

Read entire protocol before use.

hGH-Elisa

Bio-Line S.A. - Rue André Fauchille.17 - B-1150 Bruxelles - Belgium

I. INTENDED USE

Immunoenzymetric assay for the *in vitro* quantitative measurement of human Growth Hormone (hGH) in serum and plasma.

II. GENERAL INFORMATION

- A. Name: Bio-Line **HGH-Elisa** Kit
- B. Catalogue number: **BL-34-E**: 96 tests
- C. Manufactured by: Bio-Line S.A.
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III. CLINICAL BACKGROUND

A. Biological activities

hGH is a polypeptide hormone (molecular weight 21,500 Da) produced by the acidophil cells of the anterior pituitary under the control of two main substances from the median eminence : Growth-hormone Releasing Factor (GRF) and an inhibitory agent, somatostatin. Dopaminergic, adrenergic and serotonergic neuroendocrine pathways also play an important role in the control of hGH secretion. Excitatory stimuli of hGH secretion include hypoglycemia, exercise, fasting, meals with a high protein content, deep sleep, stress, glucagon, L Dopa, amino acids, etc. Inhibitory stimuli include glucose, cortisol, hGH and free fatty acids. Because of its short plasma half life (± 25 minutes) and of the frequent excitatory or inhibitory stimuli, hGH displays frequent and large variations of concentration in serum.

One of the main physiological functions of hGH is to act on the liver and other tissues to produce Somatomedins, which in turn induce growth by direct action on target tissues. In contrast to hGH, the concentration of somatomedin in serum is kept stable by virtue of being largely bound to circulating plasma proteins.

B. Clinical application

Growth retardation

hGH hyposecretion is one of the various causes of small stature in children. Serum hGH measurement with a highly sensitive assay, especially following a provocative stimulus (absence of response), is an important way to establish this diagnosis because this group of patients can be treated by administration of hGH.

Hypopituitarism

Serum hGH measurement is also an index of pituitary function when hypopituitarism (either idiopathic or due to tumour and surgery) is suspected.

Gigantism and acromegaly


Serum hGH measurement, especially following a provocative inhibitory test (absence of response), is an important way to establish the diagnosis of hGH hypersecretion due to acidophilic pituitary tumour. This results in gigantism in children and acromegaly in adults. Both of these disorders may be treated by surgery or radiation.

IV. PRINCIPLES OF THE METHOD

The Bio-Line HGH-ELISA is a solid phase Enzyme Amplified Sensitivity Immunoassay performed on a microtiterplate. Calibrators and samples react with the capture monoclonal antibody (MAb 1) coated on microtiter well and with a monoclonal antibody (MAb 2) labelled with horseradish peroxidase (HRP). After an incubation period allowing the formation of a sandwich: coated MAb 1 – hGH – MAb 2 – HRP, the microtiterplate is washed to remove unbound enzyme labelled antibody. Bound enzyme-labelled antibody is measured through a chromogenic reaction. The revelation solution (TMB – H₂O₂) is added and incubated. The reaction is stopped with the addition of Stop Solution and the microtiterplate is then read at the appropriate wavelength. The amount of substrate turnover is determined colourimetrically by measuring the absorbance, which is proportional to the hGH concentration.

A calibration curve is plotted and hGH concentration in samples is determined by interpolation from the calibration curve. The use of the ELISA reader (linearity up to 3 OD units) and a sophisticated data reduction method (polychromatic data reduction) result in a high sensitivity in the low range and in an extended calibration range.

V. REAGENTS PROVIDED

Reagents	96 tests Kit	Color Code	Reconstitution			
 Microtiterplate with 96 anti hGH (monoclonal antibodies) coated wells	96 wells	blue	Ready for use			
<table border="1" data-bbox="55 795 199 840"><tr><td>Ab</td><td>HRP</td></tr></table> Conjugate: HRP labelled anti-hGH (monoclonal antibodies) in TRIS-HCl buffer with bovine serum albumin and thymol	Ab	HRP	1 vial 6 ml	red	Ready for use	
Ab	HRP					
<table border="1" data-bbox="55 974 183 1019"><tr><td>CAL</td><td>0</td></tr></table> Zero calibrator in sheep serum and thymol	CAL	0	1 vial lyophilized	yellow	Add 2.0 ml distilled water	
CAL	0					
<table border="1" data-bbox="55 1086 183 1131"><tr><td>CAL</td><td>N</td></tr></table> Calibrator N = 1 to 5 (see exact values on vial labels) in sheep serum and thymol	CAL	N	5 vials lyophilized	yellow	Add 0.5 ml distilled water	
CAL	N					
<table border="1" data-bbox="55 1220 247 1265"><tr><td>WASH</td><td>SOLN</td><td>CONC</td></tr></table> Wash Solution (Tris-HCl)	WASH	SOLN	CONC	1 vial 10 ml	brown	Dilute 200 x with distilled water (use a magnetic stirrer).
WASH	SOLN	CONC				
<table border="1" data-bbox="55 1321 215 1366"><tr><td>CONTROL</td><td>N</td></tr></table> Controls - N = 1 or 2 in human serum with thymol	CONTROL	N	2 vials lyophilized	silver	Add 0.5 ml distilled water	
CONTROL	N					
<table border="1" data-bbox="55 1433 263 1478"><tr><td>CHROM</td><td>TMB</td><td>CONC</td></tr></table> Chromogen TMB (Tetramethylbenzidine) in Dimethylformamide	CHROM	TMB	CONC	1 vial 1 ml	green	Dilute 0.2 ml into 1 vial of substrate buffer
CHROM	TMB	CONC				
<table border="1" data-bbox="55 1579 199 1624"><tr><td>SUB</td><td>BUF</td></tr></table> Substrate buffer: H ₂ O ₂ in acetate / citrate buffer	SUB	BUF	3 vials 21 ml	white	Ready for use	
SUB	BUF					
<table border="1" data-bbox="55 1691 199 1736"><tr><td>STOP</td><td>SOLN</td></tr></table> Stop solution: H ₂ SO ₄ 1.8N	STOP	SOLN	1 vial 6 ml	black	Ready for use	
STOP	SOLN					

- Note:**
1. Use the zero calibrator for sample dilutions.
 2. 1 µIU of the calibrator preparation is equivalent to 1 µIU of the 2nd IS 98/574.

VI. SUPPLIES NOT PROVIDED

The following material is required but not provided in the kit:

1. High quality distilled water
2. Pipettes for delivery of: 50 µl, 200 µl, 500 µl and 2 ml (the use of accurate pipettes with disposable plastic tips is recommended)
3. Vortex mixer
4. Magnetic stirrer
5. Horizontal microtiterplate shaker capable of 700 rpm ± 100 rpm
6. Washer for microtiterplates

7. Microtiterplate reader capable of reading at 450 nm, 490 nm and 650 nm (in case of polychromatic reading) or capable of reading at 450 nm and 650 nm (monochromatic reading)
8. Optional equipment: The ELISA-AID™ necessary to read the plate according to polychromatic reading (see paragraph XIA.) can be purchased from Robert Maciels Associates, Inc. Mass. 0.2174 USA.

VII. REAGENT PREPARATION

- A. Calibrators** : Reconstitute the zero calibrator with 2.0 ml distilled water and the other calibrators with 0.5 ml distilled water.
- B. Controls** : Reconstitute the controls with 0.5 ml distilled water.
- C. Working Wash solution** : Prepare an adequate volume of Working Wash solution by adding 199 volumes of distilled water to 1 volume of Wash Solution (200x). Use a magnetic stirrer to homogenize. Discard unused Working Wash solution at the end of the day.
- D. Revelation Solution**: pipette 0.2 ml of the chromogen TMB into one of the vials of substrate buffer (H₂O₂ in acetate/citrate buffer). Extemporaneous preparation is recommended.

VIII. STORAGE AND EXPIRATION DATING OF REAGENTS

- Before opening or reconstitution, all kits components are stable until the expiry date, indicated on the vial label, if kept at 2 to 8°C.
- Unused strips must be stored, at 2-8°C, in a sealed bag containing a desiccant until expiration date.
- After reconstitution, calibrators and controls are stable for 1 week at 2 to 8°C. For longer storage periods, aliquots should be made and kept at -20°C. Avoid successive freeze thaw cycles.
- The concentrated Wash Solution is stable at room temperature until expiration date.
- Freshly prepared Working Wash solution should be used on the same day.
- After its first use, the conjugate is stable until expiry date, if kept in the original well-closed vial at 2 to 8°C.
- The freshly prepared revelation solution is stable, before use, for maximum 15 minutes at room temperature and must be discarded afterwards.
- Alterations in physical appearance of kit reagents may indicate instability or deterioration.

IX. SPECIMEN COLLECTION AND PREPARATION

- Serum and plasma must be kept at 2 - 8°C.
- If the test is not run within 24 hours, storage in aliquots at -20°C is recommended. Avoid subsequent freeze thaw cycles.
- Prior to use, all samples should be at room temperature. It is recommended to vortex the samples before use.
- Serum, heparinized plasma or EDTA plasma provide similar results.

$$Y(\text{serum}) = 0.89 \times (\text{EDTA plasma}) + 0.14 \mu\text{IU/ml} \quad r=0.98 \quad n=46$$

$$Y(\text{serum}) = 1.02 \times (\text{Heparin plasma}) + 0.01 \mu\text{IU/ml} \quad r=0.98 \quad n=46$$
- Do not use haemolysed samples.

X. PROCEDURE

A. Handling notes

- Do not use the kit or components beyond expiry date.
- Do not mix materials from different kit lots.
- Bring all the reagents to room temperature prior to use.
- Thoroughly mix all reagents and samples by gentle agitation or swirling.
- Perform calibrators, controls and samples in duplicate. Vertical alignment is recommended.
- Use a clean plastic container to prepare the Wash Solution.
- In order to avoid cross-contamination, use a clean disposable pipette tip for the addition of each reagent and sample.
- For the dispensing of the Revelation Solution and the Stop Solution avoid pipettes with metal parts.
- High precision pipettes or automated pipetting equipment will improve the precision.
- Respect the incubation times.
- To avoid drift, the time between pipetting of the first calibrator and the last sample must be limited to the time mentioned in section XIII paragraph E (Time delay).
- Prepare a calibration curve for each run, do not use data from previous runs.
- The chromogenic solution should be colourless. If a dark blue colour develops within a few minutes after preparation, this indicates that the preparation is unusable and must be discarded.
- Dispense the Revelation Solution within 15 minutes following the washing of the microtiterplate.
- During incubation with Revelation Solution, avoid direct sunlight on the microtiterplate.

B. Procedure

- Select the required number of strips for the run. The unused strips should be resealed in the bag with a desiccant and stored at 2-8°C.
- Secure the strips into the holding frame.
- Pipette 50 µl of each Calibrator, Control and Sample into the appropriate wells.
- Pipette 50 µl of anti-hGH-HRP conjugate into all the wells.
- Incubate for 1 hour at room temperature on a horizontal shaker set at 700 rpm ± 100 rpm.
- Aspirate the liquid from each well.
- Wash the plate 3 times by:
 - Dispensing 0.4 ml of Wash Solution into each well
 - Aspirating the content of each well
- Pipette 200 µl of the freshly prepared revelation solution into each well within 15 minutes following the washing step.
- Incubate the microtiterplate for 15 minutes at room temperature on a horizontal shaker set at 700 rpm ± 100 rpm, avoid direct sunlight.
- Pipette 50 µl of Stop Solution well.
- Read the absorbencies at 450 nm and 490 nm (reference filter 630 nm or 650 nm) within 1 hour and calculate the results as described in section XI.

XI. CALCULATION OF RESULTS

A. Polychromatic Reading:

- In this case, the ELISA-AID™ software will do the data processing.
- The plate is first read at 450 nm against a reference filter set at 650 nm (or 630 nm).
- A second reading is performed at 490 nm against the same reference filter.
- The ELISA-AID™ Software will drive the reader automatically and will integrate both readings into a polychromatic model. This technique can generate OD's up to 10.
- The principle of polychromatic data processing is as follows:
 - $X_i = OD$ at 450 nm
 - $Y_i = OD$ at 490 nm
 - Using a standard unweighted linear regression, the parameters A & B are calculated : $Y = A * X - B$
 - If $X_i < 3$ OD units, then X calculated = X_i
 - If $X_i > 3$ OD units, then X calculated = $(Y_i - B) / A$
 - A 4-parameter logistic curve fitting is used to build up the calibration curve.
 - The hGH concentration in samples is determined by interpolation on the calibration curve.

B. Bichromatic Reading

- Read the plate at 450 nm against a reference filter set at 650 nm (or 630 nm).
- Calculate the mean of duplicate determinations.
- On semi-logarithmic or linear graph paper plot the OD values (ordinate) for each calibrator against the corresponding concentration of hGH (abscissa) and draw a calibration curve through the calibrator points by connecting the plotted points with straight lines.
- Read the concentration for each control and sample by interpolation on the calibration curve.
- Computer assisted data reduction will simplify these calculations. If automatic result processing is used, a 4-parameter logistic function curve fitting is recommended.

XII. TYPICAL DATA

The following data are for illustration only and should never be used instead of the real time calibration curve.

hGH-ELISA		OD units Polychromatic model
Calibrator	0 µIU/ml	0.022
	0.64 µIU/ml	0.131
	3.6 µIU/ml	0.524
	10.4 µIU/ml	1.333
	35.5 µIU/ml	2.837
	74 µIU/ml	3.621

XIII. PERFORMANCE AND LIMITATIONS

A. Detection Limit

Twenty zero calibrators were assayed along with a set of other calibrators. The detection limit, defined as the apparent concentration two standard deviations above the average OD at zero binding, was 0.2 µIU/ml.

B. Specificity

Cross-reactive hormones were added to a low and to a high hGH value Control sample. The apparent hGH response was measured.

added Hormone	hGH C1 µIU/ml	hGH C2 µIU/ml
-	1.9	13.5
hCG 100000 mIU/ml	2.0	14.3
hPL 10000 ng/ml	1.4	13.0
PRL 12500 ng/ml	1.8	12.6

C. Precision

INTRA ASSAY				INTER ASSAY			
Serum	N	<X> ± SD (µIU/ml)	CV (%)	Serum	N	<X> ± SD (µIU/ml)	CV (%)
A	10	1.9 ± 0.1	3.7	A	20	6.4 ± 0.2	3.6
B	10	3.5 ± 0.4	9.8	B	20	21.2 ± 0.9	4.4
C	10	13.1 ± 0.3	2.2				

SD : Standard Deviation; CV: Coefficient of variation

D. Accuracy

RECOVERY TEST

Sample	Added hGH (µIU/ml)	Recovered hGH (µIU/ml)	Recovery (%)
Serum	4.3	4.1	95
	13.5	12.8	95
	26.8	28.1	105
	52.1	58.9	113
Plasma	4.3	4.6	106
	13.5	13.2	98
	26.8	25.3	94
	52.1	53.0	102

DILUTION TEST

Sample	Dilution	Theoretical Concent. (µIU/ml)	Measured Concent. (µIU/ml)
Serum 1	1/2	-	97.7
	1/4	48.8	57.0
	1/8	24.4	27.7
	1/16	12.2	13.6
	1/32	6.1	6.4
	1/64	3.1	3.0
Serum 2	1/2	-	12.8
	1/4	6.4	6.9
	1/8	3.2	3.3
	1/16	1.6	1.8
	1/32	0.8	0.8

Samples were diluted with zero calibrator.

E. Time delay between last calibrator and sample dispensing

As shown hereafter, assay results remain accurate even when a sample is dispensed 60 minutes after the calibrators have been added to the coated wells.

TIME DELAY						
	T0	10 min	20 min	30 min	45 min	60 min
S1	4.0	3.6	3.3	3.3	3.0	3.8
S2	13.5	15.0	13.8	13.0	12.6	13.0

F. Hook effect

A sample spiked with hGH up to 4000 µIU/ml gives higher OD's than the last calibrator point.

XIV. INTERNAL QUALITY CONTROL

- If the results obtained for Control 1 and/or Control 2 are not within the range specified on the vial label, the results cannot be used unless a satisfactory explanation for the discrepancy has been given.
- If desirable, each laboratory can make its own pools of control samples, which should be kept frozen in aliquots. Controls that contain azide will interfere with the enzymatic reaction and cannot be used.
- Acceptance criteria for the difference between the duplicate results of the samples should rely on Good Laboratory Practices
- It is recommended that Controls be routinely assayed as unknown samples to measure assay variability. The performance of the assay should be monitored with quality control charts of the controls.
- It is good practise to check visually the curve fit selected by the computer.

XV. REFERENCE INTERVALS

These values are given only for guidance; each laboratory should establish its own normal range of values.

In normal subjects, growth hormone (hGH) secretion is pulsatile. During day-time, hGH concentrations range from <0.2-10 µU/ml. During sleep, hGH concentrations increase consistently (± 30 µU/ml).

hGH secretion is greatly stimulated by exercise and stress (venous puncture, hypoglycemia, ...), but is decreased by hyperglycemia.

In normal subjects (n=34), two hours after oral glucose load (75 g in adults), hGH levels were lower than 10 µU/ml and the hGH response to stimulation tests (insulin, arginine, glucagon administration) exceeded 20 µU/ml.

hGH levels were elevated (even after glucose load) in acromegaly (> 10 µU/ml). In hGH deficiency, the response to stimulation test is absent or blunted (short stature by hGH deficiency; hypopituitarism from various origins).

XVI. PRECAUTIONS AND WARNINGS

Safety

For *in vitro* diagnostic use only.

The human blood components included in this kit have been tested by European approved and/or FDA approved methods and found negative for HBsAg, anti-HCV, anti-HIV-1 and 2. No known method can offer complete assurance that human blood derivatives will not transmit hepatitis, AIDS or other infections. Therefore, handling of reagents, serum or plasma specimens should be in accordance with local safety procedures.

All animal products and derivatives have been collected from healthy animals. Bovine components originate from countries where BSE has not been reported. Nevertheless, components containing animal substances should be treated as potentially infectious.

Avoid any skin contact with all reagents, Stop Solution contains H₂SO₄, the chromogen contains TMB in Dimethylformamide, Substrate buffer contains H₂O₂. In case of contact, wash thoroughly with water.

Do not smoke, drink, eat or apply cosmetics in the working area. Do not pipette by mouth. Use protective clothing and disposable gloves.

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XVIII. SUMMARY OF THE PROTOCOL

	CALIBRATORS (µl)	SAMPLE(S) CONTROLS (µl)
Calibrators (0-5) Controls, Samples Anti-hGH-HRP conjugate	50 - 50	- 50 50
Incubate for 1 hour at room temperature with continuous shaking at 700 rpm. Aspirate the contents of each well. Wash 3 times with 400 µl of Wash Solution and aspirate.		
Revelation Solution	200	200
Incubate for 15 min at room temperature with continuous shaking at 700 rpm.		
Stop Solution	50	50
Read on a microtiterplate reader and record the absorbance of each well at 450 nm (versus 630 or 650 nm) and 490 nm (versus 630 or 650 nm)		

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