

BIOTIN

Indications

Biotin (coenzyme R, vitamin H) is an essential micronutrient for all mammals and is a water-soluble member of the B complex group of vitamins [1]. Biotin functions as the coenzyme for four carboxylase enzymes: pyruvate carboxylase (EC 6.4.1.1), acetyl-CoA carboxylase (EC 6.4.1.2), propionyl-CoA carboxylase (EC 6.4.1.3) and methylcrotonyl-CoA carboxylase (EC 6.4.1.4) [2,3]. Biotin therefore has an essential role in the metabolic pathways of gluconeogenesis, fatty acid synthesis and the metabolism of amino acids [2-4]. Biotinylation of histones appears to be important in embryological development [2] and there is evidence that marginal maternal biotin deficiency is teratogenic to the foetus [2,6].

Poor biotin status has been recorded in pregnancy [1,5], in the elderly and in athletes [5]. Biotin deficiency has also been linked to impaired glucose tolerance, with an inverse correlation between serum biotin and fasting blood glucose concentrations [5]. Biotin status is reduced by smoking [1] and by anticonvulsant therapy [1,2,6]. Raw egg white contains the protein avidin, which can bind tightly to biotin in the gut and prevent its absorption [2]. Long term consumption of undenatured egg white may thus produce biotin deficiency [2,3,7]. Biotin deficiency has also in the past been linked to sudden infant death [2].

Symptoms of biotin deficiency include reduced growth and impaired reproductive performance, as well as dermatitis [4]. However, clinical signs alone are often insufficient to distinguish the symptoms caused by a deficiency of biotin from those caused by deficiency of pantothenate or zinc [4,7]. Biochemical means must thus be used to assess biotin status in cases of suspected deficiency of the vitamin [4]. However, the diagnosis is seldom made due to the relative un-availability of laboratory methods for the assessment of biotin deficiency.

Synonyms

Biotin, coenzyme R, vitamin H.

Patient preparation

No special preparation is required but the patient should refrain from taking nutritional supplements containing biotin for at least 24 hours before the collection of the sample (avoid all vitamin containing supplements if there is any uncertainty).

Specimen requirements

The sample required for biotin measurement is an EDTA (lavender) tube which should reach the laboratory within 24 hours of collection.

Turn around time

Up to 10 working days.

Interpretation

The Biolab reference interval for is 300 – 3000 ng/l.

References

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4. Whitehead CC. The assessment of biotin status in man and animals. *Proc Nutr Soc* 1981; 40:165-172
5. Báez-Saldaña A, Zendejas-Ruiz I, Revilla-Monslave C et al. Effects of biotin on pyruvate carboxylase, acetyl-CoA carboxylase, propionyl-CoA carboxylase, and markers for glucose and lipid homeostasis in type 2 diabetic patients and nondiabetic subjects. *Am J Clin Nutr* 2004;79:238—243
6. Stratton SL, Bogusiewicz A, Mock MM. Lymphocyte propionyl-CoA carboxylase and its activation by biotin are sensitive indicators of marginal biotin deficiency in humans. *Am J Clin Nutr* 2006;84:384-388
7. Bitsch R, Tôth-Dersi A, Howetzel D. Biotin deficiency and biotin supply. *Ann N Y Acad Sci* 1985;447:133-139
8. Warren GB, Tipton KF. Pig liver pyruvate carboxylase. Purification, properties and cation specificity. *Biochem J* 1974;139:297-310

Suggested further reading

Bender DA, *Nutritional Biochemistry of the Vitamins*, 2nd Ed., Cambridge University Press, 2003.