maintenance of normal hair (ID 74)**

A total of 16 references were provided, including six textbooks, two opinions of scientific bodies, one review, five human studies and two other publications, on outcomes unrelated to the claimed effect. The Panel considers that no conclusions can be drawn from these references for the scientific substantiation of the claimed effect.

The Panel concludes that a cause and effect relationship has not been established between the dietary intake of vitamin B6 and maintenance of normal hair.

### **3.5. Maintenance of normal skin (ID 74)**

A total of 16 references were provided, including six textbooks, two opinions of scientific bodies, one review, five human studies and two other publications. The only reference related to vitamin B6 and skin was a link to a website advising adolescents on their intake of nutrients. The Panel considers that no conclusions can be drawn from these references for the scientific substantiation of the claimed effect.

The Panel concludes that a cause and effect relationship has not been established between the dietary intake of vitamin B6 and maintenance of normal skin.

### **3.6. Maintenance of normal nails (ID 74)**

A total of 16 references were provided, including six textbooks, two opinions of scientific bodies, one review, five human studies and two other publications, on outcomes unrelated to the claimed effect. The Panel considers that no conclusions can be drawn from these references for the scientific substantiation of the claimed effect.

The Panel concludes that a cause and effect relationship has not been established between the dietary intake of vitamin B6 and maintenance of normal nails.

### **3.7. Contribution to normal energy-yielding metabolism (ID 75, 214)**

Vitamin B6, as PLP, plays a dual role in the provision of glucose. Glycogen phosphorylase relies on PLP as a coenzyme in the enzymatic cleavage of glycogen that sequentially releases glucose-1-phosphate units. PLP-dependent transaminases convert gluconeogenic amino acids to alpha-keto acids to create substrates for the production of glucose (Mackey et al., 2006).

The Panel concludes that a cause and effect relationship has been established between the dietary intake of vitamin B6 and contribution to normal energy-yielding metabolism.

### **3.8. Contribution to normal psychological functions (ID 77)**

One of the classical symptoms of vitamin B6 deficiency is confusion (IoM, 2000), implying impairment of normal psychological functions.

The Panel concludes that a cause and effect relationship has been established between the dietary intake of vitamin B6 and contribution to normal psychological functions.

### **3.9. Reduction of tiredness and fatigue (ID 78)**

Chronic vitamin B6 deficiency can cause microcytic, hypochromic anaemia in which the haemoglobin concentration of erythrocytes is reduced (Mackey et al., 2006), which may lead to symptoms of weakness, tiredness or fatigue.

The Panel concludes that a cause and effect relationship has been established between the dietary intake of vitamin B6 and a reduction of tiredness and fatigue.

### **3.10. Contribution to normal cysteine synthesis (ID 4283)**

The SH group in cysteine derives from methionine whilst the carbon skeleton comes from serine. Both the synthesis of cystathionine from homocysteine and serine and the splitting of cystathionine to release cysteine are catalysed by PLP dependent enzymes.

The Panel concludes that a cause and effect relationship has been established between the dietary intake of vitamin B6 and contribution to normal cysteine synthesis.

## **4. Panel's comments on the proposed wordings**

### **4.1. Contribution to normal homocysteine metabolism (ID 73, 76, 199)**

The Panel considers that the following wording reflects the scientific evidence: "Vitamin B6 contributes to normal homocysteine metabolism".

### **4.2. Contribution to normal energy-yielding metabolism (ID 75, 214)**

The Panel considers that the following wording reflects the scientific evidence: "Vitamin B6 contributes to normal energy-yielding metabolism".

### **4.3. Contribution to normal psychological functions (ID 77)**

The Panel considers that the following wording reflects the scientific evidence: "Vitamin B6 contributes to normal psychological functions".

### **4.4. Reduction of tiredness and fatigue (ID 78)**

The Panel considers that the following wording reflects the scientific evidence: "Vitamin B6 can contribute to the reduction of tiredness and fatigue".

#### **4.5. Contribution to normal cysteine synthesis (ID 4283)**

The Panel considers that the following wording reflects the scientific evidence: “Vitamin B6 contributes to normal cysteine synthesis”.

#### **5. Conditions and possible restrictions of use**

The Panel considers that in order to bear the claims a food should be at least a source of vitamin B6 as per Annex to Regulation (EC) No 1924/2006. Such amounts can be easily consumed as part of a balanced diet. The target population is the general population. Tolerable Upper Intake Levels (ULs) have been established for vitamin B6 in children, adolescents and adults (SCF, 2000).

#### **CONCLUSIONS**

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

- The food constituent, vitamin B6, which is the subject of the health claims is sufficiently characterised.

#### **Contribution to normal homocysteine metabolism (ID 73, 76, 199)**

- The claimed effects are “homocysteine levels”, “homocysteine metabolism” and “heart health”. The target population is assumed to be the general population. Contribution to normal homocysteine metabolism is a beneficial physiological effect.
- A cause and effect relationship has been established between the dietary intake of vitamin B6 and contribution to normal homocysteine metabolism.
- The following wording reflects the scientific evidence: “Vitamin B6 contributes to normal homocysteine metabolism”.

#### **Maintenance of normal bone (ID 74)**

- The claimed effect is “bone/teeth/hair/skin and nail health”. The target population is assumed to be the general population. Maintenance of normal bone is a beneficial physiological effect.
- A cause and effect relationship has not been established between the dietary intake of vitamin B6 and maintenance of normal bone.

#### **Maintenance of normal teeth (ID 74)**

- The claimed effect is “bone/teeth/hair/skin and nail health”. The target population is assumed to be the general population. Maintenance of normal teeth is a beneficial physiological effect.
- A cause and effect relationship has not been established between the dietary intake of vitamin B6 and maintenance of normal teeth.

#### **Maintenance of normal hair (ID 74)**

- The claimed effect is “bone/teeth/hair/skin and nail health”. The target population is assumed to be the general population. Maintenance of normal hair is a beneficial physiological effect.
- A cause and effect relationship has not been established between the dietary intake of vitamin B6 and maintenance of normal hair.

#### **Maintenance of normal skin (ID 74)**

- The claimed effect is “bone/teeth/hair/skin and nail health”. The target population is assumed to be the general population. Maintenance of normal skin is a beneficial physiological effect.
- A cause and effect relationship has not been established between the dietary intake of vitamin B6 and maintenance of normal skin.

#### **Maintenance of normal nails (ID 74)**

- The claimed effect is “bone/teeth/hair/skin and nail health”. The target population is assumed to be the general population. Maintenance of normal nails is a beneficial physiological effect.
- A cause and effect relationship has not been established between the dietary intake of vitamin B6 and maintenance of normal nails.

#### **Contribution to normal energy-yielding metabolism (ID 75, 214)**

- The claimed effects are “energy and vitality” and “muscle metabolism: shares in biochemical reaction which are needed for muscle contraction”. The target population is assumed to be the general population. Contribution to normal energy-yielding metabolism is a beneficial physiological effect.
- A cause and effect relationship has been established between the dietary intake of vitamin B6 and contribution to normal energy-yielding metabolism.
- The following wording reflects the scientific evidence: “Vitamin B6 contributes to normal energy-yielding metabolism”.

#### **Contribution to normal psychological functions (ID 77)**

- The claimed effect is “The role of vitamins and minerals in mental performance (where mental performance stands for those aspects of brain and nerve functions which determine aspects like concentration, learning, memory and reasoning)”. The target population is assumed to be the general population. Contribution to normal psychological functions, which encompass cognitive and affective domains, is a beneficial physiological effect.
- A cause and effect relationship has been established between the dietary intake of vitamin B6 and contribution to normal psychological functions.
- The following wording reflects the scientific evidence: “Vitamin B6 contributes to normal psychological functions”.

#### **Reduction of tiredness and fatigue (ID 78)**

- The claimed effect is “vitamin/mineral supplementation to reduce fatigue and tiredness in situations of inadequate micronutrient status”. The target population is assumed to be the general population. Reduction of tiredness and fatigue is a beneficial physiological effect.
- A cause and effect relationship has been established between the dietary intake of vitamin B6 and reduction of tiredness and fatigue.
- The following wording reflects the scientific evidence: “Vitamin B6 can contribute to the reduction of tiredness and fatigue”.

#### **Contribution to normal cysteine synthesis (ID 4283)**

- The claimed effect is “cystine synthesis and incorporation in keratin”. The target population is assumed to be the general population. Contribution to normal cysteine synthesis is a beneficial physiological effect.

- A cause and effect relationship has been established between the dietary intake of vitamin B6 and contribution to normal cysteine synthesis.
- The following wording reflects the scientific evidence: “Vitamin B6 contributes to normal cysteine synthesis”.

#### Conditions and possible restrictions of use

- In order to bear the claims a food should be at least a source of vitamin B6 as per Annex to Regulation (EC) No 1924/2006. Such amounts can be easily consumed as part of a balanced diet. The target population is the general population.

#### DOCUMENTATION PROVIDED TO EFSA

Health claims pursuant to Article 13 of Regulation (EC) No 1924/2006 (No: EFSA-Q-2008-860, EFSA-Q-2008-861, EFSA-Q-2008-862, EFSA-Q-2008-863, EFSA-Q-2008-864, EFSA-Q-2008-865, EFSA-Q-2008-986, EFSA-Q-2008-1001, EFSA-Q-2010-00236). 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 full list of supporting references as provided to EFSA is available on: <http://www.efsa.europa.eu/panels/nda/claims/article13.htm>

#### REFERENCES

- EFSA Panel on Dietetic Products, Nutrition and Allergies (NDA), 2009. Scientific Opinion on the substantiation of health claims related to vitamin B6 and protein and glycogen metabolism (ID 65, 70, 71), function of the nervous system (ID 66), red blood cell formation (ID 67, 72, 186), function of the immune system (ID 68), regulation of hormonal activity (ID 69) and mental performance (ID 185) pursuant to Article 13(1) of Regulation (EC) No 1924/2006 on request from the European Commission. EFSA Journal, 7(9):1225, 20 pp.
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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<sup>8</sup> (hereinafter "the Regulation") entered into force on 19<sup>th</sup> 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<sup>9</sup>

Foods are commonly involved in many different functions<sup>10</sup> 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.

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<sup>8</sup> OJ L12, 18/01/2007

<sup>9</sup> The term 'food' when used in this Terms of Reference refers to a food constituent, the food or the food category.

<sup>10</sup> 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 DISCLAIMER**

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.

APPENDIX C

Table 1. Main entry health claims related to vitamin B6, including conditions of use from similar claims, as proposed in the Consolidated List.

ID	Food or Food constituent	Health Relationship	Proposed wording
73	Vitamin B6	Homocysteine levels	Vitamin B6 helps maintain a normal blood homocysteine level
	<p><b>Conditions of use</b></p> <ul style="list-style-type: none"> <li>- MINDESTENS 15 % RDA JE 100 G ODER 100 ML ODER JE PORTION GEMÄß 90/496/EWG</li> <li>- 15% RDA per 100 Source of / 15% of RDA per 100 g</li> </ul> <p>Agency guidance for supplements is that products containing &gt;10mg of vitamin B6 should carry the label advisory statement "long term intakes of this amount of vitamin B6 may lead to mild tingling and numbness"</p> <ul style="list-style-type: none"> <li>- Does claim rely on the presence/presence in a reduced quantity/absence of a nutrient or other substance: Presence of a nutrient or other substance</li> </ul> <p>Number of nutrients/other substances that are essential to claimed effect: 1</p> <p>Names of nutrient/other substances and Quantity in Average daily serving: .30 miligram(s) Vitamin B6 (pyridoxine)</p> <p>Daily amount to be consumed to produce claimed effect: .30 miligram(s)</p> <p>Length of time after consumption for claimed effect to become apparent: Regular consumption</p>		
ID	Food or Food constituent	Health Relationship	Proposed wording
74	Vitamin B6	Bone/Teeth/Hair/Skin and Nail health	Necessary for healthy teeth, bones, hair, skin and nails.
	<p><b>Conditions of use</b></p> <ul style="list-style-type: none"> <li>- Es werden nur die Nährstoffe beworben, die lt. Nährwertkennzeichnungs-verordnung (Anlage 1) mindestens 15 Prozent der empfohlenen Tagesdosis in 100 g oder 100 ml enthalten.</li> <li>- 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.</li> <li>- 366,34 mg/day of pumpkin seed oil + 41,25 mg/day of zinc sulphate (=15 mg/day of zinc) + 2 mg/day of Vitamin B6</li> </ul>		
ID	Food or Food constituent	Health Relationship	Proposed wording
75	Vitamin B6	Energy and Vitality <u>Clarification provided</u> Vitamin B6 supports energy metabolism. It is needed to release energy from carbohydrates stored in muscle	Necessary to maintain energy and general vitality
	<p><b>Conditions of use</b></p> <ul style="list-style-type: none"> <li>- 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.</li> </ul>		

ID	Food or Food constituent	Health Relationship	Proposed wording
76	Vitamin B6	Heart Health	Supplementation of Vitamin B6 can lower blood levels of amino acid homocysteine which may maintain a healthy heart and circulation.
<p><b>Conditions of use</b></p> <ul style="list-style-type: none"> <li>- Only for products with at least 100 % RDA</li> </ul> <p>Agency guidance for supplements is that products containing &gt;10 mg of vitamin B6 should carry the label advisory statement "Long term intakes [of this amount of vitamin B6] may lead to mild tingling and numbness"</p> <ul style="list-style-type: none"> <li>- Milk-based drinks with 0.66mg/100g = serving of vitamin B6, 66 µg/serving of folic acid and 0.33µg/serving of vitamin B12</li> <li>- 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.</li> </ul> <p>Agency guidance for supplements is that products containing &gt;10 mg of Vitamin B6 should carry the label advisory statement "Long term intakes may lead to mild tingling and numbness"</p> <p>Encourages reformulation to lower daily amount.</p> <ul style="list-style-type: none"> <li>- Food supplement with 4mg of vitamin B6 in the daily dose</li> <li>- Does claim rely on the presence/presence in a reduced quantity/absence of a nutrient or other substance: Presence of a nutrient or other substance</li> </ul> <p>Number of nutrients/other substances that are essential to claimed effect: 4</p> <p>Names of nutrient/other substances and Quantity in Average daily serving: 1.8mg Vitamin E, 0.36mg Vitamin B6, 0.18micrograms Vitamin B12, 36micrograms Folic acid</p> <p>Daily amount to be consumed to produce claimed effect: 500g</p> <p>Length of time after consumption for claimed effect to become apparent: Depends on the individual's nutritional status</p> <ul style="list-style-type: none"> <li>- Minimum 100% RDA dla kwasu foliowego (200 µg), witaminy B6 (2 mg) oraz witaminy B12 (1µg).</li> </ul>			
ID	Food or Food constituent	Health Relationship	Proposed wording
77	Pyridoxine (B6)	The role of vitamins and minerals in mental performance (where mental performance stands for those aspects of brain and nerve functions which determine aspects like concentration, learning, memory and reasoning)	<p>Water-soluble vitamins, calcium, magnesium and zinc are essential for mental function and performance</p> <p>In situations of inadequate micronutrient status, supplementation with water-soluble vitamins, minerals and zinc can sustain mental performance. Helps maintain activity, memory, perception of the environment, particularly in the elderly</p> <ul style="list-style-type: none"> <li>- Promotes mental concentration</li> </ul>

			<ul style="list-style-type: none"> <li>- Stimulates mental capacities</li> <li>- Soothes, promotes healthy sleep</li> <li>- Improves the psychoemotional state</li> </ul>
<p><b>Conditions of use</b></p> <ul style="list-style-type: none"> <li>- Only for products with at least 100 % RDA of vitamins</li> <li>- Agency guidance for supplements is that products containing &gt;10 mg of vitamin B6 should carry the label advisory statement "Long term intakes [of this amount of vitamin B6] may lead to mild tingling and numbness"</li> </ul>			
ID	Food or Food constituent	Health Relationship	Proposed wording
78	Pyridoxine (B6)	<p>Vitamin/mineral supplementation to reduce fatigue and tiredness in situations of inadequate micronutrient status</p> <p><u>Clarification provided</u></p> <p>Reduce fatigue and tiredness, particularly in situations of inadequate micronutrient status, due to role in macronutrient metabolism</p>	<p>Ensures normal functioning of the body's organ tissues and systems, particularly in old age</p> <ul style="list-style-type: none"> <li>- Stimulates physical work capacities</li> <li>- Recommended in case of intense fatigue and during recovery</li> </ul> <p><u>Clarification provided</u></p> <p>Ensures normal functioning of the body's organ tissues and systems, particularly in old age - Stimulates physical work capacities - Recommended in case of intense fatigue and during recovery</p>
<p><b>Conditions of use</b></p> <ul style="list-style-type: none"> <li>- 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.</li> <li>Agency guidance for supplements is that products containing &gt;10 mg of Vitamin B6 should carry the label advisory statement "'Long term intakes [of this amount of vitamin B6]* may lead to mild tingling and numbness"</li> </ul>			
ID	Food or Food constituent	Health Relationship	Proposed wording
199	Vitamin B6 (Pyridoxine)	Homocysteine metabolism	<ul style="list-style-type: none"> <li>-vitamin B6 (pyridoxine) contributes to the maintenance of normal blood homocysteine levels.</li> <li>- Folic acid, vitamin B6 and B12 reduce elevated homocysteine levels.</li> </ul>
<p><b>Conditions of use</b></p> <ul style="list-style-type: none"> <li>- MUST AT LEAST BE A SOURCE OF VITAMIN/S AS PER ANNEX TO REGULATION 1924/2006</li> <li>Agency guidance for supplements is that products containing &gt;10mg Vitamin B6 should carry the label statement: 'Long term intakes [of this amount of Vitamin B6] may lead to mild tingling</li> </ul>			

	and numbness'. Only for products with at least 100 % RDA		
ID	Food or Food constituent	Health Relationship	Proposed wording
214	Vitamin B6	Muskulatur <u>Clarification provided</u> Muscle metabolism: shares in biochemical reaction which are needed for muscle contraction	Wichtig für den Proteinstoffwechsel und daher auch für die Muskulatur <u>Clarification provided</u> Cares for a proper protein metabolism; in succession it ensures also a proper muscle metabolism
		<b>Conditions of use</b> - none provided	
ID	Food or Food constituent	Health Relationship	Proposed wording
4283	Vitamin B6 (Pyridoxine)	Cystine synthesis and incorporation in keratin	Contribute to cystine synthesis and its incorporation in keratin

## GLOSSARY AND ABBREVIATIONS

PLP	Pyridoxal phosphate
PMP	Pyridoxamine phosphate
PNP	Pyridoxine phosphate
UL(s)	Tolerable Upper Intake Level(s)