BECKMAN COULTER CE

**SYNCHRON System(s)**

# Chemistry Information Sheet



**CHOL**

**Cholesterol**

REF 467825

**For *In Vitro* Diagnostic Use**

**Rx Only**

**ANNUAL REVIEW**

| Reviewed by | Date | Reviewed by | Date |
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## PRINCIPLE

### INTENDED USE

CHOL reagent, when used in conjunction with UniCel DxC 600/800 System(s) and Synchron Systems Multi Calibrator, is intended for quantitative determination of cholesterol concentration in human serum or plasma.

### CLINICAL SIGNIFICANCE

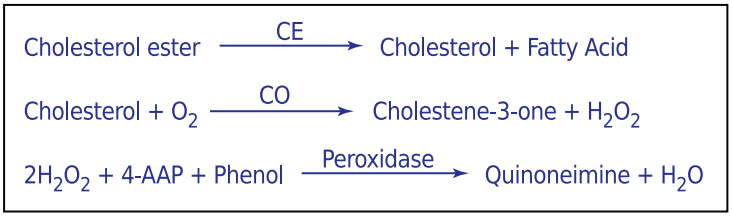
Cholesterol measurements are used in the diagnosis and treatment of atherosclerotic coronary artery disease. Cholesterol measurements are also used in the diagnosis of metabolic disorders involving lipids and lipoproteins. Total serum cholesterol concentrations depend on many factors including age, gender, diet, physical activity, liver disease, and other metabolic disorders.

### METHODOLOGY

CHOL reagent is used to measure cholesterol concentration by a timed-endpoint method.[1,2,3] In the reaction, cholesterol esterase (CE) hydrolyzes cholesterol esters to free cholesterol and fatty acids. Free cholesterol is oxidized to cholestene-3-one and hydrogen peroxide by cholesterol oxidase (CO). Peroxidase catalyzes the reaction of hydrogen peroxide with 4-aminoantipyrine (4-AAP) and phenol to produce a colored quinoneimine product.

The SYNCHRON System(s) automatically proportions the appropriate sample and reagent volumes into the cuvette. The ratio used is one part sample to 100 parts reagent. The system monitors the change in absorbance at 520 nanometers. This change in absorbance is directly proportional to the concentration of CHOL in the sample and is used by the System to calculate and express CHOL concentration.

### CHEMICAL REACTION SCHEME

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## SPECIMEN

### TYPE OF SPECIMEN

Biological fluid samples should be collected in the same manner routinely used for any laboratory test.[4] Freshly drawn serum or plasma are the preferred specimens. Acceptable anticoagulants are listed in the PROCEDURAL NOTES section of this chemistry information sheet. Whole blood or urine are not recommended for use as a sample.

### SPECIMEN STORAGE AND STABILITY

1. Tubes of blood are to be kept closed at all times and in a vertical position. It is recommended that the serum or plasma be physically separated from contact with cells within two hours from the time of collection.[5]
2. Separated serum or plasma should not remain at room temperature longer than 8 hours. If assays are not completed within 8 hours, serum or plasma should be stored at +2°C to +8°C. If assays are not completed within 48 hours, or the separated sample is to be stored beyond 48 hours, samples should be frozen at -15°C to -20°C. Frozen samples should be thawed only once. Analyte deterioration may occur in samples that are repeatedly frozen and thawed.[5] Sample that are visually lipemic and contain high Triglycerides, when frozen and thawed may exhibit a low Total Cholesterol result.

**Additional specimen storage and stability conditions as designated by this laboratory:**

### SAMPLE VOLUME

The optimum volume, when using a 0.5 mL sample cup, is 0.3 mL of sample. For optimum primary sample tube volumes and minimum volumes, refer to the Primary Tube Sample Template for your system.

### CRITERIA FOR UNACCEPTABLE SPECIMENS

Refer to the PROCEDURAL NOTES section of this chemistry information sheet for information on unacceptable specimens.

**Criteria for sample rejection as designated by this laboratory:**

### PATIENT PREPARATION

**Special instructions for patient preparation as designated by this laboratory:**

### SPECIMEN HANDLING

**Special instructions for specimen handling as designated by this laboratory:**

## REAGENTS

### CONTENTS

Each kit contains the following items:

Two CHOL Reagent Cartridges (2 x 300 tests)

### VOLUMES PER TEST

| | |
|---|---|
| Sample Volume | 3 µL |
| ORDAC Sample Volume | 2 µL |
| Total Reagent Volume | 300 µL |
| Cartridge Volumes | |
| A | 290 µL |
| B | – – |
| C | 10 µL |

### REACTIVE INGREDIENTS

### REAGENT CONSTITUENTS

| | |
|---|---|
| 4-Aminoantipyrine | 0.28 mmol/L |
| Phenol | 8.06 mmol/L |
| Cholesterol esterase (Candida Cylindracea) | 211 IU/L |
| Cholesterol oxidase (Brevibacterium Maris) | 216 IU/L |
| Peroxidase (horseradish) | 6,667 IU/L |

Also non-reactive chemicals necessary for optimal system performance.

### GHS HAZARD CLASSIFICATION

Not classified as hazardous

| | |
|---|---|
| SDS | Safety Data Sheet is available at techdocs.beckmancoulter.com |

### MATERIALS NEEDED BUT NOT SUPPLIED WITH REAGENT KIT

Synchron Systems Multi Calibrator
At least two levels of control material
Saline

### REAGENT PREPARATION

No preparation is required.

### ACCEPTABLE REAGENT PERFORMANCE

The acceptability of a reagent is determined by successful calibration and by ensuring that quality control results are within your facility's acceptance criteria.

### REAGENT STORAGE AND STABILITY

CHOL reagent when stored unopened at +2°C to +8°C will obtain the shelf-life indicated on the cartridge label. Once opened, the reagent is stable for 30 days at +2°C to +8°C unless the expiration date is exceeded. DO NOT FREEZE.

**Reagent storage location:**

## CALIBRATION

### CALIBRATOR REQUIRED

Synchron Systems Multi Calibrator

### CALIBRATOR PREPARATION

No preparation is required.

### CALIBRATOR STORAGE AND STABILITY

If unopened, the Synchron Systems Multi Calibrator should be stored at -15°C to -20°C until the expiration date printed on the calibrator bottle. Opened calibrators that are resealed and stored at +2°C to +8°C are stable for 20 days unless the expiration date is exceeded.

> ⚠ **CAUTION**
>
> **Because this product is of human origin, it should be handled as though capable of transmitting infectious diseases. Each serum or plasma donor unit used in the preparation of this material was tested by United States Food and Drug Administration (FDA) approved methods and found to be negative for antibodies to HIV and HCV and nonreactive for HbsAg. Because no test method can offer complete assurance that HIV, hepatitis B virus, and hepatitis C virus or other infectious agents are absent, this material should be handled as though capable of transmitting infectious diseases. This product may also contain other human source material for which there is no approved test. The FDA recommends such samples to be handled as specified in Centers for Disease Control's Biosafety Level 2 guidelines.[6]**

**Calibrator storage location:**

### CALIBRATION INFORMATION

1. The system must have valid calibration factors in memory before controls or patient samples can be run.
2. Under typical operating conditions the CHOL reagent cartridge must be calibrated every 14 days and also with certain parts replacements or maintenance procedures, as defined in the UniCel DxC 600/800 System *Instructions For Use* (IFU) manual. This assay has within-lot calibration available. Refer to the UniCel DxC 600/800 System *Instructions For Use* (IFU) manual for information on this feature.
3. For detailed calibration instructions, refer to the UniCel DxC 600/800 System *Instructions For Use* (IFU) manual.
4. The system will automatically perform checks on the calibration and produce data at the end of calibration. In the event of a failed calibration, the data will be printed with error codes and the system will alert the operator of the failure. For information on error codes, refer to the UniCel DxC 600/800 System *Instructions For Use* (IFU) manual.

### TRACEABILITY

For Traceability information refer to the Calibrator instructions for use.

## QUALITY CONTROL

At least two levels of control material should be analyzed daily. In addition, these controls should be run with each new calibration, with each new reagent cartridge and after specific maintenance or troubleshooting procedures as detailed

in the appropriate system manual. More frequent use of controls or the use of additional controls is left to the discretion of the user based on good laboratory practices or laboratory accreditation requirements and applicable laws.

The following controls should be prepared and used in accordance with the package inserts. Discrepant quality control results should be evaluated by your facility.

**Table 1.0 Quality Control Material**

| CONTROL NAME | SAMPLE TYPE | STORAGE |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
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## TESTING PROCEDURE(S)

1. If necessary, load the reagent onto the system.
2. After reagent load is completed, calibration may be required.
3. Program samples and controls for analysis.
4. After loading samples and controls onto the system, follow the protocols for system operations.

For detailed testing procedures, refer to the UniCel DxC 600/800 System *Instructions For Use* (IFU) manual.

## CALCULATIONS

The SYNCHRON System(s) performs all calculations internally to produce the final reported result. The system will calculate the final result for sample dilutions made by the operator when the dilution factor is entered into the system during sample programming.

## REPORTING RESULTS

Equivalency between the SYNCHRON LX and UniCel DxC 600/800 Systems has been established. Chemistry results between these systems are in agreement and data from representative systems may be shown.

### REFERENCE INTERVALS

The National Cholesterol Education Program has published reference cholesterol values for cardiovascular risk to be:

**Table 2.0 Reference intervals**

| | |
|---|---|
| Less than 200 mg/dL | low risk |
| 201 – 239 mg/dL | borderline risk |
| 240 mg/dL and greater | high risk |

Refer to Reference (7) for additional reference intervals according to age and sex. Each laboratory should establish its own reference intervals based upon its patient population.

Refer to References (8,9,10) for guidelines on establishing laboratory-specific reference intervals.

**Additional reporting information as designated by this laboratory:**

# PROCEDURAL NOTES

## ANTICOAGULANT TEST RESULTS

1. If plasma is the sample of choice, the following anticoagulants were found to be compatible with this method based on a study of 20 healthy volunteers:

**Table 3.0 Acceptable Anticoagulants[a]**

| ANTICOAGULANT | LEVEL TESTED FOR IN VITRO INTERFERENCE | PLASMA-SERUM BIAS |
|---|---|---|
| Ammonium Heparin | 29 Units/mL | NSI[b] |
| Lithium Heparin | 29 Units/mL | NSI |
| Sodium Heparin | 29 Units/mL | NSI |

a Data shown was collected using SYNCHRON CX Systems. Equivalency between SYNCHRON LX Systems has been established by Deming regression analysis to SYNCHRON CX Systems.
b NSI = No Significant Interference (within ±10.0 mg/dL or 6%).

2. The following anticoagulants were found to be incompatible with this method:

**Table 4.0 Incompatible Anticoagulants[a]**

| ANTICOAGULANT | LEVEL TESTED FOR IN VITRO INTERFERENCE | PLASMA-SERUM BIAS[b] |
|---|---|---|
| EDTA | 3.0 mg/mL | ≤-24.0 |
| Sodium Citrate | 6.6 mg/mL | ≤-79.0 |
| Potassium Oxalate/Sodium Fluoride | 4.0 / 5.0 mg/mL | ≤-60.0 |

a Data shown was collected using SYNCHRON CX Systems. Equivalency between SYNCHRON LX Systems has been established by Deming regression analysis to SYNCHRON CX Systems.
b Bias is based on worst case instead of average. Plus (+) or minus (-) signs in this column signify positive or negative bias.

## LIMITATIONS

None identified

## INTERFERENCES

1. The following substances were tested for interference with this methodology:

**Table 5.0 Interferences[a]**

| SUBSTANCE | SOURCE | LEVEL TESTED | OBSERVED EFFECT[b] |
|---|---|---|---|
| Hemoglobin | RBC hemolysate | (4+) 500 mg/dL | NSI[c] |
| Bilirubin | Bovine (unconjugated) | 30 mg/dL | ≤ - 25 mg/dL @ 400 mg/dL |
| Lipemia | Intralipid[d] | (4+) 400 mg/dL | NSI |
| Ascorbic Acid | NA[e] | 3 mg/dL | NSI |
| Albumin | Human | 7.7 g/dL | ≤ - 12 mg/dL @ 240 mg/dL |
| Urea | NA | 500 mg/dL | NSI |

a Data shown was collected using SYNCHRON CX Systems. Equivalency between SYNCHRON LX Systems has been established by Deming regression analysis to SYNCHRON CX Systems.
b Plus (+) or minus (-) signs in this column signify positive or negative interference.
c NSI = No significant interference (within ± 10.0 mg/dL or 6%).
d Intralipid is a registered trademark of KabiVitrum, Inc., Clayton, NC 27250.
e NA = Not applicable.

2. Samples or control materials which contain acetic acid, detergents, or surfactants may inhibit the enzymes in the reagent and should not be used.
3. Venipuncture immediately after or during the administration of Metamizole (Dipyrone) may lead to falsely low results for CHOL. Venipuncture should be performed prior to the administration of Metamizole.
4. Refer to References (11,12,13) for other interferences caused by drugs, disease and preanalytical variables.

# PERFORMANCE CHARACTERISTICS

### ANALYTIC RANGE

The SYNCHRON System(s) method for the determination of this analyte provides the following analytical ranges:

**Table 6.0 Analytical Range**

| SAMPLE TYPE | CONVENTIONAL UNITS | S.I. UNITS |
|---|---|---|
| Serum or Plasma | 5 – 750 mg/dL | 0.13 – 19.43 mmol/L |
| Serum or Plasma (ORDAC) | 600– 1,000 mg/dL | 15.54 – 25.90 mmol/L |

Samples with concentrations exceeding the high end of the analytical range should be rerun with ORDAC enabled or diluted with saline and reanalyzed.

### REPORTABLE RANGE (AS DETERMINED ON SITE):

**Table 7.0 Reportable Range**

| SAMPLE TYPE | CONVENTIONAL UNITS | S.I. UNITS |
|---|---|---|
| | | |
| | | |
| | | |

## SENSITIVITY

Sensitivity is defined as the lowest measurable concentration which can be distinguished from zero with 95% confidence. Sensitivity for CHOL determination is 5 mg/dL (0.13 mmol/L).

## EQUIVALENCY

Equivalency was assessed by Deming regression analysis of patient samples to accepted clinical methods.

**Serum or Plasma (in the range of 39 to 723 mg/dL):**

| | |
|---|---|
| Y (SYNCHRON LX Systems) | = 0.975X + 3.94 |
| N | = 77 |
| MEAN (SYNCHRON LX Systems) | = 241.9 |
| MEAN (SYNCHRON CX7 DELTA) | = 244.0 |
| CORRELATION COEFFICIENT (r) | = 0.9997 |

Equivalency to the Abell-Kendall procedure was assessed by Deming regression of Abell-Kendall values to those obtained with the SYNCHRON LX Systems using patient samples.

**Serum or Plasma (in the range of 134 to 316 mg/dL):**

| | |
|---|---|
| Y (SYNCHRON LX Systems) | = 1.000X – 2.1 |
| N | = 39 |
| MEAN (SYNCHRON LX Systems) | = 212.0 |
| MEAN (Abell-Kendell) | = 213.9 |
| CORRELATION COEFFICIENT (r) | = 0.9961 |

The calibrator for Total Cholesterol is value-assigned by CDC-certified Lipid Laboratories using the Abell-Kendall procedure. The Total Cholesterol test on SYNCHRON Systems has been certified by the National Cholesterol Education Program (NCEP).

Refer to References (14) for guidelines on performing equivalency testing.

## PRECISION

A properly operating SYNCHRON System(s) should exhibit precision values less than or equal to the following:

**Table 8.0 Precision Values**

| TYPE OF PRECISION | SAMPLE TYPE | 1 SD | | CHANGEOVER VALUE[a] | | % CV |
|---|---|---|---|---|---|---|
| | | mg/dL | mmol/L | mg/dL | mmol/L | |
| Within-run | Serum/Plasma | 5.0 | 0.13 | 166.7 | 4.3 | 3.0 |
| | Serum/Plasma (ORDAC) | NA[b] | NA | NA | NA | 10.0 |
| Total | Serum/Plasma | 7.5 | 0.20 | 166.7 | 4.3 | 4.5 |
| | Serum/Plasma (ORDAC) | NA | NA | NA | NA | 15.0 |

a When the mean of the test precision data is less than or equal to the changeover value, compare the test SD to the SD guideline given above to determine the acceptability of the precision testing. When the mean of the test precision data is greater than the changeover value, compare the test % CV to the guideline given above to determine acceptability. Changeover value = (SD guideline/CV guideline) x 100.

b NA = Not applicable.

Refer to References (15) for guidelines on performing precision testing.

Comparative performance data for a SYNCHRON LX System evaluated using the NCCLS Proposed Guideline EP5-T2 appears in the table below.[15] Each laboratory should characterize their own instrument performance for comparison purposes.

**Table 9.0 NCCLS EP5-T2 Precision Estimate Method**

| TYPE OF IMPRECISION | SAMPLE TYPE | | No. Systems | No. Data Points[a] | Test Mean Value (mg/dL) | EP5-T2 Calculated Point Estimates | |
|---|---|---|---|---|---|---|---|
| | | | | | | SD | % CV |
| Within-run | Serum | Control 1 | 1 | 80 | 98.7 | 1.08 | 1.09 |
| | Serum | Control 2 | 1 | 80 | 155.4 | 1.65 | 1.06 |
| | Serum | Control 3 | 1 | 80 | 213.2 | 20.8 | 0.98 |
| Total | Serum | Control 1 | 1 | 80 | 98.7 | 1.46 | 1.48 |
| | Serum | Control 2 | 1 | 80 | 155.4 | 2.44 | 1.57 |
| | Serum | Control 3 | 1 | 80 | 213.2 | 2.99 | 1.40 |

a The point estimate is based on the data from one system, run for twenty days, two runs per day, two observations per run on an instrument operated and maintained according to the manufacturer`s instructions.

Samples with mean values in the ORDAC range were also evaluated on one system using twenty replicates. Samples with a mean value of 716.2 mg/dL showed a standard deviation of 12.5 mg/dL and a coefficient variation of 1.75%. Samples with a mean value of 876.3 mg/dL showed a standard deviation of 19.9 mg/dL and a coefficient of variation of 2.28%.

NOTICE

These degrees of precision and equivalency were obtained in typical testing procedures on a SYNCHRON LX System and are not intended to represent the performance specifications for this reagent.

## ADDITIONAL INFORMATION

For more detailed information on UniCel DxC Systems, refer to the appropriate system manual.



### SHIPPING DAMAGE

If damaged product is received, notify your Beckman Coulter Clinical Support Center.

### REVISION HISTORY

**Revision AG**

Updated corporate address; updated European Hazard Classification and OSHA precaution.

**Revision AH**

Revised Quality Control section. Removed OSHA precaution, and Sodium Azide warning.

**Revision AJ**

Added Revision History

**Revision AK**

Added new language requirement: Czech, and Korean.

**Revision AL**

Removed references to CX and LX systems as they are discontinued effective 12/2013.

Added Beckman Coulter trademark statement and disclaimer.

**Revision AM**

Added GHS Classification information

**Revision AN**

Added new language requirement: Romanian

**Revision AP**

Updates to comply with requirements per Beckman Coulter Global Labeling Policy.

New statement (item #3) added under INTERFERENCES section.

**Revision AR**

Additional changes to comply with requirements per Beckman Coulter Global Labeling Policy.

**Revision AT**

Added new language requirement: Bulgarian, Serbian, and Vietnamese. Additional changes to comply with requirements per Beckman Coulter Global Labeling Policy.

## SYMBOLS KEY

**Table 10.0**

| | | | |
|---|---|---|---|
| REF | Catalogue Number | IVD | In Vitro Diagnostic |
| CONTENTS | Contents | | Temperature limit |
| | Manufacturer | | Expiration Date |
| LOT | Batch code | SDS | Safety Data Sheet |
| CE | CE Mark | | Consult Instructions for Use |
| EC REP | Authorized Representative in the European Community | | Date of Manufacture |
| | Caution | | Do not reuse |
| Made in USA of US and Foreign Components | | Made in USA of US and Foreign Components | |

# REFERENCES


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