Assessment of Iodine Intake: Analytical Methods and Quality Control

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PRESENTATION ABSTRACT

Measurement Procedures and Reference Materials for Assessment of Iodine Status

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Abstract

Accurate and reliable measurements of iodine status markers are necessary to identify individuals with nutritional deficiencies and to evaluate potential health benefits associated with dietary supplementation. Certified reference materials (CRMs) play an essential role in the validation of analytical methods. For nearly four decades the National Institute of Standards and Technology (NIST) has provided natural-matrix standard reference materials (SRMs), which are CRMs produced by NIST, to assist in assessing and improving the quality of environmental, clinical diagnostic, nutritional assessment, and food composition measurements. The certified values in these natural-matrix SRMs are generally based on the approach of combining results from two or more independent analytical methods. These natural-matrix SRMs are useful for validation of the complete analytical measurement process and for quality control of routine analytical measurements.

To address chemical measurement needs related to iodine status assessment, NIST, in conjunction with the National Institutes of Health/Office of Dietary Supplements (NIH/ODS), has developed or is currently developing measurement procedures and SRMs for iodine content in foods, dietary supplements, and human urine and for thyroid hormone markers in human serum. NIST recently issued several food-matrix and dietary supplement-matrix SRMs with values assigned for vitamins and nutritional elements including iodine. These food-matrix SRMs include fortified foods (breakfast cereal, infant/adult nutritional formula) and nonfortified foods (whole egg powder, whole milk powder, baby food, and typical diet composite). For dietary supplement materials, the NIST/NIH-ODS collaboration has produced a multivitamin/multi-element tablet (SRM 3280) with values assigned for 14 vitamins and 18 nutrient elements including iodine [1,2]. In addition a kelp-matrix SRM, which is high in iodine content, and 2 iodized salt SRMs are currently in progress.

For human nutritional assessment, NIST has developed several human serum-based SRMs with values assigned for nutrients and/or nutritional assessment markers, for example, metabolites of vitamins D and B6, folate, and fatty acids. In particular for iodine status markers, two urine-based SRMs with values assigned for iodine levels have been issued. For the thyroid hormone markers, NIST has published a reference measurement procedures (RMP) for total thyroxine (T4) and total 3,3',5-Triiodothyronine (T3) in human serum using liquid chromatography-mass spectrometry (LC-MS) and LC tandem mass spectrometry (MS/MS) [3,4], which were accepted by the Joint Committee for Traceability in Laboratory Medicine (JCTLM). NIST is also developing a second method for T3 and T4 using LC with inductively coupled plasma-mass spectrometry (ICP-MS), which utilizes the specificity of ICP-MS for iodine. These two methods will be used to assign values for T3 and T4 in an existing serum material, SRM 971 Hormones in Serum.

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