CREATINE KINASE (CK)

COD 12524 3 x 15 mL

Only for *in vitro* use in the clinical laboratory

BioSystems

CREATINE KINASE (CK)
IFCC

INTENDED USE

Reagent for the measurement of creatine kinase (CK) concentration in human serum or plasma. The obtained values are useful as an aid in the diagnosis and control of the evolution of acute myocardial infarction and various muscle disorders.

This reagent is for use in the BioSystems A25 and A15 analyzers or in other analyzer with similar performance characteristics.

CLINICAL SIGNIFICANCE

Creatine kinase (CK) plays an important role in muscle by providing ATP, when muscle contracts, from ADP and using creatine phosphate as the phosphorylation reservoir.

Serum CK originates mainly in muscle and its concentration is subject to a number of physiological variations (sex, age, muscle mass, physical activity and race).

Serum CK concentration is greatly elevated in patients with some diseases of skeletal muscle (muscular distrofy, myositis, polymyositis, malignant hyperthermia, trauma, acute rhabdomyolysis), of the central nervous system (acute cerebrovascular disease, cerebral ischemia, Reye's syndrome) and of the thyroid (hypothyroidism)[1,2].

After a myocardial infarction, CK elevation begins in 3-6 hours and peaks at 24-36 hours. The enzyme is rapidly cleared from the plasma, so that it is common for the activity to return to normality in 3-4 days[1,2].

Clinical diagnosis should not be made on the findings of a single test result, but should integrate both clinical and laboratory data.

PRINCIPLE OF THE METHOD

Creatine kinase (CK) catalyzes the phosphorylation of ADP, in the presence of creatine phosphate, to form ATP and creatine. The catalytic concentration is determined from the rate of NADPH formation, measured at 340 nm, by means of the hexokinase (HK) and glucose-6-phosphate dehydrogenase (G6P-DH) coupled reactions[3,4].

$$\text{Creatine phosphate} + \text{ADP} \xrightarrow{\text{CK}} \text{Creatine} + \text{ATP}$$

$$\text{ATP} + \text{Glucose} \xrightarrow{\text{HK}} \text{ADP} + \text{Glucose - 6 - phosphate}$$

$$\text{Glucose - 6 - phosphate} + \text{NADP}^+ \xrightarrow{\text{G6P-DH}} \text{6 - Phosphogluconate} + \text{NADPH} + \text{H}^+$$

CONTENTS AND COMPOSITION

A. Reagent: 3 x 12 mL. Imidazol 125 mmol/L, EDTA 2 mmol/L, magnesium acetate 12.5 mmol/L, D-glucose 25 mmol/L, N-acetyl cysteine 25 mmol/L, hexokinase 6000 U/L, NADP 2.4 mmol/L, pH 6.7.

DANGER: H360: May damage fertility or the unborn child. P201: Obtain special instructions before use. P202: Do not handle until all safety precautions have been read and understood. P280: Wear protective gloves/protective clothing/eye protection/face protection. P308+P313: IF exposed or concerned: Get medical advice/attention. P405: Store locked up.

B. Reagent: 1 x 10 mL. Creatine phosphate 250 mmol/L, ADP 15 mmol/L, AMP 25 mmol/L, P1,P5-di(adenosine-5'-)pentaphosphate, 102 μmol/L, glucose-6-phosphate dehydrogenase 8000 U/L.

For further warnings and precautions, see the product safety data sheet (SDS).

STORAGE AND STABILITY

Store at 2-8ºC.

Components are stable once opened until the expiry date marked in the label if they are stored well closed and care is taken to prevent contamination during their use.

On board stability: Reagents open and kept in the refrigerated compartment of the analyzer are stable 15 days.

Indications of deterioration: Absorbance of the blank over the limit indicated in "Test Parameters".

ADDITIONAL MATERIALS REQUIRED (NOT PROVIDED)

Biochemistry Calibrator (BioSystems cod. 18011) or Biochemistry Calibrator Human (BioSystems cod. 18044).

REAGENT PREPARATION

Working Reagent: Add 3.0 mL of the Reagent B into the Reagent A bottle. Mix gently. Other volumes can be prepared in the proportion: 4 mL Reagent A + 1 mL Reagent B.

Stable for 15 days at 2-8ºC. The working reagent must be protected from light.

SAMPLES

Serum and plasma collected by standard procedures.

Creatine kinase in serum and plasma is stable for 7 days at 2-8ºC. Use heparin or EDTA as anticoagulant.

CALIBRATION

A reagent blank should be done every day and a calibration at least every 15 days, after reagent lot change or as required by quality control procedures.

QUALITY CONTROL

It is recommended to use the Biochemistry Control Serum level I (cod. 18005, 18009 and 18042) and II (cod. 18007, 18010 and 18043) to verify the accuracy of the measurement procedure.

Each laboratory should establish its own internal Quality Control scheme and procedures for corrective action if control results are not within the acceptable limits.

REFERENCE VALUES

Reaction Temperature	Men[1] U/L	Men[1] nKat/L	Women[1] U/L	Women[1] nKat/L
25ºC	10-65	167-1084	7-55	117-917
30ºC	15-105	250-1750	10-80	167-1334
37ºC	38-174	633-2900	26-140	433-2334

These ranges are given for orientation only; each laboratory should establish its own reference ranges.

METROLOGICAL CHARACTERISTICS

The metrological characteristics described below have been obtained using an A25 analyzer. Results are similar with A15.

- Detection limit: 10 U/L = 153 nkat/L.
- Linearity limit: 1300 U/L = 21671 nkat/L. For higher values dilute sample 1/2 with distilled water and repeat measurement.
- Precision:

Mean concentration	Repeatability (CV)	Within-laboratory (CV)
145 U/L = 2417 nkat/L	1.5 %	2.9 %
446 U/L = 7435 nkat/L	0.9 %	3.3 %

- Trueness: Results obtained with this reagent did not show systematic differences when compared with reference reagents. Details of the comparison experiments are available on request.

LIMITATIONS OF THE PROCEDURE

- Interferences: bilirubin (up to 20 mg/dL), hemolysis (hemoglobin up to 1000 mg/dL) and lipemia (triglycerides up to 500 mg/dL) do not interfere. Other drugs and substances may interfere[5].

BIBLIOGRAPHY

1. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics, 4th ed. Burtis CA, Ashwood ER, Bruns DE. WB Saunders Co, 2005.
2. Friedman and Young. Effects of disease on clinical laboratory tests, 4th ed. AACC Press, 2001.
3. IFCC primary reference procedures for the measurement of catalytic activity concentrations of enzymes at 37ºC, Part 2. Reference procedure for the measurement of catalytic concentration of creatine kinase. *Clin Chem Lab Med* 2002;40:635-642.
4. IFCC reference procedures for measurement of catalytic concentrations of enzymes: corrigendum, notes and useful advice. *Clin Chem Lab Med* 2010; 48: 615-621.
5. Young DS. Effects of drugs on clinical laboratory tests, 5th ed. AACC Press, 2000.

TEST PARAMETERS

These reagents may be used in several automatic analyzers. Specific instructions for application in many of them are available on request.

R1: use Reagent A.

	A25	A15
GENERAL		
Name	**CK**	**CK**
Sample type	SER	SER
Analysis mode	kinetic mon.	kinetic mono.
Units	U/L	U/L
Turbidimetry test	no	no
Decimals	0	0
Type of reaction	increasing	increasing
PROCEDURE		
Reading mode	monoch.	monoch.
Main filter	340	340
Reference filter	-	-
Sample	15	15
Vol. R1	300	300
Vol. R2	-	-
Washing	1.2	1.2
Reading 1 (cycle)	13	9
Reading 2 (cycle)	25	16
Reagent 2 (cycle)	-	-
Predilution factor	-	-
CALIBRATION AND BLANK		
Calibration type	multiple	multiple
Number of calibrators	-	-
Calibration curve	-	-
OPTIONS		
Blank absorbance limit	0.300	0.300
Kinetic blank limit	-	-
Linearity limit	1300	1300
Substrate depletion	-	-

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