



Epinephrine
REF AG002K

R 3 vials x 0.5 µmol



155 rue d'Eragny, 95000 Neuville-sur-Oise, France

Tél : +33 (0)1 34 40 65 10

Fax : +33 (0)1 34 48 72 36

www.hyphen-biomed.com

info@hyphen-biomed.com

English, revision: 03-2024

INTENDED USE:

Platelet agonist for light transmission aggregometry (LTA) method for the *in vitro* quantitative determination of platelet aggregation, in human citrated plasma, using an automated or semi-automated method. This method is used in aid to diagnosis of platelet function disorders or to assess responsiveness to antiplatelet drugs in patients suspected of having platelets functional disorders or on antiplatelet therapy. This device of *in vitro* diagnostic use is intended for professional use in the laboratory.

SUMMARY AND EXPLANATION:

Technical¹⁻³

Platelet function is assessed by light transmission aggregometry (LTA). LTA measures the transmission of light through a sample of platelet-rich plasma (PRP) in response to a panel of platelet agonists. Light transmittance through PRP is measured relative to a reference cuvette containing platelet poor plasma (PPP). Light transmission is set at 100% in the PPP and 0% in the PRP. When a platelet agonist is added to the stirred PRP, platelets then start to aggregate, and the light transmission of PRP increases.

Clinical³⁻⁸

The platelets ability or inability to respond to particular agonist is the basis for differentiating platelet dysfunctions, congenital (e.g.: Glanzmann thrombasthenia, Bernard-Soulier syndrome, gray platelet syndrome, etc.) or acquired (e.g.: medications, procedures, medical conditions, hematologic disease). When required, to assess response to antiplatelet therapy such as Acetylsalicylic acid (ASA, aspirin), P₂Y₁₂ receptor inhibitors, Glycoprotein IIb/IIIa inhibitors.

PRINCIPLE:

When epinephrine is added to the platelet rich plasma (PRP) from a healthy subject, platelets are activated via α₂-adrenergic receptors on the surface of platelets. The primary wave of aggregation of epinephrine is reversible^{5,6}. The secondary wave shows the further platelet aggregation that occurs after platelet granules are released.

REAGENTS:

R **Epinephrine** at approximately 0.5 µmol, lyophilized. Contains Epinephrine hydrogen tartrate and stabilizers.

Danger! H300 : Fatal if swallowed.

WARNINGS AND PRECAUTIONS:

- Waste should be disposed of in accordance with applicable local regulations.
- Any serious incident that has occurred in relation to the device shall be reported to the manufacturer and the competent authority of the Member State in which the user and/or the patient is established.
- Summary of Safety and Performance (SSP) is available in the European database on medical devices (see Eudamed public website: <https://ec.europa.eu/tools/eudamed> or on request to HYPHEN BioMed).
- Please consult Safety Data Sheet (SDS), available on www.hyphen-biomed.com.
- P264 : Wash thoroughly after handling.
- P301 + P310 : IF SWALLOWED: Immediately call a POISON CENTER/ doctor.
- P330 : Rinse mouth.
- To ensure optimal test results, testing the specimens and controls in succession and without interruption is recommended.

REAGENT PREPARATION:

Gently remove the freeze-drying stopper, to avoid any product loss when opening the vial.

R For aggregometer:

Reconstitute the contents of each vial with **exactly 0.5 mL distilled water** (1 mM). Shake vigorously until complete dissolution. Allow the reagent to stabilize for 30 min. at room temperature (18-25°C), shaking occasionally.

Dilute the reconstituted Epinephrine as follows (example for 1 mL):

For final concentration in the test (µM)	10	5
Prepare following 10X solutions:		
"10X" Epinephrine preparation (µM)	100	50
Epinephrine 1 mM (µL)	100	50
Physiological Saline (µL)	900	950

R For analyzer:

Reconstitute the contents of each vial with **exactly 0.625 mL of distilled water** (800 µM).

Shake vigorously until complete dissolution. Allow the reagent to stabilize for 30 min. at room temperature (18-25°C), shaking occasionally.

Dilute the reconstituted Epinephrine as follows (example for 1 mL):

For final concentration in the test (µM)	10	5
Prepare following 8X solutions:		
"8X" Epinephrine preparation (µM)	80	40
Epinephrine 800 µM (µL)	100	50
Physiological Saline (µL)	900	950

Homogenize the reagent prior to each use.

STORAGE AND STABILITY:

Unopened reagents should be stored at 2-8°C in their original packaging. Under these conditions, they can be used until the expiry date printed on the kit.

R Reagent stability after reconstitution, free from any contamination or evaporation, and stored closed, is of:

- 7 days at 2-8°C.
- 24 hours at room temperature (18-25°C).
- 2 months frozen at -20°C or less*
- Stability on board of the analyzer: see the specific Application Guide.

*Thaw only once at room temperature (18-25°C) and use immediately.

REAGENTS AND MATERIALS REQUIRED BUT NOT PROVIDED:

- Laboratory material.
- Physiological Saline (0.9% NaCl).
- SB Cuvette (064-1041-9) and SB Set tool (063-4151-5) for CS- and CN-series.
- Automatic analyzer such as: CS-series, CN-series.
- Light transmission Aggregometer.

Please note that the applications on other analyzers can be validated by the instrument manufacturer in accordance with the requirements of the REGULATION (EU) 2017/746 under their responsibility as long as the intended purpose is not modified.

SPECIMEN COLLECTION AND PREPARATION:

Collection, preparation and storage of fresh samples (Platelet-rich Plasma (PRP) and Platelet-poor Plasma (PPP)) should be made according to laboratory or other validated methods.^{3,10}

The blood (9 volumes) should be carefully collected onto the trisodium citrate anticoagulant (1 volume) (0.109 M, 3.2%) by clean venipuncture.

CLSI H58-A and studies^{3,10}: studies should be completed on fresh sample within a maximum of 4 h after blood collection.

PROCEDURE:

Platelet agonist should be used at 5 µM. If the platelet aggregation is abnormal, higher concentrations of Epinephrine should be tested (e.g. 10 µM)^{1,3}.

HYPHEN BioMed provides Application Guides for defined coagulation analyzer families. The Application Guides contain analyzer/assay specific handling and performance information and complement the information in these Instructions for Use.

Protocol on Aggregometer:

- Place a stirrer in each cuvette.
- Establish the 100% aggregation point with a cuvette containing 360 µL PPP.
- Pipette 360 µL PRP into a second cuvette. Incubate for 2 minutes at 37 °C. Establish the 0% aggregation point with the PRP.
- Add 40 µL of epinephrine (10X) solution directly into the PRP using a long and fine pipette tip. Do not inject against the walls of the cuvette.
- Allow the aggregation profile to develop for 5 to 10 minutes.

If a reaction volume other than that specified above is required for the method used, the ratio of volumes must be strictly observed to guarantee assay performance.

QUALITY CONTROL:

Commercial controls are not available.

The control may consist of fresh sample collected from a normal donor who has not taken any antiplatelet medication and with a history of normal platelet function.

Include control samples preferably for each test series, and at least for each new reagent batch, or after instrument maintenance.

RESULTS:

- Results are evaluated by examining the aggregation curve and the maximal aggregation (%). These parameters vary depending on instrument type, and specific normal values should be determined by each laboratory.
- Results should be interpreted on the basis of a patient's clinical condition, platelet count, potential medication influences, lifestyle, nutrition, and pre-analytical conditions^{11,12}
- Abnormal curves should be confirmed via a retest.
- Lot to lot variability measured on 3 lots is %CV ≤ 10% (normal sample).

LIMITATIONS:

- To ensure optimum test performance and to meet the specifications, the technical instructions validated by HYPHEN BioMed should be followed carefully.
- Any reagent presenting no limp appearance or showing signs of contamination must be rejected.
- Any suspicious samples or those showing signs of activation must be rejected.
- User defined modifications are not supported by HYPHEN BioMed as they may affect performance of the system and assay results. It is the responsibility of the user to validate modifications to these instructions or use of the reagents on analyzers other than those included in HYPHEN BioMed Application Guides or these Instructions for Use.
- If the number of platelets is lower than $150 \times 10^9/L$ or higher than $600 \times 10^9/L$, test results may be affected. The platelet count of PRP samples should not be adjusted to a standardized value with autologous PPP³.

EXPECTED VALUES:

The reference interval established, in internal study, on healthy adult subjects with 5 µM Epinephrine on aggregometer (n=51), on CS-series (n=50) and on CN-series (n=66), was measured between 70 and 103%, between 69 and 96% and between 53 and 96% respectively (Central 90%, 95th percentile)¹³. However, each laboratory has to determine its own normal and abnormal ranges for the affected populations^{3,10,14}

PERFORMANCES:

Performances studies were conducted as described in CLSI guidelines. The following performance data represent typical results and are not to be regarded as specifications for Epinephrine. Mathematical analyses are performed using a validated statistical software built in accordance with CLSI guidelines. For automated assays, performances are documented in the respective Application Guides of the analyzers.

On aggregometer:

Analytical performances

Precision

Precision studies were assessed using abnormal and normal samples, on 1 series and 10 repetitions.

Sample	Repeatability	
	% Max Aggregation	CV%
Normal	89%	6.4%
Abnormal	35%	23.6%

Interfering substances

No interference was observed with the molecules and up to following concentrations:

Bilirubin C	Bilirubin F	Intralipids	Hemoglobin
30 mg/dL	30 mg/dL	360 mg/dL	250 mg/dL

Clinical performances

Agreement		
Agonist	Reference method	Agreement (n = 116)
Epinephrine (5µM)	Helena reagent	97%

Sensitivity/Specificity					
Agonist	n	Sensitivity	Specificity	Area under the curve ROC	
Epinephrine	116	95%	100%	0.991	
Agonist	n	PPV	NPV	LR+	LR-
Epinephrine	116	100%	95%	+ ∞	0.055

PPV: Predictive value of a positive result
NPV: Predictive value of a negative result
LR+ : Likelihood Ratio +
LR- : Likelihood Ratio -

On CS-series / CN-series:

Analytical performances

Precision

Precision studies were assessed using abnormal and normal samples, on 1 series and 30 repetitions.

CS-series			Repeatability	
Sample	% Max Aggregation	CV%		
Normal	91%	5.4%		
Abnormal	45%	14.4%		
CN-series			Repeatability	
Sample	% Max Aggregation	CV%		
Normal	90%	3.0%		
Abnormal	42%	10.6%		

Interfering substances

Interferences are defined by the analyzer system used and are documented in the respective Application Guides of the analyzers.

Clinical performances

Agreement		
Agonist	Reference method (aggregometer)	Agreement (n = 114) (CS-series)
Epinephrine	Helena reagent	90%

Sensitivity/Specificity					
Agonist	n	Sensitivity	Specificity	Area under the curve ROC	
Epinephrine	114	90%	91%	0.954	
Agonist	n	PPV	NPV	LR+	LR-
Epinephrine	114	91%	90%	10,200	0,115

PPV: Predictive value of a positive result
NPV: Predictive value of a negative result
LR+ : Likelihood Ratio +
LR- : Likelihood Ratio -

Clinical performance was defined at Epinephrine 5µM for antiplatelet drugs and normal samples and confirmed at 10µM on bleeding syndrome, dual antiplatelet therapy and normal samples.

REFERENCES:

- Le Blanc J. et al. Advances in Platelet Function Testing-Light Transmission Aggregometry and Beyond. J Clin Med. 2020.
- Egashira M. et al. The Basic Evaluation of Light Transmission Platelet Aggregation Method on an Automated Coagulation Analyzer CN-6000. Sysmex Journal International. 2020.
- Cattaneo M. et al. Recommendations for the Standardization of Light Transmission Aggregometry: A Consensus of the Working Party from the Platelet Physiology Subcommittee of SSC/ISTH. J Thromb Haemost. 2013.
- Michelson AD. et al. How I use laboratory monitoring of antiplatelet therapy. Blood. 2017.
- Yardumian DA. et al. Laboratory investigation of platelet function: a review of methodology. J Clin Pathol. 1986..
- Zhou L. et al. Platelet aggregation testing in platelet-rich plasma: description of procedures with the aim to develop standards in the field. Am J Clin Pathol. 2005.
- Angiolillo DJ. et al. Basic principles of platelet biology and clinical implications. Circ J. 2010.
- Gresele P. Subcommittee on Platelet Physiology of the International Society on Thrombosis and Hemostasis. Diagnosis of inherited platelet function disorders: guidance from the SSC of the ISTH. J Thromb Haemost. 2015.
- McCabe White M. et al. Platelet protocols: research and clinical laboratory procedures. Elsevier Science. 1999.
- CLSI. Platelet Function Testing by Aggregometry; Approved Guideline. CLSI document H58-A (ISBN 1-56238-683-2). CLSI, 940 West Valley Road, Suite 1400, Wayne, PA 19087 USA 2012.
- Kaeng W.L. et al. Effects of Lifestyle on Hemostasis, Fibrinolysis, and Platelet Reactivity. Arch Intern Med. 2003.
- Olas B. and Brys M. Effects of coffee, energy drinks and their components on hemostasis: The hypothetical mechanisms of their action. Food and Chemical Toxicology. 2019.
- CLSI Document EP28-A3c: "Defining, Establishing, and Verifying Reference Intervals in the Clinical Laboratory; Approved Guideline – Third Edition". 2010.
- Munnix et al., Harmonizing light transmission aggregometry in the Netherlands by implementation of the SSC-ISTH guideline, Platelets. 2021.

e-IFU and SDS (other languages) are available on www.hyphen-biomed.com.

For customer support and Application Guides, please contact your local provider or distributor (see www.hyphen-biomed.com).

Changes compared to the previous version.

The following symbols may appear on the product labeling:

REF	Catalogue number	LOT	Batch code	IVD	In-vitro diagnostic medical device
Rx	Numerical < x > identification of reagent		See instructions for use	WHO STD	WHO standard code
	Temperature limitation		Manufacturer		Use by
	CE marking of conformity with notified body ID number.		Reconstitution volume	CONTENTS	Contents
Cx	Numerical < x > identification of control		See instructions in Method Application guide	CONTAINS	Contains
EXP	Expiration date		Contains sufficient for <n> tests	UNIT	Measurement unit
TARGET VALUE	Target Value		Keep away from sunlight and heat	CALx	Numerical < x > identification of calibrator
UDI	Unique Device Identifier		Contains biological material of animal origin		Contains human blood or plasma derivatives
	UKCA marking of conformity		Biological risks	ACCEPTANCE RANGE	Acceptance range