

1	Biotin.....	1
2	Introduction.....	1
3	Dietary sources and intake .....	1
4	Physiology and metabolism .....	1
5	Requirement and recommendation .....	2
6	Upper intake levels and toxicity.....	2
7	References.....	2

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## 9 **Biotin**

### 10 **Introduction**

11 Biotin is a water-soluble heterocyclic compound formerly known as vitamin H. Biotin is essential to  
 12 all known organisms and is synthesized by plants and microorganisms, but animals including man  
 13 lack the ability to synthesize the vitamin (Zempleni et al. 2009). It belongs to the group of B-  
 14 vitamins. Biotin in foods exists in free or protein-bound form.

15

### 16 **Dietary sources and intake**

17 Biotin is found in most foods at low concentrations. Offal meats such as liver and kidney, egg yolk,  
 18 rolled oats and wheat bran are rich sources (Pedersen 1988). Average intake in Danish adults is  
 19 estimated at 40 µg per day and approximately 70 % of this intake is provided by bread and other  
 20 cereal products, dairy products and eggs (Pedersen 1988).

21

### 22 **Physiology and metabolism**

23 Protein-bound biotin is digested in the gut prior absorption involving the enzyme biotinidase  
 24 (Zempleni et al. 2009) in the cleavage of the covalent bond to protein (Zempleni et al. 2009).  
 25 Bioavailability of biotin in different foods varies from very low to almost complete utilisation. In  
 26 general, less than half the biotin in foods is available (Combs 1992). Raw egg white contains the  
 27 glycoprotein avidin, which binds biotin and prevents its absorption. The biotin binding capacity of  
 28 egg white is lost on cooking. A potential source of biotin is microbial synthesis in the large  
 29 intestine, but the quantitative contribution to the metabolism is unclear (Said 2011).

30

31 Biotin functions as a cofactor in carboxylation reactions – transfer of one-carbon units in the form  
 32 of activated carboxyl groups – in intermediary metabolism. These reactions are important in fatty  
 33 acid synthesis, in conversion of pyruvate to oxaloacetate (an intermediate in the citric acid cycle),  
 34 and in degradation of branched amino acids and odd-chain fatty acids.

35

36 When activity of 3-methylcrotonyl-CoA carboxylase is decreased, its substrate is shunted to an  
 37 alternate metabolic pathway, producing 3-hydroxyisovaleric acid (3-HIA), which is then excreted in  
 38 urine. Elevated urinary concentration of 3-HIA is regarded as an early and sensitive indicator of  
 39 biotin deficiency (Zempleni et al 2009, Mock et al 1997).

40

41 Dietary deficiency of biotin is rare and only demonstrated conclusively in individuals on parenteral  
 42 nutrition without biotin or on chronic ingestion of raw egg white. Biotin deficiency has also been  
 43 demonstrated in inherited biotinidase deficiency (Zempleni et al. 2009). Increased excretion of 3-  
 44 HIA as seen frequently in normal pregnancy reflects reduced biotin status (Mock et al 2002).

45 However no untoward effects of marginal biotin status in pregnancy have been documented (Said  
46 2002).

47

#### 48 **Requirement and recommendation**

49 Data providing an estimate of biotin requirements are scarce, and no recommendation is given in  
50 NNR 2012. The U.S. Food and Nutrition Board set an adequate intake (AI) for adults of 30 µg/day  
51 (IoM 1998). This reference intake is based upon intake of biotin in breast-fed infants extrapolated  
52 by body weights to adults.

53

#### 54 **Upper intake levels and toxicity**

55 Data on adverse effects from high biotin intake are not sufficient to set a tolerable upper intake  
56 level. Although no numerical UL can be established, existing evidence from observational studies  
57 indicates that current levels of intakes of biotin from all sources do not represent a health risk for  
58 the general population (SCF 2001).

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