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ACTH ELISA Kit

Name	ACTH ELISA Kit
INTENDED USE	The ACTH ELISA Kit is intended for the quantitative determination of ACTH Adrenocorticotropic Hormone) in human plasma.
SUMMARY AND EXPLANATION	ACTH is a 39-amino acid peptide hormone (MW=4500) secreted by the pituitary to regulate the production of steroid hormones by the adrenal cortex. ACTH increases the synthesis and release of all adrenal sterioids, aldosterone, cortisol and adrenal androgens. It is the principal modulator of cortisol, the most important glucocorticoid in man. As the cortisol level in blood increases, release of ACTH is inhibited directly at the pituitary level. Through this same mechanism, decreasing cortisol levels lead to elevated ACTH levels. In healthy individuals, ACTH reaches a peak in the early morning (6:00 - 8:00 hour) and levels become lowest late in the day and near the beginning of the sleep period. Stress may also override the diurnal variation. Plasma ACTH assays are useful in the differential diagnosis of pituitary Cushing’s disease, Addison’s disease, autonomous ACTH producing pituitary tumors (e.g. Nelson’s syndrome), hypopituitarism with ACTH deficiency and ectopic ACTH syndrome. Primary adrenocortical insufficiencies, Addison’s disease. Hypopituitarism with ACTH deficiency, which is secondary adrenocortical insufficiency, is characterized by low plasma ACTH and cortisol concentrations, and a subnormal, but usually distinct adrenal response to stimulation with synthetic ACTH (Cortrosyn).
PRINCIPLE OF THE TEST	The ACTH Immunoassay is a two-site ELISA for the measurement of the biologically active 39 amino acid chain of ACTH. One antibody is prepared to bind only the

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C-terminal ACTH 34-39 and this antibody is biotinylated. The other antibody is prepared to bind only the mid-region and N-terminal ACTH 1-24 and this antibody is labeled with HRP for detection. In this assay, calibrators, controls, or patient samples are simultaneously incubated with the enzyme labeled antibody and a biotin coupled antibody in a streptavidin-coated microplate well. At the end of the assay incubation, the microwell is washed to remove unbound components and the enzyme bound to the solid phase is incubated with the TMB substrate. Stop solution is then added to stop the reaction and converts the color to yellow. The intensity of the yellow color is directly proportional to the concentration of ACTH in the sample. A dose response curve of absorbance unit vs. concentration is generated using results obtained from the calibrators. Concentrations of ACTH present in the controls and patient samples are determined directly from this curve.

MATERIALS PROVIDED	96 Tests
Microwells coated with Streptavidin	12x8x1
Biotinylated ACTH Antibody (Reagent 1)	2.7 ml
Peroxidase (Enzyme) labeled ACTH Antibody (1 Vial)	2.7 ml
Wash Concentrate (1 Vial)	30 ml
TMB Substrate (1 Vial)	15 ml
Stop Solution (1 Vial)	20 ml
Calibrators (5 Vials)	2 ml
Zero Calibrator (1 Vial)	4 ml
Controls 1 & 2 (CTRL) (2 Vials)	2 ml

MATERIALS NOT PROVIDED

Distilled or deionized water

Precision pipettes

Disposable pipette tips

ELISA reader capable of reading absorbance at 450 nm

	Absorbance paper or paper towel Graph paper
STORAGE AND STABILITY	1. Store the kit at 2 – 8 C. 2. Keep microwells sealed in a dry bag with desiccants. 3. The reagents are stable until expiration of the kit. 4. Do not expose test reagents to heat, sun or strong light.
WARNINGS AND PRECAUTIONS FOR USERS	Potential biohazardous materials: The calibrator and controls contain human source components, which have been tested and found non-reactive for hepatitis B surface antigen as well as HIV antibody with FDA licensed reagents. However, as there is no test method that can offer complete assurance that HIV, Hepatitis B virus or other infectious agents are absent, these reagents should be handled at the Biosafety Level 2, as recommended in the Centers for Disease Control/National Institutes of Health manual, "Biosafety in Microbiological and Biomedical Laboratories." 1984. Optimal results will be obtained by strict adherence to the test protocol. Precise pipetting as well as following the exact time and temperature requirements is essential. Do not pipette by mouth. Do not smoke, eat, or drink in the areas in which specimens or kit reagents are handled. The components in this kit are intended for use as an integral unit. The components of different lots should not be mixed. This product contains components preserved with sodium azide. Sodium azide may react with lead and copper plumbing to form explosive metal azide. On disposal, flush with a large volume of water.
REAGENT PREPARATION AND STORAGE	Store all kit components at 2-8°C except Wash Concentrate and Stop Solution All reagents except the non-zero calibrators, kit controls and the Wash Concentrate are ready-to-use. Store all reagents at 2-8°C, except the Wash Concentrate, which should be kept at room temperature until dilution to avoid precipitation.

For each of the non-zero calibrators (Calibrator B through F) and kit controls 1 and 2, reconstitute each vial with 2 ml of distilled or deionized water and mix. Allow the vial to stand for 10 minutes and then mix thoroughly by gentle inversion to insure complete reconstitution. Use the calibrators and controls as soon as possible upon reconstitution. Freeze (-20°C) the remaining calibrators and controls as soon as possible after use. Calibrators and controls are stable at -20°C for 6 weeks after reconstitution with up to 3 freeze thaw cycles when handled as recommended in “Procedural Notes” section
ELISA Reagent A: Wash Concentrate: Mix contents of wash concentrate thoroughly. If precipitate is present in the Wash Concentrate due to storage at lower temperature such as 4°C, dissolve by placing the vial in a 37°C water bath or oven with swirling or stirring. Add wash concentrate (30 ml) to 570 ml of distilled or deionized water and mix. The diluted working wash solution is stable for 90 days when stored at room temperature.

ASSAY PROCEDURE

Bring all specimens and kit reagents to room temperature (20-25C) and gently mix.

Place sufficient Streptavidin Coated Strips in a holder to run all six (6) ACTH calibrators, A - F of the ACTH CALIBRATORS (concentration is stated on the vial label), Quality Control Plasma and patient samples.

Pipet 200 µl of sample into the designated or mapped well. Freeze (-20°C) the remaining calibrators and controls as soon as possible after use.

Add or dispense 25 µl of Reagent 1 (Biotinylated Antibody) into each of the wells which already contain the sample.

Add or dispense 25 µl of Reagent 2 (Enzyme Labeled Antibody) into each of the same wells. Cover the microplate(s) with aluminum foil or a tray to avoid exposure to light, and place it on an orbital shaker or

rotator set at 170 + 10 rpm for 4 hours + 30 minutes at room temperature (20-25°C).
First aspirate the fluid completely and then wash/aspirate each well five (5) times with the Working Wash Solution (prepared from Reagent A), using an automatic microplate washer. The wash solution volume should be set to dispense 0.35 ml into each well.
Add or dispense 150 µL of the ELISA Reagent B (TMB Substrate) into each of the wells.
With appropriate cover to avoid light exposure, place the microplate(s) on an orbital shaker or rotator set at 170 + 10 rpm for 30 +5 minutes at room temperature (20-25°C).
Add or dispense 100 µl of the Stopping Solution into each of the wells. Mix gently.
Read the absorbance of the solution in the wells within 10 minutes, using a microplate reader set to 450 nm against 250 µl of distilled or deionized water. Read the plate again with the reader set to 405 nm against distilled or deionized water. Note: The second reading is designed to extend the analytical validity of the calibration curve to the value represented by the highest calibrator, which is approximately 500 pg/ml. Hence, patient samples with ACTH > 150 pg/ml can be quantified against a calibration curve consisting of the readings all the way up to the concentration equivalent to the highest calibrator using the 405 nm reading, away from the wavelength of maximum absorbance. In general, patient and control samples should be read using the 450 nm for ACTH concentrations up to 150 pg/ml. ACTH concentrations above 150 pg/ml should be interpolated using the 405 nm reading.
By using the final absorbance values obtained in the previous step, construct a calibration curve via cubic spline, 4 parameter logistics, or point-to-point interpolation to quantify the concentration of the ACTH.

CALCULATION OF RESULTS

For the 450 nm readings, construct a dose response curve (calibration curve) using the first five calibrators provided,

	i.e. Calibrators A, B, C, D and E. For the 405 nm readings, construct a second dose response curve using the three calibrators with the highest concentrations, i.e. Calibrators D, E and F. Assign the concentration for each calibrator stated on the vial in pg/ml. Plot the data from the calibration curve on linear graph paper with the concentration on the X-axis and the corresponding A.U. on the Yaxis. Draw a straight line between 2 adjacent points. This mathematical algorithm is commonly known as the "point-to-point" calculation. Obtain the concentration of the sample by locating the absorbance unit on the Y-axis and finding the corresponding concentration value on the X-axis. Patient and control samples should be read using the 450 nm for ACTH concentrations up to 150 pg/ml. ACTH concentrations above 150 pg/ml should be interpolated using the 405 nm reading.
QUALITY CONTROL	Control plasma or plasma pools should be analyzed with each run of calibrators and patient samples. Results generated from the analysis of the control samples should be evaluated for acceptability using appropriate statistical methods. In assays in which one or more of the quality control sample values lie outside the acceptable limits, the results for the patient sample may not be valid.
LIMITATIONS OF THE PROCEDURE	The ACTH ELISA kit has exhibited no “high dose hook effect” with samples spiked with 20,000 pg/ml of ACTH. Samples with ACTH levels greater than the highest calibrator, however, should be diluted and reassayed for correct values. Like any analyte used as a diagnostic adjunct, ACTH results must be interpreted carefully with the overall clinical presentations and other supportive diagnostic tests.
EXPECTED VALUES	ACTH levels were measured in eighty-three (83) apparently normal individuals. The values obtained ranged from 7.9 to 66.1 pg/ml. The geometric mean + 2 standard deviations of the mean were calculated to be 8.3 to 57.8

pg/ml. It's recommended that each lab establishes its own normal range.

PERFORMANCE CHARACTERISTICS

ACCURACY

One hundred seventeen (117) patient samples, with ACTH values ranging from 1.5 to 1045 pg/ml were assayed by the ELISA procedure and the IRMA (immunoradiometric assay) ACTH kit. Linear regression analysis gives the following statistics:

ELISA = 0.976 IRMA Kit + 4.2 pg/ml, r = 0.995 N = 117

SENSITIVITY

The sensitivity, or minimum detection limit, of this assay is defined as the smallest single value, which can be distinguished from zero at the 95% confidence limit. The ACTH ELISA has a calculated sensitivity of less than 1 pg/ml.

PRECISION AND REPRODUCIBILITY

The precision (intra-assay variation) of the ACTH ELISA Test was calculated from 20 replicate determinations on each of the two samples.

Intra-Assay Variation

Sample	Mean Value (pg/ml)	N	Coefficient of Variation %
A	35.7	20	3.1
B	255.0	20	4.2

The total precision (inter-assay variation) of the ACTH ELISA Test was calculated from data on two samples obtained in 35 different assays, by three technicians on three different lots of reagents, over a nine week period

Inter-Assay Variation

Sample	Mean Value (pg/ml)	N	Coefficient of Variation %
A	35.2	35	5.8
B	230.0	35	6.2

RECOVERY

Various amounts of ACTH were added to two different samples to determine the recovery. The results are

described in the following table:

Serum Sample	Endogenous ACTH (pg/ml)	ACTH Added (pg/ml)	Expected Value (pg/ml)	Measured Value (pg/ml)	Recovery (%)
A	21.8	-	-	-	-
A	19.6	50.0	69.6	67.6	97.1
A	17.4	100.0	117.4	125.0	106.4
B	9.8	-	-	-	-
B	8.8	50.0	58.8	51.6	87.7
B	7.8	100.0	107.8	96.4	89.4

LINEARITY OF PATIENT SAMPLE DILUTIONS:

PARALLELISM

Two samples were diluted with Calibrator A (Zero Calibrator). Results in pg/ml are shown below:

Sample	Dilution	Expected	Observed	% Observed Expected
A	Undiluted	-	236.0	-
A	1:2	118.0	110.0	93
A	1:4	59.0	54.9	93
A	1:8	29.5	26.3	89
B	Undiluted	-	>1000	-
B	1:2	-	423.0	-
B	1:4	212.0	217.0	103
B	1:8	106.0	109.0	103
B	1:16	52.9	49.2	93

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