



BIOTIN INTERFERENCE

In November 2017, the FDA issued a [Safety Communication](https://www.fda.gov/MedicalDevices/Safety/AlertsandNotices/ucm586505.htm) (<https://www.fda.gov/MedicalDevices/Safety/AlertsandNotices/ucm586505.htm>) to caution patients, laboratorians and health care providers about the potential of biotin interference with certain laboratory tests.

Below is a summary of what we know about biotin and its interference in **immunoassay** tests offered at Wisconsin Diagnostic Laboratories (WDL) and laboratories in the Froedtert Hospital (FH) system.

WDL and FH Laboratories will take the following ongoing actions:

- Add biotin interference information to the affected immunoassay tests in the directory of services (<https://www.wisconsindiagnostic.com>).
- Add interpretative comments to tests impacted by biotin; informing of the potential interference. See a list of these tests in the attachment.
- Determine the level of education needed for different health care team members and dissemination mechanisms.
- Determine the level of education needed for patients and dissemination mechanisms.

Recommendations for healthcare providers:

- Assess the possible impact of biotin interference; consult the attached documentation and contact Wisconsin Diagnostic Laboratories with further questions.
- Advise patients, when possible, to cease multi-vitamin and biotin supplements 12 hours prior to testing.
- Consult with the laboratory:
 - If ceasing multi-vitamin and biotin supplements 12 hours prior to testing is not possible (or intake status is unknown) and the result is not as expected.
 - For testing recommendations in patients taking therapeutic doses of biotin (>10,000 mcg/day).
 - With concerns regarding inconsistent laboratory results.
- In emergency settings, testing should proceed considering the full patient profile. Retesting later is recommended if interference is suspected, as biotin is water-soluble and cleared quickly. Consult with the laboratory for further guidance.

Recommendations for patients:

- Do not take multi-vitamins or dietary supplements containing biotin (vitamin B7 or vitamin H) **at least 12 hours before your blood draw**. Biotin supplementation is commonly found in multi-vitamins and supplements sold for hair, skin, and nail support.

<u>For questions, contact:</u>	Phone	Pager	Email
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Biotin Background & Immunoassay Interference

Biotin, also known as vitamin B7 or vitamin H, is a water-soluble vitamin needed to support metabolic functions. Deficiency is rare; its supplementation is infrequently needed and there is no recommended daily intake. However, consumption of biotin is not uncommon as it is found in multivitamins and as a standalone supplement, some of which are marketed for hair, skin and nail benefits. These supplements contain doses much higher than the daily recommended allowance of 30-100 mcg (0.03-0.10 mg) and generally range up to 10,000 mcg (10 mg) (Table 1). Doses of 10,000 mcg/day and above are used therapeutically for inherited diseases such as biotinidase deficiency, biotin-thiamin-responsive basal ganglia disease and holocarboxylase synthetase deficiency and in experimental clinical trials for multiple sclerosis.

Table 1: Recommended biotin clearance prior to performing laboratory testing.

Biotin supplementation	Dose (mcg/day)	Risk of interference*	Recommended clearance
Normal	30-100	Low	8 hours
Daily multivitamins and low-dose supplementation	Up to 2,500	Low-Moderate	8 hours (12 hours preferred)
Mid- to high-dose supplementation	2,500-10,000	Moderate-High	8 hours (12 hours preferred)
Therapeutic high-to mega-dose supplementation	>10,000	High-Very High	72 hours

*Depends on the assay threshold for biotin; see Table 2.

Biotin, when present in the blood, may affect laboratory tests known as immunoassays (Figure 1). Biotin can cause falsely elevated or falsely decreased results, depending on the immunoassay format (Figure 2). Also, each assay has a different biotin interference threshold (Table 2). Biotin is cleared from the body within hours, but this depends on the dose and renal function. Table 1 shows recommended biotin clearance periods for different biotin intake levels; this is the time recommended to wait after biotin intake to perform laboratory tests. Pharmacokinetic studies in individuals taking up to 10,000 mcg/day of biotin, showed that blood biotin was below 30 ng/mL within 8 hours of intake. Assays with biotin thresholds up to 30 ng/mL are highlighted on Table 2. The biotin clearance period needs to be evaluated carefully, within the context of dose and interference threshold.

Figure 1: Biotin is a component of immunoassays.

What is an immunoassay?

A method commonly used in assays, which rely on the interaction of antibodies and analyte (target) and the formation of antibody-analyte complexes. Two common immunoassay formats are non-competitive (sandwich) and competitive. Biotin is used in many immunoassays to capture these complexes.

How is biotin used in immunoassays?

Biotin can be easily attached to antibodies or analytes without affecting them biologically. Its strong affinity for avidin-related molecules makes it effective at capturing and separating biotin-bound molecules.



Biotin Background & Immunoassay Interference

Figure 2: Effect of biotin on immunoassays.

- Biotin may cause falsely increased or falsely decreased results.
- The direction of the interference depends on the immunoassay format (Table 2).
- The extent of the interference depends on the biotin threshold for each assay (Table 2).
- Biotin interference thresholds mean the blood concentration that changes a result by +/- 10%.

Falsely elevated interference Occurs on competitive immunoassays	Falsely decreased interference Occurs on non-competitive immunoassays
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Table 2: Biotin interference thresholds (blood concentration at which result changes by +/-10%).

Assay	Threshold (ng/mL)	Interference	Assay	Threshold (ng/mL)	Interference
ACTH	60	Falsely decreased	LH	50	Falsely decreased
AFP	60	Falsely decreased	Procalcitonin	30	Falsely decreased
Anti-TPO	10	Falsely increased	ProBNP	30	Falsely decreased
CA 125	35	Falsely decreased	Progesterone	30	Falsely increased
CA 15-3	100	Falsely decreased	Prolactin	40	Falsely decreased
CA 19-9	100	Falsely decreased	PSA Free	30	Falsely decreased
CEA	120	Falsely decreased	PSA Total	60	Falsely decreased
CK-MB	30	Falsely decreased	PTH	50	Falsely decreased
Cortisol	30	Falsely increased	Rubella IgG	50	Falsely decreased
C-Peptide	60	Falsely decreased	T3	10	Falsely increased
DHEAS/DHEA	30	Falsely increased	T4	100	Falsely increased
Estradiol	36	Falsely increased	Testosterone	30	Falsely increased
Ferritin	50	Falsely decreased	Thyroglobulin	5	Falsely decreased
Folate	21	Falsely increased	Toxo IgG	60	Falsely decreased
FSH	60	Falsely decreased	Troponin T	50	Falsely decreased
FT3	70	Falsely increased	TSH	25	Falsely decreased
FT4	20	Falsely increased	T-Uptake	40	Falsely increased
HBc IgM	150	Falsely decreased	Vitamin B12	50	Falsely increased
HCG Pregnancy	80	Falsely decreased	Vitamin D (FH laboratories)	30	Falsely increased
Insulin	60	Falsely decreased			

NOTE: Assays with thresholds up to 30 ng/mL are highlighted. Assays with lowest thresholds are bolded.