MEDTEST DX
A MEDTEST COMPANY

Creatinine Reagent Set

Intended Use
For the quantitative determination of creatinine in serum using the Mindray BS-480 analyzer. For *in vitro* diagnostic use only.

Clinical Significance
Creatinine assays are most frequently performed to aid in the determination of renal function.

Method History
In 1886, Jaffe[1] described a method for the determination of creatinine involving a protein free filtrate and a reaction with picric acid in alkaline solution. Although several methods have been described since then, the classic Jaffe reaction is still the most widely used. The Jaffe reaction is subject to interferences by a number of substances, including protein and glucose.[2,3,4] Modifications of the procedure have been developed to combat the drawbacks.[5] The kinetic procedures[6] have become popular because they are fast, simple and avoid interference. The present method is based on a modification of the above procedure, incorporating a surfactant and other ingredients to minimize protein and carbohydrate interferences.

Principle

$$\text{Creatinine} + \text{Sodium Picrate} \xrightarrow{\text{Alkali}} \text{Creatinine-picrate complex}$$

(yellow-orange)

Creatinine reacts with picric acid in alkaline conditions to form a color complex that absorbs at 510 nm. The rate of formation of color is proportional to the creatinine in the sample.

Reagents
Creatinine R1 Reagent: Alkaline Buffer, Creatinine R2 Reagent: Picric Acid 40mM, Surfactant

Reagent Preparation
Reagents are ready to use.

Reagent Storage and Stability
Both reagents are stored at room temperature. (15-30˚C) The reagents are stable until the expiration date appearing on the label when stored as directed. Manufacturer studies have shown reagent is stable for 7 days once placed in the refrigerated reagent carousel (2-10°C), however reagent stability may vary based on individual laboratory conditions.

Reagent Deterioration
Do not use if:
1. The reagent is cloudy (contaminated).
2. The reagent fails to achieve assigned values on fresh control sera.

Precautions and Hazards
1. This reagent is for *in vitro* diagnostic use only.
2. Picric Acid is a strong oxidizing agent. Avoid contact with skin. WIPE ANY SPILLAGE, SINCE EVAPORATED PICRIC ACID IS EXPLOSIVE.
3. All specimens and controls should be handled in accordance with good laboratory practices using appropriate precautions as described in the CDC/NIH Manual, "Biosafety in Microbiological and Biomedical Laboratories", 2nd Ed. 1988, HHS Publication No. (CDC) 88-8395.

Hazards:

Signal Word: Danger

R1: Hazard Classifications: Skin corrosion/irritation (Category 1), Serious eye damage/eye irritation (Category 1)
Hazard Statements: H314: Causes severe skin burns and eye damage, H318: Causes serious eye damage
Precautionary Statements: **Prevention:** P260 Do not breathe dust/fume/gas/mist/vapors/spray. P264 Wash skin thoroughly after handling. P280 Wear protective gloves/protective clothing/eye protection/face protection. **Response:** P310 Immediately call a POISON CENTER or doctor/physician. P363 Wash contaminated clothing before reuse. P301 + P330 + P331 IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. P303 + P361 + P353 IF ON SKIN (or hair): Remove/Take off Immediately all contaminated clothing. Rinse SKIN with water/shower. P304 + P340 IF INHALED: Remove victim to fresh air and Keep at rest in a position comfortable for breathing. P305 + P351 + P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. **Storage:** P404: Store in a closed container. **Disposal:** P501: Dispose of contents into sewer system after diluting with large volumes of water, if in accordance with local regulations.

Signal Word: Danger

R2: Hazard Classifications: Skin corrosion/irritation (Category 1), Serious eye damage/eye irritation (Category 1), Sensitization, skin (Category 1)
Hazard Statements: H314: Causes severe skin burns and eye damage, H317: May cause an allergic skin reaction, H318: Causes serious eye damage.
Precautionary Statements: **Prevention:** P260 Do not breathe dust/fume/gas/mist/vapors/spray. P264 Wash skin thoroughly after handling. P272 Contaminated work clothing should not be allowed out of the workplace. P280 Wear protective gloves/protective clothing/eye protection/face protection. **Response:** P310 Immediately call a POISON CENTER or doctor/physician. P363 Wash contaminated clothing before reuse. P301 + P330 + P331 IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. P302 + P352 IF ON SKIN: wash with plenty of soap and water. P303 + P361 + P353 IF ON SKIN (or hair): Remove/Take off Immediately all contaminated clothing. Rinse SKIN with water/shower. P304 + P340 IF INHALED: Remove victim to fresh air and Keep at rest in a position comfortable for breathing. P305 + P351 + P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. P333 + P313 IF SKIN irritation or rash occurs: Get medical advice/attention. **Storage:** P404: Store in a closed container. **Disposal:** P501: Dispose of contents into sewer system after diluting with large volumes of water, if in accordance with local regulations. **Refer to the Safety Data Sheet for this product (SDS-CRE600) available at www.medtestdx.com.**

Specimen Collection and Storage
1. Serum is recommended.
2. Creatinine in serum is stable for twenty-four hours at refrigerated temperatures (2-8°C) and for several months when frozen (-20°C) and protected from evaporation and contamination.

3. 24-hour urine specimens must be preserved with 15 grams of boric acid.
4. Specimen collection should be carried out in accordance with NCCLS M29-T2.[7] No method can offer complete assurance that human blood samples will not transmit infection. Therefore, all blood samples should be considered potentially infectious.

Interferences

1. A number of substances affect the accuracy of creatinine. See Young, et al.[8]
2. The method is not influenced (< 10%) by hemoglobin values up to 500mg/dl, bilirubin levels up to 20mg/dl and lipemia / Triglycerides (Intralipid used to simulate) to 1000mg/dl. The studies were performed on the Hitachi 717™ analyzer following a modification of the guidelines contained in NCCLS document EP7-P.[9]

Materials Provided

Creatinine R1 Reagent, Creatinine R2 Reagent

Materials Required but not Provided

1. Mindray BS-480 Analyzer.
2. BS-480 Operation manual.
3. Chemistry Calibrator, catalog number CHEC480
4. Chemistry control, catalog number CHEQ480

Limitations

Samples with values above 25 mg/dl should be diluted 1:1, re-assayed and results multiplied by two.

Calibration

Use an NIST-traceable serum calibrator. The procedure should be calibrated according to the instrument manufacturer's calibration instructions. If control results are found to be out of range, the test may need to be re-calibrated. Under typical operating conditions, manufacturer calibration stability studies have shown the calibration curve will be stable for at least 3 days.

Quality Control

The integrity of the reaction should be monitored by use of normal and abnormal control sera with known creatinine values. These controls should be run at least with every working shift in which creatinine assays are performed. It is recommended that each laboratory establish its own frequency of control determination. Quality control requirements should be performed in conformance with local, state, and/or Federal regulations or accreditation requirements.

Expected Values

0.40 – 1.40 mg/dl
It is highly recommended that each laboratory establish its own reference range.

Performance

1. Assay Range: 0.1 - 25.0 mg/dL
2. Correlation: A study was performed between the Mindray BS-480 and a similar analyzer using this method, resulting in the following:

Method	Creatinine
N	117
Mean Creatinine (mg/dL)	2.542
Range (mg/dL)	0.37-19.49
Standard Deviation	3.733
Regression Analysis	y = 0.979x – 0.082
Correlation Coefficient	0.9914

3. Precision: Precision studies were performed using the Mindray BS-480 analyzer following a modification of the guidelines which are contained in NCCLS document EP5-T2.[10]

Within Day

Sample	LOW	MID	HIGH
N	20	20	20
Mean	1.055	4.905	23.124
Standard Deviation	0.50	0.102	0.111
Coefficient of Variation (%)	4.8%	2.1%	0.5%

Total

Sample	LOW	MID	HIGH
N	40	40	40
Mean	1.242	4.852	23.499
Standard Deviation	0.048	0.287	0.697
Coefficient of Variation (%)	3.9%	5.9%	3.0%

4. Sensitivity**:** 2SD limit of detection (95% Conf) = 0.04 mg/dL

References

1. Jaffe, M., Z. Physiol. Chem. 10:391 (1886).
2. DiGiorgio, J., Clinical Chemistry: Principles and Technics, 2nd Ed., Edited by Henry, R.J., et al, Hagerstown (MD), Harper & Row, pp. 541-553 (1974).
3. Cook, J.G.H., Ann. Clin. Biochem. 12:219 (1975).
4. Taussky, H.H., Standard Methods of Clinical Chemistry, Vol. 3, New York Academic Press, p. 99 (1966).
5. Heinegard, D., Tiderstom, G., Clin. Chem. Acta, 43:305 (1973).
6. Fabiny, D.L., Ertingshausen, G., Clin. Chem. 17:391 (1971).
7. NCCLS document "Protection of Laboratory Workers form Infectious Disease Transmitted by Blood, Body Fluids, and Tissue", 2nd Ed. (1991).
8. Young, D.S. et al, Clin. Chem. 21:1D (1975).
9. NCCLS document "Interference testing in Clinical Chemistry", 2nd Ed. (1992).
10. NCCLS document "Evaluation of Precision Performance of Clinical Chemistry Devices", 2nd Ed., (1992).

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CHEMISTRY PARAMETERS

Chem:	CRET	No.:	212	Sample Type:	Serum
Chemistry:	Creatinine			Print Name:	CRET
Reaction Type:	Fixed Time			Reaction Direction:	Positive
Pri Wave:	505			Sec Wave:	570
Unit:	mg/dL			Decimal	0.01
Blank Time:	47 49			Reaction Time:	55 63

	Sample Vol.	Aspirated	Diluent	Reagent Vol.	Diluent
Standard:	7.2 ul	--- ul	--- ul	R1: 120 ul	--- ul
Decreased:	--- ul	--- ul	--- ul	R2: 24 ul	-- ul
Increased:	--- ul	--- ul	--- ul	R3: --- ul	-- ul
	☐ Sample Blank	☑ Auto Rerun		R4: --- ul	--- ul

Slope/Offset Adjustment

Slope: 1 Offset: 0

Linearity Range (Standard)	0.1	25	Linearity Limit:	
Linearity Range (Decreased)	____	____	Substrate Depletion:	
Linearity Range (Increased)	____	____	Mixed Blank Abs:	
R1 Blank Abs:	____	____	Uncapping Time	
Blank Response:	____	____	Reagent Alarm Limit:	
Twin Chemistry:			☐ Enzyme Linear Extension	

☐ Prozone Check ○ Rate Check ○ Antigen Addition

Q1: Q2: Q3: Q4:

PC: ABS:

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CALIBRATION PARAMETERS

Calibrator Definition

Calibrator:	*	Lot No.:	*
Exp Date:	*		

Carousel	**Pos**
Sample Carousel 1	*
Sample Carousel 2	
Sample Carousel 3	

Reagent/Calibration

Calibrator	Pos	Lot No	Exp Date	Chem	Conc	Unit
Water	W	*	*	CRET	0	mg/dL
Chemistry Calibrator	*	*	*	CRET	*	mg/dL

Calibration Setup

Chem: CRET

Calibration Settings

Math Model:	Two-Point Linear		
Factor:		Replicates:	2

Acceptance Limits

Cal Time:	*	Hour	
Slope Diff:	---	SD:	---
Sensitivity :	---	Repeatability:	---
Deter Coeff:	---		

Auto Calib.

☐ Bottle Changed ☐ Lot Changed ☐ Cal Time

It is recommended that two levels of control material be assayed daily.
* Indicates user defined parameter.

REF CRE480

Manufactured for MedTest DX
5449 Research Drive Canton, MI 48188

IVD

Symbol Key

Use by (YYYY-MM-DD)	LOT Lot and batch code	REF Catalog number	Manufacturer
Temperature limitation	Consult instructions for use	IVD *In vitro* diagnostic medical device	