

DRIED URINE TEST SPECIFICATIONS

Iodine

Clinical Information

Iodine is an essential component of the thyroid hormones T4 and T3. Severe iodine deficiency during pregnancy can cause severe neurological and developmental defects such as cretinism in the infant. Even moderate iodine deficiency can result in impaired intellectual development in children. Insufficient iodine intake reduces thyroid hormone synthesis, leading to overstimulation of the thyroid gland by increased TSH production from the brain in an attempt to maintain thyroid hormone levels, eventually resulting in goiter and/or other thyroid disease. However, too much iodine can also cause problems, including both hypo- and hyperthyroidism.

About 90% of iodine consumed from any source (e.g., diet, supplements, medication) is eliminated in urine within 24-48 hours; therefore urine testing is an excellent method to determine an individual's iodine status, providing clues to thyroid dysfunction and the means to correct it (i.e., increase or lower iodine intake).

Two dried urine samples are collected for iodine testing, first morning and last night. The iodine content is averaged for the two samples, which we have found to correlate excellently with results from a simultaneous 24-hour urine collection. Iodine levels are corrected using urinary creatinine to allow for variations in hydration status. The reference range is 100–380 µg iodine/g creatinine.

References:

Zava TT, Kapur S, Zava DT. Iodine and creatinine testing in urine dried on filter paper. *Anal Chim Acta* 2013;764:64-9.

Zava TT, Zava DT. Determination of iodine, bromine, selenium and arsenic by ICP-DRC-MS using urine dried on filter paper. *Thyroid* 2013;23(1):A21. (Poster presented at 83rd Annual Meeting of the American Thyroid Association, Oct 16-20, 2013, San Juan, Puerto Rico).

Zimmermann MB. Iodine deficiency. *Endocr Rev* 2009;30:376-408.

Mina A, Favalaro EJ, Koutts J. Iodine deficiency: current aspects and future prospects. *LAB-MEDICINE* 2011;42:744-6.

Shelor CP, Dasgupta PK. Review of analytical methods for the quantification of iodine in complex matrices. *Anal Chim Acta* 2011;702:16-36.

Andersson M, Karumbunathan V, Zimmermann MB. Global iodine status in 2011 and trends over the past decade. *J Nutr* 2012; 142:744-50.

Assay Method: ICP-MS

Intra-assay Precision

Intra-assay precision was determined by choosing three dried urine samples spanning the reference range for iodine, and analyzing them 20 times within the same run. Results are shown below:

Mean Iodine Concentration (µg/L)	Standard Deviation	Coefficient of Variation (C.V. %)
86.9	4.6	5.3
192.2	4.6	2.4
518.5	14.0	2.7

Inter-assay Precision

Inter-assay precision was determined by choosing three samples spanning the reference range for iodine, and analyzing them in 12 different runs. Results are shown below:

Mean Iodine Concentration (µg/L)	Standard Deviation	Coefficient of Variation (C.V. %)
102.0	3.9	3.8
222.1	7.3	3.3
545.3	28.4	5.2

Accuracy

To test the accuracy of the dried urine assay for iodine, external urine controls containing known concentrations of iodine were analyzed. An inter-laboratory comparison was also performed with matching samples. Results are shown below:

External Control	Expected Iodine (µg/L)	ZRT Iodine (µg/L)	Inter-Laboratory Comparison	Other Lab Result (µg/L)	ZRT Result (µg/L)
SeroNorm Trace Elements Level 1	105	105.5	Sample 1	96	100
SeroNorm Trace Elements Level 2	297	297.3	Sample 2	280	304
ClinChek Trace Elements Level 1	120	114.9			
ClinChek Trace Elements Level 2	497	486.3			

Analyte Stability

The dried urine iodine samples are stable for more than one month at room temperature and for more than six months when stored at –80°C. Three freeze-thaw cycles did not cause a significant change in concentration.

Specimen Collection

Kits for dried urine collection contain two filter paper collection strips, easy-to-follow instructions, and a mailer to return the sample for analysis.