

V. 510(K) SUMMARY: CARESIDE™ DIRECT BILIRUBIN SAFETY AND EFFECTIVENESS

I. Applicant Information

A. Applicant Name	CARESIDE, Inc.
B. Applicant/Manufacturer Address	6100 Bristol Parkway Culver City, CA 90230
C. Telephone Number	310-338-6767
D. Contact Person	Kenneth B. Asarch, Pharm.D., Ph.D.
E. FAX Number	310-338-6789
F. e-Mail Address	AsarchK@CARESIDE.com
G. Date 510(k) Summary prepared	November 5, 1999

II. Device Information

A. Device Name (Trade)	CARESIDE™ <i>Direct Bilirubin</i>
B. Device Name (Classification)	Direct bilirubin test system
C. Device Classification	Clinical chemistry panel Bilirubin (total or direct) test system Regulation Number: 21 CFR 862.1110 Regulatory Class 2 Classification Number: 75CIG
D. Special controls and performance standards	None applicable

III. Substantial Equivalence Claim

A. General equivalency claim

The ability to monitor analyte-specific biochemical reactions in dry film and other formats is widely recognized and has gained widespread acceptance for use in chemistry assays. As well, the ability to measure direct bilirubin via reaction with sodium nitrite and sulfanilic acid is used in other commercial methods.

Direct bilirubin *in vitro* diagnostic products are already on the U.S. market, including spectrophotometric methods from Trace America, Inc. and from Boehringer Mannheim/Hitachi 902.

B. Specific equivalency claim

This CARESIDE™ *Direct Bilirubin* test is substantially equivalent in intended use and clinical performance to the currently marketed reagents for the quantitative measurement of direct bilirubin on the Trace America Direct Bilirubin. Both are based on the diazo method; however, the Trace America method is based upon liquid reagents while the CARESIDE method is based dry reagents.

Name of Predicate Device:	Trace America, Inc. Direct Bilirubin.
Predicate Device 510K number:	K870365
Product Code:	75CIW

IV. Device Description

CARESIDE™ *Direct Bilirubin* cartridges are used with the CARESIDE *Analyzer*™ to measure direct bilirubin in whole blood, plasma or serum specimens. The CARESIDE™ *Direct Bilirubin* cartridge, a single use disposable *in vitro* diagnostic test cartridge, delivers a measured volume of plasma or serum to a dry film to initiate the measurement of direct bilirubin. The film cartridge (patent pending) contains all reagents necessary to measure direct bilirubin .

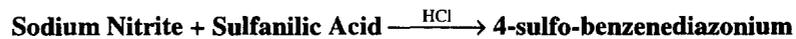
A. Explanation of Device Function

Each CARESIDE™ *Direct Bilirubin* cartridge consists of a direct bilirubin-specific multi-layer reagent film mounted in a plastic base with a hinged lid. The user introduces the specimen into the cartridge Sample Well, closes the lid and inserts the cartridge into the CARESIDE *Analyzer*™.

Once loaded, the CARESIDE *Analyzer*™ scans the cartridge barcode, brings the cartridge and the contained specimen to 37°C, and spins the cartridge to move the sample from the Sample Well into the cartridge channels and chambers. 8.5 microliters of sample remains in the metering passage. Any excess sample flows into an overflow well.

The 8.5 microliters of sample is automatically dispensed onto the multi-layer reagent film. The spreading layer distributes the specimen uniformly before it passes through to the absorption layer. The color intensity of the resulting bluish dye, as measured by the amount of reflected light at 570 nanometers, directly relates to the direct bilirubin concentration of the specimen.

Test Reaction Sequence:



As the cartridges spin, a photodiode measures reflectance of light emitted by a wavelength-specific light emitting diode (LED) over a fixed time period. The instrument uses the reflectance measurements and the lot-specific standard curve to calculate direct bilirubin concentration.

B. Test Summary

Bilirubin is formed by the reticuloendothelial system as a by-product of the breakdown of hemoglobin. Bilirubin circulates in multiple forms: (1) unconjugated bilirubin, sometimes referred to as indirect bilirubin, which circulates non-covalently bound to albumin, (2) conjugated or direct bilirubin which is covalently bound to glucuronic acid and circulates freely, and (3) covalently protein bound. Conjugated bilirubin, excreted into the bile by the liver, imparts to bile its major pigmentation.

In healthy individuals, a small amount of bilirubin is found in the serum. An increase in unconjugated bilirubin is more frequently associated with increased destruction of red blood cells (hemolysis); and an increase in conjugated bilirubin is more likely seen in dysfunction of the liver or bile ducts.

Total bilirubin is commonly measured as part of a routine examination. A normal level of total bilirubin rules out any significant impairment of the excretory function of the liver or excessive hemolysis of red blood cells. If the total bilirubin level is elevated, the direct bilirubin level may be measured in order to discriminate between the levels of conjugated and unconjugated bilirubin.

V. Intended Use

A. Intended Use

The CARESIDE™ *Direct Bilirubin* cartridge is intended for *in vitro* diagnostic use in conjunction with the CARESIDE *Analyzer*™ to quantitatively measure direct bilirubin in whole blood, plasma or serum.

B. Indications for Use

This product is indicated for use in the diagnosis and treatment of patients with hepatic, hemolytic hematological, and metabolic disease, including hepatitis and gall bladder blockage.

VI. Technological Characteristics

A. Similarities

	CARESIDE™ <i>Direct Bilirubin</i>	Trace Direct Bilirubin
Intended Use	Primarily to aid in the diagnosis and treatment of patients with hepatic, hemolytic hematological, and metabolic disease, including hepatitis and gall bladder blockage.	Same
Indications	For <i>in vitro</i> diagnostic use. For point of care use	For <i>in vitro</i> diagnostic use
Measurement	Quantitative	Same
Method Principle	Dry film, diazo method	Acid diazo method
Materials	Sulfanilic acid, sodium nitrite	Sulphanilic acid, sodium nitrite
Detector	Reflectance photometer (570 nm)	Spectrophotometer (550 nm)
Test time	Approx. 4 minute warm-up (on-board) plus approximately 5 minute test time.	10 minutes
Sample Type	Anti-coagulated whole blood, plasma, or serum plasma.	Serum
Specimen volume	8.5 µl test volume (90 ± 10 µl applied volume)	10 µl
Calibration	Calibration information bar-coded on each cartridge. Calibration information may change with each lot.	Calibration required.
Quality Control	2 levels	Same
Reporting Units	mg/dL	Same
Reaction Temp.	37 °C	Constant

B. Differences

	CARESIDE™ Direct Bilirubin	Trace Direct Bilirubin
Specimen Processing	Not required	Required
Accurate pipetting	Not required	Required
Reagent pre-warming	Not required	Required

C. Comparative Performance Characteristics

	CARESIDE™ Direct Bilirubin	Trace Direct Bilirubin
Detection limit	0.2 mg/dL	Depends on instrumentation
Reportable range	0.1 to 16 mg/dL	to 20 mg/dL
Accuracy	Mean recovery 97%	Not provided
Precision	Total CV, 2.2 mg/dL, 3.1%	Total CV, 1.2 mg/dL, 8.7%
Method comparison	CARESIDE™ = 0.99 (BM/Hitachi 902 Direct Bilirubin) + 0.019 mg/dL, r = 0.997	
Linearity	Linear up to 16 mg/dL.	Linear up to 20 mg/dL
Interference	No significant interference observed at tested concentration of interferent: Ascorbic Acid,..... 10 mg/dL Hemoglobin,..... 300 mg/dL Total Protein,..... 9 g/dL Triglycerides 3000 mg/dL	No reported interference

D. Conclusion

The nonclinical and clinical data provided demonstrate that the CARESIDE™ *Direct Bilirubin* product is as safe, effective, and performs as well as or better than the legally marketed predicate device



DEPARTMENT OF HEALTH & HUMAN SERVICES

Food and Drug Administration
2098 Gaither Road
Rockville MD 20850

DEC 27 1999

Kenneth B. Asarch, Ph.D.
VP Quality Systems and Regulatory Affairs
CARESIDE, Inc.
6100 Bristol Parkway
Culver City, California 90230

Re: K993771
Trade Name: CARESIDE™ Direct Bilirubin
Regulatory Class: II
Product Code: CIG
Dated: November 5, 1999
Received: November 8, 1999

Dear Dr. Asarch:

We have reviewed your Section 510(k) notification of intent to market the device referenced above and we have determined the device is substantially equivalent (for the indications for use stated in the enclosure) to legally marketed predicate devices marketed in interstate commerce prior to May 28, 1976, the enactment date of the Medical Device Amendments, or to devices that have been reclassified in accordance with the provisions of the Federal Food, Drug, and Cosmetic Act (Act). You may, therefore, market the device, subject to the general controls provisions of the Act. The general controls provisions of the Act include requirements for annual registration, listing of devices, good manufacturing practice, labeling, and prohibitions against misbranding and adulteration.

If your device is classified (see above) into either class II (Special Controls) or class III (Premarket Approval), it may be subject to such additional controls. Existing major regulations affecting your device can be found in the Code of Federal Regulations, Title 21, Parts 800 to 895.

A substantially equivalent determination assumes compliance with the Current Good Manufacturing Practice requirements, as set forth in the Quality System Regulation (QS) for Medical Devices: General regulation (21 CFR Part 820) and that, through periodic QS inspections, the Food and Drug Administration (FDA) will verify such assumptions. Failure to comply with the GMP regulation may result in regulatory action. In addition, FDA may publish further announcements concerning your device in the Federal Register. Please note: this response to your premarket notification submission does not affect any obligation you might have under sections 531 through 542 of the Act for devices under the Electronic Product Radiation Control provisions, or other Federal laws or regulations.

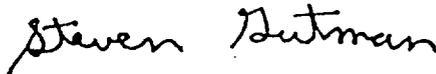
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Under the Clinical Laboratory Improvement Amendments of 1988 (CLIA-88), this device may require a CLIA complexity categorization. To determine if it does, you should contact the Centers for Disease Control and Prevention (CDC) at (770) 488-7655.

This letter will allow you to begin marketing your device as described in your 510(k) premarket notification. The FDA finding of substantial equivalence of your device to a legally marketed predicate device results in a classification for your device and thus, permits your device to proceed to the market.

If you desire specific advice for your device on our labeling regulation (21 CFR Part 801 and additionally 809.10 for in vitro diagnostic devices), please contact the Office of Compliance at (301) 594-4588. Additionally, for questions on the promotion and advertising of your device, please contact the Office of Compliance at (301) 594-4639. Also, please note the regulation entitled, "Misbranding by reference to premarket notification"(21 CFR 807.97). Other general information on your responsibilities under the Act may be obtained from the Division of Small Manufacturers Assistance at its toll-free number (800) 638-2041 or (301) 443-6597, or at its internet address "<http://www.fda.gov/cdrh/dsma/dsmamain.html>".

Sincerely yours,

A handwritten signature in black ink that reads "Steven Gutman". The signature is written in a cursive style.

Steven I. Gutman, M.D, M.B.A.
Director
Division of Clinical
Laboratory Devices
Office of Device Evaluation
Center for Devices and
Radiological Health

Enclosure

VII. INDICATIONS FOR USE

510(k) Number:

Device Name: CARESIDE™ *Direct Bilirubin*

Indications for use: For *in vitro* diagnostic use with the CARESIDE Analyzer™ to measure direct bilirubin from whole blood, serum or plasma specimens to aid in the diagnosis and treatment of patients with hepatic, hemolytic hematologic, and metabolic diseases, including hepatitis and gall bladder blockage.



(Division Sign-Off)
Division of Clinical Laboratory Devices
510(k) Number K993771

(PLEASE DO NOT WRITE BELOW THIS LINE-CONTINUE ON ANOTHER PAGE IF NEEDED)

Concurrence of CDRH, Office of Device Evaluation (ODE)

Prescription Use
(Per 21 CFR 801.109)

OR

Over-The-Counter Use
(Optional Format 1-2-96)