

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

A. 510(k) Number:

k110416

B. Purpose for Submission:

Addition of using pleural fluid sample for pH measurement to the ABL835 FLEX analyzer previously cleared for whole blood gases, pH, electrolytes, co-oximetry, and expired air for the parameters pO₂ and pCO₂ (k041874).

C. Measurand:

pH in Pleural Fluid

D. Type of Test:

Quantitative, Ion Selective Electrode

E. Applicant:

Radiometer Medical ApS

F. Proprietary and Established Names:

ABL835 FLEX analyzer

G. Regulatory Information:

Product Code	Classification	Regulation Section	Panel
CHL Electrode measurement, blood-gases (PCO ₂ , PO ₂) and blood pH	Class II	21 CFR § 862.1120	Clinical Chemistry (75)

H. Intended Use:

1. Intended use(s) for pleural fluid pH:

See indications for use below.

2. Indication(s) for use for pleural fluid pH:

The ABL835 FLEX analyzer is intended for in vitro testing of pleural fluid samples for the pH parameter.

The pH measurement of pleural fluid can be a clinically useful tool in the management of patients with parapneumonic effusions. Critical values: pH >7.3 is measured in uncomplicated parapneumonic effusions. All pleural effusions with a pH of <7.3 are referred as complicated parapneumonic effusions; they are exudative in nature.

3. Special conditions for use statement(s):
This device is intended for prescription use only. If the measured values obtained for pleural fluid pH lie outside the test range (pH 7.0 to 7.5), Radiometer advises users to repeat the measurement by means of another method.
4. Special instrument requirements:
Performance data was provided for ABL835 FLEX analyzer.

I. Device Description:

The ABL835 FLEX analyzer is a member of the ABL800 FLEX blood gas analyzer family for the whole blood measurement of pH (whole blood and pleural fluid), pO₂, pCO₂, chloride, calcium, potassium, sodium, glucose, lactate, total bilirubin, and co-oximetry parameters (total hemoglobin, oxygen saturation, and the hemoglobin fractions FO₂Hb, FCOHb, FMetHb, FHHb, FHbF) and expired air for the parameters pO₂ and pCO₂. The ABL835 FLEX analyzer is comprised of a blood gas analyzer, a computer and software

J. Substantial Equivalence Information:

Predicate device name	Predicate 510(k) number
Roche Omni C Currently marketed as Roche Cobas b221	k050423

Comparison with predicate:

Item	Proposed Device	Predicate Device Roche Omni C (k050423)
Indication for Use for pleural fluid pH	Same	The pH measurement of pleural fluid can be a clinically useful tool in the management of patients with paraneumonic effusions. Critical Values: pH>7.3 is measured in uncomplicated paraneumonic effusions. All pleural effusions with a pH of <7.3 are referred as complicated paraneumonic effusions; they are exudative in nature.
Pleural fluid pH measuring range	Same	7.0 to 7.5
pH measurement principle	Same	Potentiometric
pH electrode	Same	pH-sensitive glass electrode.
Reference electrode	Same	Ag/AgCl
Calibration Method	Same	Two-Point liquid calibration
Calibration and QC solutions	Same	Discrete bottles and ampoules

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

CLSI EP5-A2: Evaluation of Precision Performance of Quantitative Measurement Methods.

CLSI EP9-A2: Method Comparison and Bias Estimation Using Patient Samples.

L. Test Principle:

The pH in Pleural fluid is measured by potentiometry. The potential of an electrode chain is recorded using a voltmeter, and related to the concentration of the sample, as described by the Nernst equation. An electrode chain describes an electrical circuit consisting of a sample, electrode, reference electrode, voltmeter, membranes and electrolyte solutions. The reference electrode maintains a stable, fixed potential against which other potential differences can be measured. The potential is not altered by sample composition.

M. Performance Characteristics (if/when applicable):

1. Analytical performance:

a. *Precision/Reproducibility:*

The evaluation of precision for the pleural fluid on the ABL835 FLEX analyzer was conducted using pooled human pleural fluid samples adjusted to three different pH levels (7.1, 7.3 and 7.5). The pH adjusted pleural fluid samples were frozen and thawed prior to testing. Each pH adjusted pleural fluid sample was analyzed on three ABL835 FLEX analyzers, 2 runs per day, and 2 aliquots per run for 20 days. The precision studies were performed according to CLSI EP5-A2.

pH	Number of Observations	Mean	Repeatability (S _o)	Total Precision (S _x)	%CV Total Precision
7.1	244	7.150	0.013	0.029	0.41
7.3	248	7.290	0.009	0.019	0.26
7.5	248	7.517	0.005	0.027	0.36

b. *Linearity/assay reportable range:*

Linearity data for pleural fluid collected in the comparison study (see Section M2a below) was used to demonstrate linearity on the ABL835 FLEX analyzer. Linear regression analysis of the results yielded the following:
 $y = 1.063x - 0.446, r^2 = 0.994.$

The measuring range for pleural fluid samples is pH 7.0 to 7.5.

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

The traceability, stability and expected value of pH calibration solutions (Calibration Solution 1 and 2) was previously cleared under k041874. The pH control solution kits (QUALICHECK3+ and QUALICHECK5+) were previously cleared under k904733 and k980135, respectively. The traceability, stability and expected value of the pH control solution kit (Range+

Qualicheck) were previously cleared under k980135.

d. Detection limit:

Detection limit for pleural fluid pH was established in the method comparison study M. 2 a. below and for whole blood pH in the previously cleared submission (k041874).

The measuring range for pleural fluid samples is pH 7.0 to 7.5.

e. Analytical specificity:

Analytical specificity was established in the previously cleared submission (k041874).

f. Assay cut-off:

Not applicable

2. Comparison studies:

a. Method comparison with predicate device:

A correlation study was performed between the proposed device (ABL835 analyzer) and the predicate device (Roche Omni C which is currently marketed as Roche Cobas b221) according to CLSI protocol EP9-A2. This study was performed using 58 pleural fluid samples, pH ranged from 6.93 to 7.57, obtained from 29 patients. Some of the samples were spiked with either NaOH or acetic acid to adjust the pH, so that the samples were evenly distributed in the pH range 7.0 to 7.5. All pleural fluid samples were frozen and thawed prior to testing. Eight samples were tested per day on two analyzers per day over a span of eight days. A single measurement obtained on an ABL835 analyzer was compared to an average of duplicate measurements obtained on the predicate device. Linear regression analysis of the results yielded the following:
 $y = 1.063x - 0.446, r^2 = 0.994.$

A bias plot of individual data points showed that all values were within ± 0.1 pH unit of the predicate device. At medical decision points of pH 7.2 and 7.3, the bias was 0.0074 and 0.0138, respectively.

b. Matrix comparison:

Not applicable

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:

Critical values: pH > 7.3 is measured in uncomplicated parapneumonic effusions. All pleural effusions with a pH < 7.3 are referred as complicated parapneumonic effusions; they are exudative in nature £,§,†.

£ Lesho EP, Roth BJ. *Chest* (1997) 5, 1291 – 1292.

§ Chandler TM, McCoskey EH, Byrd RP, Roy TM. *Southern Medical Journal* (1999) 92, 214 – 217.

† Hooper C, Lee YC, Maskell N. BTS Pleural Guideline Group. *Thorax* (2010) 65:Suppl 2: ii4-17.

N. Proposed Labeling:

The labeling is sufficient and 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.