

What Does This Mean for Clinicians?

As a healthcare provider, it is your responsibility to routinely screen patients with thalassemia for nutritional deficiencies. An annual blood panel of trace minerals, vitamins, and inflammatory biomarkers should be sufficient to monitor their nutrient levels and ensure that infection or inflammation is not significantly depressing those values.

For patients with low serum zinc, a 10-25 mg/day elemental zinc supplement should be considered.

Due to the possibility of zinc interfering with the absorption of copper, or copper being extracted by chelation therapy, during supplementation serum copper must also be monitored and kept above 70 ug/dL.

To prevent the contamination and artificial inflation of serum zinc levels, be sure to use certified trace element free materials in the collection and processing of blood samples.



For more information about zinc, please visit:

<http://www.izincg.org/>

<https://ods.od.nih.gov/factsheets/Zinc>

For more information about nutrition and its role in thalassemia, please visit our website:

<http://www.thalassemia.com>

Citations:

1. Perera NJ. Overview of endocrinopathies associated with β -thalassaemia major. *Internal Med J* 2010;40(10):689-96.
2. Fung EB, et al. Zinc supplementation improves bone density in patients with thalassemia: a double-blind, randomized, placebo-controlled trial. *Amer J Clin Nutr* 2013;98(4):960-971.
3. Fung EB. Nutritional deficiencies in patients with thalassemia. *Ann NY Acad Sciences* 2010;1202:188-196.
4. Killilea DW. et al. Identification of a Hemolysis Threshold That Increases Plasma and Serum Zinc Concentration. *J Nutr* 2017;147(6):1218-1225.
5. Mburu ASW. The influence of inflammation on plasma zinc concentration in apparently healthy, HIV+ Kenyan adults and zinc responses after a multi-micronutrient supplement. *Eur J Clin Nutr* 2010;64(5) 510-517.



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ZINC

An Informational Pamphlet for Care Providers of Individuals with Thalassemia



Why is Zinc Important for Patients with Thalassemia?

Zinc deficiency has been associated with frequent co-morbidity in patients with thalassemia, which includes: growth failure, hypogonadism, reduced immune function, glucose intolerance and low bone mineral density.^{1,2} Supplementation with zinc has resulted in improved growth and increased bone mass in at-risk patients with thalassemia.²

How much Zinc do Patients Need?

Recommended Dietary Allowance of Zinc

	Male	Female
4-8 years	5 mg	5 mg
9-13 years	8 mg	8 mg
14-18 years	11 mg	9 mg
≥19 years	11 mg	8 mg

With our intake of red meat, seafood, and poultry, zinc is ubiquitous in the American diet. Despite this, between 20-80% of transfused individuals with beta thalassemia have been found to be zinc deficient. The causes for this deficiency are myriad. As patients with thalassemia are often shorter and less physically active than individuals without chronic illnesses, many require fewer calories. With less overall food intake, eating “empty” calories, or food with little nutritional value, can quickly contribute to micro-nutrient deficiency. Furthermore, individuals with thalassemia have an elevated requirement for zinc due to increased nutrient turnover, and elevated urinary loss.³ Together, these factors contribute to a significant risk for zinc deficiency.

Patients with thalassemia require more zinc than healthy individuals. We do not know exactly how

much zinc is appropriate for these chronically ill patients, but we do know oral zinc intake is often insufficient to fulfill their needs. Patients found to be zinc deficient should take a 10-25 mg/day zinc supplement for three months, at which time serum zinc should be retested.

There are many formulations of zinc supplements. Zinc gluconate, citrate and acetate are better tolerated than zinc sulfate, which can be a gastric irritant. It is recommended to use the lowest dose of zinc supplement possible to improve zinc status while maintaining serum copper levels; high doses of zinc can induce copper deficiency by interfering with its absorption. In addition to supplementation, patients should be encouraged to identify and consume zinc-rich foods.

How to Assess Zinc Status

The concentration of zinc in blood serum is the best available biomarker for zinc deficiency.

Serum zinc levels are influenced by numerous factors, both in vivo and in the processing of blood samples. When analyzing laboratory results, clinicians must be keenly aware of these factors in order to properly assess zinc status.

Serum zinc can be artificially increased by:

Internal Factors:

- Estrogen

External Factors:

- Hemolysis⁴
- Time to centrifugation
- Contaminated Tubes
- Contamination in Processing

Serum zinc can be artificially decreased by:

- Post Prandial Fluctuation
- Infection/Inflammation
- Diurnal Variation

While testing for nutritional deficiencies, additional screening for inflammatory biomarkers such as CRP and AGP should also be conducted to ensure that inflammation is not influencing zinc.⁵

How to Correctly Collect Blood for Zinc Analysis

Blood should be collected pre-transfusion following a strict protocol that controls the time of day and fasting status of the patient. If fasting is not possible, each subject should be provided with a standard snack and the blood drawn after a standardized time interval (e.g. one hour). Blood should be spun down within 30 minutes of specimen collection, and kept on ice for the duration of that time.

To control for confounding factors in the analysis, the following information should be recorded:

- Time of previous meal
- Time of blood draw
- Time of centrifugation

Cutoffs for Serum Zinc Concentration:

Time of Day and Fasting Status	Suggested lower cutoffs for serum zinc concentration ug/dL ^a		
	<10 years	≥10 years	
	Males & Females	Non-Pregnant Females	Males
Morning, Fasting ^b	n/a	70	74
Morning, Non-Fasting	65	66	70
Afternoon, Non-Fasting	57	59	61

^a For Conversion to μmol/L, divide by 6.54.

^b Fasting is defined as no food or beverage consumption for a minimum of 8 hours.