

REF			SYSTEM
03000087122	03000087500	100	<b>cobas e 411</b> <b>cobas e 601</b> <b>cobas e 602</b>

## English

### System information

For **cobas e 411** analyzer: test number 740

For **cobas e 601** and **cobas e 602** analyzers: Application Code Number 142

### Intended use

Immunoassay for the in vitro quantitative determination of dehydroepiandrosterone sulfate (DHEA-S) in human serum and plasma.

The electrochemiluminescence immunoassay "ECLIA" is intended for use on **cobas e** immunoassay analyzers.

### Summary

Dehydroepiandrosterone sulfate (DHEA-S) measurements, performed with this assay, in human serum and plasma are used as an aid in diagnosis and differential diagnosis of androgens related endocrine function such as hyperandrogenism, adrenal tumors and premature adrenarche.

DHEA-S is a steroid hormone synthesized in the zona reticularis of the adrenal glands in response to adrenocorticotrophic hormone (ACTH). Like other steroids, DHEA-S is synthesized from cholesterol. DHEA-S is hormonally inert, but it can be converted to other more potent androgens or estrogens. Therefore DHEA-S can be considered a prohormone.

During fetal development DHEA-S is produced in the adrenal gland and the level declines rapidly during the first year of life. The production of DHEA-S resumes again during adrenarche, increases during puberty and reaches the peak values between 20 and 30 years of age. Thereafter DHEA-S levels steadily decline. In males the adrenal glands account for only a small amount of the total androgen production, while in females of reproductive age the adrenal contribution to androgen production is more pronounced.<sup>1</sup>

Measurement of DHEA-S may be useful in the diagnostic work-up of female subjects presenting with signs and symptoms of hyperandrogenism. Hyperandrogenism is usually caused by excessive androgen production by the ovaries, the adrenal glands, or both.<sup>2</sup>

The most common disease associated with hyperandrogenism is polycystic ovary syndrome (PCOS).<sup>3</sup> Other diseases where the measurement of DHEA-S may be useful are nonclassic congenital adrenal hyperplasia<sup>4</sup>, androgen-secreting adrenal tumors<sup>5</sup>, Cushing syndrome and hyperprolactinemia.<sup>1,2</sup>

A high DHEA-S level may indicate an adrenal factor in androgen production<sup>6</sup>, and if substantially elevated, the presence of an adrenocortical neoplasm.<sup>7</sup> DHEA-S measurements are also useful in the determination of premature adrenarche in children.<sup>8</sup>

The Elecsys DHEA-S assay makes use of a competition test principle using a polyclonal antibody (rabbit) specifically directed against DHEA-S. Endogenous DHEA-S in the sample competes with added DHEA-S derivative labeled with a ruthenium complex<sup>a)</sup> for the binding sites on the biotinylated antibody.

a) Tris(2,2'-bipyridyl)ruthenium(II)-complex (Ru(bpy)<sub>3</sub><sup>2+</sup>)

### Test principle

Competition principle. Total duration of assay: 18 minutes.

- 1st incubation: By incubating the sample (15 µL) with a DHEA-S-specific biotinylated antibody, an immunocomplex is formed, the amount of which is dependent upon the analyte concentration in the sample.
- 2nd incubation: After addition of streptavidin-coated microparticles and a DHEA-S derivative labeled with a ruthenium complex, the still-vacant sites of the biotinylated antibodies become occupied, with formation of an antibody-hapten complex. The entire complex becomes bound to the solid phase via interaction of biotin and streptavidin.
- The reaction mixture is aspirated into the measuring cell where the microparticles are magnetically captured onto the surface of the electrode. Unbound substances are then removed with ProCell/ProCell M. Application of a voltage to the electrode then induces chemiluminescent emission which is measured by a photomultiplier.

- Results are determined via a calibration curve which is instrument-specifically generated by 2-point calibration and a master curve provided via the reagent barcode or e-barcode.

### Reagents - working solutions

The reagent rackpack is labeled as DHEA-S.

- M Streptavidin-coated microparticles (transparent cap), 1 bottle, 6.5 mL: Streptavidin-coated microparticles 0.72 mg/mL; preservative.
- R1 Anti-DHEA-S-Ab-biotin (gray cap), 1 bottle, 9 mL: Biotinylated polyclonal anti-DHEA-S antibody (rabbit) 450 ng/mL; phosphate buffer 100 mmol/L, pH 6.8; preservative.
- R2 DHEA-S-Ru(bpy)<sub>3</sub><sup>2+</sup> (black cap), 1 bottle, 9 mL: DHEA-S derivative (synthetic) labeled with ruthenium complex 0.32 ng/mL; phosphate buffer 100 mmol/L, pH 6.8; preservative.

### Precautions and warnings

For in vitro diagnostic use for health care professionals. Exercise the normal precautions required for handling all laboratory reagents.

Infectious or microbial waste:

Warning: handle waste as potentially biohazardous material. Dispose of waste according to accepted laboratory instructions and procedures.

Environmental hazards:

Apply all relevant local disposal regulations to determine the safe disposal.

Safety data sheet available for professional user on request.

This kit contains components classified as follows in accordance with the Regulation (EC) No. 1272/2008:



### Warning

- H317 May cause an allergic skin reaction.

### Prevention:

- P261 Avoid breathing mist or vapours.
- P272 Contaminated work clothing should not be allowed out of the workplace.
- P280 Wear protective gloves.

### Response:

- P333 + P313 If skin irritation or rash occurs: Get medical advice/attention.
- P362 + P364 Take off contaminated clothing and wash it before reuse.

### Disposal:

- P501 Dispose of contents/container to an approved waste disposal plant.

Product safety labeling follows EU GHS guidance.

Contact phone: all countries: +49-621-7590

Avoid foam formation in all reagents and sample types (specimens, calibrators and controls).

## Reagent handling

The reagents in the kit have been assembled into a ready-for-use unit that cannot be separated.

All information required for correct operation is read in from the respective reagent barcodes.

## Storage and stability

Store at 2-8 °C.

Do not freeze.

Store the Elecsys reagent kit **upright** in order to ensure complete availability of the microparticles during automatic mixing prior to use.

Stability:	
unopened at 2-8 °C	up to the stated expiration date
after opening at 2-8 °C	12 weeks
on the analyzers	8 weeks

## Specimen collection and preparation

Only the specimens listed below were tested and found acceptable.

Serum collected using standard sampling tubes or tubes containing separating gel.

Li-heparin, K<sub>2</sub>-EDTA and K<sub>3</sub>-EDTA plasma.

Plasma tubes containing separating gel can be used.

Criterion: Slope 0.9-1.1 + coefficient of correlation ≥ 0.95.

Stable for 5 days at 20-25 °C, 14 days at 2-8 °C, 12 months at -20 °C (± 5 °C). Freeze only once.

The sample types listed were tested with a selection of sample collection tubes that were commercially available at the time of testing, i.e. not all available tubes of all manufacturers were tested. Sample collection systems from various manufacturers may contain differing materials which could affect the test results in some cases. When processing samples in primary tubes (sample collection systems), follow the instructions of the tube manufacturer.

Centrifuge samples containing precipitates before performing the assay.

Do not use heat-inactivated samples.

Do not use samples and controls stabilized with azide.

Ensure the samples, calibrators and controls are at 20-25 °C prior to measurement.

Due to possible evaporation effects, samples, calibrators and controls on the analyzers should be analyzed/measured within 2 hours.

## Materials provided

See "Reagents – working solutions" section for reagents.

## Materials required (but not provided)

- REF 03000095122, DHEA-S CalSet, for 4 x 1.0 mL
- REF 11731416190, PreciControl Universal, for 4 x 3.0 mL
- General laboratory equipment

**cobas e** analyzer

Additional materials for the **cobas e** 411 analyzer:

- REF 11662988122, ProCell, 6 x 380 mL system buffer
- REF 11662970122, CleanCell, 6 x 380 mL measuring cell cleaning solution
- REF 11930346122, Elecsys SysWash, 1 x 500 mL washwater additive
- REF 11933159001, Adapter for SysClean
- REF 11706802001, AssayCup, 60 x 60 reaction cups
- REF 11706799001, AssayTip, 30 x 120 pipette tips
- REF 11800507001, Clean-Liner

Additional materials for **cobas e** 601 and **cobas e** 602 analyzers:

- REF 04880340190, ProCell M, 2 x 2 L system buffer
- REF 04880293190, CleanCell M, 2 x 2 L measuring cell cleaning solution
- REF 03023141001, PC/CC-Cups, 12 cups to prewarm ProCell M and CleanCell M before use

- REF 03005712190, ProbeWash M, 12 x 70 mL cleaning solution for run finalization and rinsing during reagent change
  - REF 03004899190, PreClean M, 5 x 600 mL detection cleaning solution
  - REF 12102137001, AssayTip/AssayCup, 48 magazines x 84 reaction cups or pipette tips, waste bags
  - REF 03023150001, WasteLiner, waste bags
  - REF 03027651001, SysClean Adapter M
- Additional materials for all analyzers:
- REF 11298500316, ISE Cleaning Solution/Elecsys SysClean, 5 x 100 mL system cleaning solution

## Assay

For optimum performance of the assay follow the directions given in this document for the analyzer concerned. Refer to the appropriate operator's manual for analyzer-specific assay instructions.

Resuspension of the microparticles takes place automatically prior to use. Read in the test-specific parameters via the reagent barcode. If in exceptional cases the barcode cannot be read, enter the 15-digit sequence of numbers.

**cobas e** 601 and **cobas e** 602 analyzers: PreClean M solution is necessary.

Bring the cooled reagents to approximately 20 °C and place on the reagent disk (20 °C) of the analyzer. Avoid foam formation. The system automatically regulates the temperature of the reagents and the opening/closing of the bottles.

## Calibration

**Traceability:** This method has been standardized against gravimetrically produced master calibrators consisting of exactly defined DHEA-S concentrations in depleted human serum matrix.

Every Elecsys reagent set has a barcoded label containing specific information for calibration of the particular reagent lot. The predefined master curve is adapted to the analyzer using the relevant CalSet.

**Calibration frequency:** Calibration must be performed once per reagent lot using fresh reagent (i.e. not more than 24 hours since the reagent kit was registered on the analyzer).

Calibration interval may be extended based on acceptable verification of calibration by the laboratory.

Renewed calibration is recommended as follows:

- after 1 month (28 days) when using the same reagent lot
- after 7 days (when using the same reagent kit on the analyzer)
- as required: e.g. quality control findings outside the defined limits

## Quality control

Use PreciControl Universal or other suitable controls for routine quality control procedures.

Controls for the various concentration ranges should be run individually at least once every 24 hours when the test is in use, once per reagent kit, and following each calibration.

The control intervals and limits should be adapted to each laboratory's individual requirements. Values obtained should fall within the defined limits. Each laboratory should establish corrective measures to be taken if values fall outside the defined limits.

If necessary, repeat the measurement of the samples concerned.

Follow the applicable government regulations and local guidelines for quality control.

## Calculation

The analyzer automatically calculates the analyte concentration of each sample (either in µmol/L, µg/dL or µg/mL).

$$\begin{aligned} \text{Conversion factors:} & & \mu\text{mol/L} \times 36.846 &= \mu\text{g/dL} \\ & & \mu\text{g/dL} \times 0.02714 &= \mu\text{mol/L} \\ & & \mu\text{g/dL} \times 0.01 &= \mu\text{g/mL} \end{aligned}$$

## Limitations - interference

### Endogenous substances

Compound	Concentration tested
Bilirubin	≤ 222 µmol/L or ≤ 13 mg/dL
Hemoglobin	≤ 0.35 mmol/L or ≤ 0.56 g/dL
Intralipid	≤ 2000 mg/dL
Biotin	≤ 123 nmol/L or ≤ 30 ng/mL
Rheumatoid factors	≤ 80 IU/mL

Criterion: For concentrations of 0.100-50 µg/dL the deviation is ≤ ± 5 µg/dL. For concentrations > 50 µg/dL the deviation is ≤ ± 10 %.

Samples should not be taken from patients receiving therapy with high biotin doses (i.e. > 5 mg/day) until at least 8 hours following the last biotin administration.

In vitro tests were performed on 17 commonly used pharmaceuticals. No interference with the assay was found.

In rare cases, interference due to extremely high titers of antibodies to analyte-specific antibodies, streptavidin or ruthenium can occur. These effects are minimized by suitable test design.

For diagnostic purposes, the results should always be assessed in conjunction with the patient's medical history, clinical examination and other findings.

## Limits and ranges

### Measuring range

0.003-27.1 µmol/L or 0.100-1000 µg/dL (defined by the lower detection limit and the maximum of the master curve). Values below the lower detection limit are reported as < 0.003 µmol/L or < 0.100 µg/dL. Values above the measuring range are reported as > 27.1 µmol/L or > 1000 µg/dL (or up to 135 µmol/L or 5000 µg/dL for 5-fold diluted samples).

### Lower limits of measurement

#### Lower detection limit of the test

Lower detection limit: 0.003 µmol/L (0.100 µg/dL)

The Lower Detection Limit represents the lowest measurable analyte level that can be distinguished from zero. It is calculated as the value lying two standard deviations above that of the lowest standard (master calibrator, standard 1 + 2 SD, repeatability study, n = 21).

### Dilution

Samples with DHEA-S concentrations above the measuring range can be diluted using human samples with a low analyte concentration. The recommended dilution is 1:5. The concentration of the diluted sample must be > 1.22 µmol/L (> 45 µg/dL).

If the endogenous DHEA-S concentration is negligible, multiply the result by the dilution factor or calculate using the following equation:

$$C = c + 4(c - D)$$

C = true DHEA-S concentration of the sample

c = measured DHEA-S concentration

D = DHEA-S concentration in the diluent (human sample)

### Expected values

Extended studies with the Elecsys DHEA-S assay conducted in two clinical centers in Germany covering a total of 519 samples from female individuals, a total of 489 samples from male individuals and a total of 269 samples from children gave the following values for the age groups listed below (study protocols No.: C00P032 and C01P005):

Age (years)	N	50 <sup>th</sup> percentile		5-95 <sup>th</sup> percentile	
		µmol/L	µg/dL	µmol/L	µg/dL
Females:					
10-14	73	3.34	123	0.92-7.60	33.9-280
15-19	55	4.26	157	1.77-9.99	65.1-368
20-24	36	6.46	238	4.02-11.0	148-407
25-34	64	4.96	183	2.68-9.23	98.8-340

Age (years)	N	50 <sup>th</sup> percentile		5-95 <sup>th</sup> percentile	
		µmol/L	µg/dL	µmol/L	µg/dL
35-44*	85	4.38	161	1.65-9.15	60.9-337
45-54*	89	3.28	121	0.96-6.95	35.4-256
55-64	59	2.08	76.7	0.51-5.56	18.9-205
65-74	29	1.75	64.4	0.26-6.68	9.40-246
≥ 75	29	1.65	60.9	0.33-4.18	12.0-154
Males:					
10-14	74	2.74	101	0.66-6.70	24.4-247
15-19	67	7.57	279	1.91-13.4	70.2-492
20-24	28	9.58	353	5.73-13.4	211-492
25-34	60	7.68	283	4.34-12.2	160-449
35-44	70	6.00	221	2.41-11.6	88.9-427
45-54	45	5.94	219	1.20-8.98	44.3-331
55-64	69	3.75	138	1.40-8.01	51.7-295
65-74	55	2.45	90.2	0.91-6.76	33.6-249
≥ 75	21	1.53	56.2	0.44-3.34	16.2-123
Children:					
< 1 week	37	7.60	280	2.93-16.5	108-607
1-4 weeks	25	3.91	144	0.86-11.7	31.6-431
1-12 months	69	0.59	21.6	0.09-3.35	3.4-124
1-4 years	59	0.14	5.0	0.01-0.53	0.47-19.4
5-9 years	79	0.63	23.1	0.08-2.31	2.8-85.2

\* Effects of the menopause on the results obtained for the women of the corresponding age groups were tested and found to be negligible.

DHEA-S values of newborns are strongly influenced by maternal hormonal exchange via placenta.

Each laboratory should investigate the transferability of the expected values to its own patient population and if necessary determine its own reference ranges.

### Specific performance data

Representative performance data on the analyzers are given below. Results obtained in individual laboratories may differ.

### Precision

Precision was determined using Elecsys reagents, pooled human sera and controls in a modified protocol (EP5-A) of the CLSI (Clinical and Laboratory Standards Institute): 6 times daily for 10 days (n = 60); repeatability on MODULAR ANALYTICS E170 analyzer, n = 21. The following results were obtained:

cobas e 411 analyzer								
Sample	Repeatability					Intermediate precision		
	Mean		SD		CV	SD		CV
	µmol/L	µg/dL	µmol/L	µg/dL	%	µmol/L	µg/dL	%
HS <sup>b)</sup> 1	3.18	117	0.09	3.28	2.8	0.11	4.16	3.6
HS 2	10.7	395	0.26	9.46	2.4	0.50	18.4	4.7
HS 3	26.7	984	0.46	17.0	1.7	0.63	23.3	2.4
PC U <sup>c)</sup> 1	4.15	153	0.09	3.33	2.2	0.11	3.99	2.6
PC U2	3.34	123	0.09	3.41	2.8	0.10	3.83	3.1

b) HS = human serum

c) PC U = PreciControl Universal

cobas e 601 and cobas e 602 analyzers					
Sample	Mean		Repeatability		CV
			SD		
	µmol/L	µg/dL	µmol/L	µg/dL	
HS 1	2.60	96.0	0.08	3.03	3.2
HS 2	10.9	402	0.29	10.5	2.6
HS 3	21.3	784	0.49	18.0	2.3
PC U1	5.81	214	0.10	3.60	1.7
PC U2	14.1	519	0.21	7.71	1.5

cobas e 601 and cobas e 602 analyzers					
Sample	Mean		Intermediate precision		CV
			SD		
	µmol/L	µg/dL	µmol/L	µg/dL	
HS 1	2.53	93.2	0.06	2.29	2.5
HS 2	10.7	395	0.29	10.6	2.7
HS 3	20.4	753	0.48	17.7	2.4
PC U1	5.69	210	0.14	4.99	2.4
PC U2	13.6	501	0.29	10.8	2.2

### Analytical specificity

For the Elecsys DHEA-S assay, the following cross-reactivities were found:

Substance	Cross-reactivity %	Additive concentration µg/dL
Androstenedione	10.8	1000
DHEA	8.90	1000
Androsterone	2.10	2000
Testosterone	2.55	2000
Aldosterone	0.320	5000
Androsterone-sulfate	1.10	5000
DHEA-glucuronide	2.08	5000
Estradiol	n. d. <sup>d)</sup>	5000
Estriol	n. d.	5000
Estrone	0.740	5000
Estrone-3-sulfate	0.500	5000
Progesterone	1.32	5000
5-α-Dihydrotestosterone	1.12	5000
19-Hydroxyandrostendione	1.66	5000
Cortisol	0.060	10000

d) n. d. = not detectable

### References

- Bertholf RLB, Cooper M, Winter WE. Adrenal Cortex. Rifai N, Chiu RWK, Young I, Burnham CAD, Wittwer CT, editors. Tietz Textbook of Laboratory Medicine, Saunders Elsevier, Philadelphia, 7th edition, 2023, ch. 56, p. 805-805.e37.
- Goodman NF, Bledsoe MB, Cobin RH, et al. American Association of Clinical Endocrinologists Hyperandrogenic Disorders Task Force. American Association of Clinical Endocrinologists medical guidelines for the clinical practice for the diagnosis and treatment of hyperandrogenic disorders. Endocr Pract. 2001 Mar-Apr;7(2):120-34.
- Teede HJ, Tay CT, Laven J, et al. International PCOS Network. Recommendations from the 2023 International Evidence-based Guideline for the Assessment and Management of Polycystic Ovary Syndrome†. Hum Reprod. 2023 Sep 5;38(9):1655-1679.

- Speiser PW, Arlt W, Auchus RJ, et al. Congenital Adrenal Hyperplasia Due to Steroid 21-Hydroxylase Deficiency: An Endocrine Society Clinical Practice Guideline. J Clin Endocrinol Metab. 2018 Nov 1;103(11):4043-4088.
- Fassnacht M, Dekkers OM, Else T, et al. European Society of Endocrinology Clinical Practice Guidelines on the management of adrenocortical carcinoma in adults, in collaboration with the European Network for the Study of Adrenal Tumors. Eur J Endocrinol. 2018 Oct 1;179(4):G1-G46.
- Goodarzi MO, Carmina E, Azziz R. DHEA, DHEAS and PCOS. J Steroid Biochem Mol Biol. 2015 Jan;145:213-25.
- Pugeat M, Déchaud H, Raverot V, et al. Recommendations for investigation of hyperandrogenism. Ann Endocrinol (Paris). 2010 Feb;71(1):2-7.
- Rosenfield RL. Normal and Premature Adrenarche. Endocr Rev. 2021 Nov 16;42(6):783-814.

For further information, please refer to the appropriate user guide or operator's manual for the analyzer concerned, the respective application sheets and the Method Sheets of all necessary components (if available in your country).

A point (period/stop) is always used in this Method Sheet as the decimal separator to mark the border between the integral and the fractional parts of a decimal numeral. Separators for thousands are not used.

Any serious incident that has occurred in relation to the device shall be reported to the manufacturer and the competent authority of the Member State in which the user and/or the patient is established.

### Symbols

Roche Diagnostics uses the following symbols and signs in addition to those listed in the ISO 15223-1 standard (for USA: see [navifyportal.roche.com](http://navifyportal.roche.com) for definition of symbols used):

	Contents of kit
	Analyzers/Instruments on which reagents can be used
	Reagent
	Calibrator
	Volume for reconstitution
	Global Trade Item Number

Rx only For USA: Caution: Federal law restricts this device to sale by or on the order of a physician.

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