

**CO<sub>2</sub> XL Reagent****Special 510(k): Device Modification Summary****I. Submitter's Name/Contact Person**

Melissa A. Saner/Manager

**Address**

Raichem Division of Hemagen Diagnostics Inc. # 2022395  
 Formerly: Reagents Applications, Inc.  
 8225 Mercury Court  
 San Diego, CA 92129  
 Phone: 619-569-8009  
 Fax: 619-569-6208

**Date Prepared**

June 1, 1998

**II. Device Name**

Trade Name: CO<sub>2</sub> XL Reagent  
 Common Name: Carbon Dioxide  
 Classification Name: Bicarbonate/carbon dioxide Test System  
 Device Classification: II  
 Regulation Number: 21 CFR 862.1160  
 Panel: Chemistry (75) CDT

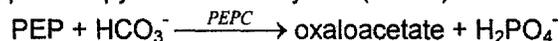
**III. Predicate (Cleared) Device**

CO<sub>2</sub> Reagent: 510(k) Docket No. K854544  
 Manufactured By: Raichem Division of Hemagen Diagnostics Inc. (Reagents Applications, Inc.)  
 Submitted By: Reagents Applications, Inc.

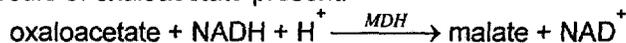
**IV. Description of Modified Device**

This reagent is intended for the quantitative in vitro enzymatic determination of CO<sub>2</sub> in serum or plasma on manual or automated systems.

The method used in the present procedure is based on the following reactions. Carbon dioxide, in the form of bicarbonate ions, reacts with phosphoenolpyruvate (PEP) to form oxaloacetate and phosphate. This reaction is catalyzed by the enzyme phosphoenolpyruvate carboxylase (PEPC).



This reaction is coupled with a second enzymatic reaction. Oxaloacetate, in the presence of malate dehydrogenase (MDH), is converted to malate, by reduced nicotinamide adenine dinucleotide (NADH). In this reaction one molecule of NADH is oxidized for each molecule of oxaloacetate present.



The decrease in absorbance resulting from the oxidation of NADH is proportional to the original concentration of CO<sub>2</sub> in the sample.

Raichem wishes to market an extended stability formulation modification of the predicate device. Slight variations in the concentrations of ingredients were made to achieve an extended reconstituted stability of one year at 2 to 8 °C. The assay procedure and timing of the assay is the same as that of the predicate device.

## V. **Intended Use of Modified Device**

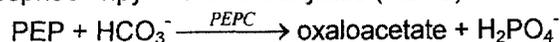
This reagent is intended for the quantitative in vitro enzymatic determination of CO<sub>2</sub> in serum or plasma on manual or automated systems. The measurement of serum or plasma CO<sub>2</sub> content is useful in the assessment of disturbances of acid-base balance in respiratory or metabolic acidosis and alkalosis.

## VI. **Substantial Equivalence**

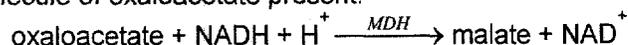
### **Modified Device**

This reagent is intended for the quantitative in vitro enzymatic determination of CO<sub>2</sub> in serum or plasma on manual or automated systems.

The method used in the present procedure is based on the following reactions. Carbon dioxide, in the form of bicarbonate ions, reacts with phosphoenolpyruvate (PEP) to form oxaloacetate and phosphate. This reaction is catalyzed by the enzyme phosphoenolpyruvate carboxylase (PEPC).



This reaction is coupled with a second enzymatic reaction. Oxaloacetate, in the presence of malate dehydrogenase (MDH), is converted to malate, by reduced nicotinamide adenine dinucleotide (NADH). In this reaction one molecule of NADH is oxidized for each molecule of oxaloacetate present.

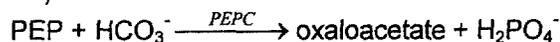


The decrease in absorbance resulting from the oxidation of NADH is proportional to the original concentration of CO<sub>2</sub> in the sample.

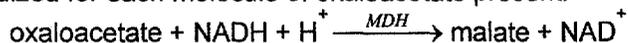
### **Predicate (Cleared) Device**

Raichem CO<sub>2</sub> Reagent is intended for the quantitative in vitro enzymatic determination of CO<sub>2</sub> content in serum or plasma.

The following enzymatic reactions are involved in the assay: Carbon dioxide (in the form of bicarbonate ions) reacts with phosphoenolpyruvate (PEP) to form oxaloacetate and phosphate. This reaction is catalyzed by the enzyme phosphoenolpyruvate carboxylase (PEPC).



This reaction is coupled with another enzymatic reaction in which oxaloacetate, in the presence of malate dehydrogenase (MDH), is converted to malate, by reduced nicotinamide adenine dinucleotide (NADH). In this reaction one molecule of NADH is oxidized for each molecule of oxaloacetate present.



The decrease in absorbance resulting from the oxidation of NADH is proportional to the original concentration of CO<sub>2</sub> in the sample.

### **Summary**

The intended use and the fundamental scientific technology of the device remain the same. The CO<sub>2</sub> XL Reagent (modified device) is substantially equivalent to the predicate (cleared) device.

## VII. Performance Data

### Precision

#### Manual Assay

##### Within Run

Mean (mmol/L)	15.7	23.2
SD	0.7	0.4
CV (%)	4.3	1.8
N	10	10

##### Total

Mean (mmol/L)	15.3	23.2
SD	0.9	0.5
CV (%)	5.7	2.3
N	20	20

### Hitachi 717

Precision studies were performed in 52 runs over a period of 26 days following the NCCLS EP5-T2 Tentative Guideline.

Mean (mmol/L)	Total		Within Run	
	SD	CV %	SD	CV %
15.6	0.6	3.7	0.3	1.8
27.8	0.6	2.0	0.4	1.3

### Comparison Testing

#### Comparison with Raichem CO<sub>2</sub> Reagent (510(k) No. K854544)

Number of sample pairs	65
Range of results (mmol/L):	4 - 40
Correlation Coefficient :	0.993
Regression Equation:	$y = 0.988x + 0.43$

Note: where x = CO<sub>2</sub> Reagent, y = CO<sub>2</sub> XL Reagent

#### Automated Method (Hitachi 717) Comparison with Raichem CO<sub>2</sub> Reagent (510(k) No. K854544) on Hitachi 717 following the NCCLS EP9-A Approved Guideline

Number of sample pairs	107
Range of results (mmol/L):	7 - 46
Correlation Coefficient :	0.998
Regression Equation:	$y = 0.976x + 0.487$

Note: where x = CO<sub>2</sub> Reagent, y = CO<sub>2</sub> XL Reagent

### Interfering Substances

Interference from bilirubin, hemolysis, and lipemia was evaluated in accordance with NCCLS EP7-P.

**Bilirubin:** No significant interference observed up to 20 mg/dL of bilirubin.

**Hemolysis (Hemoglobin):** No significant interference observed up to 500 mg/dL of hemoglobin.

**Lipemia:** No significant interference observed up to 3000 mg/dL of triglycerides.

**Summary**

The product performance has been evaluated by both manual and automated analyzer methods. The results of the comparative studies support the claim that the Raichem CO<sub>2</sub> XL Reagent (modified device) is substantially equivalent to the predicate (cleared) device.

The safety and effectiveness information upon which the substantial equivalence determination is based has been enclosed with this submission. This has been prepared in accordance with the requirements of the SMDA 1990 and 21 CFR Sections 807.87.



DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

JUN 24 1998

Food and Drug Administration  
2098 Gaither Road  
Rockville MD 20850

Melissa A. Saner  
Manager  
RAICHEM Division of Hemagen Diagnostics  
8225 Mercury Court  
San Diego, CA 92111

Re: K982056  
Trade Name: CO2 XL Reagent Application  
Regulatory Class: II  
Product Code: CDT  
Dated: June 2, 1998  
Received: June 9, 1998

Dear Ms. Saner:

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.

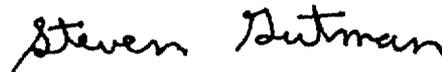
Failure to comply with the GMP regulation may result in regulatory action. In addition, FDA may publish further announcements concerning your device in the Federal Register. Please note: this response to your premarket notification submission does not affect any obligation you might have under sections 531 through 542 of the Act for devices under the Electronic Product Radiation Control provisions, or other Federal laws or regulations.

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 at (301) 443-6597, or at its internet address "<http://www.fda.gov/cdrh/dsmamain.html>".

Sincerely yours,

A handwritten signature in black ink that reads "Steven Gutman". The signature is written in a cursive style with a large initial 'S' and 'G'.

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

Device Name:

CO2 XL Reagent

**Indication(s) For Use**

The use of this reagent is indicated for the measurement of CO<sub>2</sub> levels in serum or plasma on manual or automated systems. The measurement of serum or plasma CO<sub>2</sub> content is useful in the assessment of disturbance of acid base balance in respiratory or metabolic acidosis and alkalosis

(PLEASE DO NOT WRITE BELOW THIS LINE)

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Concurrence of CDRH, Office of Device Evaluation (ODE)

*Clara Sluis*

(Division Sign-Off)  
Division of Clinical Laboratory Devices

510(k) Number

K982056

Prescription Use   
(Per 21 CFR 801.109)

OR

Over-The-Counter-Use