English

ACTALYKE®
Clotting Time Test System

CE

REF Cat. No. C-ACT, K-ACT, G-ACT

INTENDED USE

Actalyke Activated Clotting Time Test Tubes are intended for use in the performance of the activated clotting time test, a whole blood coagulation assay commonly used to monitor heparin anticoagulation during various medical and surgical procedures. Actalyke ACT test tubes can be used in conjunction with the Actalyke MINI II and the Actalyke XL instruments. Actalyke ACT test tubes can also be used in conjunction with Hemochron® instruments.

SUMMARY

Actalyke ACT test tubes employ clot-promoting reagents (celite, kaolin or glass beads) to standardize and quicken fibrin formation induced by contact activation of the coagulation protein Factor XII. ACT test results reflect the ability of a blood sample to clot in this fashion, and they are prolonged in the presence of heparin. The more prolonged the ACT result is from baseline or normal values, the greater the degree of anticoagulation. As a result, the ACT test is widely used to assess an individual patient's response to a given heparin dose. Especially when moderate to high levels of heparin are administered and during extra-corporeal circulation, the ACT is a practical, accurate method for controlling anticoagulation therapy.

PRINCIPLE

The ACT test was first described by Paul Hattersley, M.D., in 1966. Although the test was originally a manual method, automated ACT instruments were later introduced. These improved the accuracy, reproducibility and convenience of ACT test results. Automated test systems like Actalyke involve pre-loaded, disposable test tubes to which a blood sample is added; the test tube is then inserted into the instrument where the tube is rotated and warmed to 37°C (± 0.5°C) until a fibrin clot is mechanically detected. Upon clot detection the test terminates, a beeper is sounded and the instrument displays the ACT result in seconds.

Each Actalyke test tube has a barcode label affixed to it, which may be read by the Actalyke instrument to determine the test tube type (i.e. celite, kaolin or glass bead activated). [Barcode reader not available on Actalyke MINI models]. The lot number and expiration date of each tube are also identified on the barcode label.

REAGENTS

WARNING: FOR IN VITRO DIAGNOSTIC USE. CAUTION: Some data suggests that the micro crystalline silica in C-ACT is a possible carcinogen. Avoid contact.

Each box contains 50 Actalyke test tubes:

Cat. No.	Use	Activator	Description
C-ACT	Bypass and vascular surgery and PTCA	Celite (14 mg)	Glass tube w/ black flip-top flip-top and barcode label. 2.0 cc blood sample.
K-ACT	Bypass surgery in the presence of aprotinin	Kaolin (14 mg)	Glass tube w/ yellow flip-top and barcode label. 2.0 cc blood sample.
G-ACT	Renal Dialysis, ECMO	Glass (50 mg) beads	Plastic tube w/ clear flip-top and barcode label. 0.4 cc blood sample.

Note: Used Actalyke test tubes should be disposed of in accordance with each institution's policy regarding biohazardous material.

Recommended Use: Extracorporeal circulation, angioplasty, thoracic and vascular surgery (in the presence or absence of antifibrinolytics).

Storage and Stability: Actalyke ACT test tubes can be stored at room temperature (15-30°C). They must not be used past the expiration date that appears on the barcode label affixed to each test tube and its corresponding box.

INSTRUMENTS

The Actalyke test tubes should be used with the Actalyke MINI II, Actalyke XL or Hemochron® instruments. Refer to the appropriate Operator's Manual's for detailed instructions.

SPECIMEN COLLECTION AND HANDLING

C-ACT and K-ACT:

The specimen collection and test procedure for both the C-ACT and K-ACT test tubes are exactly the same. Use a 5.0 cc syringe to obtain the blood specimen as follows:

Extracorporeal line: Using a two-syringe technique, flush the extracorporeal blood access line by withdrawing 5.0 cc of blood into a syringe and discarding it. Then use a second syringe to obtain a 3.0 cc sample for testing.

In-dwelling line: Discontinue fluids drip, if necessary. Using a two-syringe technique, withdraw 5.0 cc of blood into a syringe and discard it. Then use a second syringe to obtain a 3.0 cc sample for testing.

Venipuncture: Using a two-syringe technique, withdraw 2.0 cc of blood into a syringe and discard it. Then use a second syringe to obtain a 3.0 cc sample for testing.

G-ACT:

Use a 1.0 cc tuberculin syringe to obtain the blood specimen as follows:

Extracorporeal line: Do not take a blood sample from a line through which heparin has been administered. Using a two-syringe technique, flush the blood access line by withdrawing 3.0 cc of blood into a syringe and discarding it. Then use a 1.0 cc syringe to obtain a 0.4 cc sample for testing.

PROCEDURE

Materials Provided:	**Cat. No.**
Celite Test Tubes (50/box)	C-ACT
Kaolin Test Tubes (50/box)	K-ACT
Glass Bead Tubes (50/box)	G-ACT

Materials Required:

Actalyke XL Analyzer	5770
Actalyke XL Barcode Reader & Cable	5758
Actalyke MINI II,110/220V (with printer)	5753
Actalyke MINI II Battery Pack	5754
Actalyke MINI II, without printer (110/220V) (single well)	5755
Actalyke XL Battery Pack	5759
Actalyke MINI II, with Printer & Battery (110/220V) (single well)	5763
Actalyke MINI II, with Battery (110/220V) (single well)	5765
Actalyke Thermometer	5757
Actalyke QC Kit (Level I & II)	AQC-LP
Actalyke QC Kit (Level I & III)	AQC-HP
Electronic Clotting Tube	XL-ECT
Syringes for sample collection	

STEP-BY-STEP METHOD

Note: Refer to the appropriate Operator's Manual for detailed instrument instructions. Refer to the SAMPLE COLLECTION section for detailed collection instructions.

1. Visually inspect the glass c-ACT tubes for cracks prior to use. Open the flip top of the selected Actalyke test tube.
2. Dispense the following amount of blood into the appropriate tube or fill to line indicated on the tube.

Tube	Blood Volume
C-ACT	2.0 cc
K-ACT	2.0 cc
G-ACT	0.4 cc

3. Perform the next steps quickly and in order depending on the type of instrument settings used.
   - Press the Start button at the same time that the blood is added to the tube.
   - Close the flip-top. Mix the blood in the tube according to the appropriate instructions.

Tube	Mixing
C-ACT/K-ACT	Shake the tube vigorously from end- to-end ten times to disperse the activator. Tap the bottom of the tube lightly on the table top to ensure that the magnet moves freely.
G-ACT	While holding the tube in a vertical position, tap the bottom sideways five times to ensure proper mixing. **NOTE:** This mixing procedure eliminates protein loss to the tube walls and assists in standardizing the mixing procedure from operator to operator.

   - Insert the tube into the instrument test well.
   - Rotate the tube 4-5 times; the green detector light will illuminate or "Tube In" will display.
4. Upon clot detection, the buzzer will sound and the ACT test result will be displayed in seconds. (Results can be printed if using Actalyke XL or Actalyke MINI II with printer.)

Quality Control

Routine quality control testing and tracking should be part of a comprehensive quality assurance program. Actalyke Quality Control products are available to make routine QC convenient and affordable. In the US, according to the CLIA '88 regulations, the frequency of quality control testing is mandated. Since the ACT is categorized as moderately complex, ACT users must (1) perform two levels of quality control during each shift in which the test system is used clinically, and (2) subscribe to a Proficiency Testing program. Additionally, CLIA (42 CFR 493) requires that biological controls be used weekly to verify system function. To help users comply with these regulations, Actalyke Quality Control Material is available (or other commercial coagulation products can also be used), and ACT Proficiency Testing Programs are available through the American Proficiency Institute. Contact Helena's Technical Services Department for details.

Each box of Actalyke Activated Clotting Time tubes contains 50 unitized reaction tubes from a single manufactured lot and should be validated once, initially upon arrival. This can be accomplished using the appropriate Actalyke QC Kit. Acceptable performance ranges for the various Actalyke coagulation assays are included in each kit. After a box from each lot number of Actalyke Activated Clotting Time tubes has been verified with the QC kit, that lot number of tubes should be marked as "VERIFIED", along with the date of verification and the initials of the operator. This box is now "IN CONTROL" and will not require any further investigation until a new box of tubes is received, unless the tubes are not stored to manufacturers recommendations or unless a shift in clinical results is experienced. Since Actalyke test tubes contain non-biological, inert reagents and are not susceptible to environmental or temperature changes, Actalyke ACT test tubes have exceptional room temperature stability and longevity.

Quality control results that fall outside the established expected values should be repeated. If the problem persists, the source should be investigated and corrected prior to continued use of the test system.

Operating Cautions and Limitations

1. Do not use Actalyke ACT test tubes that are past the expiration date marked on the tube barcode label and the corresponding test tube box.
2. All guidelines pertaining to the handling of fresh whole human blood should be adhered to when handling Actalyke test tubes and instruments.
3. Specimen contamination and inappropriate technique can affect ACT results.
4. The ACT results may be affected by hemodilution, hypothermia, pharmacologic compounds, and various coagulopathies. Test results should be interpreted with respect to the patient's condition and the clinical circumstances. Those results which do not agree with expected values should be repeated and further evaluated by other diagnostic methods, if indicated.
5. When using the ACT test as a monitor for heparin anticoagulation effect, a baseline (non-heparinized) sample may be run so that a differential ratio can be used as a comparison.

REFERENCE RANGES

Actalyke ACT test tubes were run on Actalyke instruments (Model A2P, MINI and XL) and Hemochron Instrument (Model 8000). Quality control tests were performed on each instrument prior to testing of Actalyke tubes for this study. Each tube type was run with normal volunteers on each instrument. The results are as follows:

Test	Instrument	N	Mean	2SD	Reference Range
C-ACT	Actalyke	30	123	26	97-149 sec.
	Actalyke MINI	30	123	29	94-152 sec.
	Actalyke XL	66	126	21	105-148 sec.
	Hemochron	15	126	15	111-141 sec.
K-ACT	Actalyke	35	123	28	93-150 sec.
	Actalyke MINI	35	125	25	100-150 sec.
	Actalyke XL	64	132	21	102-153 sec.
	Hemochron	15	129	23	106-152 sec.
G-ACT	Actalyke	44	185	38	147-223 sec.
	Actalyke MINI	44	181	34	147-215 sec.
	Actalyke XL	63	189	42	147-233 sec.
	Hemochron	15	167	20	147-187 sec.

PERFORMANCE CHARACTERISTICS

Precision Studies

All precision studies were done according to NCCLS EP-5 guidelines.

Actalyke MINI

The precision of the Actalyke Activated Clotting Time Test System was evaluated by performing multiple replicates on twenty separate days with heparinized and non-heparinized Actalyke Whole Blood Control samples. C-ACT and K-ACT tests were run with levels I and III; G-ACT with levels I and II. The coefficient of variation for each test type was less than 10%.

	C-ACT		K-ACT		G-ACT	
Level	**I**	**III**	**I**	**III**	**I**	**II**
mean	127.0	388.2	125.1	389.9	146.8	286.3
sd	4.60	18.44	4.97	16.40	6.76	16.37
% cv	3.6	4.8	4.0	4.2	4.6	5.7

Actalyke XL

The precision of the Actalyke Activated Clotting Time Test System was evaluated by performing multiple replicates on twenty separate days with heparinized and non-heparinized Actalyke QC samples. C-ACT and K-ACT tests were run with levels I and III; G-ACT with levels I and II. The coefficient of variation for each test type was less than 10%.

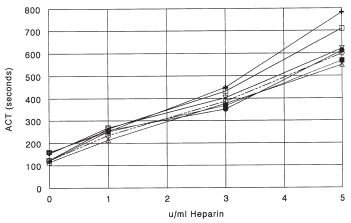
	C-ACT		K-ACT		G-ACT	
Level	**I**	**III**	**I**	**III**	**I**	**II**
mean	173.5	277.8	172.5	287.7	176.7	245.6
sd	11.3	17.1	11.1	14.7	9.2	17.2
% cv	6.5	6.2	6.4	5.1	5.2	7.0

Accuracy Data

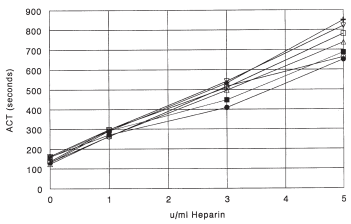
The accuracy of the Actalyke Activated Clotting Time Test System was evaluated by performing multiple Activated Clotting Time tests using varied combinations of instruments and tubes. Citrated pooled blood was heparinized to create the below concentrations yielding the following results:

Heparin Sensitivity

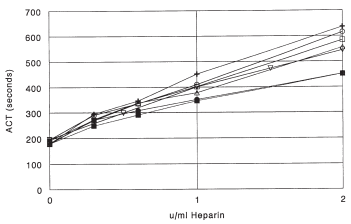
Celite Response to Heparin



Kaolin Response to Heparin



Glass Beads Response to Heparin



Key to Graphs

A-A* M-A* H-H H-A
A-H A-A XL-A**

Instrument/Tube

A-A* = Actalyke /Actalyke
M-A* = MINI /Actalyke
XL-A* = Actalyke XL /Actalyke
H-H = Hemochron /Hemochron
H-A = Hemochron /Actalyke
A-H = Actalyke /Hemochron
A-A = Actalyke /Actalyke
*run with different set of donors

Correlation Data

Patient samples from all clinical sites were tested using each tube type on the MINI, the XL and the Actalyke. The data was as follows.

C-ACT	MINI	n=84	Y=0.948X + 15	r=0.979
	XL	n=104	Y=0.943X + 11.7	r=0.960
G-ACT	MINI	n=97	Y=0.967X + 2	r=0.979
	XL	n=92	Y=0.998X - 3.0	r=0.985
K-ACT	MINI	n=90	Y=0.984X + 10	r=0.966
	XL	n=97	Y=0.978X + 6.9	r=0.988

Linearity

Linearity studies were done according to NCCLS EP-6 guidelines with the following results.

	C-ACT	K-ACT	G-ACT
Heparin u/mL blood	**5.0**	**5.0**	**2.0**

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