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SALIVARY 17 α-HYDROXYPROGESTERONE ENZYME IMMUNOASSAY KIT

Catalog No. 1-2602/1-2612, 96-Well Kit

For Research Use

Intended Use

Salimetrics' salivary 17 α-hydroxyprogesterone (17OHP) kit is a competitive immunoassay specifically designed for the quantitative measurement of salivary 17OHP. It is not intended for use with serum/plasma. It is intended for research use with saliva. Please read the complete kit insert before performing this assay. For further information about this kit, or the application, or the procedures in this insert, contact the technical service team at Salimetrics or your local sales representative.

Introduction

17OHP (17-hydroxy-4-pregnene-3, 20-dione) is a steroid hormone produced in the adrenal gland and gonads. Immediate precursors are progesterone or 17-hydroxypregnenolone. In the adrenal gland, 17OHP can be converted to cortisol, and in the adrenal and ovaries it can be converted to androstenedione. Androstenedione is a precursor to testosterone and estradiol. Thus, the primary physiological role of 17OHP is as a precursor molecule. 17OHP levels show an ACTH-dependent diurnal rhythm with peak levels in the morning and a nadir at night. Levels of 17OHP remain low and constant in early development and progressively increase during puberty until they reach adult levels (1). Ovarian production of 17OHP increases several fold during the luteal phase of the menstrual cycle (2). Measurement of 17OHP is routinely used for the diagnostic assessment of 21-hydroylase deficiency (3,4). 21-hydroylase deficiency is causally linked to congenital adrenal hyperplasia (5) and infant screening programs are widespread (6,7). The deficiency is also associated with impaired aldosterone synthesis, and risk for potentially fatal salt-wasting. Levels of 17OHP are also used to monitor steroid replacement therapy.

To ensure the most accurate results, this salivary immunoassay is designed using a matrix that matches saliva. The level of 17OHP in saliva (pg/mL) is significantly lower than levels in the general circulation (ng/mL). The standard curve range is sensitive enough to capture individual differences in the 17OHP levels expected in saliva. The current protocol uses only 50 µL of saliva per test. No separation or extractions are necessary.

Test Principle

A microtitre plate is coated with rabbit antibodies to 17OHP. 17OHP in standards and unknowns competes with 17OHP linked to horseradish peroxidase for the antibody binding sites. After incubation, unbound components are washed away. Bound 17OHP peroxidase is measured by the reaction of the peroxidase enzyme on the substrate tetramethylbenzidine (TMB). This reaction produces a blue color. A yellow color is formed after stopping the reaction using 2-molar sulfuric acid. Optical density is read on a standard plate reader at 450 nm. The amount of 17OHP peroxidase detected is inversely proportional to the amount of 17OHP present (8).

pH Indicator

A pH indicator in the 17OHP diluent alerts the user to samples with high or low pH values. Acidic samples will turn the diluent yellow. Alkaline samples will turn the diluent purple. Dark yellow or purple wells indicate that a pH value for that sample should be obtained using pH strips. 17OHP values from samples with a pH $\leq$ 4.0 or $\geq$ 9.0 may be artificially inflated or lowered (9).

Precautions

1. Liquid stop solution is a 2-molar solution of sulfuric acid. This solution is caustic; use with care. Stop solution in powdered form is not sulfuric acid-based, and is mildly corrosive.
2. This kit uses break-apart microtitre strips. Unused wells must be stored at 2 - 8°C in the sealed foil pouch and used in the frame provided.
3. Do not mix components from different lots of kits.
4. When using a multichannel pipette, reagents should be added to duplicate wells at the same time. Follow the same sequence when adding additional reagents so that incubation time with reagents is the same for all wells.
5. See 'Material Safety Data' at the end of procedure.
6. We recommend that samples be screened for possible blood contamination (10,11), using a reliable screening tool such as the Salimetrics Blood Contamination EIA Kit (Cat. No.: 1-1302/1-1312). Do not use dipsticks, which result in false positive values due to salivary enzymes.
7. Routine calibration of pipettes is critical for the best possible assay performance.
8. Pipetting of samples and reagents must be done as quickly as possible (without interruption) across the plate.
9. When running multiple plates, or multiple sets of strips, a standard curve should be run with each individual plate and/or set of strips.
10. The temperature of the laboratory may affect assays. Salimetrics' kits have been validated at 68 - 74ºF (20 - 23.3ºC). Higher or lower temperatures will cause an increase or decrease in OD values, respectively. Salimetrics cannot guarantee test results outside of this temperature range.

Storage

All components of this kit are stable at 2 - 8°C until the kit's expiration date.

Reagents and Reagent Preparation

1. **Anti-17OHP Coated Plate:** A ready-to-use 96-well microtitre plate pre-coated with rabbit anti-17OHP antibodies in a resealable foil pouch.
2. **17OHP Standard:** 1.0 mL of 17OHP, in a saliva-like matrix with a non-mercury preservative, at a concentration of 500 pg/mL.
3. **17OHP Controls:** Two controls representing high and low levels of 17OHP in a saliva-like matrix with a non-mercury preservative. Each vial contains 0.5 mL. See vials for target ranges.
4. **Wash Buffer:** 100 mL of a 10X phosphate buffered solution containing detergents and a non-mercury preservative. Dilute only the amount needed for current day's use. Discard any leftover reagent. Dilute the wash buffer concentrate 10-fold with room temperature deionized water (100 mL of 10X wash buffer to 900 mL of deionized H_20). (**Note:** *If precipitate has formed in the concentrated wash buffer, it may be heated to 60°C for 15 minutes. Cool to room temperature before use in assay.)*
5. **17OHProgesterone Diluent:** 50 mL of a phosphate buffered solution containing a pH indicator and a non-mercury preservative.
6. **Enzyme Conjugate:** 40 µL of a solution of 17OHP labeled with horseradish peroxidase. Dilute prior to use with 17OHP diluent.
7. **Tetramethylbenzidine (TMB):** 25 mL of a non-toxic ready-to-use solution.
8. **Stop Solution:** 12.5 mL of a 2-molar solution of sulfuric acid (USA customers only). Stop solution is provided in powdered form (not sulfuric acid-based) to customers outside the USA. Reconstitute the powdered stop solution with 12.5 mL of deionized water. Let sit for 10 minutes before using.
9. **Non-specific Binding Wells:** These wells do not contain anti-17OHP antibody. In order to support multiple use, a strip of NSB wells is included. They are located in the foil pouch. Wells may be broken off and inserted where needed.

Note: *The quantity of reagent provided with break-apart kits is sufficient for three individual runs. The volume of diluent and conjugate used for assays using less than a full plate should be scaled down accordingly, keeping the same dilution ratio.*

Materials Needed But Not Supplied

- Precision pipette to deliver 18 µL, 50 µL, and 150 µL
- Precision multichannel pipette to deliver 50 µL, 150 µL, and 200 µL
- Vortex
- Plate rotator (assay sensitivity may be affected if a rotator is not used)
- Plate reader with a 450 nm filter
- Computer software for data reduction
- Deionized water
- Reagent reservoirs
- One 20 mL disposable tube
- Five small disposable tubes
- Pipette tips
- 25 mL serological pipette

Specimen Collection

Due to the episodic secretion pattern of steroid hormones, we can expect reproducible and reliable results only in cases of multiple sampling. Therefore, we recommend taking 5 samples within at least a 2-hour period and pooling the samples before testing (12).

The preferred saliva collection method is by unstimulated passive drool. **Do not use any cotton absorbent material, such as Salivettes, Sorbettes and cotton ropes or swabs to collect samples (13,14), as false high readings will result.** Do not use polyester versions of the Salivette device, or the Salisaver device. **Do not** add sodium azide to saliva samples as a preservative. Samples visibly contaminated with blood should be recollected. Freeze at -20^{0}C or lower for long-term storage. Contact the technical service team at Salimetrics for more detailed information on specimen collection.

Saliva samples should be frozen prior to assay to precipitate the mucins. On day of assay, thaw completely, vortex, and centrifuge at 1500 x g (@3000 rpm) for 15 minutes. It is important to avoid additional freeze-thaws cycles. Pipette clear sample into appropriate wells. Particulate matter may interfere with antibody binding, leading to falsely elevated results.

Procedure

Bring all reagents to room temperature.

Step 1: Determine your plate layout (see below).

	1	2	3	4	5	6	7	8	9	10	11	12
A	500 Std	500 Std	C-H	C-H								
B	200 Std	200 Std	C-L	C-L								
C	80 Std	80 Std	Unk-1	Unk-1								
D	32 Std	32 Std	Unk-2	Unk-2								
E	12.8 Std	12.8 Std	Unk-3	Unk-3								
F	5.1 Std	5.1 Std	Unk-4	Unk-4								
G	Zero	Zero	Unk-5	Unk-5								
H	NSB	NSB	Unk-6	Unk-6								

Step 2: Keep the desired number of strips in the strip holder and place the remaining strips back in the foil pouch. If you choose to place non-specific binding wells in H-1, 2, remove strips 1 and 2 from the strip holder and break off the bottom wells. Place the strips back into the strip holder leaving H-1, 2 blank. Break off 2 NSB wells from the strip of NSBs included in the foil pouch. Place in H-1, 2. Alternatively, NSBs may be placed wherever you choose on the plate. Reseal the pouch and refrigerate at 2 - 8°C.
Caution: Extra NSB wells should not be used for determination of standards, controls or unknowns.

Step 3:

- Label five microcentrifuge tubes or other small tubes 2 through 6.
- Pipette 150 µL of 17OHP diluent in tubes 2 through 6.
  Serially dilute the standard 2.5X by adding 100 µL of the 500 pg/mL standard (tube 1) to tube 2. Mix well. After changing pipette tips, remove 100 µL from tube 2 to tube 3. Mix well. Continue for tubes 4, 5, and 6. The final concentrations of standards for tubes 1 through 6 respectively are 500 pg/mL, 200 pg/mL, 80 pg/mL, 32 pg/mL, 12.8 pg/mL, and 5.1 pg/mL. Standard concentrations in pmol/L are 1513.04, 602.22, 242.09, 96.83, 38.73 and 15.43, respectively.
- Pipette 18 mL of 17OHP diluent into the disposable tube (scale down proportionally if not using the entire plate). Set aside for Step 5.

Step 4:

- Pipette 50 µL of standards, controls and unknowns into appropriate wells. Standards, controls and unknowns should be assayed in duplicate.
- Pipette 50 µL of 17OHP diluent into 2 wells to serve as the zero.
- Pipette 50 µL of 17OHP diluent into each NSB well.

Step 5: Dilute the enzyme conjugate 1:1000 by adding 18 µL of the conjugate to the 18 mL of 17OHP diluent prepared in Step 3. Immediately mix the diluted conjugate solution and add 150 µL to each well using a multichannel pipette. Cover plate with plate seal.

Step 6: Mix plate on a plate rotator for 5 minutes at 500 rpm and incubate at room temperature for an additional 115 minutes.

Step 7: Wash the plate 4 times with 1X wash buffer. A plate washer is recommended. However, washing may be done by gently squirting wash buffer into each well with a squirt bottle or by pipetting 300 µL of wash buffer into each well and then flipping the liquid into a sink. After each wash, the plate should be thoroughly blotted on paper towels before turning upright. If using a plate washer, blotting is still recommended after the final wash.

Step 8: Add 200 µL of TMB solution to each well with a multichannel pipette.

Step 9: Mix on a plate rotator for 5 minutes at 500 rpm and incubate the plate in the dark at room temperature for an additional 25 minutes.

Step 10: Add 50 µL of stop solution with a multichannel pipette.

Step 11: Mix on a plate rotator for 3 minutes at 500 rpm. Be sure all wells have turned yellow. If green color remains, continue mixing until green color turns to yellow. **Caution:** *Do not mix at speeds over 600 rpms.* Wipe off bottom of plate with a water-moistened lint-free cloth and wipe dry. Read in a plate reader at 450 nm. Read plate within 10 minutes of adding stop solution (correction at 620 is desirable).

Calculations

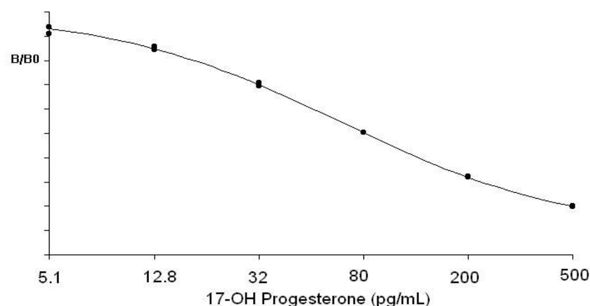
1. Compute the average optical density (OD) for all duplicate wells.
2. Subtract the average OD for the NSB wells from the average OD of the zero, standards, controls and unknowns (B).
3. Calculate the percent bound (B/Bo) for each standard, control and unknown by dividing the average OD (B) by the average OD for the zero (Bo).
4. Determine the concentrations of the controls and unknowns by interpolation using software capable of logistics. We recommend using a 4-parameter sigmoid minus curve fit.

Typical Results

The following results are shown for illustration only and should not be used to calculate results from another assay.

Well	Sample	Average OD	B	B/Bo	17OHP (pg/mL)
A1, A2	S1	0.136	0.126	0.231	500
B1, B2	S2	0.213	0.203	0.372	200
C1, C2	S3	0.307	0.297	0.512	80
D1, D2	S4	0.410	0.400	0.734	32
E1, E2	S5	0.476	0.466	0.855	12.8
F1, F2	S6	0.505	0.495	0.908	5.1
G1, G2	Bo	0.555	0.545	NA	NA
H1, H2	NSB	0.010	NA	NA	NA

Example: 17OHP 4-Parameter Sigmoid Minus Curve Fit



Material Safety Data*

Hazardous Ingredients

Liquid stop solution is a 2-molar solution of sulfuric acid. This solution is caustic; use with care. ***Note:*** *Stop solution in powdered form is not sulfuric acid-based and is mildly corrosive.*
We recommend the procedures listed below for all kit reagents.

Handling

Follow good laboratory procedures when handling kit reagents. Laboratory coats, gloves, and safety goggles are recommended. Wipe up spills using standard absorbent materials while wearing protective clothing. Follow local regulations for disposal.

Emergency Exposure Measures

In case of contact, immediately wash skin or flush eyes with water for 15 minutes. Remove contaminated clothing. If inhaled, remove individual to fresh air. If individual experiences difficulty breathing, give oxygen and call a physician.

*The above information is believed to be accurate but is not all-inclusive. This information should be used only as a guide. Salimetrics shall not be liable for accidents or damage resulting from contact with reagents.

Performance Characteristics

A. Recovery:

Saliva samples containing different levels of an endogenous 17OHP were spiked with known quantities of the protein and assayed.

Sample	Endogenous (pg/ml)	Added (pg/ml)	Expected (pg/ml)	Observed (pg/ml)	Recovery (%)
1	15.24	300	315.24	340.76	108.1
2	36.01	300	336.01	336.05	100.0
3	13.27	50	63.27	70.88	112.0
4	77.55	50	127.55	131.87	103.4
5	13.27	8	21.27	22.10	103.9
6	77.55	8	85.55	77.43	90.5

B. Precision:

The intra-assay precision was determined from the mean of 12 replicates each.

Sample	N	Mean (pg/ml)	Standard Deviation (pg/ml)	Coefficient of Variation (%)
H	12	361.41	12.05	3.3
L	12	14.58	0.93	6.4

The inter-assay precision was determined from the mean of average duplicates for 8 separate runs.

Sample	N	Mean (pg/ml)	Standard Deviation (pg/ml)	Coefficient of Variation (%)
H	8	247.55	20.94	8.5
L	8	14.87	1.9	12.8

C. Sensitivity:

The lower limit of sensitivity was determined by interpolating the mean minus 2 SD's for 10 sets of duplicates at 0 pg/ml standard. The minimal concentration of 17OHP that can be distinguished from 0 is 3.0 pg/ml.

D. Correlation with serum:

The correlation between saliva and total serum 17OHP was determined by assaying 24 matched samples (12 adult males and 12 females), $r(22) = 0.64$., $p < 0.001$

E. Linearity of Dilution:

Two saliva samples were diluted with 17OHP diluent and assayed.

Sample	Dilution Factor	Expected (pg/ml)	Observed (pg/ml)	Recovery (%)
1			340.20	
	1:2	170.10	185.17	108.9
	1:4	85.05	77.78	91.5
	1:8	42.53	38.54	90.6
	1:16	2126	19.48	91.6
2	1:2		340.76	
	1:4	170.38	171.83	100.9
	1:8	85.19	88.22	103.6
	1:16	42.60	45.70	107.3
		21.30	20.31	95.4

F. Specificity

The following compounds were tested at concentrations up to1,000 ng/mL for cross-reactivity:

Compound	Spiked Concentration (ng/mL)	% Cross-reactivity
Testosterone	1000	0.015
DHEA	1000	ND
DHEA-S	1000	ND
Progesterone	1000	0.425
Androstenedione	1000	ND
Estradiol	10	ND
Estrone	1000	ND
Estriol	1000	ND
Aldosterone	1000	ND
Cortisol	1000	ND
Cortisone	1000	ND
11-Deoxycortisol	1000	0.051
21-Deoxycortisol	1000	0.022
Dexamethasone	1000	ND
Triamincinolone	1000	ND
Corticosterone	1000	ND
Prednisolone	1000	0.632
Prednisone	1000	ND
Transferrin	1000	ND

ND = None detected (< 0.004)

G. Expected Ranges

Group	N	17OHP (pg/mL)	Std Dev (pg/mL)
Adult Males	20	50.68	29.23
Adult Females	20	39.54	23.93
Females early am, luteal	17	60.94	16.26
Females early am, follicular	17	49.45	18.68

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Seller's Limited Warranty

"Seller warrants that all goods sold hereunder will be free from defects in material and workmanship. Upon prompt notice by Buyer of any claimed defect, which notice must be sent within thirty (30) days from date such defect is first discovered and within three months from the date of shipment, Seller shall, at its option, either repair or replace the product that is proved to Seller's satisfaction to be defective. All claims should be submitted in written form. This warranty does not cover any damage due to accident, misuse, negligence, or abnormal use. Liability, in all cases, will be limited to the purchased cost of the kit.

It is expressly agreed that this limited warranty shall be in lieu of all warranties of fitness and in lieu of the warranty of merchantability. Seller shall not be liable for any incidental or consequential damages that arise out of the installation, use or operation of Seller's product or out of the breach of any express or implied warranties."