

**510(k) SUBSTANTIAL EQUIVALENCE DETERMINATION
DECISION SUMMARY
ASSAY ONLY TEMPLATE**

A. 510(k) Number:

k111143

B. Purpose for Submission:

New Device

C. Measurand:

Total Bilirubin

D. Type of Test:

Quantitative enzymatic, photometric assay

E. Applicant:

Polymedco, Inc.

F. Proprietary and Established Names:

Poly- Chem 90 Total Bilirubin test

G. Regulatory Information:

1. Regulation section:

21 CFR 862.1110 Bilirubin (total or direct) test system

2. Classification:

Class II

3. Product code:

CIG

4. Panel:

H. Intended Use:

1. Intended use(s):

See indications for use below.

2. Indication(s) for use:

Poly-Chem 90 Total Bilirubin is for the quantitative in vitro measurement of the level of total bilirubin in human serum on the Poly-Chem 90 clinical chemistry analyzer. Measurements of the level of bilirubin, an organic compound formed during the normal and abnormal destruction of red blood cells, is used in the diagnosis and treatment of liver, hemolytic hematological, and metabolic disorders, including hepatitis and gall bladder block.

3. Special conditions for use statement(s):

For prescription use only

4. Special instrument requirements:

Poly-Chem 90 analyzer

I. Device Description:

The Poly-Chem 90 Total Bilirubin reagent contains two liquid reagents, R1 and R2, with ingredients listed below:

REAGENT	QTY IN KIT	CONTENTS	CONCENTRATION
R1. Caffeine	2 x 50 ml	Caffeine	0.26 mmol/L
		Sodium benzoate	0.52 mmol/L
R2. Sulphanilic Acid	8 x 4 ml	Sulphanilic acid	29 mmol/L
		Hydrochloric acid	170 mmol/L
		Sodium nitrite	250 mmol/L

J. Substantial Equivalence Information:

1. Predicate device name(s):

Poly-Chem Total Bilirubin

2. Predicate 510(k) number(s):

k973995

3. Comparison with predicate:

Similarities and Differences Total Bilirubin		
Item	Poly-Chem 90 Total Bilirubin (Candidate device)	Poly-Chem Total Bilirubin (Predicate device)
Intended Use /Indications for Use	For the quantitative in vitro measurement of the level of bilirubin in human serum. Measurements of the level of bilirubin, an organic compound formed during the normal and abnormal destruction of red blood cells, are used in the diagnosis and treatment of liver, hemolytic hematological, and metabolic disorders, including hepatitis and gall bladder block.	Same
Sample type	Serum	Serum and plasma
Test methodology	Colorimetric	Same
Precision	Intraassay: %CV from 0.4% to 1.7% Interassay: %CV from 4.3% to 5.4% Samples from 0.50 to 25.71 g/dL	Intraassay: %CV from 2.1% to 2.3% Interassay: %CV from 1.4% to 1.9% Samples from 0.92 to 5.29 mg/dL
Measuring range	0.1 – 27.5 mg/dL	0.09 - 25 mg/dL
Storage	15 - 25°C	Same
Expected values	Adults: up to 1 mg/dL (17 µmol/l)	Same
Analyzer	Poly-Chem 90	Poly-Chem 180

K. Standard/Guidance Document Referenced (if applicable):

- CLSI EP5-A2 *Evaluation of Precision Performance of Quantitative Measurement Methods; Approved Guideline-Second Edition.*
- CLSI EP6-A *Evaluation of the Linearity of Quantitative Measurement Procedures: A Statistical Approach; Approved Guideline.*
- CLSI EP17-A *Protocols for Determination of Limits of Detection and Limits of Quantitation; Approved Guideline.*
- ISO 14971:2000 *Medical devices - Application of risk management to medical devices*

L. Test Principle:

Colorimetric method based on that described by Jendrassik and Grof (1938). Total bilirubin is determined in the presence of caffeine, which releases albumin bound bilirubin, by the reaction with diazotized sulphanilic acid.

M. Performance Characteristics (if/when applicable):

1. Analytical performance:

a. *Precision/Reproducibility:*

Inter-assay precision:

Precision studies were performed with three serum samples at three different concentrations of bilirubin, on two separate Poly-Chem 90 instruments, over 10 days. Samples were tested in duplicate twice a day (N=20). Results are summarized in the table below:

Sample	Instrument	Mean (mg/dL)	Within run		Between run	
			SD	%CV	SD	%CV
1	1	0.50	0.008	1.65	0.027	5.40
	2	0.50	0.006	1.19	0.025	5.10
2	1	5.02	0.021	0.42	0.215	4.29
	2	4.98	0.032	0.65	0.225	4.51
3	1	25.71	0.059	0.23	1.270	4.94
	2	25.42	0.249	0.98	1.336	5.26

Intra-assay precision:

Intra-assay precision was performed with three serum samples at different concentrations of bilirubin on two instruments. Twenty replicates of each sample were tested within one instrument run. Results are summarized in the table below:

Replicate	Level 1		Level 2		Level 3	
	INSTR 1	INSTR 2	INSTR 1	INSTR 2	INSTR 1	INSTR 2
Mean (mg/dL)	0.51	0.50	5.10	5.00	24.07	23.66
SD	0.008	0.006	0.030	0.035	0.051	0.080
%CV	1.6%	1.1%	0.6%	0.7%	0.2%	0.3%
Minimum	0.49	0.49	5.05	4.92	23.98	23.52
Maximum	0.52	0.51	5.16	5.06	24.14	23.81
Range	0.03	0.02	0.11	0.14	0.16	0.29

b. Linearity/assay reportable range:

The linearity of bilirubin on the Poly-Chem 90 system was tested by mixing human serum containing the analyte (0.07-30.90 mg/dL) to obtain 9 concentrations of bilirubin. All samples were tested in triplicate on the Poly-Chem 90 analyzer and generated a linear regression correlation of the following:

Slope: 0.996

Intercept: - 0.091

The linearity studies support the sponsor's claimed measuring range of 0.1-27.5 mg/dL

c. Traceability, Stability, Expected values (controls, calibrators, or methods):

Traceability:

Bilirubin test is traceable to an internal master.

The master calibrator is traceable to NIST#916 based on diazo sulphanic acid and DPD methods.

d. Detection limit:

A limit of detection study was performed according to the CLSI EP17-A guideline. LoB was conducted using a blank sample measured 60 times and was calculated to be 0.0043 mg/dL. LoD and LoQ were conducted using five serum samples containing very low concentrations of bilirubin tested in replicates of three over four days. LoQ is defined as the concentration at which inter-assay precision is $\leq 10\%$ CV. LoD was calculated to be 0.0184 mg/dL and the LoQ is 0.08 mg/dL.

The sponsor's claimed measuring range of the device is 0.1 to 27.5 mg/dL.

e. Analytical specificity:

An endogenous interfering substances study was performed according to the CLSI EP7-A guideline. Serum samples containing the analyte at three levels (low, medium and high) of the test were spiked with the potentially interfering substance—hemoglobin and triglyceride—to several concentrations. Samples were then run in triplicate using the Poly-Chem 90 test. The recovery of the test at each concentration of interferents was calculated by comparing the mean result of testing with no interferents to the mean result at each level tested. The sponsor defines non-significant interference as bias $< 10\%$ between the spiked and unspiked samples. The highest level tested with no significant interference is listed in the table below.

Test	Hemoglobin	Triglyceride
Total Bilirubin	600 mg/dL	554 mg/dL

f. *Assay cut-off:*

Not applicable

2. Comparison studies:

a. *Method comparison with predicate device:*

Patient serum samples with values across the range of the assay were assayed on the Poly-Chem 180 instrument (predicate device,) vs. the Poly-Chem 90 instrument. 82 samples were analyzed (8 samples were spiked) in singlet on both methods. Results obtained were compared using Passing-Bablok analysis. Results are summarized in the table below:

Test	n	Range of samples	Slope (95% CI)	Intercept (95% CI)	r
Total Bilirubin	82	0.10 – 24.10 mg/dL	0.98 (0.98 to 0.99)	-0.03 (-0.04 to -0.01)	0.9998

b. *Matrix comparison:*

Not applicable. Serum is the only claimed sample type.

3. Clinical studies:

a. *Clinical Sensitivity:*

Not Applicable

b. *Clinical specificity:*

Not Applicable

c. *Other clinical supportive data (when a. and b. are not applicable):*

Not Applicable

4. Clinical cut-off:

Not Applicable

5. Expected values/Reference range:

Bilirubin: up to 1 mg/dL

Sherlock, S., (1990), Liver Disease, Chirchill London, page 204.

N. Proposed Labeling:

The labeling is sufficient and it satisfies the requirements of 21 CFR Part 809.10.

O. Conclusion:

The submitted information in this premarket notification is complete and supports a substantial equivalence decision.