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Validation of a Sex Hormone- Binding Globulin (SHBG) Immunoassay on the ADVIA Centaur Immunoassay System

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Abstract

Sex hormone-binding globulin (SHBG) is a glycoprotein, produced by the liver, with a high binding affinity for steroid hormones such as estradiol, dihydrotestosterone, and testosterone. SHBG measurement is a useful indicator of androgen disorders, including hirsutism, when it is combined with testosterone measurement to calculate a free testosterone index (FTI). The FTI is determined by calculating the ratio of testosterone to SHBG.

Siemens Healthcare Diagnostics has developed a fully automated SHBG immunoassay for testing plasma or serum samples on the ADVIA Centaur® platform. The objective of this study was to evaluate the analytical performance of the SHBG assay on this platform.

The ADVIA Centaur SHBG assay is a quantitative, two-site sandwich immunoassay. Relative light units (RLUs) detected by the system are directly proportional to the amount of SHBG present in the test sample. The assay range is 0-180 nmol/L. The FTI is automatically calculated and reported by the ADVIA Centaur system.

Imprecision was assessed at two clinical sites (US and Canada) on repeated measurements using calibrators, control material and prepared pools. The within-run CVs ranged from 2.7% to 4.0% and total CVs from 3.2% to 4.3% on samples with SHBG concentrations of 9.62-52.15 nmol/L. The distribution of within-run CVs for 250 patient samples showed that more than 90% of samples had a CV of \leq 5%.

A method comparison against the Roche ELECSYS 2010 was performed at one site on 250 samples, including 50 pediatric

samples, covering the range of the assay. Two lots of SHBG reagent were tested; their correlation coefficients were 0.992 and 0.993.

In conclusion, preliminary assessment of the results of this clinical evaluation indicate that the ADVIA Centaur SHBG immunoassay is a precise method for measuring SHBG in serum across a wide range of clinically relevant concentrations and shows equivalent performance to the Roche ELECSYS 2010 SHBG assay.

Background

Sex hormone-binding globulin (SHBG) is a glycoprotein with a high binding affinity for steroid hormones such as estradiol and testosterone. SHBG measurement is useful in the evaluation of androgen disorders including hirsutism and polycystic ovarian syndrome. SHBG results are commonly combined with total testosterone results to calculate the free testosterone index (FTI), a parameter defined as the ratio of testosterone to SHBG. The FTI provides an indication of the concentration of free testosterone levels.

The objective of this study was to evaluate the analytical performance of the SHBG assay on ADVIA Centaur platform.

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2. White Plains Hospital, White Plains, NY, US
3. Siemens Healthcare Diagnostics Inc, Tarrytown, NY, US

Materials and Methods: Precision: Assay precision was assessed over two weeks at two clinical sites on repeated measurements using calibrators, control material and prepared pools. The two sites were White Plains Hospital, White Plains, New York; and CRED, Centre Hospitalier Universitaire de Sherbrooke, Sherbrooke, Quebec. Within-run and total precision are expressed as % coefficient of variation (CV).

Correlation: Correlation was evaluated by method comparison to the Roche ELECSYS 2010 using 250 samples, including 50 pediatric samples, covering the range of the assay.

Two ADVIA Centaur SHBG reagent lots were used in this evaluation. The "Results" section displays results for one lot.

Assay Principle: Siemens has developed a fully automated SHBG immunoassay for testing plasma or serum samples on the ADVIA Centaur platform. This quantitative, two-site sandwich immunoassay measures the direct relationship between the amount of SHBG present in the test sample and the relative light units (RLU) detected by the system. The assay range is 0-180 nmol/L. The FTI is automatically calculated and reported by the ADVIA Centaur.

Results

The precision data from the two sites are summarized in Table 1. The total CVs ranged from 3.4 to 4.1% on samples with SHBG concentrations of 9.62 to 52.15 nmol/L.

Table 1. ADVIA Centaur SHBG precision summary

Sample	# Days	# Runs	# Replicates	MEAN (nmol/L)	Within Run		Total	
					SD	CV	SD	CV
Bio-Rad control Level 1	16	16	146	25.91	1.00	3.9	1.07	4.1
Bio-Rad control Level 2	16	17	143	52.15	1.84	3.5	2.11	4.0
Bio-Rad control Level 3	16	17	146	48.89	1.93	4.0	2.02	4.1
Medical Decision Pool 1	16	17	146	9.62	0.32	3.3	0.33	3.4
Medical Decision Pool 2	16	17	146	41.54	1.39	3.3	1.44	3.5



For clinical samples, the distribution of within-run variations determined on serum samples used in the correlation study are given in Figure 1. Ninety-five % of samples have a within-run CV \leq 5%.

Figure 1. Distribution of within-run patient CVs for ADVIA Centaur SHBG assay

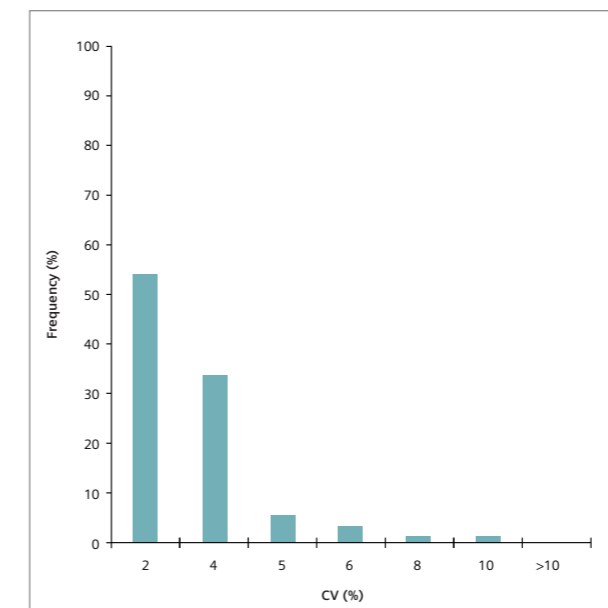


Table 2. Method comparison summary

Comparison	n	r	Slope	Intercept	Syx
ADVIA Centaur vs. ELECSYS	492	0.992	0.91	4.8	5.1
ADVIA Centaur vs. ELECSYS (< 60 nmol/L)	266	0.984	1.04	-0.6	2.6
ADVIA Centaur vs. ELECSYS, Pediatric	95	0.994	0.88	7.1	4.9

Figure 2. Correlation between the ADVIA Centaur SHBG and the ELECSYS SHBG assay

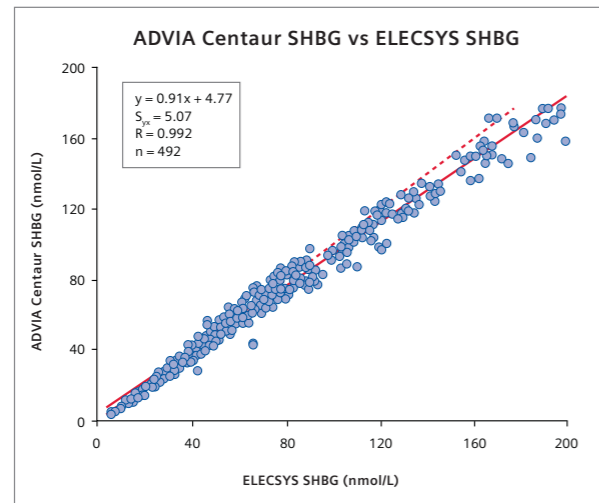


Figure 3. Correlation between the ADVIA Centaur SHBG and the ELECSYS SHBG (<60 nmol/L) assay

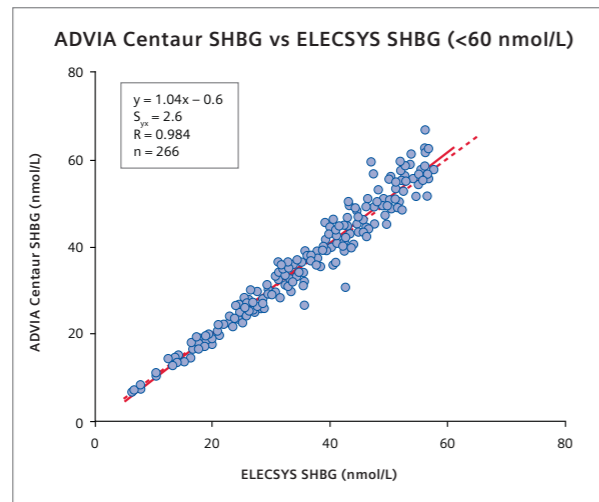
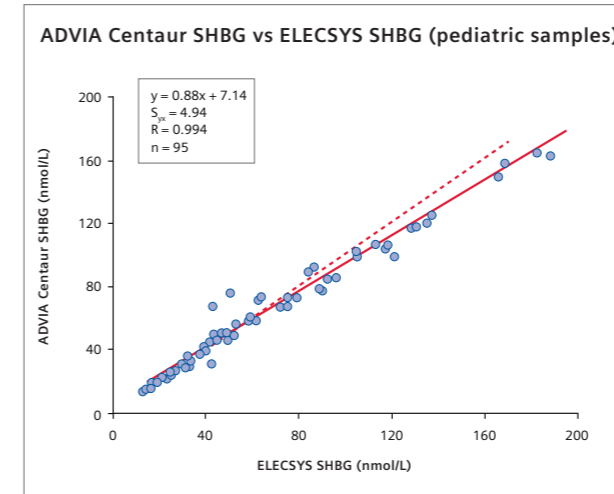


Figure 4. Correlation between the ADVIA Centaur SHBG and the ELECSYS SHBG using pediatric samples



Conclusions

The ADVIA Centaur SHBG immunoassay is a precise method for measuring SHBG in serum across a wide range of clinically relevant concentrations and shows good correlation with the Roche ELECSYS 2010 SHBG assay on adult and pediatric samples.