

<i>VITAMIN</i>	<i>MEASUREMENT</i>	<i>Test Equipment</i>	<i>NORMAL RANGE</i>	<i>DEFICIENCY</i>	<i>TOXICITY</i>
D	25-OH-D	HPLC	Deficiency: 0-9 Insufficiency: 10-30 Sufficiency: 31-100 Toxicity: >100	osteopenia and rickets	Hypercalcemia, weakness, fatigue, diarrhea, anorexia, headache, confusion, psychosis, tremor, hypercalciuria and nephrolithiasis
E	α -tocopherol	HPLC	Child: 3-9 Adult: 5-18 (micg/mL)	Ataxia, Hemolytic anemia, altered reflexes, muscle weakness, visual field defects to complete blindness, and cardiac arrhythmias	No significant toxicity
K	Prothrombin time	CoaguChek device	11-15 s	Hemorrhagic diseases and skeletal problems	Liver damage
A	Retinol	HPLC	Child: 0.26-0.72 Adult: 0.26-0.49 (micg/mL)	Night blindness, xerophthalmia, anemia, leucopenia, Bitot's spots, hyperkeratosis, anorexia, keratomalacia, depressed helper T-cell activity, and impaired mucus secretion	Pseudotumor cerebri, photophobia, alopecia, ataxia, muscle and bone pain, cheilitis, conjunctivitis, hepato- toxicity, and hyperlipidemia

Table 1. Fat-Soluble Vitamins - Classification, Laboratory Measurements, Test Equipment, Normal Range, Deficiencies, and Toxicities