



# COAMATIC® Heparin

For In Vitro Diagnostic Use

## COAMATIC® Heparin

Art. No. 82 33 93

# CHROMOGENIX



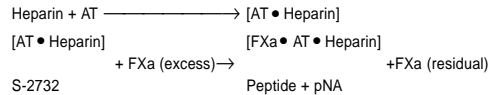
### INTENDED USE

For the quantitative determination of unfractionated heparin (UF Heparin) or low molecular weight heparin (LMW Heparin) in human citrated plasma using automated and microplate methods.

### BACKGROUND AND SUMMARY

Heparin is the most frequently used antithrombotic therapeutic. The biological activity of this sulfated glycosaminoglycan resides in its ability to accelerate (up to 2000-fold) the inhibitory effect of antithrombin (AT) on the coagulation proteases. The amount of LMW Heparin or UF Heparin is determined from the anti-FXa activity expressed by the [AT • Heparin] complex formed in plasma.<sup>1-3</sup>

### MEASURING PRINCIPLE



Factor Xa (FXa) is added to a mixture of undiluted plasma and the chromogenic substrate S-2732.

When Heparin and AT are complexed, two competing reactions occur simultaneously:

- Inhibition of FXa by the [AT • Heparin] complex.
- Reaction of FXa with S-2732 resulting in cleavage of pNA. The pNA release measured at 405 nm is inversely proportional to the heparin level in the sample.<sup>1</sup>

In order to reduce the influence from heparin antagonists, such as platelet factor 4 (PF4), dextran sulfate is included in the reaction mixture.<sup>4</sup>

### REAGENTS

- S-2732, 15 mg** 2 vials  
Chromogenic substrate, Suc-Ile-Glu( $\gamma$ -pip)-Gly-Arg-pNA • HCl lyophilized with detergent and mannitol as bulking agent.
- Factor Xa, 35 nkat** 2 vials  
Lyophilized bovine FXa containing Tris buffer, EDTA, NaCl, dextran sulfate and bovine serum albumin.

### Reagent preparation:

For the microplate method reconstitute REAGENTS 1 and 2 with 5.0 ml of water (see REAGENTS 3). Replace the stoppers and swirl gently. Make sure of the complete reconstitution of the product. Keep reagent at 15-25°C for 10-30 min and invert before use.

NOTE: Other reagent reconstitution volumes may apply for automated methods. (See section: INSTRUMENT APPLICATIONS). The reagents are not interchangeable between lots.

### Reagents required but not provided:

- Deionized water filtered through 0.22  $\mu\text{m}$  or NCCLS type II water.<sup>5</sup>
- Acetic acid 20% or citric acid 2% (end-point method).
- Saline (0.9% NaCl).
- Human normal plasma.
- Calibrator plasma for LMW Heparin and/or UF Heparin calibrated against International Standards.
- Controls for LMW Heparin and/or UF Heparin activity.

NOTE: Antithrombin reagent and tris buffer is required for the ACL Hundred/Thousand Series method (the assay is run as a two stage method with the addition of antithrombin). See the instrument Application Sheet for specific information.

### Materials required but not provided:

- Spectrophotometer 405 nm (and 490 nm for the microplate procedure)
- Incubator 37°C
- Microplates\*
- Centrifuge, 2000 x g
- Plastic test tubes
- Stopwatch
- Vortex mixer
- Calibrated pipettes
- Linear graph paper

\*NOTE: Do not use microplates intended for coating

### STORAGE CONDITIONS AND STABILITY

The sealed reagents are stable at 2-8°C until the expiry date printed on the label.

- S-2732  
Stability after reconstitution: 3 months at +2-8°C in the original vial.
- Factor Xa  
Stability after reconstitution: 3 months at +2-8°C in the original vial.

WARNING: Do not use reagents beyond the expiry date printed on the package label. Substrate - Avoid exposure to light. Discard the substrate solution if it appears yellow.

Avoid contamination by microorganisms.

### SPECIMEN COLLECTION

Nine parts of freshly drawn venous blood is collected into one part trisodium citrate. Centrifugation: 2000 x g for 20 minutes at 20-25°C. Refer to NCCLS document H21-A2 for further instructions on specimen collection, handling and storage.<sup>6</sup>

### QUALITY CONTROLS

Two levels of heparin controls are recommended for a complete quality control program.<sup>7</sup> Each laboratory should establish its own mean and standard deviation and should establish a quality program to monitor laboratory testing. Controls should be analyzed at least once every 8 hour shift in accordance with good laboratory practice. Refer in Westgard et al for identification and resolution for out-of-control situations.<sup>8</sup>

### RESULTS

Heparin results are reported in activity (IU/ml).

### RECOMMENDED MEASURING RANGE

For the microplate method the relationship between the heparin concentration and the pNA release, measured as absorbance at 405 nm, follows a second order polynomial function in the range of 0-1.5 IU/ml.

### CALIBRATION

For the calibration of LMW Heparin or UF Heparin use a source of material which has been calibrated against an International Standard preparation.

For example: To prepare standards for 10 runs.

- Dilute heparin with saline (0.9% NaCl) to obtain a working solution with a value of 100 IU/ml.
- Add 160  $\mu\text{l}$  of the heparin working solution to 20.0 ml of normal plasma to obtain the heparin concentration of 0.8 IU/ml. Dilute according to the table below.

Standard IU/ml	Plasma with heparin 0.8 IU/ml ml	Normal plasma ml
0	-	4.0
0.2	1.0	3.0
0.4	2.0	2.0
0.6	3.0	1.0
0.8	4.0	-

These standards can be kept in aliquots at -20°C for 12 months.

### PROCEDURE

#### Microplate Method:

#### Dilutions of samples and controls.

Samples/controls/standards	100 $\mu\text{l}$
Water (see REAGENTS 3)	300 $\mu\text{l}$
Mix well	
Add diluted samples/controls/standards to the microplate wells	50 $\mu\text{l}$
Incubate at 37°C for 2-6 min	
Add S-2732 (pre-heated at 37°C)	50 $\mu\text{l}$
Mix and add within 2 min Factor Xa (pre-heated at 37°C)	50 $\mu\text{l}$
Mix and incubate at +37°C for 120 sec.	
Stop reaction with acetic acid 20% or citric acid 2%	50 $\mu\text{l}$

Read the absorbance against water (see REAGENT 3) at 405 nm. If possible, read and subtract the absorbance at 490 nm in order to compensate for differences in the material of the microplate wells.

#### Determinations/kit.

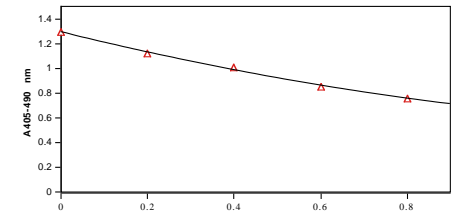
Microplate: 200

### CALCULATION

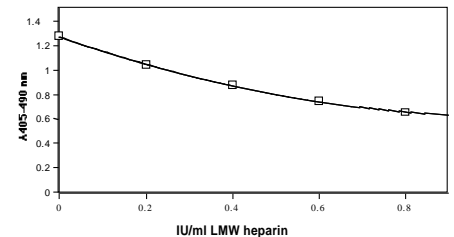
#### Microplate Method:

Plot the absorbance (A) for the standards against the concentration of heparin using an appropriate software program or on linear graph paper. Plot A on the Y-axis and IU/ml heparin on the X-axis. Connect the standard points with the best fitting second order polynomial line. Samples and controls are evaluated based on this standard curve. Examples of typical standard curves (microplate method) are shown below:

Standard curve Unfractionated heparin.



Standard curve LMW heparin.



### INSTRUMENT APPLICATIONS

Detailed instrument settings including instructions for preparation of the reagents for a variety of automated instrument are available on request from Chromogenix or your local Chromogenix Representative.

## PERFORMANCE CHARACTERISTICS

### PRECISION:

**Microplate method.** The data summarized below was obtained with the microplate method using unfractionated heparin (UFH) and low molecular weight heparin (LMWH).

Mean concentration	Within run C.V. (%)	Between run C.V. (%)	Total C.V. (%)
0.7 IU/ml UFH	2.8	1.2	2.8
0.4 IU/ml UFH	3.4	1.5	3.7
0.7 IU/ml LMWH	3.6	2.8	4.4
0.4 IU/ml LMWH	2.4	2.3	3.2

Examples of instrument-specific precision results obtained by or for Chromogenix are included in the instrument application sheets. Each laboratory should establish their own precision data.

### CORRELATION:

1. The COAMATIC® Heparin assay shows good correlation with COATEST® Heparin and COATEST® LMW Heparin/Heparin performed on the Cobas Mira instrument:

COAMATIC® Heparin versus COATEST® Heparin (n = 112)  
IU/ml Heparin = +0.005 + 1.00 x Heparin, r = 0.97

COAMATIC® Heparin versus COATEST® LMW Heparin/Heparin (n = 90)  
IU/ml Heparin = +0.002 + 1.04 x Heparin, r = 0.96

2. The COAMATIC® Heparin (performed on various Instruments) versus IL Test™ Heparin performed on the ACL 300 Instrument

#### Microplate

	(n = 70)	IU/ml Heparin = +0.017 + 1.00x Heparin,	r = 0.97
<b>Instruments</b>			
Cobas Mira	(n = 87)	IU/ml Heparin = -0.012 + 1.04x Heparin,	r = 0.98
ACL 300†	(n = 62)	IU/ml Heparin = +0.004 + 1.03x Heparin,	r = 0.98
Futura	(n = 113)	IU/ml Heparin = +0.009 + 0.97x Heparin,	r = 0.97
MLA Electra 1600	(n = 80)	IU/ml Heparin = +0.004 + 1.01x Heparin,	r = 0.97
Thrombolyzer*	(n = 76)	IU/ml Heparin = +0.008 + 0.92x Heparin	r = 0.97
BCS*	(n = 30)	IU/ml Heparin = +0.008 + 0.93x Heparin,	r = 0.99
STA*	(n = 29)	IU/ml Heparin = +0.017 + 0.96x Heparin,	r = 0.99
Sysmex 6000	(n = 30)	IU/ml Heparin = +0.061 + 0.91x Heparin,	r = 0.99
AMAX	(n = 30)	IU/ml Heparin = +0.028 + 0.97x Heparin,	r = 0.99
AMGA*	(n = 30)	IU/ml Heparin = -0.061 + 1.02x Heparin,	r = 0.99
Hitachi 911	(n = 30)	IU/ml Heparin = +0.014 + 0.98x Heparin,	r = 0.99
Hitachi 917	(n = 30)	IU/ml Heparin = +0.021 + 1.00x Heparin,	r = 0.98

\*NOTE: Instrument not available in all countries.

†NOTE: In the case of the ACL Hundred/Thousand Series, the assay is run as a two-stage method with the addition of antithrombin reagent. See the Instrument Application Sheet for specific information.

### LIMITATIONS/INTERFERING SUBSTANCES

Heparin results are not affected by hemoglobin up to 200 mg/dl, triglycerides up to 600 mg/dl and bilirubin up to 12 mg/dl.

The presence of dextran sulfate reduces the influence from heparin antagonists, e.g. platelet factor 4 (PF4).<sup>4</sup>

### EXPECTED VALUES

To obtain an optimal effect with minimum risk of bleeding or thromboembolic complications the heparin should be in the range recommended by the manufacturer.<sup>9</sup>



## REFERENCES

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1. Teien A N et al. Assay of heparin in plasma using a chromogenic substrate. *Thromb Res* 8, 413-416 (1976).
2. Holmer E et al. The molecular-weight dependence of the rate-enhancing effect of heparin on the inhibition of thrombin, factor Xa, factor IXa and kallikrein by antithrombin, *Biochem J* 193, 395-400 (1981)
3. Holmer E et al. A new simple chromogenic assay for Heparin and Heparin-like anti-FXa activity in plasma. *Thromb Haemost* 54, 29 (1985).
4. Lyons S G et al. Modification of an amidolytic heparin assay to express protein-bound heparin and to correct for the effect of antithrombin III concentration. *Thromb Haemost* 58, 884-887 (1987).
5. National Committee for Clinical Laboratory Standards, Specifications for reagent water used in the Clinical laboratory, NCCLS Approved Standard: ASC:3.
6. National Committee for Clinical Laboratory Standards, H21A2; Collection, transport, and processing of blood specimens for coagulation testing and performance of coagulation assays-second edition, NCCLS Document H21-A2.
7. Zucker S, Cathey M H, West B. Preparation of Quality Control Specimens for Coagulation. *Am J Clin Pathol* 53, 924-927 (1970).
8. Westgard J O, Barry P L. Cost-effective quality control: Managing the quality and productivity of analytical process. AACC press (1988).
9. Holm H A et al. Heparin assays and bleeding complications in deep venous thrombosis with particular reference to retroperitoneal bleeding, *Thromb Haemost* 53, 278-281 (1985).

# ***CHROMOGENIX***

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