Functional Sensitivity of Five Automated Estradiol Immunoassays

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Abstract

Background: Estradiol (E2) is a steroid hormone produced primarily by the ovaries with small amounts produced in the testes and adrenal cortex. E2 measurement is used for assessing sexual development, fertility disorders, gynecomastia, estrogen-producing tumors and clinically important low concentrations, continue to be problematic for E2 immunoassays. Functional sensitivity (FS) is defined as the concentration at which the assay imprecision (CV) is 20%. We studied the FS of five automated E2 immunoassays.

Methods: We evaluated the ARCHITECT i2000 (Abbott, Beckman), ELECSYS E170 (Roche), and ADVIA Centaur and IMMULITE 2000 (Siemens) immunoassays. Five pools of different concentrations were each prepared by combining serum samples with comparable E2 concentrations as determined by LC-MS/MS. Pools were aliquoted and stored frozen (-70°C) until testing. Immunoassays were evaluated over 12 days using two lots of reagent and two calibrations. Five aliquots per pool (one per method) were thawed per day and assayed once per day, one run per day, two days per week and three weeks per reagent lot (total=12 replicates). FS was determined by fitting a power function to the imprecision data using Excel.

Results: The FS's (ng/L) for ARCHITECT i2000, DxI 800, ELECSYS E170, ADVIA Centaur, and IMMULITE 2000 were determined to be 15.4, 39.0, 10.5, 20.0, and 651.0, respectively. The manufacturers indicated their assays are traceable to GC/MS reference methods except the IMMULITE 2000.

Conclusions: The immunoassays are most useful for Pool 1 (range 15.5 to 29.5 ng/L) and Pool 5 (range 524.8 to 782.3 ng/L). The most comparable results were seen in Pool 2 (range 86.1 to 93.1 ng/L). Many manufacturers indicated their assays are traceable to I-DC/GCMS or GC/GCMS reference methods except the IMMULITE 2000.

Introduction

Estradiol (E2) is the most potent natural estrogen in humans. It regulates reproductive function in females, and, with progesterone, maintains pregnancy. In non-pregnant women most E2 is secreted by the ovaries. During pregnancy, the placenta produces most of the circulating E2. Additional sources of E2 are the testes (in men) and adrenal cortex (in men and women). In men, secretion of E2 by the testes accounts for about 20% of circulating hormone, the remainder being derived from peripheral aromatization. Because the ovaries produce the majority of E2 in normal women, measurement of this hormone is useful in assessing ovarian function. In addition, monitoring E2 levels is important in evaluating women during in vitro fertilization to predict when optimal follicular maturity has been attained.

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Results And Discussion

Comparison of assay data including Pool E2 concentrations and calculated FS by method are summarized in Table 1 and Figure 1. FS results ranged from a best performance of 3 ng/L (ARCHITECT i2000) to a poorest performance of 39 ng/L (DxI 800). A recent Endocrine Society position statement has indicated that E2 assays should have FS of 5 ng/L or lower to be most clinically useful.

References