REF Cat. No. 5724

Contents

50 c-ACT test cards, individually sealed in foil pouches INTENDED USE

The Cascade Abrazo c-ACT test cards are activated clotting time tests to be used with the Cascade Abrazo analyzer and are intended to monitor the effect of heparin

on coagulation in fresh whole blood. The c-ACT test cards, together with the analyzer, are especially suited for use by trained medical personnel in decentralized areas of testing near the site of patient

care

SUMMARY

Heparin is currently the major intravenous drug used to control blood coagulation. It is used to control or prevent clotting in patients with thromboembolic diseases such as deep venous thrombosis and acute myocardial infarction. It is also used to maintain an anticoagulated state in patients undergoing percutaneous transluminal coronary angioplasty, coronary bypass surgery, and other invasive surgical procedures. Heparin is composed of a mixture of glycosaminoglycan molecules of various sizes, and it exists naturally in various body tissues. Heparin acts as an anticlotting agent by combining with Antithrombin (AT, previously Antithrombin III) in the blood to accelerate the rate of neutralization of various serine proteases (clotting factors), especially thrombin and Xa, that participate in the coagulation cascade Although it is widely used, heparin is responsible for more iatrogenic complications than any other drug. The major side effect is bleeding.¹ For this reason and because of the variability of patient response to the dose of heparin,^{2,3} many attempts have been made to develop and improve the monitoring of heparin therapy.

The c-ACT test cards together with the analyzer are intended for rapid monitoring of the effect of heparin levels (1 to 6 U/mL) on coagulation. Precise pipetting of reagent or sample and manual timing skills are not a factor with the c-ACT test card. Many of the variables encountered with sample transport and handling are avoided although testing of fresh whole blood must be done immediately to obtain accurate results

PRINCIPLE

The Cascade Abrazo c-ACT test consists of the contact activation of whole blood with the subsequent measurement of the time for clot formation. The c-ACT test may be used as a sensitive means of monitoring the effect of heparin

on clotting in whole blood samples. Generally, in the presence of adequate levels of Antithrombin and clotting factors, increasing heparin concentration results in progressive prolongation of the c-ACT result.

REAGENT

For in vitro diagnostic use only.

Components	Storage	Stability
Calcium chloride, celite, modifiers,	2-8°C (36-46°F)	Unopened – until expiration date
stabilizers, and paramagnetic		on the pouch label
iron oxide particles		or

20–25°C (68–77°F) Unopened – 2 weeks Any pouches not kept refrigerated should be dated and used within 2 weeks

CAUTION: Exposure of the test cards at any time to magnetic objects or fields (for example, an MRI instrument) can potentially prevent the analyzer from performing the test properly

SPECIMEN COLLECTION AND PREPARATION

The c-ACT test cards may be used with fresh whole blood collected according to CLSI Guidelines H03-A64 and H11-A45. For indwelling catheters, the line should be flushed with 5 mL saline; separate, single-use syringes should be used to collect at least 5 mL or 6 dead space volumes of blood (to be discarded) prior to collection of blood specimens for testing, to minimize effects of hemodilution (e.g., crystalloid fluid in line) or heparin in solutions used for flushing indwelling lines. Institutional polices and procedures should be followed.⁶ Fresh blood collected into a plastic syringe should be used immediately.

CAUTION: Heparinized syringes are not appropriate vehicles for the c-ACT Test. CAUTION: When handling blood specimens, all samples should be treated as biohazards.8,9

PROCEDURE

Materials provided: The following materials are contained in the Abrazo c-ACT Test Kit (Cat. No. 5724).

50 Cascade Abrazo c-ACT Test Cards

Materials	provided	but	not	contained	in	the	kit:

Cascade Abrazo Analyzer	5710
Cascade Abrazo Electronic QC (EQC) Test Card	5848
Cascade Abrazo c-ACT Level 1 Control	5737
Cascade Abrazo c-ACT Level 2 Control	5738

Materials Required but not provided:

Blood sampling materials such as venipuncture needles, syringes, alcohol swabs

Sample transfer devices (pipettes or droppers) capable of delivering approximately 30 to 35 µL

STEP BY STEP

- 1. Refer to the Abrazo Operator's manual for appropriate analyte set up procedures.
- 2. Equilibrate test cards at room temperature (15 to 25°C, or 59 to 77°F) for a minimum of 15 minutes before removing from the foil pouch. CAUTION: The test card <u>must</u> be used within 15 minutes <u>after</u> the pouch is
- opened. Pouches of cards should not be repeatedly warmed and returned to the refrigerator.
- 3. Select patient test from main menu on Abrazo. Remove the test card from its foil pouch and hold it backwards with the barcode facing the Abrazo, approximately 6 to 8 inches from the Abrazo.
- Tilt the card backwards slightly (approx. 15 degrees) and scan the encoded 2D barcode in the middle of the card. The analyzer interprets the encoded information on the test card and display prompts for each step of the procedure.

- 5. When prompted, place the test card in the analyzer, and allow to warm. Once the card is warmed, the Abrazo starts a countdown for the sample addition CAUTION: The Abrazo will only perform tests on test cards and sample types
- that have been entered into the instrument's setup menu. 6. Holding the sample transfer device at least one inch above the sample well (colored circle) on the test card, add 30 to 35 μL of free-falling sample. Sample placement automatically initiates testing. NOTE: Do not allow the transfer device nor the hanging sample drop to contact
- the test card when applying the sample.
- 7. When the card is removed from the analyzer at the end of each test, ensure that the entire reaction chamber was filled with sample. If an inadequate amount of sample was added to the card, repeat the test, using a fresh card.
- 8. Dispose of the test card and other contaminated items in a manner approved for biohazardous material.7-9
- 9. After testing is complete, inspect the test card. Refer to the Operator Manual for images of the test card for comparison.
- 10. If Abrazo analyzer is used in monitoring multiple patients, the analyzer must be properly cleaned and disinfected between patients after every use following the cleaning instructions provided in the Abrazo operator's manual. 7,10

Procedural Notes

- The analyzer is preset to provide a constant temperature of 37 \pm 0.3°C (98.6 \pm $0.5^\circ F)$ and will automatically prewarm the test card before prompting the user to apply the sample drop. All other calibrations necessary are encoded on each test card. Refer to the operator's manual for details.
- To maintain a fully charged battery, leave the unit plugged into its power supply which is, in turn, plugged into an AC outlet.
- The Operator Identification and the Quality Control Lockout are optional features.
- Refer to the operator's manual if either of these features has been enabled Operate the analyzer only at ambient temperatures between 15 to 32°C (59 to
- 89.6°F) Ensure that the sealed pouch containing a test card has reached room
- temperature and that the analyzer is either plugged into an appropriate AC wall outlet or has a sufficiently charged battery. Collect the sample as described in Specimen Collection and Preparation.
- After the test card is inserted into the Abrazo, the card should not be touched until the test has been completed

QUALITY CONTROL

Calibration: Operator calibration is not required. Calibration of both the analyzer

and test cards was performed at the time of manufacture. Daily quality control (QC) is good laboratory practice and is required by most states in the U.S. and the Clinical Laboratory Improvement Amendment, 1988 (CLIA '88). Quality control procedures are part of an overall quality assurance program to ensure the accuracy and reliability of patient results and reports. Monitoring the results of QC analyses can alert you to possible system performance problems. Healthcare professionals should follow proper local and national guidelines for quality control and check with appropriate licensing/accrediting bodies to ensure that QC programs meet established standards. Participation in Proficiency Survey programs allows for the comparison with systems in other laboratories and may help identify possible errors not detected by intra-laboratory QC testing alone

There are two types of quality control that may be used on the Cascade Abrazo: Electronic Quality Control (EQC Test Card) and plasma controls.

The EQC Test Card ensures that the electronic components of the Cascade Abrazo analyzer are working properly. The purpose of the EQC Test Card is to offer a simple and economic alternative to the daily use of Cascade Abrazo test cards and plasma controls. However, the EQC test card is <u>not</u> intended to permanently replace plasma controls

At least two levels of EQC quality control must be performed every 8 hours of operation when patient samples are tested. It is imperative that, at a minimum, plasma controls are tested in the following situations:

- With each new box of test cards or at least once per week
- With each new shipment of test cards With each new lot number of test cards
- Whenever improper storage or handling of test cards is suspected

• Whenever patient results appear abnormally high or low This testing is in addition to the daily EQC testing. For more detailed information about quality control for the Cascade Abrazo, refer to the Cascade Abrazo Operator's Manual, the EQC test card package inserts, or contact your local authorized distributor

REFERENCE VALUES

Blood samples collected from 171 preheparinized cardiac patients including males and females, ranging in age from 29 to 93 years, were tested with the Abrazo c-ACT test. The normal range (mean + 2 SD) was from 118 to 174 for fresh blood samples. These ranges should be used as a guideline only. Operators should establish their own normal ranges, based on their own population of normal individuals.6.

Individual c-ACT clotting responses to heparin depend on several factors and can vary considerably. In general, as heparin concentration is increased in the presence of Antithrombin, c-ACT clotting times will be progressively prolonged.

Actual heparin levels can differ substantially by patient and by sample over the course of a cardiac procedure due to changes in concentrations of clotting factors and Antithrombin caused by hemodilution.

RESULTS

The Abrazo c-ACT test reporting units are in seconds. The results are displayed upon test completion. The Abrazo c-ACT test card limits are 70 and 850 seconds. Verify results <70 seconds and > 850 seconds by repeat testing.

If a test result appears inconsistent with the patient's clinical presentation, the result should be verified by testing a fresh sample or evaluated using an alternative diagnostic method.

LIMITATIONS

The influence of many seemingly insignificant environmental factors can affect c-ACT testing. The recommended specimen handling procedures should be strictly followed

During cardiopulmonary bypass, a number of contributing factors may affect the performance of the c-ACT reported with some patient samples. These could include the components used in some priming and cardioplegia solutions, certain medications, unknown coagulopathies or hypocoagulable states, or conditions created by a combination of these factors. These factors must be considered when interpreting c-ACT results. If a test result appears inconsistent with the patient's clinical presentation, the result should be verified by testing a fresh sample or evaluated using an alternative diagnostic method.

The performance characteristics of this product when used for testing neonatal or pediatric patients have not been established.

This product has not been evaluated for low dose heparin. For procedures requiring lower doses of heparin, a product such as Cascade Abrazo c-ACT-LR could be considered or a test recommended by the anti-coagulant manufacturer's instructions for use. Due to variations of heparin products, a heparin linearity study is suggested upon validation or any time heparin products are changed.

INTERFERENCES

The presence of oxalate, EDTA or any additive other than sodium citrate can interfere with the test. Hemolysis should not affect the results; however, it is often an indication of poor specimen quality. The Cascade Abrazo c-ACT card uses Celite as the activator, therefore the presence of aprotinin may result in prolonged clotting times in patients receiving heparin.¹³ The following table lists those factors that do not normally interfere with the c-ACT test:

Factors	Concentration	Factors	Concentration
Hespan	<u>≤</u> 45%		
Fibrinogen	100–1000 mg/dL	Lipemia	Up to 20 g/L
Hematocrit	10–60%	Nitroglycerin	≤ 1000 ng/mL
Bilirubin	0-20 mg/dL		

PERFORMANCE CHARACTERISTICS

SPECIFICITY: Studies show that in the presence of adequate levels of Antithrombin, the c-ACT test is sensitive to the presence of unfractionated heparin. The c-ACT test is sensitive to heparin with concentrations of 1 to 6 U/mL.

PRECISION: The precision studies were performed using three lots of Cascade Abrazo c-ACT cards and one lot each of Cascade Abrazo c-ACT controls Level 1 and Level 2. The studies were performed by three non-laboratorian (POC) operators at a single site across 6 Cascade Abrazo analyzers over a period of 20 days. Each operator performed 2 runs per day, 2 tests per run on each lot of Abrazo c-ACT test cards.

Within-run, between run, and between day Precision*

N= 240										
	Grand	within run		between run		between day		total		
c-ACT	mean	SD	%CV	SD	%CV	SD	%CV	SD	%CV	
Level 1	136	12.2	8.9	3.5	2.6	4.7	3.5	13.5	9.9	
Level 2	489	14.1	2.9	3.9	0.8	0.0	0.0	14.7	3.0	

Lot to Lot Precision

Lot Number		1			2			3	
Sample	Mean	SD	%CV	Mean	SD	%CV	Mean	SD	%CV
Level 1 Control	138	13.7	9.9	134	13.0	9.7	138	13.4	9.7
Level 2 Control	488	13.2	27	490	12.1	25	492	12.9	2.6

Operator to Operator Precision³ N= 80

		Operato	r 1	Operator 2			Operator 3		
Sample	Mean	SD	%CV	Mean	SD	%CV	Mean	SD	%CV
Level 1 Control	138	13.7	9.9	136	14.5	10.7	135	12.2	9.0
Level 2 Control	488	13.2	2.7	490	13.5	2.8	490	16.1	3.3

*Precision studies were performed according to EP05-A2.12

Within-run Precision in citrated whole blood samples with various concentrations of heparin.

N=40	Clot Time (sec)				
Heparin concentration U/ml	Mean	SD	CV		
0	132	8.8	6.7		
1.5	324	15.9	4.9		
5.0	551	17.8	3.2		

COMPARISON: Clinical studies were conducted using fresh whole blood samples collected from patients undergoing cardiac surgery before and following heparinization and during cardiopulmonary bypass. The Abrazo c-ACT were compared with a celite ACT. Comparisons of 760 whole blood samples gave correlation coefficients of 0.94 for the Abrazo c-ACT compared to predicate celite ACT.

HEPARIN RESPONSE CURVE: The Abrazo c-ACT test card is linear within 1 U/mL to 6 U/mL of unfractionated heparin. Heparin response can vary between individuals.



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