

# PCT iClia

## Chemiluminescence microparticle immunoassay for Quantitative measurement of Procalcitonin in Human Serum/Plasma

PROBLEM	POSSIBLE CAUSE	SOLUTION
2) High PCT test results	c) Reagents deterioration to improper storage or used after expiry.	Use reagents within 30 days once opened and Check storage temp. It should be 2-8°C.
	d) Magnetic microsphere are not properly mixed before loading in the analyzer.	Ensure proper mixing of bottle containing microparticles by gentle shaking/ inversion before use.
	a) Use of turbid, lipaemic or hemolyzed sample.	Use clear fresh sample. Refer test specimen collection, handling and processing for more details.
	b) Sample position is wrongly defined while loading the sample details in analyzer.	check the sample position and run the test meticulously.
3) Low PCT test results	c) Magnetic microsphere are not properly mixed before loading in the analyzer.	Ensure proper mixing of bottle containing microparticles by gentle shaking/ inversion before use.
	d) Wrong Sample identification	Make sample I.D. at the time of sample Collection.
	a) Sample deterioration due to improper Storage or microbially contaminated sample.	Use clear fresh sample immediately after collection. Refer Specimen collection, and handling processing for more details.
	b) Sample position is wrongly defined while loading the sample details in analyzer.	check the sample position and run the test meticulously.
	c) Magnetic microsphere are not properly mixed before loading in the analyzer.	Ensure proper mixing of bottle containing microparticles by gentle shaking/ inversion before use.
	d) Wrong sample identification.	Mark the sample I.D. at the time of sample collection.

### 1. INTRODUCTION

Procalcitonin (PCT) the precursor of the hormone calcitonin, is a 116 amino acid protein with a molecular mass of 13 kDa, encoded by CALC1 gene.

Under normal conditions all the PCT are formed in thyroid C cells and converted to calcitonin so that no PCT is released into circulation therefore the level of procalcitonin in the blood of healthy individuals is low (<0.05 ng/ml). But during inflammation, PCT is not converted in calcitonin and produced from cells by two mechanism; direct pathway induced by bacterial lipopolysaccharide and indirect pathway induced by inflammatory mediators like IL-6, TNF-a, etc. So, the risk of systemic bacterial infection occurs when the value of procalcitonin exceeds 0.5 ng/ml.

Procalcitonin levels increase from 3 to 4 hours, peak at about 6 hours and then plateau for up to 24 hours.

### 2. INTENDED USE

PCT iClia kit is intended for the in vitro quantitative measurement of Procalcitonin (PCT) in human serum/plasma as an aid in the diagnosis of bacterial infectious disease in conjunction with other laboratory and clinical findings. The assay kit is intended for in-vitro diagnostic use. This kit is only operational in conjunction with J.Mitra CLIA Analyzer.

### 3. PRINCIPLE

PCT iClia Diagnostic Kit is a sandwich immunoassay using microparticle acridinium ester-labeled chemiluminescent technology.

In the first step, anti-PCT labeled magnetic microparticle, human serum, diluent and an anti-PCT labeled acridinium ester (AE Conjugate) are mixed and incubated in an assay tube, which allows patient specific PCT to bind to microparticle. After sample matrix is removed by washing, the Microparticle-anti-PCT antibody/antigen/antibody immune complex is kept with the help of a magnetic separator. Excess acridinium ester conjugate is removed by washing and finally the bound enzyme is detected by addition of chemiluminescent substrate.

The relative light unit (RLU) intensity is proportional to the amount of PCT. According to the PCT RLU-concentration standard curve, the RLU tested can be interpreted to PCT concentration in the sample expressed as ng/mL.

### 4. DESCRIPTION OF SYMBOLS USED

The following are graphical symbols used in or found on J. Mitra diagnostic products and their packing. These symbols are the most common ones appearing on medical devices and their packing. They are explained in more detail in European Standard EN ISO 15223-1:2021.

	Manufactured By		In vitro diagnostic medical device
	No. of tests		Instruction for use
	Lot Number Batch Number		Temperature Limitation
	Manufacturing Date		Caution, see instruction for use
	Expiry Date		Catalogue Number
	Keep away from sunlight		Do not use if package is damaged
	Contains biological Material of Human Origin		Contains biological Material of Animal Origin
	Country of Manufacture		Keep Dry

### 5. KIT PRESENTATION

- 50 Tests
- 100 Tests

### 6. KIT & ITS COMPONENTS

COMPONENT	DESCRIPTION
<b>Microparticle Buffer (RA)</b>	Magnetic Microspheres coated with anti-PCT antibodies with preservatives.
<b>Diluent (RB)</b>	Tris buffer with preservative.

<b>AE Conjugate (RD)</b>	Anti-PCT antibodies linked to acridinium ester with Protein stabilizers.
<b>Calibrator-1 (C0)</b>	Low concentration of PCT in human serum containing preservatives.
<b>Calibrator-2 (C1)</b>	High concentration of PCT in human serum containing preservatives.
<b>Control-1 (Q1)</b>	Low concentration of PCT in human serum containing preservatives.
<b>Control-2 (Q2)</b>	High concentration of PCT in human serum containing preservatives.
<b>Reagent Plugs</b>	Silicon caps to cover the opened reagents.

### 7. STORAGE AND STABILITY

The kit should be stored at 2-8°C in the cool and driest area available. Expiry date on the kit indicates the date beyond which kit and its components should not be used. **Once the kit is opened, onboard stability of reagents, calibrator and control is 30 days at 2-8°C.**

### 8. ADDITIONAL MATERIAL AND INSTRUMENTS REQUIRED

- **Pre-Trigger Solution:** Hydrogen peroxide solution.
- **Trigger Solution:** Sodium hydroxide solution.
- **Wash Buffer:** Phosphate buffered saline solution with surfactant.
- **Assay Cup**
- **J. Mitra CLIA Analyzer**

All materials and analyzer to be used for running the PCT iClia shall be from J. Mitra & Co. Pvt. Ltd.

### 9. SPECIMEN COLLECTION & HANDLING

1. Only human serum or plasma samples should be used for the test.
2. For serum collection use serum vacutainer. While preparing serum samples, remove the serum from the clot as soon as possible to avoid hemolysis. Fresh serum/plasma samples are preferred.
3. For plasma collection: use Dipotassium EDTA, Tripotassium EDTA, Sodium heparin and lithium heparin gel vacutainer.
4. Specimens should be free of microbial contamination and may be stored at 2-8°C for one week, or frozen at -20°C or lower. Avoid repeated freezing and thawing.
5. Do not use heat inactivated samples as their use may give false results. Hemolyzed and Icteric hyperlipemic samples may give erroneous results.
6. Serum specimens from patients receiving anticoagulant or thrombolytic therapy may contain fibrin due to incomplete clot formation.
7. Always use clear specimens. Centrifuge viscous/ thick or turbid specimen at 10,000 RPM for 15 minutes or 5,000 RPM for 30 minutes prior to use to avoid inconsistent result.
8. Use of disposable pipettes or pipette tips is recommended to prevent cross contamination.

### 10. SPECIMEN PROCESSING

#### (A) FROZEN SAMPLE

PCT iClia test is best used with fresh plasma samples that have not been frozen and thawed. However most frozen samples will perform well if the procedure suggested below is followed.

Allow the frozen sample to thaw in a vertical position in the rack. Do not shake the sample. This allows particles to settle to the bottom. Centrifuge the sample at 10,000 rpm for 15 minutes or 5,000 rpm for 30 minutes.

#### (B) TRANSPORTATION

If the specimen is to be transported, it should be packed in compliance with the current Government regulations regarding transport of aetiologic agents.

in vitro diagnostic Reagent, not for medicinal use

#### J. MITRA & CO. PVT. LTD.

A 180-181, Okhla Indl. Area, Phase-1, New Delhi-110 020, INDIA  
Ph: +91-11-47130300, 47130500

e-mail: jmitra@jmitra.co.in Internet: www.jmitra.co.in

## 11. WARNING & PRECAUTION

**CAUTION:** THIS KIT CONTAINS MATERIALS OF HUMAN ORIGIN. NO TEST METHOD CAN OFFER COMPLETE ASSURANCE THAT HUMAN BLOOD PRODUCTS WILL NOT TRANSMIT INFECTION. NEGATIVE CONTROL, POSITIVE CONTROL & ALL THE SAMPLES TO BE TESTED SHOULD BE HANDLED AS THOUGH CAPABLE OF TRANSMITTING INFECTION.

1. The use of disposable gloves and proper biohazardous clothing is STRONGLY RECOMMENDED while running the test.
2. In case there is a cut or wound in hand, DO NOT PERFORM THE TEST.
3. Do not smoke, drink or eat in areas where specimens or kit reagents are being handled.
4. Tests are for in vitro diagnostic use only and should be run by competent person only.
5. Do not pipette by mouth.
6. All materials used in the assay and samples should be decontaminated in 5% sodium hypochlorite solution for 30-60 min. before disposal or by autoclaving at 121°C at 15psi for 60 minutes. Do not autoclave materials or solution containing sodium hypochlorite. They should be disposed off in accordance with established safety procedures.
7. Wash hands thoroughly with soap or any suitable detergent, after the use of the kit. Consult a physician immediately in case of accident or contact with eyes, in the event that contaminated material are ingested or come in contact with skin puncture or wounds.
8. Spills should be decontaminated promptly with Sodium Hypochlorite or any other suitable disinfectant.

## 12. PRECAUTIONS FOR USE & REAGENT HANDLING

1. Do not use kit components beyond the expiration date which is printed on the kit.
2. Store the reagents & samples at 2-8°C.
3. Do not pool reagents from within a batch or between different batches, as they are optimised for individual batch to give best results.
4. Before loading the reagent kit in the clia analyzer for the first time, ensure proper mixing of microparticle bottle to resuspend microparticles that may have settled during transport or storage.
5. Once reagents are opened, reagent plug must be used to prevent reagent evaporation and contamination and to ensure reagent integrity. Reliability of assay results cannot be guaranteed if reagent plugs are not used according to the instructions given.
6. Mark the test specimen with patient's name or identification number. Improper identification may lead to wrong result reporting.
7. To avoid contamination, wear clean gloves when placing a reagent plug on an uncapped reagent bottle.
8. Once a reagent plug has been placed on an open reagent bottle, do not invert the bottle as this will result in reagent leakage and may compromise assay results.
9. Reagents may be stored on or off the Chemiluminescence immunoassay analyzer. If reagents are removed from the analyzer, store them at 2-8°C (with Reagent plugs) in an upright position. For reagents stored off the system, it is recommended that they should be stored in their original trays and boxes to ensure they remain upright. If the microparticle bottle does not remain upright (with a Reagent plugs placed) while in refrigerated storage off the system, the reagent kit must be discarded.
10. Run control-1 & control-2 in each assay to evaluate validity of the kit.
11. Distilled or deionised water must be used for wash buffer preparation.
12. Avoid strong light exposure during the assay.
13. In case of any doubt the run should be repeated.

## 13. TEST PROCEDURE

### Assay Procedure

1. Refer to the Clia Analyzer user manual for detailed information on preparing the analyzer.

2. Before loading the PCT iClia reagent tray on the analyzer for the first time, mix contents of the microparticle buffer bottle to resuspend microparticles that may have settled during transportation/ storage. Once the microparticles have been loaded, no further mixing is required.

**Important Note: Swirl the microparticle (RA) bottle 30 times. Visually inspect the bottle to ensure microspheres are resuspended. If microspheres are still adhered to the bottle, continue to Swirl the bottle until the microspheres have been completely resuspended. If the microspheres do not resuspend, DO NOT USE. Once the microspheres have been resuspended, remove the cap and place the reagent plug on the bottle to make it ready to use. Remove the cap of (RA), (RB) and (RD) bottles and place the reagent plugs before use as follow:**

**(RA) & (RB) : Natural color plug**

**(RD) : Brown color plug**

3. Load the PCT iClia reagent kit on the Chemiluminescence immunoassay analyzer.
4. Verify that all necessary reagents are available in the reagent tray.
5. Ensure that adequate sample volume (not less than 250 µL) is present in sample tube prior to running the test.
6. Sample volume required for each additional test from same sample tube is 20 µl.
7. Ensure sample positions are properly defined at the time of loading in the analyzer.
8. The PCT test-specific parameters are stored in barcode placed on the reagent tray and read through barcode reader. In cases, the barcode cannot be read, contact customer support at: 011-47130300, 500 or write us at: jmitra@jmitra.co.in.
9. Mix PCT iClia calibrators and controls by gentle inversion before use. Open the cap and place the calibrator-1, calibrator-2, control-1 and control-2 vials into each respective sample positions. Read the barcode for calibrator and controls provided with the kit.
10. Press Run. The test result for first sample will be obtained at 20 minutes.
11. The Chemiluminescence immunoassay analyzer performs all the functions automatically and calculates the results.

### Calibration

1. Every PCT iClia kit has a two-dimension code label containing the predefined master curve of the particular reagent lot.
2. Test both the Calibrators in triplicate. Both PCT Control-1 and PCT Control-2 must be tested in each run to evaluate the assay calibration. Ensure that controls values are within the validity range specified in bar code of both the controls.
3. Once calibration is accepted (within range) and stored, all subsequent samples may be tested without further calibration unless:
4. Recalibrate the analyzer in following conditions:
  - a) After each exchange/use of new lot (Test reagent and pritrigger/ Trigger solution/wash buffer).
  - b) Every week and/or at the time of any component to be changed.
  - c) Controls are out of validation range.
  - d) Required by pertinent regulations.
  - e) After specified service procedures have been performed or maintenance to critical part or subsystems that might influence the performance of the PCT iClia.
5. Calibration range of PCT iClia is 0.02 ng/ml to 100 ng/ml.

### RESULT CALCULATION:

The analyzer automatically calculates the concentration of each sample. The results are given in ng/ml.

### Result Interpretation

If sample concentration is lower than the lower limit of the linear range, report the result <0.02 ng/ml, while > 100.00 ng/ml when it is higher than the upper limit of linear range. Sample with concentration higher than linear range can be further diluted 1:5 or 1:10 with Sample diluent.

For the calculation of the concentration, this dilution factor has to be taken into account.

### Determination of Reference Interval

Each laboratory should establish its own range of normal value. The values given below are only indicative:-

- PCT values below 0.1 ng/ml are considered as normal.
- Values between 0.1 ng/ml to 0.5 ng/ml are considered as of local infection.
- Values between 0.5 ng/ml to 2 ng/ml are considered as of sepsis.
- Values between 2 ng/ml to 10 ng/ml are considered as of severe sepsis.
- Values above 10 ng/ml are considered as of septic shock.

## 14. PERFORMANCE CHARACTERISTICS

- Assay results obtained in individual laboratories may vary from data presented in this product insert.

### Limit of Blank (LoB)

- The Limit of Blank was determined in accordance with the CLSI (Clinical and Laboratory Standards Institute) EP17-A requirements.

- The Limit of Blank is the 95th percentile value from n >20 measurements of analyte free samples over several independent series. The Limit of Blank corresponds to the concentration below which analyte-free samples are found with a probability of 95%.

- The observed LoB value was <0.02ng/mL.

**Accuracy:** The accuracy of PCT iClia was detected with 60 clinical specimens and compared with Roche CLIA. The co-relation co-efficient is >0.990.

### Precision

#### Intra Assay Variation

Within run variation was determined by 10 replicate measurements of two different PCT control sera( Low) and (High) in one assay in 3 different lots. The within assay variability is <10%.

#### Inter Assay Variation

Between run variation was determined by 10 replicate measurements in 10 sequential days of two different control sera( Low ) and (High)in 3 different lots.The between assay variability is <1.0%.

Intra-Assay, n=10			Inter-Assay, n=10×2		
Control	Mean (ng/ml)	CV	Control	Mean (ng/ml)	CV
1	0.54	5.11%	1	0.53	6.44%
2	45.89	4.80%	2	46.05	8.05%

### Inter machine(CLIA Analyzer) Variation

Between machine variation was determined by 3 replicate measurements of two different PCT control sera( Low ) and (High)in 3 different lots in 3 different CLIA Analyzer. The between machine variability is <10.0 %.

### Linearity

The linearity was determined in accordance with the CLSI (Clinical and Laboratory Standards Institute) EP6-A requirements.

The linearity range was verified by more than 6 concentration levels which encompass or be equal to the minimum and the maximum values of linearity range and duplicate assays in triplicate in single run for each lot at all 6 levels.

The PCT iClia kit has been demonstrated to be linear from is 0.02 ng/mL to 100 ng/ml, regression (R<sup>2</sup>) of more than >0.990.

### Cross-Reactivity

A study was performed based on guidance from CLSI EP7-A2.

The cross-reactants listed below (Using PCT-free samples) were evaluated to determine whether PCT concentrations were affected when using the PCT iClia kit.

Cross-Reactant	Cross-Reactant Concentration	Results
Katacalcin	25 ng/ml	< 0.2 ng/ml
a-CGRP	30 ng/ml	< 0.2 ng/ml
b-CGRP	30 ng/ml	< 0.2 ng/ml
Parathyroid Hormone	10 ng/ml	< 0.2 ng/ml

### Interference

A study was performed based on guidance from CLSI EP7-A2.

Potentially interfering substances were evaluated to determine whether PCT concentrations were affected when using the PCT iClia kit. Samples containing the potential interferents were prepared at two PCT concentrations. The samples were assayed, and the PCT concentrations of the spiked samples were compared to the reference samples.

Potential Interferent	Interferent Concentration	% Interferent Bias
Bilirubin	20 mg/dL	<10%
Hb	500 mg/dL	<10%
Intralipid	1000 mg/dL	<10%
Total protein	10 g/dL	<10%
RF	1000IU/mL	< 10%
ANA	400AU/mL	< 10%
HAMA	600 ng/mL	<10%

## 15. LIMITATION OF THE TEST

- The PCT iClia should be used for detection of procalcitonin in serum or plasma only and not in other body fluids.

- Results should be used in conjunction with other data; e.g., symptoms, results of other tests, and clinical impressions, If the PCT results are inconsistent with clinical evidence, additional testing is recommended.

- Clinical diagnosis should not be made on the findings of a single test result, but should be integrated with all clinical and laboratory findings.

- Samples of lipid, hemolysis or jaundice may result in incorrect results.

## 16. LIMITED EXPRESSED WARRANTY DISCLAIMER

The manufacturer limits the warranty to the test kit, as much as that the test kit will function as an in-vitro diagnostic assay within the limitations and specifications as described in the product instruction for use, when used strictly in accordance with the instructions contained therein. The manufacturer disclaims any warranty expressed or implied including such expressed or implied warranty with respect to merchantability, fitness for use or implied utility for any purpose. The manufacturer's liability is limited to either replacement of the product or refund of the purchase price of the product and in no case liable to for claim of any kind for an amount greater than the purchase price of the goods in respect of which damages are likely to be claimed.

The manufacturer shall not be liable to the purchaser or third parties for any injury, damage or economic loss, howsoever caused by the product in the use or in the application thereof.

## 17. REFERENCES

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## 18. TROUBLE SHOOTING CHART

PROBLEM	POSSIBLE CAUSE	SOLUTION
1. Controls out of validation limit	a) Controls/ Calibrator deterioration due to improper storage or used after expiry.	Ensure calibration is done after 15 days and use controls/ Calibrator within 30 days once opened and check storage temp. It should be 2-8°C.
	b) Cross contamination of Controls	Pipette carefully and do not interchange caps.