Brown Clinic Northridge
511 14th Ave. NE
Watertown, SD

Brown Clinic
506 First Ave. SE
Watertown, SD

BROWN CLINIC

LABORATORY PROCEDURE MANUAL

PROCEDURE: Creatine Kinase (CKI)

PURPOSE: The CKI method is an *in vitro* diagnostic test for the quantitative measurement of creatine kinase in human serum and plasma on the Dimension® clinical chemistry system.

PRINCIPLE:

The Dimension® creatine kinase (CKI) method is standardized to the International Federation of Clinical Chemistry (IFCC) primary reference procedure at 37 °C, adapted to the Dimension® clinical chemistry system.[1]

Measurements of creatine kinase are used in the diagnosis and treatment of myocardial infarction and muscle diseases. Creatine kinase may also be elevated following muscle injury or strenuous exercise.[2,3]

In a coupled enzyme reaction, the creatine kinase in patient samples catalyzes the transphosphorylation of phosphate from creatine phosphate to adenosine-diphosphate (ADP) producing adenosine- triphosphate (ATP). Hexokinase (HK) phosphorylates glucose from the ATP to phosphorylate glucose. The resulting glucose-6-phosphate is oxidized by glucose-6-phosphate dehydrogenase (G-6-PDH) with the simultaneous reduction of nicotinamide adenine dinucleotide phosphate (NADP).

The rate of formation of NADPH is directly proportional to the CK activity in the sample and is measured bichromatically at 340 and 540 nm.

$$\text{Creatine phosphate + ADP} \xrightarrow[Mg^{++},\ NAC,\ EDTA]{CK} \text{Creatine + ATP}$$

$$\text{ATP + Glucose} \xrightarrow[Mg^{++}]{HK} \text{ADP + Glucose-6-phosphate}$$

$$\text{Glucose-6-phosphate + } NADP^{+} \xrightarrow{G\text{-}6\text{-}PDH} \text{6-Phosphogluconolactone + NADPH + } (H^{+})$$

INSTRUMENT, REAGENTS & SUPPLIES:

Reagents

Wells[a]	Form	Ingredient	Concentration[b]	Source
1 – 4[c]	Liquid	Hexokinase	13700 U/L	Yeast
		Glucose -6-phosphate dehydrogenase	14900 U/L	Bacterial
		ADP	7.05 mM	

		AMP	16.15 mM
		EDTA	6.47 mM
		Mg acetate	32.3 mM
		Diadenosine Pentaphosphate (AP5A)	0.05 mM
		NADP	6.28 mM
		N-acetylcycteine	64.7 mM
		Imidazole buffer	123 mM
5, 6[c]	Liquid	Creatine phosphate	184 mM
		Glucose	120 mM
		EDTA	2.46 mM
		3-(cyclohexylamino)-2-hydroxyl-1-propane sulfonic acid (CAPSO) buffer	20 mM

a. Wells are numbered consecutively from the wide end of the cartridge.
b. Nominal value per well in a cartridge.
c. Wells 1 – 6 contain preservative and stabilizer.

Risk and Safety:
Safety Data Sheet (MSDS/SDS) available on www.siemens.com/healthcare

Precautions: Used cuvettes contain human body fluids; handle with appropriate care to avoid skin contact or ingestion.
For *in vitro* diagnostic use

REAGENT PREPARATION, STORAGE & STABILITY:
Reagent Preparation: All reagents are liquid and ready to use.

Store at: 2 – 8 °C

Expiration: Refer to carton for expiration date of individual unopened reagent cartridges. Sealed wells on the instrument are stable for 30 days.

Open Well Stability: 5 days for wells 1 – 4, 10 days for wells 5 – 6.

SPECIMEN REQUIREMENTS:
Recommended specimen types: serum, sodium and/or lithium heparin plasma.
Grossly hemolyzed samples should not be used with the CKI method.[3]
Serum and plasma can be collected using recommended procedures for collection of diagnostic blood specimens by venipuncture.[4]
Follow the instructions provided with your specimen collection device for use and processing.[5]
For serum, complete clot formation should take place before centrifugation. Serum or plasma should be physically separated from cells as soon as possible with a maximum limit of two hours from the time of collection.[6]

Specimen:
- patient preparation: no patient preparation required
- specimen type: serum or heparinized plasma
- Separated serum/plasma samples should be stored at 2 – 8 °C and analyzed within 7 days. For longer storage, samples should be frozen at or below -20 °C.[7]

CONTROLS:
At least once daily run solutions at two levels of a quality control material with known concentrations.
For further details, refer to your Dimension® system manual. The result obtained should fall within limits defined by the day-

to-day variability of the system as measured in the user's laboratory. If the results fall outside the laboratory's acceptable limits, follow the procedure in the quality control policy.

Procedure

Materials Provided

CKI Flex® reagent cartridge, Cat. No. DF38

Materials Required But Not Provided

Dimension® CKI/MBI Calibrator, Cat. No. DC32

Quality Control Materials

Test Steps

Sampling[d], reagent delivery, mixing, processing, and printing of results are automatically performed by the Dimension® System. For details of this processing, refer to your Dimension® Operator's Guide.

d. The sample container must contain sufficient quantity to accommodate the sample volume plus dead volume. Precise container filling is not required.

Test Conditions

Sample Volume	14 µL
Reagent 1 Volume	112 µL
Reagent 2 Volume	55 µL
Temperature	37.0 °C ± 0.1 °C
Reaction Time	8.7 minutes[e]
Wavelength	340 and 540 nm
Type of Measurement	Bichromatic rate

Calibration

Assay Range	7 – 1000 U/L [0.12 – 16.67 µkat/L][f]
Calibration Material	Dimension® CKI/MBI Calibrator, Cat. No. DC32
Calibration Scheme	3 levels in triplicate
Units	U/L [µkat/L] (U/L ÷ 60) = [µkat/L]
Typical Calibration Levels	Level 1: 0 U/L [0.00 µkat/L][g] Level 2: 525 U/L [8.75 µkat/L] Level 3: 1100 U/L [18.33 µkat/L]
Calibration Frequency	Every 90 days for any one lot
A new calibration is required	• For each new lot of Flex® reagent cartridges • After major maintenance or service, if indicated by quality control results • As indicated in laboratory quality control procedures • When required by government regulations
Assigned Coefficients	C_0 1.708 C_1 8.044

e. Calculated as time from test initiation to final result.

f. Système International d'Unités (SI Units) are in brackets.

g. Level 1 calibrator for CKI/MBI is not included in the CKI/MBI carton. Purified Water Diluent (Cat No. 710615901) or Reagent grade water should be used as the level 1 calibrator for the CKI method.

Back-up Testing :

Refer to Brown Clinic Backup Policy

INTERPRETATION:

Results of this test should always be interpreted in conjunction with the patient's medical history, clinical presentation and other findings.

EXPECTED VALUES:

Serum/Plasma

Males: 39 – 308 U/L [0.65 – 5.11 µkat/L]

Females: 26 – 192 U/L [0.43 – 3.19 µkat/L]

Each laboratory should establish its own expected values for CKI as performed on the Dimension® clinical chemistry system.

REPORTING:

The instrument calculates the enzymatic activity of creatine kinase in U/L using the calculation scheme described in your Dimension® Operator's Guide.

LIMITATIONS:

Serum/plasma samples with results in excess of 1000 U/L [16.67 µkat/L] are reported as "Above Assay Range" and should be repeated on dilution.

Manual Dilution: Dilute with Reagent grade water to obtain results within the analytical measurement range. Enter dilution factor on the instrument. Reassay. Resulting readout is corrected for dilution.

Autodilution (AD): The autodilute sample volume is 2 µL (dilution factor = 7) for serum/plasma. Refer to your Dimension® Operator's Guide.

Serum/plasma with results less than 7 U/L [0.12 µkat/L] should be reported as "less than 7 U/L [0.12 µkat/L]"

The instrument reporting system contains flags and comments to provide the user with information regarding instrument processing errors, instrument status information and potential errors in creatine kinase results. Refer to your Dimension® Operator's Guide for the meaning of report flags and comments. Any report containing flags and/or comments should be addressed according to your laboratory's procedure manual and not reported.

Analytical Specificity

For Known Interfering Substances section refer to package insert.
For Known Non-Interfering Substance refer to package insert.
For Additional Technical Information refer to package insert.

Reference: CKI Flex® reagent cartridge insert sheet PN 717038.001 Issue Date 2016-2-26 Rev. B

Origination Date: 9-10-10

Date of Implementation: 9-4-12

****

Written By: ____Lori Murray MT(ASCP)_____ Date: _8-23-12

Approved By: _____Aaron Shives, MD_____ Date: ___10/21/2017_____

Laboratory Director

REVIEW - REVISION SUMMARY DOCUMENTATION

Date	By	Revision Summary
07/10	Lori Murray	New format
8-8-12	Lori Murray	changed instrument
3/20/15	Heather Hall	Update revision date
10/17/2017	Heather Hall	Updated format to match other BC procedures, referenced updated package insert, modified backup process