

## Biotin treatment causing erroneous immunoassay results: A word of caution for clinicians

Raashda Ainuddin Sulaiman<sup>1,2,\*</sup>

<sup>1</sup>Department of Medical Genetics, King Faisal Specialist Hospital and Research center, Riyadh, Saudi Arabia;

<sup>2</sup>College of Medicine, Alfaisal University, Riyadh, Saudi Arabia.

**Summary** Biotin or vitamin B7 when ingested in high doses may cause immunoassay interference leading to false potentially misleading results. It is important that clinicians should always interpret laboratory results in the context of patient's clinical state as erroneous results may lead to misdiagnosis and injudicious treatment with adverse patient outcome.

**Keywords:** Biotin, immunoassay interference, erroneous results

Knowledge of biotin induced immunoassay interference is crucial for clinicians as not only biotin is used to treat certain inherited metabolic disorders and multiple sclerosis, it is also widely consumed as nutritional supplement. We recently had experience of erroneous thyroid function test (TFT) results in three adult patients receiving high doses of biotin (1-10 mg/kg body weight daily) to treat their inherited metabolic disorders. Two patients with biotin responsive basal ganglia disease had depression which triggered the request for TFT (1). Another patient with biotinidase deficiency brought in abnormal TFT results performed in another hospital. Although these patients were clinically euthyroid, their TFT persistently showed high free thyroxine (FT4): 26-56 nmol/L, (12-22 nmol/L), high free triiodothyronine (FT3): 5.2-7.8 nmol/L (1.3-3.1 nmol/L) with variable thyroid stimulating hormone (TSH) concentrations 0.03-0.24 mU/L (0.27-4.2 mU/L). One patient had high thyrotropin receptor antibody (TRAb) titer 30 IU/L (< 1.75 IU/L) as well. Subsequent Iodine-123 thyroid scan was normal in all patients. Discordance in laboratory results and clinical picture, as well as in physiologically dependent variables FT4, TSH, strongly suggested immunoassay interference. Blood samples were tested on Roche Modular Cobas 602 which uses biotin-streptavidin capture in immunoassay. Subsequent testing of samples on Abbott Architect I-2000 analyzer which does not use biotin-streptavidin capture,

showed normal FT4, FT3 and TSH results, confirming biotin induced immunoassay interference in Roche method. Since biotin is a water soluble vitamin and is rapidly cleared from the body, we repeated TFT of one patient 13 hours after the last dose of biotin, on Roche platform. There were significant changes in TFT as FT4 and TSH were normalized to 18.5 nmol/L and 0.51 mU/L respectively.

Biotin or vitamin B7 acts as a coenzyme for different carboxylases involved in gluconeogenesis, fatty acid synthesis and in certain amino acid catabolism. High concentration of biotin in blood interferes with the immunoassays which rely on the biotin streptavidin interaction as an immobilizing system (2). Henry *et al.* first described biotin interference in immunoassay yielding erroneous TSH and FT4 results of a newborn who was on biotin supplement (3). Biotin interference gives falsely high or low results in competitive or immunometric immunoassay respectively (4). It may cause falsely raised thyrotropin receptor antibodies (TRAb) as seen in one of our patients. This could lead to a misdiagnosis of Graves' disease. Biotin also interferes with the measurement of testosterone, oestradiol, dehydroepiandrosterone-sulfate (DHEAS), parathyroid hormone, ferritin and thyroglobulin, testosterone, thyroglobulin, leutinizing hormone (LH), follicle stimulating hormone (FSH), sex hormone binding globulin (SHBG), vitamin B12 and folate (4).

Clinicians should always interpret laboratory results in the context of patient's clinical state. A high index of clinical suspicion and good collaboration with the laboratory is essential to prevent and detect erroneous results which could otherwise lead to misdiagnosis, unnecessary, expensive additional laboratory and clinical

\*Address correspondence to:

Dr. Raashda A Sulaiman, Department of Medical Genetics, MBC 75 King Faisal Specialist Hospital and Research Centre, PO Box No: 3354, Riyadh, 11211, Saudi Arabia.  
E-mail: rsulaiman@kfshrc.edu.sa

investigations in addition to injudicious treatment with adverse patient outcome.

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