

DRIED URINE TEST SPECIFICATIONS

Selenium

Clinical Information

Selenium is an essential dietary element that is incorporated into the selenoproteins in the body, which include glutathione peroxidases, thioredoxin reductases, iodothyronine deiodinases, and the extracellular glycoprotein, selenoprotein P. These selenoproteins play vital roles in thyroid hormone synthesis, free radical scavenging, DNA synthesis, and cancer prevention. Foods such as brazil nuts, seafood, eggs, and grains are significant selenium sources. The optimal therapeutic range for selenium is narrow: excess selenium intake can result in toxicity, while inadequate selenium affects thyroid function because of impaired synthesis and conversion of T4 into the active T3. Urine is the major route of selenium elimination, therefore dried urinary selenium is an indicator of dietary selenium intake.

Two dried urine samples are collected for selenium testing; first morning and last night. The selenium content is averaged for the two samples, which we have found to correlate excellently with results from a simultaneous 24-hour urine collection. Selenium levels are corrected using urinary creatinine to allow for variations in hydration status.

The reference range is 34–220 µg selenium/g creatinine; optimum levels are 50–175 µg selenium/g creatinine.

References:

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 the 83rd Annual Meeting of the American Thyroid Association, October 16-20, 2013, San Juan, Puerto Rico).

Brown KM, Arthur JR. Selenium, selenoproteins and human health: a review. *Public Health Nutr.* 2001;4:593-9.

Mehdi Y, Hornick JL, Istasse L, Dufresne I. Selenium in the environment, metabolism and involvement in body functions. *Molecules.* 2013;18:3292-311.

Bianco AC, Salvatore D, Gereben B, et al. Biochemistry, cellular and molecular biology, and physiological roles of the iodothyronine selenodeiodinases. *Endocr Rev.* 2002;23:38-89.

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

Assay Method: ICP-MS

Intra-assay Precision

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

Mean Selenium Concentration (µg/L)	Standard Deviation	Coefficient of Variation (C.V. %)
29.3	2.1	7.1
49.8	2.2	4.5
143.0	5.1	3.6

Inter-assay Precision

Inter-assay precision was determined by choosing three samples spanning the reference range for selenium, and analyzing them over a 1-month period. Results are shown below:

Mean Selenium Concentration (µg/L)	Standard Deviation	Coefficient of Variation (C.V. %)
24.0	3.3	13.7
50.1	4.8	9.5
158.6	10.2	6.4

Accuracy

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

External Control	Expected Selenium (µg/L)	ZRT Selenium (µg/L)	Inter-Laboratory Comparison	Other Lab Result (µg/L)	ZRT Result (µg/L)
SeroNorm Trace Elements Level 1	15.8	29.1	Sample 1	29.3	27.5
SeroNorm Trace Elements Level 2	71.7	84.3	Sample 2	107.1	108.3
ClinChek Trace Elements Level 1	29.9	25.0			
ClinChek Trace Elements Level 2	83.2	70.2			
BioRad 400 Lyphocheck Metals Level 1	81.4	83.6			
BioRad 405 Lyphocheck Metals Level 2	217	239.9			

Analyte Stability

The dried urine selenium 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.