Clinical Studies and Utility of Dried Blood Spot for Total Micronutrient (DBS)

Overall: DBS Micronutrients *(now available as an option under the Vibrant Wellness menu)* can serve as a valid baseline assessment of whole blood micronutrient status. For providers who want a more comprehensive assessment of micronutrient status, including differentiation of extra- vs intracellular levels, the Vibrant Micronutrient 3.0 test *(still available to order under the Vibrant America menu)* would be the best choice.

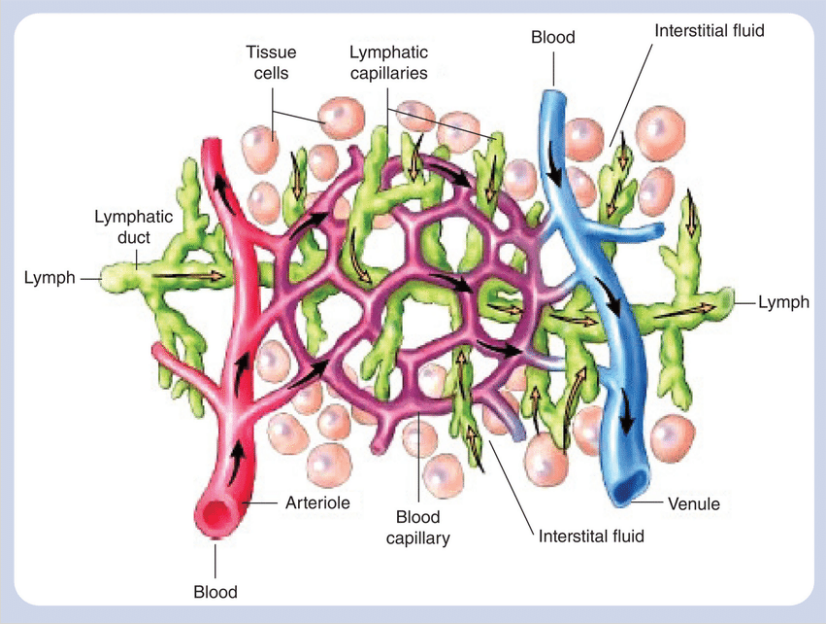

Figure 1. Distribution of blood, lymph and interstitial fluid in human tissue Tissue-embedded networks of blood and lymph capillaries along with interstitial fluid compartment contain significant amounts of abundant blood-derived proteins. Reproduced with permission from Mass spectrometry in cancer biomarker research: A case for immunodepletion of abundant blood-derived proteins from clinical tissue specimens - Scientific Figure on ResearchGate. Available from: https://www.researchgate.net/figure/Distribution-of-blood-lymph-and-interstitial-fluid-in-human-tissue-Tissue-embedded_fig2_260167519.

DBS Methodology:

- Dried blood samples are a mixture of capillary blood, arterial blood, interstitial fluid, and extracellular fluid.
- Over 2000 analytes have been studied in DBS testing.
- DBS samples are collected for virtually every newborn in the United States.
- DBS analysis has been extensively studied in clinical, research, and community settings, and is used routinely in toxicology, forensic, and post-mortem testing.

Given intraindividual variability of micronutrient status over time, retesting is recommended (by either Vibrant methodology) to identify an individual's "true value" (normative levels) over time.

Clinical References by Nutrient

1. **Vitamin A**: DBS retinol has been found to be precise and comparable to plasma and serum retinol and stable in DBS storage for 90 days.
2. **B Vitamins:** DBS B1 has been validated for assessing thiamine deficiency in infants, and found comparable to venous blood. DBS B1, B2, and B6 (PLP) have been validated in children, and found good agreement with the corresponding concentrations in liquid blood. DBS 5-methyltetrahydrofolic acid (5-MTHF) has been validated and found comparable to whole blood and plasma folate in healthy controls and subjects with MTHFR genotypes. DBS B5 (pantothenic acid) has been measured in metabonomic studies for newborn screenings.
3. **Vitamin C**: DBS vitamin C was compared to venous samples and the difference was found to be less than five percent.
4. **Vitamin D**: DBS vitamin D3 has been found comparable to serum and plasma D3 levels.
5. **Vitamin E:** DBS alpha tocopherol technique is simple, rapid, specific, accurate, precise, and reproducible, and can be useful in field-based epidemiological studies.
6. **Glutathione (GSH)**: DBS technique determined total GSH is comparable to venous blood. Mass screening of newborns for DBS reduced GSH and GSH disulfide is used to detect Glucose-6-phosphate dehydrogenase (G6PD) deficiency. Additionally, glutathione-S-transferase has been measured in DBS proteomics analysis.
7. **Carnitine:** DBS L-carnitine has been measured in DBS newborn screenings for amino, organic, and fatty acid disorders.
8. **MMA:** DBS MMA has been validated in adult women and shown high linearity with plasma MMA, with concentrations stable in storage at one year.
9. **Minerals:** DBS calcium, manganese, zinc, copper, chromium, iron, magnesium, and selenium have been quantified in newborn screenings.
10. **Amino Acids (AAs)**: DBS testing has long been used nationally and globally in newborn screenings for inborn errors of metabolism and malnutrition. Stability studies of DBS AAs have found AAs were stable after 4 hours of direct sunlight exposure, and after storage for 30 days there was less than ten percent loss.

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