

Read entire protocol before use.

# h-Osteocalcin-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 intact human Osteocalcin (OST) in serum and plasma.

## ***II. GENERAL INFORMATION***

- A. Name: Bio-Line Osteocalcin-Elisa Kit
  - B. Catalogue number: BL-43-E: 96 tests
  - C. Manufactured by: Bio-Line S.A.  
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- For technical assistance or ordering information contact:  
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## ***III. CLINICAL BACKGROUND***

### **A. Biological activities**

Osteocalcin or bone Gla protein (B.G.P) is the major non-collagen protein of the bone matrix. It has a molecular weight of 5800 Da and contains 49 amino-acids, including 3 residues of gamma carboxyl glutamic acid. Osteocalcin is synthesized in the bone by the osteoblasts. After production, it is partly incorporated in the bone matrix and the rest is found in the blood circulation. The exact physiological function of osteocalcin is still unclear. A large number of studies show that the circulating levels of osteocalcin reflect the rate of bone formation.

### **B. Clinical application**

The determination of the blood levels of osteocalcin is valuable for :


- . The identification of women at risk of developing osteoporosis
- . Monitoring bone metabolism during the perimenopause and postmenopause
- . Monitoring bone metabolism during hormone replacement therapy and treatment of premenopausal women with LH-RH agonists
- . Monitoring bone metabolism in patients with growth hormone deficiency, hypothyroidism, hyperthyroidism, chronic renal failure.

#### IV. PRINCIPLES OF THE METHOD

The Bio-Line hOST-ELISA is a solid phase Enzyme Amplified Sensitivity Immunoassay performed on microtiterplates. The assay uses monoclonal antibodies (MAbs) directed against distinct epitopes of human osteocalcin. 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 – human osteocalcin – MAB 2 – HRP, the microtiterplate is washed to remove unbound enzyme labelled antibody. Bound enzyme-labelled antibody is measured through a chromogenic reaction. Chromogenic solution (TMB ready for use) 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 osteocalcin concentration.

A calibration curve is plotted and OST 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 OST (monoclonal antibodies) coated wells	96 wells	blue	Ready for use			
<table border="1" data-bbox="71 929 215 996"><tr><td>Ab</td><td>HRP</td></tr></table> Conjugate: HRP labelled anti-OST (monoclonal antibodies) in TRIS-HCl buffer with bovine serum albumin, bovine casein, EDTA, gentamycin and thymol	Ab	HRP	1 vial 11 ml	red	Ready for use	
Ab	HRP					
<table border="1" data-bbox="71 1142 215 1198"><tr><td>CAL</td><td>0</td></tr></table> Zero calibrator in human serum with protease inhibitors and benzamidin	CAL	0	1 vial lyophilized	yellow	Add 1.0 ml distilled water	
CAL	0					
<table border="1" data-bbox="71 1288 215 1344"><tr><td>CAL</td><td>N</td></tr></table> Calibrator N = 1 to 5 (see exact values on vial labels) in human serum with protease inhibitors and benzamidin	CAL	N	5 vials lyophilized	yellow	Add 0.5 ml distilled water	
CAL	N					
<table border="1" data-bbox="71 1444 263 1500"><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="71 1545 231 1601"><tr><td>CONTROL</td><td>N</td></tr></table> Controls - N = 1 or 2 in human serum with protease inhibitors, benzamidin and thymol	CONTROL	N	2 vials lyophilized	silver	Add 0.5 ml distilled water	
CONTROL	N					
<table border="1" data-bbox="71 1680 215 1736"><tr><td>CHROM</td><td>TMB</td></tr></table> Chromogenic Solution TMB (Tetramethylbenzidine)	CHROM	TMB	1 vial 25 ml	white	Ready for use	
CHROM	TMB					
<table border="1" data-bbox="71 1803 215 1859"><tr><td>STOP</td><td>SOLN</td></tr></table> Stop Solution: HCl 2N	STOP	SOLN	1 vial 25 ml	white	Ready for use	
STOP	SOLN					

- Note:**
1. Use the zero calibrator for sample dilutions.
  2. The Bio-Line OST calibrator is calibrated on a synthetic peptide (Peninsula 6045).

#### 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: 25 µl, 100 µl, 200 µl, 500 µl and 1 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 XI.A.) can be purchased from Robert Maciels Associates, Inc. Mass. 0.2174 USA.

#### VII. REAGENT PREPARATION

- A. Calibrators :** Reconstitute the zero calibrator with 1.0 ml distilled water and 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.

#### 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 very unstable, use them immediately after reconstitution. For longer storage periods, aliquots should be made and kept at -20°C for maximally 6 weeks. Freezing should be performed immediately after use, do not wait for freezing until all the samples are pipetted. Avoid subsequent 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.
- Alterations in physical appearance of kit reagents may indicate instability or deterioration.

#### IX. SPECIMEN COLLECTION AND PREPARATION

- Serum or heparin and EDTA plasma provide similar results.
- Collect blood by venipuncture, taking care to avoid haemolysis, the samples must be kept in an ice bath. Separate the plasma or serum from the cells within 3 hours, the use of a refrigerated centrifuge is recommended. Add 100 µl Trasylol® (10000IU/ml) to the plasma or serum immediately after centrifugation (to obtain 1000 IU Trasylol® per ml sample). With this treatment the samples are stable for 3 days at 2-8°C. For a longer delay the samples have to be frozen (-20°C), however the samples can only be thawed once! For repeat testing freeze the samples in aliquots and discard each sample after the first thawing.
- Do not use citrate plasma, haemolysed samples or lipemic 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 Chromogenic 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 no longer than 30 minutes.

Prepare a calibration curve for each run, do not use data from previous runs.

Dispense the Chromogenic Solution within 15 minutes following the washing of the microtiterplate.

During incubation with Chromogenic 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 25 µl of each Calibrator, Control and Sample into the appropriate wells.
- Pipette 100 µl of anti-OST-HRP conjugate into all the wells.
- Incubate for 2 hours 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 100 µl of the chromogenic solution into each well within 15 minutes following the washing step.
- Incubate the microtiterplate for 30 minutes at room temperature on a horizontal shaker set at 700 rpm ± 100 rpm, avoid direct sunlight.
- Pipette 200 µl of Stopping Solution into each well.
- Read the absorbancies at 450 nm and 490 nm (reference filter 630 nm or 650 nm) within 3 hours 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 osteocalcin 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 OST (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.

If Trasylol® is added to the samples (100 µl/ml), sample values have to be multiplied by 1.1.

## XII. TYPICAL DATA

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

hOST-ELISA		OD units Polychromatic model
Calibrator	0.0 ng/ml	0.068
	1.9 ng/ml	0.117
	3.2 ng/ml	0.254
	8.5 ng/ml	0.774
	23 ng/ml	2.241
	49 ng/ml	4.313

## 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 0.4 ng/ml.

### B. Specificity

This method detects intact human osteocalcin. N-terminal and C-terminal fragments have been tested at their maximum levels found in normal and pathological samples, were added to a low and a high value calibrator. No cross reactivity was observed at these concentrations.

### C. Precision

INTRA ASSAY				INTER ASSAY			
Serum	N	<X> ± SD (ng/ml)	CV (%)	Serum	N	<X> ± SD (ng/ml)	CV (%)
A	10	11.6 ± 0.1	1.1	A	20	7.7 ± 0.3	4.0
B	10	19.6 ± 0.2	0.8	B	20	18.4 ± 1.2	6.6

SD : Standard Deviation; CV: Coefficient of variation

### D. Accuracy

#### RECOVERY TEST

Sample	Added OST (ng/ml)	Recovered OST (ng/ml)	Recovery (%)
Serum	1	1.1	110
	2.5	2.9	115
	7	7.5	106
	17.5	19.1	109
	45	45.5	101

#### DILUTION TEST

Sample	Dilution	Theoretical Concent. (ng/ml)	Measured Concent. (ng/ml)
1	1/1	-	22.7
	1/2	11.3	10.5
	1/4	5.7	5.5
	1/8	2.8	2.5
	1/16	1.4	1.2
	1/32	0.7	0.6
	1/64	0.4	0.3
2	1/1	-	23.4
	1/2	11.7	11.1
	1/4	5.8	5.3
	1/8	2.9	2.8
	1/16	1.5	1.1

Samples were diluted with zero calibrator.

#### E. Hook effect

A sample spiked with OST up to 10000 ng/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 which 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.

Normal values are expected between 5 to 25 ng/ml.

#### 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 HCl, the chromogen contains TMB and H<sub>2</sub>O<sub>2</sub>. 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.

#### XVII. BIBLIOGRAPHY

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#### XVIII. SUMMARY OF THE PROTOCOL

	CALIBRATORS (µl)	SAMPLE(S) CONTROLS (µl)
Calibrators (0-5) Samples, Controls Anti-OST-HRP conjugate	25 - 100	- 25 100
Incubate for 2 hours 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.		
Chromogenic Solution	100	100
Incubate for 30 min at room temperature with continuous shaking at 700 rpm.		
Stop Solution	200	200
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)		

Bio-Line Catalogue Nr : BL-43-E	Version : 040702-BL	Revision nr : 031212/1
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